

# Quad Cities Nuclear Power Station

## Fire Protection Report

### (FPR)

Amend 23 - October 2017

**Quad Cities Nuclear Power Station, Unit 1 and 2  
Renewed Facility Operating License Nos. DPR-29 (Unit 1) and DPR-30 (Unit 2)  
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## Effective Pages

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**1.0  
INTRODUCTION**

## 1.0 INTRODUCTION

### 1.1 Purpose

The purpose of the updated Fire Hazards Analysis is to provide a description of the approved station fire protection program that can be used to support the station in NRC audits and procedures to ensure that fire protection issues are addressed in safety reviews of future modifications.

The Updated Fire Hazards Analysis Report contains:

1. A summary description of the station fire protection program. This portion of the updated fire hazards analysis contains a summary of various aspects of the station fire protection program. The appropriate documents which contain the evaluation of station compliance with its commitments are referenced. The referenced documents are part of the Fire Protection Program Document Package (F.P.P.D.P.) and the Fire Protection Reports (F.P.R.).
2. A zone-by-zone description of the fire hazards and fire protection measures currently in place. The fire barriers required under both BTP APCSB 9.5-1, Appendix A and 10 CFR 50, Appendix R are identified in this section. References to the appropriate licensing documents are provided.
3. The comparison of the station's fire protection provisions with the guidelines of BTP APCSB 9.5-1, Appendix A, is provided in Section 5.0. Appendix A guidelines are provided for administrative procedures, quality assurance and fire protection features for general and specific plant areas.

## 1.2 Background

As part of the continuing NRC evaluation following the fire at Browns Ferry Nuclear Station in March 1975, Commonwealth Edison Company (ComEd) has outlined its fire protection program and features at Quad Cities Nuclear Power Station (QCNPS) in a number of documents submitted to the NRC between 1976 and the present.

The document entitled, "Information Relevant to Fire Protection Systems and Programs - Parts 1-3, April 1977," provided ComEd's response to the NRC initial request for a comparison of the fire protection provisions of Quad Cities Station with the guidelines of Appendix A to BTP APCS 9.5-1. This was ComEd's first Fire Hazards Analysis of Quad Cities Station and resulted in a number of fire protection modifications.

ComEd also responded to NRC guidelines regarding nuclear power plant fire protection programs issued in the following documents.

1. Supplementary Guidance on Information Needed for Fire Protection Evaluation, September 30, 1976,
2. Sample Technical Specifications, June 24, 1977, and
3. Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls, and Quality Assurance, August 12, 1977.

Following the review of these ComEd submittals and a plant inspection, the NRC staff docketed a Fire Protection Safety Evaluation Report (FPSER) for Quad Cities Units 1 and 2 in July 1979. A staff letter of February 12, 1981, confirmed that all FPSER items were considered closed with the exception of "Safe Shutdown Capabilities."

Implementation of these guidelines resulted in additional fire protection measures being incorporated to enhance the existing fire protection program and satisfy the NRC defense-in-depth philosophy. Many studies and much discussion were also associated with the subsequent NRC fire protection guidelines and requirements.

The fire protection rule, 10 CFR 50.48 and Appendix R of 10 CFR 50, was issued on February 17, 1981. 10 CFR 50.48(b) states: "Except for the requirements of Sections III.G, III.J, and III.O, the provisions of Appendix R to this part shall not be applicable to nuclear power plants licensed to operate prior to January 1, 1979, to the extent that fire protection features proposed or implemented by the licensee have been accepted by the NRC staff as satisfying the provision of Appendix A to Branch Technical Position BTP APCS 9.5-1 reflected in staff fire protection safety evaluation reports issued prior to the effective date of this rule, or to the extent that fire protection features were accepted by the staff in comprehensive fire protection safety evaluation reports issued before Appendix A to Branch Technical Position BTP APCS 9.5-1 was published in August, 1976."

At that time, the shutdown analyses and subsequent related correspondence for Quad Cities Station was well underway and being reviewed by the NRC staff. ComEd continued to provide the NRC staff with all of the necessary information for their review of the station's safe shutdown capability.

On July 1, 1982, ComEd submitted the final response and position on Generic Letter 81-12 questions, Safe Shutdown Capability, Associated Circuits, and a listing of the exact shutdown methods and necessary safe shutdown modifications for Quad Cities Station. Submitted with this response was Quad Cities Station's "Fire Protection Associated Circuits Analysis and Modifications Report." The cable discrepancy report was revised and resubmitted August 13, 1982, as a supplement to the Modifications Report.

Enclosure D of the July 1, 1982, submittal included the first formal exemption requests from the requirements of Appendix R Section III.G.3.b for fixed fire suppression and Section III.G.2 for three-hour fire barriers separating redundant divisions of safe shutdown equipment. The request for exemption from Section III.G.3.b was made for nine fire zones having electrical equipment critical to the power distribution necessary for normal and emergency operation of safety-related equipment for Unit 1 and 2 at Quad Cities. The request for exemption from Section III.G.2 was made for essential and associated cable in the reactor building basements of Units 1 and 2 of Quad Cities Station. A formal exemption was granted on July 23, 1983, from the requirements of Appendix R Sections III.G.3 and III.G.2 for the zones under consideration.

By cover letter dated December 30, 1982, the NRC staff stated that they had completed the review of Quad Cities Station Unit 1 and 2 alternate shutdown capability which is used to achieve safe shutdown in the event of a fire. This capability was evaluated against the requirements of Sections III.G and III.L of 10 CFR 50, Appendix R. Based on this review, the NRC staff concluded that Quad Cities Units 1 and 2 was in compliance with Appendix R Sections III.G and III.L regarding safe shutdown in the event of a fire. A Safety Evaluation Report (SER) was written on this Appendix R review. The conclusion of this evaluation states:

"We (the NRC staff) have reviewed the licensee's proposed alternate shutdown capability for Quad Cities in accordance with Appendix R criteria. Based on that review, we conclude that the performance goals for accomplishing safe shutdown in the event of a fire, i.e., reactivity control, inventory control, decay heat removal, pressure control, process monitoring and support functions are met by the proposed alternate. Therefore, we conclude that the requirements of Appendix R, Sections III.G.3 and III.L are satisfied. However, once the alternate system is implemented, the licensee will propose technical specifications for the new safe shutdown makeup pump comparable to these existing for the RCIC pump."

On the basis of these conclusions, ComEd management was confident that the intent of Appendix R had been satisfied and continued working to implement the identified modifications in accordance with 10 CFR 50.48 (c) (4).

On October 19, 1983, Generic Letter 83-33, which reemphasized NRC positions on certain requirements of Appendix R, was transmitted to Quad Cities Station Units 1 and 2. As a result, ComEd management decided to perform a reevaluation of the previous analysis to verify that misinterpretations did not exist.

### **1.3 Use of Fire Hazards Analysis**

#### 1.3.1 Procedures for Fire Protection Safety Analysis in Regard to Future Modifications

To insure that future modifications to plant systems do not adversely impact the fire protection program presently in place, station procedure CC-AA-103 requires a review of all modifications for impact on fire protection.

#### 1.3.2 Procedures for Future Updates of the FHA

The Fire Hazards Analysis report will be updated on a periodic basis per approved station procedures.

#### 1.4 Definitions

1. ANSI - American National Standards Institute
2. Automatic - self-acting, operating by its own mechanism, e.g., a change in current strength, pressure, temperature, or mechanical configuration.
3. Combustible Liquid - a liquid having a flash point at or above 100°F (37.8°C). Combustible liquids are subdivided as follows:

Class II liquids include those having flash points at or above 100°F (37.8°C) and below 140°F (60°C)

Class IIIA liquids include those having flash points at or above 140°F (60°C) and below 200°F (93.4°C)

Class IIIB liquids include those having flash points at or above 200°F (93.4°C)

4. Combustible Material - any material which burns or sustains the combustion process.
5. Design Basis Fire - that fire that is considered to cause the worst reasonable case damage assuming passive protective features function as designed, and manual, automatic, or other fire fighting actions have been initiated. The design-basis fire is the most severe fire that can credibly occur within a fire area or zone. Failure of all cables and equipment within a fire area or zone group is postulated except for cable or equipment with passive fire protection and components such as pipes, heat exchangers and CRD hydraulic units which are filled with water. Where equipment or cabling necessary for safe shutdown is located within the postulated fire area, analyses were performed to demonstrate their availability .
6. Electrical Conduit - rigid or flexible tubing usually either steel or aluminum in which electrical cables are run.
7. Equivalent Fire Area – this is a zone or zone group where the fire protection features including passive and active systems are sufficient to ensure that the design basis fire outside of the equivalent fire area will not result in damage to safe shutdown equipment within the equivalent fire area.

8. Equivalent Fire Barriers – these are barriers of substantial construction which, although they have features preventing them from being classified as rated, provide the required separation between fire zones or areas. Descriptions and justifications have been provided for each of these equivalent barriers detailing the equivalency of the protection provided in the approved Exemption Requests, Safe Shutdown Report, SERs, and other station documents.
9. Fire Area - that portion of a building or plant that is separated from other areas by 3-hour rated fire barriers (walls, floors, or roofs) with any openings or penetrations protected with seals or closures having a fire resistive rating equal to that of the barrier. Exceptions are justified with engineering evaluations.
10. Fire Barrier - those components of construction (walls, floors, and roofs) that are rated in hours by approving laboratories for resistance to a standard time/temperature curve to prevent the spread of fire.
11. Fire Break - a feature of construction which retards fire propagation along the length of cable(s) or prevents spreading of fire to nearby combustibles within a given fire area or fire zone.
12. Fire Brigade - the team of plant personnel assigned to fire fighting and trained in the manual fighting of fires by an established training program.
13. Fire Detectors - a device designed to automatically detect one or more aspects of the presence of fire and initiate an alarm system. Typical fire detectors are classified as follows:

Heat or thermal detector - a device which detects abnormally high temperature or rate-of-temperature rise.

Photoelectric detector - a device which detects the visible particles of combustion.

Ionization detector - a products-of-combustion detector whose actuation mechanism depends upon invisible pyrolysis or combustion products.

For further definitions, see National Fire Protection Association (NFPA) 72, National Fire Alarm Code.



14. Fire Door - a tested door and door assembly constructed and installed for the purpose of preventing the spread of fire through openings in walls, partitions, or other horizontal or vertical construction. (See NFPA 80 for classification and types of fire doors.)
15. Fire Hose Station - a standpipe and hose system consisting of 1-1/2 inch piping, 100% Dacron single jacket with Neoprene tube, 300-psi test UL-labeled fire hose; nozzle; and hose valve.
16. Fire Load - the amount of combustibles present in a given fire zone expressed in terms of potential heat release (Btu) per square foot of the fire zone

17. Fire Rating - refers to the endurance period of a fire barrier or structure and defines the period of resistance to a standard fire exposure elapsing before the first critical point in behavior is observed (refer to NFPA 251).
18. Fire Resistive - properties or designs to resist the effects of any fire to which a material or structure may be expected to be subjected. Fire resistive materials or assemblies of materials are noncombustible, but noncombustible materials are not necessarily fire resistive.
19. Fire Retardant - materials or structures which are combustible in whole or part but have been subjected to treatments or have surface coverings to prevent or retard ignition or the spread of fire under the conditions for which they are designed.
20. Fire Suppression - refers to capability for control and/or extinguishment of fires (fire fighting). Manual fire suppression activities refer to the use of manually initiated fixed pipe suppression systems, standpipe and hose, or portable extinguishers. Automatic fire suppression refers to fixed systems such as water sprinklers, halon, or carbon dioxide.
21. Fire Zones - subdivisions of fire areas defining natural divisions in fire areas for the purpose of discussion.
22. Flammable Liquids - a liquid having a flash point below 100°F and having a vapor pressure not exceeding 40 lb/in.<sup>2</sup> absolute at 100°F shall be known as a Class I liquid. Flammable liquids (Class I) are subdivided as follows:

Class IA includes those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class IB includes those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class IC includes those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).
23. Flashover - phenomena of a slowly developing fire producing radiant energy at wall or ceiling surfaces. The radiant feedback from those surfaces gradually heats the contents of the fire area, and when all the combustibles in the space have become heated to their ignition temperature, simultaneous ignition occurs as from a pilot ignition source.
24. FM - Factory Mutual Engineering Corporation and Factory Mutual Research Corporation.

- 25. Hydraulically designed sprinkler system - a fixed water suppression system in which sprinkler spacing and pipe sizing is, within established limits, determined by hydraulic calculation rather than a standard schedule of allowable pipe sizes.
- 26. Heat Load (Combustible Load) - the total amount of potential total heat release (Btu) present in a fire zone.
- 27. Ignition Temperature - minimum temperature to which a substance in air must be heated in order to initiate, or cause, self-sustained combustion independently of the heating or heat element.
- 28. MOV - motor-operated valve.
- 29. NFPA - National Fire Protection Association
- 30. Noncombustible - materials which will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.
- 31. Raceway - any channel for holding wires, cables, or busbars which is designed expressly for and used solely for this purpose.
- 32. RPS - reactor protection system.
- 33. Safe shutdown related systems and components - minimum systems and components required to shut down the reactor and maintain it in a safe shutdown condition as identified in the Safe Shutdown Analysis Report.
- 34. Safety-related systems and components - systems and components required to shut down the reactor, mitigate the consequences of postulated accidents, or maintain the reactor in a safe shutdown condition.
- 35. Sprinkler system - a fixed system of piping and components from the supply valve to the point at which water discharges from the system to the fire area. The system is normally activated by heat from a fire.

Sprinkler system classifications:

Wet pipe - a system employing automatic closed-head (fusible link operated) sprinklers and/or nozzles attached to a fixed piping system containing water and connected to a water supply so that water discharges immediately from sprinklers individually opened by a fire.

36. Preaction system - a system employing automatic closed-head sprinklers and/or nozzles attached to a fixed piping system containing air that may or may not be under pressure, with a fire detection system installed in the same areas as the sprinklers. Actuation of the fire detection system opens a valve which permits water to flow into the sprinkler piping system and then to be discharged from any sprinkler or nozzle which may have been opened by the heat from the fire.

Water spray system - a system employing directional open-head sprinklers and/or nozzles attached to a piping system connected to a water supply through an automatic valve which is opened by the operation of a separate fire detection system installed in the same areas as the sprinklers and/or nozzles. When this valve opens, water flows into the distribution piping system and discharges from all open sprinklers and/or nozzles simultaneously.

37. Standpipe or Manual Hose Stations - a fixed piping system connected to a water supply to provide effective fire hose streams for manual use by the fire brigade within the building.
38. TIP - Traversing in-core probe.
39. UL - Underwriters' Laboratories Inc.

**2.0  
FIRE PROTECTION PROGRAM**

## **2.0 FIRE PROTECTION PROGRAM**

### **2.1 General Concepts for the Fire Protection Program**

This section covers basic topics which must be addressed in the overall fire protection program. The references to specific documents are those contained in the Quad Cities Station's Fire Protection Program Documentation Package (F.P.P.D.P.).

#### 2.1.1 Defense-In-Depth

Quad Cities Station utilizes the defense-in-depth concept in order to ensure that safe shutdown capability is not impaired by a fire. The defense-in-depth concept achieves the high degree of safety required through the use of the following echelons of safety systems:

1. Prevent fire initiation.
2. Quickly detect and suppress fires once they have occurred.
3. Contain any unmitigated fires that might occur so that safe shutdown is not affected.

#### 2.1.2 Use of Water on Electrical Fires

Water spray is an effective extinguishing agent on electrical fires, particularly in grouped electrical cables since cable insulation and jacketing are ordinary combustibles and water spray is nonconductive. In plant areas where a water type suppression system is employed, measures have been taken to reduce the probability of equipment being damaged by water discharge. These measures include providing adequate area drainage, shielding the equipment from the spray, and curbing and or placing the equipment on pads or pedestals where needed.

Hose stations, where necessary, are equipped with fog nozzles designed for use on electrical type fires (as well as other types of fires). The fire brigade is trained in the classroom on the use of water for the extinguishment of electrical fires.

#### 2.1.3 Applicability of NFPA Codes

National Fire Protection Association (NFPA) codes were used as guidelines in the design of passive fire protection features (e.g., fire doors, dampers and walls) and active fire protection systems (i.e., fire suppression and detection systems) and in the development of administrative controls of fire hazards. A list of the NFPA Codes that have been reviewed are listed in Table 2.1-1. As the fire protection features have been modified, newer versions of the NFPA Codes have been used to design and install components. The newer version of the NFPA Code is identified and comments added to describe the applicability of the newer NFPA Code.

Unique situations and configurations arise in power plants that are not explicitly dealt with in the NFPA Codes. Detailed NFPA Code compliance reviews were conducted in 1985 using the NFPA Code revision of record. Details of these reviews are contained in Vol. 8 of the FPPDP. Follow up reviews were conducted in 1994 and 1998 to document activity on the deviations identified by the original report. (NTSC Report 93-125 and 98-041). In some cases, departure from NFPA Code requirements was determined to be acceptable based on technical justification. Table 2.1-2 provides a list of the deviations from NFPA Codes with the technical justification.

Table 2.1-1 - NFPA Codes of Record

NFPA Code	Year	Comments
4	1971	
4A	1969	
6	1974	
7	1974	
8	1974	
10	1975	
12	1973	
12A	1973	
13	1976/1991/2000	FWRV water spray system designed and installed per 1991 code. 2000 code used for U1 & 2 MPT system demands.
13A	1976	
14	1974	
15	1973/1985/1990/2001	MG set water spray systems were designed and installed per 1985 code. (MG sets abandoned in placed with oil removed) FWRV water spray system designed and installed per 1990 code. Water spray changes to accommodate 660 gal. FP Day Tanks 0-5205A/B were designed and installed per 2001 code.
16	1974	
20	1976/2003	660 gal. FP Day Tanks 0-5205A/B were designed and installed per 2003 code.
24	1973	
26	1976	
27	1975	
30	1973/2003	660 gal. FP Day Tanks 0-5205A/B were designed and installed per 2003 code.
49	1975	
50A	1973	
51	1974	
51B	1971	
69	1973	
70	1975	
72	1999	Installation of the MXL FAS reviewed against 1999 code.
72D	1975	
72E	1974/1984	Detectors installed as part of the upgrades in 1984 were evaluated against the 1984 code.
78	1975	
80	1975/1983	1983 code referenced for supplementary guidance in evaluating code compliance.
90A	1976	
92M	1972	
194	1974	
196	1974	
197	1966	
232	1980	
601	1975	



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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#7	07-01	Section 700	There is no Industrial Emergency Association which provides for "mutual aid" between Quad Cities and other industrial plants. (Ref. 2, pg 4, para 3).	In the event of a fire at Quad Cities, depending on the extent, the Emergency Preparedness procedures may be entered which in turn will provide the appropriate notification to surrounding plants, communities and authorities as needed. The Cordova Fire Department is trained to respond to fire emergencies at Quad Cities.
#10	10-01	Section 3-2	Extinguishers for class A hazards are not distributed in accordance with NFPA 10 (Ref. 3, pg 3, para 5; and pg 4, para 1).	Most hazards at Quad Cities involve electrical equipment and combustible liquids. For this reason, Quad Cities has more CO2 and dry chemical extinguishers than Class A extinguishers. CO2 extinguishers can be used to control a class A fire until the site fire brigade arrives. In addition, Quad Cities has properly distributed manual hose stations to also address the existing hazards. The combination of extinguishing agents available in the plant provides appropriate protection. (Ref EC 370562, rev 0)
#10	10-02	Section 3-3	Extinguishers for class B hazards are not distributed in accordance with NFPA 10. (Ref. 3, pg 4, para 3).	The increased travel distances for Class B extinguishers are acceptable due to the fact that there are no large quantities of flammable liquids and the major Class B fire hazards are protected by automatic detection/suppression systems. In addition, typical sources of fires, such as welding operations, are procedurally controlled. (Ref. 3, pg 4, para 3).
#10	10-03	Section 3-6	Extinguishers for class C hazards are not distributed in accordance with NFPA 10. (Ref. 3, pg 5, para 3).	CO2 extinguishers are located in close proximity to where major energized equipment exists. In addition, hose reels equipped with electrically safe nozzles are also distributed throughout the plant and in close proximity to electrical equipment. Given that, the code deviation is justified. (Ref 3, pg 5, para 3).
#10	10-04	Sections 1-4 and 4-3	Extinguisher instructions do not face outward in accordance with NFPA 10.	Fire brigade members are trained and periodically retrained on using fire extinguishers. Therefore, the fire brigade can effectively use extinguishers even if the extinguisher instructions do not face outward. Personnel can turn the extinguishers to read the instructions if necessary. (Ref AT 3971637-02) .
#12	12-01	2321	Unit 1 DG and Day Tank Rooms Do not meet the 34% concentration within 60 seconds.	Transmittal 92-060 dated 5-26-92 concludes that for the expected type of fire, the concentrations achieved were sufficient to determine the system would be operable. However, the results of the test were marginal. To enhance overall system performance, the discharge time is increased to 96 seconds. Implementation of this recommendation substantially increases the margin of safety by achieving the CO2 design concentration of 34%. (Ref. 19)
#12	12-02	2521	Unit 1 DG and Day Tank Rooms Do not meet their design concentration within 60 seconds.	Transmittal 92-060 dated 5-26-92 concludes that for the expected type of fire, the concentrations achieved were sufficient to determine the system would be operable. However, the results of the test were marginal. To enhance overall system performance, the discharge time is increased to 96 seconds. Implementation of this recommendation substantially increases the margin of safety by achieving the CO2 design concentration of 34%. (Ref. 19)
#12	12-03	2321	Unit 2 DG and Day Tank Rooms Do not meet the 34% concentration within 60 seconds.	Transmittal 92-060 dated 5-26-92 concludes that for the expected type of fire, the concentrations achieved were sufficient to determine the system would be operable. This evaluation was originally applied to Unit 1, but because Unit 2 performed better than Unit 1 on the Cardox tests, the analysis can be applied to Unit 2. (ECR 430257, Ref. 19)

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#12	12-04	2521	Unit 2 DG and Day Tank Rooms Do not meet their design concentration within 60 seconds.	Transmittal 92-060 dated 5-26-92 concludes that for the expected type of fire, the concentrations achieved were sufficient to determine the system would be operable. This evaluation was originally applied to Unit 1, but because Unit 2 performed better than Unit 1 on the Cardox tests, the analysis can be applied to Unit 2. (ECR 430257, Ref. 19)
#13	13-02	1-11.3.1	Lack of documentation verifying hydrostatic tests (200 psig for 2 hours) have been conducted for several sprinkler systems included in Table One on pgs 9-11. (Ref. 4, pg 4, Sect 2.2).	All identified systems were installed by Grinnell or Automatic Sprinkler whose standard practice, based on experience, is to hydrostatically test all such systems. This is supported by the fact that 40% of the listed sprinkler systems in Table One did have hydrostatic test documentation available. The integrity of the existing sprinkler systems is further supported by the fact that there have been no known leaks or breaks at normal system pressures as a result of inadequate installation or construction. (Ref. 4, pg 21, Sect 6.4).
#13	13-03	4.1.1(3)	U1 RHR SW & CB pumps: The sprinkler at location M as shown on Sketch QC-FP-SK1 (Ref. 4, pg 80) is partially blocked by a minor obstruction (Ref. 4, pg 27, Sect 7.1.3).	Adequate coverage is provided by sprinklers under the stairs above. Therefore, justification exists for not relocating this sprinkler (Ref. 4, pg 27, Sect 7.1.3).
#13	13-04	4-3	U1 RHR SW & CB pumps: Sprinkler J as shown on Sketch QC-FP-SK1 (Ref. 4, pg 80) is located 2 ft. below the ceiling (Ref. 4, pg 27, Sect 7.1.4).	Relocation is not considered necessary due to adequate coverage from sprinklers located below stairs south of this sprinkler. (Ref. 4, pg 27, Sect 7.1.4).
#13	13-05	4-3	U2 RHR SW & CB pumps: Sprinklers in the RHR service water pump cubicles are approximately 24 inches below the ceiling, and this does not meet NFPA spacing requirements (Ref. 4, pg 29, Sect 7.2.2).	No combustibles are typically stored in the rooms so the most likely fire would be an oil fire which result in rapidly developing high temperatures. Because of this, the minor deviation from the code (2 ft vs. 1 ft from ceiling) can be justified since response time is expected to be similar. On that basis, the response time of the sprinklers will not need to be modified. (Ref. 4, pg 29, Sect 7.2.2).
#13	13-06	4-1	U1 & U2 HPCI pump Rooms: The systems in the HPCI pump areas provide only partial protection (Ref. 4, pg 30, Sect 7.3.1).	Additional protection is not recommended at this time since 1) this area is separated from other areas by 3-hour fire doors, walls, and ceiling, 2) disabling a single HPCI system does not prevent safe plant shutdown capability, 3) the automatic depressurization system provides functional redundancy to the HPCI systems, and 4) a redundant safe shutdown path exists which does not require the HPCI pumps (Ref. 4, pg 30, Sect 7.3.1).
#13	13-07	4-4.8.2	U1 CRD Feed pumps: The stairs in the northeast corner do not have any sprinkler protection underneath (Ref. 4, pg 31, Sect 7.4.1).	Combustibles are not allowed to be stored under the stairs so no fires are expected to originate or propagate from this area. Because of this, the absence of sprinkler protection in the area can be justified. (Ref. 4, pg 31, Sect 7.4.1).
#13	13-08	4-4.8.2	U2 CRD Feed pumps: The stairs in the southeast corner do not have any sprinkler protection underneath. (Ref. 4, pg 32, Sect 7.5.1)	Combustibles are not allowed to be stored under the stairs so no fires are expected to originate or propagate from this area. Because of this, the absence of sprinkler protection in this area can be justified. (Ref. 4, pg 32, Sect 7.5.1).
#13	13-09	4-3	U2 CRD Feed pumps: Four sprinklers in the NE area are 24" below the ceiling which exceeds the NFPA spacing limits. (Ref. 4, pg 32, Sect 7.5.3)	No combustibles are typically stored in the rooms so the most likely fire would be an oil fire which result in rapidly developing high temperatures. Because of this, the minor deviation from the code (2 ft vs. 1 ft from ceiling) can be justified since response time is expected to be similar. On that basis, this configuration is justified (Ref. 4, pg 32, Sect 7.5.3).

TABLE 2.1-2  
NFPA Code Deviations

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13-10	4-3	U1 Cable Tunnel: NFPA requires sprinklers to be located within 12 inches of the ceiling in areas with smooth noncombustible ceilings. Several of the top nozzles are located 16 to 39 inches below the ceiling. (Ref. 4, pg 33, Sect 7.6.1 and pg 35, Sect. 7.6.5)	<p>Due to the narrowness of the enclosure, concrete construction, and the design objective which is merely to limit fire damage in this area, the location of these sprinklers is considered acceptable up to a maximum of 25" below the ceiling. This distance may introduce a small delay in the actuation of several nozzles (due to extended time required for heat collection at the nozzle), however, their relocation would not result in a significant improvement in protection within the limits of the stated design objective. The existing nozzles which can be justified in their present position are the top nozzles on the following riser numbers: 7, 8, 11, 17 through 24, and 29. (Ref. 4, pg 33, Sect 7.6.1).</p> <p>There are only 2 risers where the top nozzle is located greater than 25 inches below the ceiling, risers #2 and #26. Neither is located near hatches and the remaining riser top nozzles in the area are located within 25 inches from ceiling so water spray from adjacent heads/risers will adequately control any fire in the area until #2 and #26 activate or until the fire brigade arrives. (Ref. 3, calc QC09 and QC10).</p>
#13	13-11	4-1.1.1(3)	U1 Cable Tunnel: Cable trays obstruct the distribution of water from nozzles to the floor area below. (Ref. 4, pg 34, Sect 7.6.2)	The most likely fire associated with the floor area beneath the cable trays is limited to combustible materials that may be stored there. Due to administrative controls that limit combustibles in the tunnels and the fact that the cable tray widths are small (under 4') allowing some coverage of the floor by the sprinkler system, no significant improvement in protection would be afforded by providing nozzles under the lowest tray. (Ref. 4, pg 34, Sect 7.6.2).
#13	13-12	4-3	U1 Cable Tunnel: In several areas, nozzles between trays are located 12 inches or less above the tray being protected, but are over 12 inches below the tray above. (Ref. 4, pg 34, Sect 7.6.3)	This may limit heat buildup at the head to fuse the nozzle, but a significant improvement would not result from moving the nozzle to be beneath the tray above. This is because cable tray fires burn slowly, allowing heat to dissipate. In these cases, nozzles may be more desirable located immediately above the tray. In addition, the entire area is provided with smoke detectors to provide prompt notification of fire conditions. See Section 7.6.3 for specific location of these conditions. (Ref. 4, pg 34, Sect 7.6.3)
#13	13-13	4-1.1.1(3)	U2 Cable Tunnel: Cable trays obstruct the distribution of water from the nozzles to the floor area below. (Ref. 4, pg 38, Sect 7.7.2)	The most likely fire associated with the floor area beneath the cable trays is limited to combustible materials that may be stored there. Due to administrative controls that limit combustibles and traffic in the tunnels and the fact that the cable tray widths are small (under 4') allowing some coverage of the floor by the sprinkler system, no significant improvement in protection would be afforded by providing nozzles under the lowest tray. (Ref. 4, pg 38, Sect 7.7.2).
#13	13-14	4-3	U2 Cable Tunnel: In several areas nozzles between trays are located 12 inches or less above the tray being protected, but are over 12 inches below the tray or ceiling above. (Ref. 4, pg 38, Sect 7.7.3).	This may limit heat build-up at the head to fuse the nozzle, but a significant improvement may not result from moving the nozzle to be beneath the tray or ceiling above. This is because cable tray fires burn slowly, allowing heat to dissipate. In these cases, nozzles may be more desirable immediately above the tray. See Section 7.7.3 for specific location of these conditions. (Ref. 4, pg 38, Sect 7.7.3).

**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13-15	4-3	U2 Cable Tunnel: At riser 2C, the west 4' of trays are unprotected by sprinkler nozzles (Ref. 4, pg 42, Sect 7.7.8)	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given this and the small size of the area that is unprotected, no significant improvement in protection would result from providing additional nozzles. (Ref. 4, pg 42, Sect 7.7.8).
#13	13-16	4-1.1.1(3)	U2 Cable Tunnel: South of riser 1 E, on the first and second levels, about 2' of cable tray is not covered by nozzles on riser 1D due to an obstruction. (Ref. 4, pg 42, Sect 7.7.10).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given this and the small size of the area that is obstructed, no significant improvement in protection would result from providing south-facing nozzles. (Ref. 4, pg 42, Sect 7.7.10).
#13	13-17	4-1.1.1(3)	U2 Cable Tunnel: The top nozzle on the following riser numbers has a minor obstruction by a trapeze hanger. These riser numbers are: 3L, 3O, 4F, 4G, 4J, 4K, and 4M. (Ref. 4, pg 42, Sect 7.7.11).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given this and the small size of the area that is obstructed, no significant improvement in protection would result from reorienting or adding nozzles. (Ref. 4, pg 42, Sect 7.7.11).
#13	13-18	4-1.1.1(3)	U2 Cable Tunnel: On the east side of the tunnel approximately 4 feet north of column line 13, there is a minor unprotected portion of 3 cable trays due to obstructions by cables. (Ref. 4, pg 43, Sect 7.7.14).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given this and the small size of the area that is obstructed, no significant improvement in protection would result from reorienting or adding nozzles. (Ref. 4, pg 43, Sect 7.7.14).
#13	13-19	4-1.1.1(3)	U2 Cable Tunnel: Under a beam located between nozzle risers 4P and 4Q, there is a 2 foot long "dry spot" caused by the beam obstructing existing nozzles. (Ref. 4, pg 43, Sect 7.7.15).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given this and the small size of the area that is obstructed, no significant improvement in protection would result from reorienting or adding nozzles. (Ref. 4, pg 43, Sect 7.7.15).
#13	13-20	4-1	U2 Cable Tunnel: On risers 6B, 6C, 6D, 6H, and 6I, the second nozzle from the top is not centered beneath the top tray. (Ref. 4, pg 43, Sect 7.7.18).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. The existing nozzle placement, while not ideal, provides sufficient coverage to ensure that the design objective will be met. (Ref. 4, pg 43, Sect. 7.7.18).
#13	13-21	4-1.1.1(3)	U2 Cable Tunnel: West-facing nozzles would normally be required at riser 6CC on all levels to cover an elevation change in the tray which obstructs existing heads. (Ref. 4, pg 44, Sect 7.7.26).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given that the affected cable trays contain minor amounts of cable and there is adequate coverage in adjacent areas of the cable trays, no significant improvement in protection would result from providing additional nozzles. (Ref. 4, pg 44, Sect 7.7.26).
#13	13-22	Section 4-3	U1 Reactor Feed Pumps and Speed Increaser Gears Sprinklers in these rooms are generally located 24 inches below the ceiling, which is not in accordance with NFPA 13 spacing rules requiring heads within 12 inches of the ceiling. (Ref. 4, pg 46, Sect. 7.8.1).	Very few combustibles are typically stored in the room so the most likely fire would be an oil fire which result in rapidly developing high temperatures. Because of this, the minor deviation from the code (2 ft vs. 1 ft from ceiling) can be justified since response time is expected to be similar. On that basis, the response time of the sprinklers will not need to be modified. (Ref. 4, pg 46, Sect 7.8.1).
#13	13-23	4-1.1.1(3)	Cable trays 1788 and 1781 (3'-10" wide each) as well as an 18" pipe form minor obstructions to sprinklers in the northwest corner. (Ref. 4, pg 46, Sect 7.8.2).	The area directly under the cable trays and 18 inch pipe is a walkway where no combustibles are stored on the floor and no source of fire exists. The areas immediately adjacent to this corner have sprinkler protection and the areas over each Reactor Feed Pump (RFP) where any fire is likely to originate are also adequately protected with sprinklers. (Ref. 4, pg 46, Sect 7.8.2).

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13-24	Section 4-3	2 Reactor Feed Pumps and Speed increaser Gears: Sprinklers in these rooms are generally located 24 inches below the ceiling, which is not in accordance with NFPA 13 spacing rules requiring heads within 12 inches of the ceiling. (Ref. 4, pg 48, Sect 7.9.1).	Very few combustibles are typically stored in the room so the most likely fire would be an oil fire which result in rapidly developing high temperatures. Because of this, the minor deviation from the code (2 ft vs. 1 ft from ceiling) can be justified since response time is expected to be similar. On that basis, the response time of the sprinklers will not need to be modified. (Ref. 4, pg 48, Sect 7.9.1).
#13	13-25	3-14.6.3	U2 Reactor Feed Pumps and Speed Increaser Gears: The original plans for this system showed hangers located approximately 6" from the end sprinkler on each of the east branch lines. These hangers were not installed. (Ref. 4, pg 38, Sect 7.9.2).	Within 4' of these sprinklers, hangers are installed. The piping stress associated with the 4' of unsupported water filled piping is well within the limits of carbon steel piping from B31.1. Therefore, adequate support currently exists for these small sections of 1-inch pipe. (Ref. EC 376115, rev 0).
#13	13-26	4-1.1.1(3)	U2 Drum Storage Area: One nozzle in the center of the room is obstructed by unit heaters. (Ref. 4, pg 50, Sect 7.11.2).	The obstruction is minor and overlapping protection will be available from adjacent sprinklers 8' away. Relocation of this head is not justifiable in view of the marginal increase in protection that would be afforded. (Ref. 4, pg 50, Sect 7.11.2).
#13	13-27	Section 4-3	U1 Trackway: A pendant sprinkler east of the caustic tank room is positioned over 16 inches below the ceiling, which is not in accordance with NFPA 13 spacing requirements. (Ref. 4, pg 51, Sect 7.12.1).	A tray located near the sprinkler head would cause any rising heat to accumulate near the head allowing the fusible link to melt. Therefore, relocation of the head is not justified. (Ref. 4, pg 51, Sect 7.12.1).
#13	13-28	Section 4-3	EHC Fluid Reservoirs: The existing sprinklers at locations 11, 14, 15 and 18 as shown on Sketch QC-FP-SK5 (Ref. 4, pg 86) are located a considerable distance below the ceiling, in some cases exceeding 4 ft. (Ref. 4, pg 55, Sect 7.14.3)	These sprinklers are located in an area where there are no combustibles above them and the other sprinklers in the area provide adequate coverage of the EHC skids located below. (Ref. 4, pg 55, Sect 7.14.3).
#13	13-29	4-1.1.1(3)	U2 L.P.: Heater Bay – West Side: Three sprinklers located just north of column line 60 on the upper level of the low pressure heater bay are partially obstructed by a nearby crane rail running parallel to the branch line. (Ref. 4, pg 57, Sect 7.17.1).	This is justifiable since a second sprinkler branch line is located approximately 5' – 5" north of the crane rail and, therefore, adequately covers the affected area". (Ref. 4, pg 57, Sect 7.17.1).
#13	13-30	4-1.1.1(3)	U2 L.P.: Heater Bay – West Side: One sprinkler head located just north of column 9 at the far east portion of the upper level of the lower pressure heater bay (adjacent to the condenser unit) is partially obstructed by a 2-inch wide vertical support. (Ref. 4, pg 57, Sect 7.17.2).	The design objective of the wetpipe system in the U2 LP Heater Bay is to provide general area protection and to prevent the spread of fire beyond the source. Generally the most likely fire will be an oil fire originating in oil that has pooled following a turbine bearing lube oil pipe break. Generally, other combustibles are limited to short-term storage during outages and fire watches are provided where appropriate. Given this and the small size of the area that is obstructed, no significant improvement in protection would result from relocating a single nozzle. (Ref. 4, pg 58, Sect 7.17.2).
#13	13-31	4-1.1.1(3)	U2 H.P.: Heater Bay – East Side: A single sprinkler head location north of col. Line 11 and immediately west of col. Line G along the east wall of the high pressure heater bay is partially obstructed by a nearby HVAC duct. (Ref. 4, pg 59, Sect 7.19.1).	The obstruction is minor and overlapping protection will be available from adjacent sprinklers. Relocation of this head is not justifiable in view of the marginal increase in protection that would be afforded. (Ref. 4, pg 59, Sect 7.19.1).
#13	13-32	4-1.1.1(3)	U2 H.P.: Heater Bay – East Side: A single sprinkler head approximately 6'-0" south of column line 9 and 8'-0" west of column line G is partially obstructed by a large valve operator. (Ref. 4, pg 60, Sect 7.19.2).	The obstruction is minor and overlapping protection will be available from adjacent sprinklers. Relocation of this head is not justifiable in view of the marginal increase in protection that would be afforded. (Ref. 4, pg 60, Sect 7.19.2).

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13-33	4-1.1.1(3)	U2 H.P.: Heater Bay – East Side: The first sprinkler south of column line 9 and immediately east of column line G is partially obstructed due to close proximity of an electrical conduct adjacent to the sprinkler head. (Ref. 4, pg 60, Sect 7.19.3).	The obstruction is minor and overlapping protection will be available from adjacent sprinklers. Relocation of this head is not justifiable in view of the marginal increase in protection that would be afforded. (Ref. 4, pg 60, Sect 7.19.3).
#13	13-34	Section 4-3	Unit 1, 2, and ½ DG cells and Fuel Day Tank Rooms: Sprinklers are generally located more than 16 inches below the ceiling. (Ref. 4, pg 61, Sect 7.20.1).	No combustibles are typically stored in the rooms so the most likely fire would be an oil fire which result in rapidly developing high temperatures. Because of this, the minor deviation from the code (16 in vs. 12 in from ceiling) can be justified since response time is expected to be similar. On that basis, the sprinklers will not need to be relocated. (Ref. 4, pg 61, Sect 7.20.1).
#13	13-35	4-1.1.1(3)	Units 1, 2, and ½ DG Cells and Fuel Day Tank Rooms: In the Unit ½ day tank room, the sprinkler below the oil tank is located approximately 4 inches below the level of the diked spill area, with the possibility it could be submerged in the event of a spill. (Ref. 4, pg 61, Sect 7.20.2).	The sprinklers are a back-up to the CO2 system. Since the room is small and there are two ceiling sprinklers, justification exists for not relocating this head. (Ref. 4, pg 61, Sect 7.20.2).
#13	13-36	4-4.13	Cable Spreading Room: No sprinkler protection is provided below the cable trays, even where these trays exceed 4 ft. in width. (Ref. 4, pg 63, Sect 7.23.1).	The design objective is to prevent the spread of fire to other areas while limiting damage to the cabling. The most likely fire associated with the floor area beneath the cable trays is limited to combustible materials that may be stored there. Due to administrative controls that limit combustibles in these room and the fact that the nozzles in adjacent areas do provide adequate floor coverage to limit the spread of fire, no significant improvement in protection would be afforded by providing nozzles under the trays. (Ref. 4, pg 63, Sect 7.23.1).
#13	13-37	Section 4-3	Cable Spreading Room: The second nozzle from the bottom on riser #7 is located 12 inches or less above the tray protected, but is over 12 inches below the tray above. (Ref. 4, pg 64, Sect 7.23.2).	Cable tray fires burn slowly, allowing heat from the fire to more likely dissipate rather than accumulate effectively under the cable tray above. Given that, locating the nozzles immediately above the cable tray, as in this case, would be just as effective. Also, the design objective of the wetpipe system in this area is to prevent the spread of fire. The sprinklers in the adjacent areas will provide adequate protection to satisfy this objective. (Ref. 4, page 64, Sect 7.23.2).
#13	13-38	Section 4-1	Cable Spreading Room: Between sprinkler Nos. 20 and 26 there is a 4' section of cable tray 489T that is not covered by nozzles. (Ref. 4, pg 64, Sect 7.23.3).	The design objective of the wetpipe system in the cable tray area is to prevent the spread of fire to other areas while limiting damage to the cabling. Given that the affected cable trays contain minor amounts of cable and there is adequate coverage in adjacent areas of the cable trays, no significant improvement in protection would result from providing additional nozzles. (Ref. 4, pg 64, Sect 7.23.3).
#13	13-39	4-1.1.1(3)	Cable Spreading Room: There is a minor obstruction found by junction box 2SB-9/2SB-8 at ceiling. (Ref. 4, pg 64, Sect 7.23.4).	The obstruction is minor and overlapping protection will be available from adjacent sprinklers. Relocation of this head is not justifiable in view of the marginal increase in protection that would be afforded. (Ref. 4, pg 64, Sect 7.23.4).
#13	13-40	Section 4-1	Cable Spreading Room: North of nozzle risers N33 and N34, and northwest of sprinkler 58 there are five sections of cable trays where approximately 2' of the tray is not covered by existing nozzles. (Ref. 4, pg 64, Sect 7.23.5).	The design objective of the wetpipe system in the cable spreading room is to prevent the spread of fire to other areas while limiting damage to the cabling. Given this and the small size of the area that is unprotected, no significant improvement in protection would result from providing additional nozzles. (Ref. 4, pg 64, Sect 7.23.5).

**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13-42	4-1.1.1(3)	Unit 1 ASD Cooler Area: There is a small unprotected area in the southwest corner beneath a cable tray. (Ref. 4, pg 71, Sect 7.26.1).	The unprotected area is small and the obstruction allows some coverage from the sprinkler above as well as from adjacent sprinklers. Given that the design objective of the system is to limit the spread of fire from this area, additional nozzles are not necessary. (Ref. 4, pg 71, Sect 7.26.1). The MG Set Oil Coolers and Pumps were removed from this area per EC 366310, eliminating a major combustible source.
#13	13-43	Section 4-3	Unit 1 ASD Cooler Area: Sprinkler nos. 1, 2, 3, 6, 7, and 8 are located over 12 inches below cable trays or ceilings above. (Ref. 4, pg 72, Sect 7.27.1).	No combustibles are typically stored in the area so the most likely fire would be an oil fire which result in rapidly developing high temperatures. Because of this, the minor deviation from the code (sprinklers greater than 1 ft from ceiling) can be justified since response time is expected to be similar. On that basis, the location of the sprinklers will not need to be modified. (ref. 4, pg 72, Sect 7.27.1). Following removal of the oil from this area, the suppression system design objective is to limit fire damage in this area. Relocation of discrepant sprinkler heads would not result in significant protection improvement and is not required.
#13	13-44	3-13.2.1	Units 1 and 2 Turbine Bearing Life Pumps: These systems have non-indicating control valves on each riser, which do not meet the requirements for control valves in NFPA 13. (Ref. 4, pg 73, Sect 7.28.1).	The existing valves located on the sprinkler system protecting the Turbine Bearing lift pumps are maintained in a locked open position and are additionally monitored with a Potter GVS supervisory switch. The existing controls provide assurance that the sprinkler system is maintained in a ready condition.
#13	13-45	Section 4-3	Units 1 and 2 Turbine Bearing Lift Pumps: The closed nozzles are not provided with heat collectors. (Ref. 4, pg 73, Sect 7.28.2).	NFPA 13 does not require the use of heat collectors around closed nozzles. However, in response to the documented concern, the most likely fire associated with the lift pumps would be from the oil igniting. An oil fire will result in rapid heat generation and with the nozzles located 5 feet above the skid, it is expected the spray system will actuate.
#13	13-46	3-13.2.1	Units 1 and 2 Turbine Bearing Protection: The sprinkler systems provide deluge protection for the turbine bearings have non-indicating control valves. (Ref. 4, pg 74, Sect 7.29.1).	The valves are administratively controlled in their required position which ensures a flow path to the deluge system.

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13-47	Section 4-3	Unit 1 ASD Cooler Area, Unit 2 Motor Generator Set: Ceiling sprinklers are located 16 to 20 inches below the ceiling. (Ref. 4, pg 75, Sect 7.30.1).	The most likely fire in this area is a postulated oil fire which would generate intense heat, more than enough to ensure sprinkler actuation would operate effectively. In addition, the hazard is also protected by a water spray system which supplements the ceiling sprinklers. (Ref. 4, pg 75, Sect 7.30.1). With the oil removed from the MG Sets per EC 366310 and EC 366314, there are minor combustible materials located in the area of the MG Sets, the combustible load of the Turbine operating floor if negligible and transient combustible materials are controlled by station procedures. Thus, it is very unlikely for a fire to start near the MG Sets or on the Turbine operating floor. In the unlikely event of an Appendix R type fire, the suppression systems in the area of the MG Sets would be actuated and prevent the spread of a fire into the equivalent fire areas. Thus with the oil removed from the MG Sets, the ability to achieve and maintain safe shutdown is not affected.
#13	13-48	Section 4-1	Units 1 and 2 Bus Duct Penetrations: On each of two systems, two sprinklers were installed in accordance with the original sprinkler contractor's plans. These heads were aimed at a set of three ducts on each unit penetrating the east wall. (Ref. 4, pg 79, Sect 7.32.1).	These ducts contain bare wires with ceramic insulators. Due to the lack of cable insulation or other combustibles within these ducts, the proposed sprinklers are not considered necessary to provide the required protection. (Ref. 4, p g 79, Sect 7.32.1).
#13	13S-49	13 and 13A	NFPA 13A required weekly checks of control valve position. Quad Cities procedures indicate the valve position checks are performed quarterly, but the remaining surveillances are not conducted. (Ref. 5, pg 9, Sect 3.3, para 2, subpart 7; and pg 7, Table 3.3.1, Item 2 and 3).	NFPA history indicates the most common cause of sprinkler system failure has been the control valve found closed. In a nuclear power plant, controls and training are in place to assure that valves and equipment are in the correct position. Valves aren't repositioned without procedural direction and are only manipulated by the operating dept. The chance of inadvertent closure of a sprinkler control valves is minimal. Therefore a reduction in the frequency of this surveillance is acceptable. (Ref. ECR 52828). NFPA requires valve position to be supervised in the open position using an accepted method which may include seals, locks, etc. Administrative controls other than seals are used at Quad Cities so the seal integrity check requirement of 13A does not apply. Valve operation is verified annually under QCOS 4100-02. At the same time the valve stem is lubricated to ensure valve remains free to move when needed. History has shown that the annual stroke and stem lubrication has been successful at maintaining the operability of the valves. Therefore the reduction in the frequency of this surveillance is justified.



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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#13	13S-50	13 and 13A	NFPA 13A requires weekly check of riser gage readings, as well as a 2-inch drain test at each riser. These requirements are not being implemented. However, NFPA 13A requires these tests at sprinklered properties normally served by city water connections. The test verifies that the city supply is in service. (Ref. 5, pg 9, Sect 3.3, para 2, subpart 8; and pg 7, Table 3.3.1, Item 5).	Since the water supply at Quad Cities is totally under plant control, these tests are unnecessary. (Ref. 5, pg 9, Sect 3.3, para 2, subpart 8).
#13	13-51	3-14.6.3	Cable Spreading Room: The piping plans specified on F-269 specify a few locations where piping cantilevers are in excess of the maximum 3ft. dimension specified for 1-inch piping in NFPA 13.	The piping stress associated with the worst-case cantilever identified in the Cable Spreading Room, 5 ft. unsupported length, is within the limits of carbon steel piping from B31.1. Therefore, adequate support currently exists for these small sections of 1-inch pipe (Ref. EC 376446).
#14	14-01	NFPA 14 Para. 219	Several hose reels supplied with 2" pipe are located some distance from the primary risers (as much as 80 equivalent feet) (Ref. 6, pg 8, para 4).	Hydraulic calculation QDC-4100-M-1534 has been performed which demonstrates that the available fire pump discharge pressure is adequate to ensure that the required pressure is available to the limiting hose reel which is up to 80 ft from the riser.
#14	14-02	NFPA 14 Para. 322	A portion of the cable tunnel is not within reach of a hose stream. (Ref. 6, pg 8, para 6).	This area consists of a long enclosed tunnel with concrete walls, floor and ceiling. The area is adequately protected by a wetpipe system which is fully capable of containing any expected fire. Adding an additional hose reel for this area is not necessary to meet the design objective of the fire protection system in that area.
#14	14-03	Section 43	At Quad Cities, UL listed or FM approve hose reels have not been specified. (Ref. 6, pg 10, para 1)	The hose reels in use at Quad Cities meet the construction requirements of UL47, "Semiautomatic Fire Hose Storage Devices", section 11 (Rack and Reel-Type Storage Devices) and therefore are adequate as installed. (Ref. 6, pg 10, para 1).
#14	14-04	NFPA 14, Para 442	Pressure at hose outlets exceeds 100 psi with no pressure reducing devices installed. (Ref. 6, pg 10, para 4).	The intent of the standard is to protect the employee from "run-away" hoses if it becomes necessary to drop a pressurized hose line and retreat from the fire. At Quad Cities, only fire brigade personnel are authorized to use the fire hoses in the plant and brigade members are trained to handle the higher pressures. Warning signs are posted on all hose stations to warn brigade members of the high pressure.
#14	14-05	NFPA 14, Para 671	Flow switches are not provided on all standpipe risers. (Ref. 6, pg 12, paras 3,4,5)	A primary function of a flow switch is to provide notification of unauthorized use. Since access to a nuclear power plant is controlled, unauthorized operation is not normally a concern. In addition, operation of any of the hose stations should activate the fire pump running alarm. (Ref. 9, pg 12, paras 3,4,5).

TABLE 2.1-2  
NFPA Code Deviations

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#14	14-06	NFPA 14, Para 219 and 322	<p>a) No hose stations in the cable tunnels or containment drywells (Ref. 6, pg 2)</p> <p>b) A few standpipes serving multiple hose connections are less than 4 inches in diameter. Several connections to single hose stations are less than 2-1/2" diameter (i.e. several standpipes feeding single hose connections are less than 2 ½ inches in diameter). (Ref. 6, pg 2).</p>	<p>a) Even though manual hose stations are not provided for the cable tunnels and drywells, adequate hose is provided for access to these areas. In addition, the areas are adequately protected by sprinkler systems which are fully capable of containing any expected fire. (Ref. xx, Sect E.3(d), pg 5.5-8). NOTE: this reference is not included on the reference page but should be. The reference is QDC FPR Vol 1, Sect 5 – Guidelines of Appendix A to APCSB 9.5-1.</p> <p>b) Hydraulic calculation QDC-4100-M-1534 has been performed which demonstrates that the available fire pump discharge pressure is adequate to ensure that the required pressure is available to the limiting hose reel which is up to 80 ft from the riser.</p>
#20	20-01	12-3.1 and 4-1.4	One pump has failed to meet pressure and flow requirements (stated in NFPA 20-4-1.4) during periodic testing since its acceptance test, based on available information. (Ref. 4, pg 3, Sect 2.2; and pg 17, Sect 6.1).	The fire pump is monitored per surveillance and the surveillance acceptance criteria ensures the hydraulic study (Ref. 17) remains valid.
#20	20-02	11-4.4,2003	There shall be a separate fuel line and separate fuel supply tank for each engine. A cross-tie line is provided between the FP diesel pump day tanks to allow for increased fuel volume for Appendix R support.	A separate tank is provided for fire mitigation, therefore, meeting NFPA-20 requirements. Two (2) locked closed isolation valves are provided on the day tank cross-tie line. These valves will only be opened for Appendix R support. (EC 341220)
#20	20-03	11.2.1(2003)	The Cummins NT855-F3 engines are being used to provide power outside their listed value.	This deviation is justified in EC 346408 and EC 346409. Per the EC Design Summary discussion the acceptance of the engine and code deviation will be based on the acceptable results of a full flow test using procedures QCMMS 4100-32, "1/2A-4101 Diesel Driven Fire Pump Annual Capacity Test" and QCMMS 4100-33, "1/2B-4101 Diesel Driven Fire Pump Annual Capacity Test".
#20	20-04	5.18.1.1 (2003)	The pressure relief valves for the fire protection system (170-psi to 180-psi) exceed the working pressure limits of the system components. This is primarily a deviation from NFPA 20, but also deviates from NFPA 13, 14, 15, AND 24.	This deviation is justified in EC 346408 and EC 346409. The basis for the justification is that the normal pressure is maintained at 120-psi and magnitude and duration of pressure transients are within the capability of the piping systems.

**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#20	20-05	9-5.2.3	In Lieu of a “sequential timing device” to prevent one engine from starting at the same time as the other, the initiation setpoints are staggered by 5 psi, with PS 0-4141-5A set at 70 psig and PS 0-4141-5B set at 65 psig (both values nominal)	Staggering the setpoints by 5 psi satisfies the intent of NFPA 20 to prevent simultaneous start of both pumps. This approach is used at the other Exelon sites, and based on operating experience at Quad Cities and the other sites this approach is sufficient to minimize dynamic loads on the piping system as a result of fire pump starts.
#20	20-06	8-6.1	The diesel driven fire pumps are test run monthly instead of weekly as required by NFPA.	The intent of the NFPA requirement is satisfied. The fire pump rooms/assemblies are routinely observed shiftly during “operator rounds” ensuring that the pump assembly appears to be in operating condition and is free from physical damage. The automatic or manual operation upon demand and continuous delivery of the required system output is ensured. The fire pump performance and reliability is tracked and trended in accordance with the Maintenance Rule Program, and any deficiencies encountered are documented and corrected in accordance with corrective action program. As a result, the impact of performing the routine fire pump surveillance monthly (rather than once per 7 days) is monitored and acted upon to maintain reliability, if necessary. Therefore, fire pump reliability, including any necessary adjustments to the surveillance frequency based on future performance is ensured.
#24	24-01	FHA 3.5, Section E.2(a)	The unlined steel distribution piping is not acceptable as it is likely to adversely restrict the water supply to sprinkler systems through the effects of tuberculation and corrosion (FHA 3.5, Section E.2(a) requires lined pipe). (Ref. 4, pg 3, Sect 2.1; Ref. 4, pg 12, Sect 5.1)	QDC-4100-M-0537 verifies that all system demands can be met with a C-Factor of 60. The C-Factor of 60 is a bounding value against the projected end of life C-factor of 65 for the underground fire main system (Ref EC 346408 and EC 346409). In addition, the station periodically monitors the C-Factor during surveillance testing.
#24	24-02	Paragraph 2600	A fire department connection through which the public fire department can pump water into the system has not been provided. (Ref. 7, pg 7, Sect 3.1)	Due to the remote location, lack of a nearby public water supply, redundancy of fire pumps, and intake canal supplies from the Mississippi River through which water may be pumped from draft by back feeding through existing hydrants, omission of such a connection is justified. (Ref. 7, pg 7, Sect 3.1).
#24	24-03	Paragraph 3101	Yard and Distribution Piping: The “Roto Hammer” control valves stem located east of the Unit 1 Reactor Building is not UL – listed for fire protection service, particularly in areas where valves are buried below asphalt or earth. (Ref. 4, pg 79, Sect 7.33.1, Ref. 7, pg 7)	This valve has been designed for buried application and provides positive indication of valve position. The station has had no problem with the operation of the valve during routine surveillance and functional cycling. Should the valve require replacement for any reason in the future, it should be replaced with a listed or approved valve.

**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#24	24-04	Paragraph 3302	PIVs are located closer than 40 feet from buildings. (Ref. 7, pg 7-8, section 3.3)	Loss of a single PIV due to its potential close proximity to a fire will not cut off water supplies to the sprinkler systems. In addition, the walls of the buildings are constructed of reinforced concrete and collapse is not anticipated during a fire and most exposed openings have metal doors without windows.
#24	24-05	Paragraphs 9301 and 3502	Piping is located below the Radwaste Building without sectional valves. (Ref. 7, pg 8, Sect 3.5)	The most likely failure mode for this piping would be a small leak or partial piping break that would not adversely effect the operation of the system until it could be isolated and repaired. In the highly unlikely event of complete failure of this section of underground piping, the piping could be isolated by closing 1-4199-26 in the Crib House and 1-4199-29 in the Unit 1 Turbine Building. This isolation would take out several hose stations in the Radwaste Building, but would restore the vast majority of the Fire Protection system and thus satisfies the main intent of the requirement for sectional valves. Since the FP system is modeled with this section of piping isolated (worst-case), the system would be restored to an analyzed condition, and as such, additional isolation valves for this section of piping would afford little additional protection, especially since the Radwaste hose drops come off the described underground section of piping. (Ref. EC 376115, rev 0).
#24	24-06	Paragraph 4202	Hydrants are located closer than 50 feet from buildings. (Ref. 7, pg 9, Sect 3.8).	Many of the exterior walls are reinforced concrete construction, and the collapse during a postulated fire is not likely. In addition, several of the exposed walls are blank. Finally, the on site fire brigade and adequate inside hose stations reduce the dependence on outside hydrants. (Ref. 7, pg 9, Sect 3.8)
#24	24-08	Paragraph 5501	Hose houses have not been marked as required by NFPA 24 (Ref. 7, pg 10, Sect 3.12)	The lack of prominent markings does not cause any significant issue because the only personnel who can operate the hose houses are trained to recognize the hose houses and their function.
#24	24S-11	NFPA 24, Para 3601	NFPA 24 recommends weekly verification of valve position, whereas valves are inspected QUARTERLY. (Ref. 5, pg 18)	NFPA history indicates the most common cause of sprinkler system failure has been the control valve found closed. In a nuclear power plant, controls and training are in place to assure that valves and equipment are in the correct position. Valves aren't repositioned without procedural direction and are only manipulated by the operating dept. The chance of inadvertent closure of a sprinkler control valve is minimal. Therefore a reduction in the frequency of this surveillance is acceptable. (Ref. ECR 52828)
#30	30-02	Paragraph 4313	The Clean and Dirty Lube Oil Tank Room exhaust and air intakes are not located within 12 inches of the floor. (Ref. 8, pg 12, para 4)	The room is equipped with a high point forced air vent on one end of the stored oil. The other end contains a closed door with an air gap between the bottom of the door and the floor. This configuration provides continuous air flow across the oil storage area that will prevent vapors from accumulating at floor level.

**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#30	30-03	NFPA 30, Para 2140	EHC Fluid Reservoir Tank area vents are not installed. (Ref. 8, pg 13, para 3)	Each EHC Fluid Reservoir tank is equipped with a breather device that filters incoming air to minimize humidity intrusion and outgoing air to prevent EHC mist from escaping. The breather is mounted above the EHC skids so it communicates directly with the air space along the 13 line.
#30	30-04	Section 52	NFPA 30 is unclear with respect to fire resistance requirements for enclosures serving as fire barriers for tanks similar to these (EHC Fluid Reservoirs, MG Set Oil Coolers, Turbine Oil Reservoirs, Hydrogen Seal Oil Units, MG Sets, Crib Hse FP). (Ref. 8, pg 13, para 6; pg 18, paras 2 & 5; pg 20, para 1; pg 21, para 5)	Each unit of equipment is located in an open area that is protected by a sprinkler system. The fluid tanks are adequately diked and the high flash point of the oil in each application renders it difficult to ignite. Based on that, no concerns exist with respect to the storage of combustible liquids in the identified enclosures. (Ref. 8, pg 13, para 6; pg 18, paras 2 & 5; pg 20, para 1; pg 21, para 5). (MG Set Oil Coolers removed)
#30	30-05	Section 43	Deficiencies in the Unit 2 Oil Drum Storage Room include the following (Ref. 8, pg 16): Non standard fire door. Ordinary electrical equipment. No low level ventilation. Room exceeds 500 sq ft.	The non-standard fire door is acceptable due to the presence of the installed suppression system, the ramped access and the limited exposure to safety related equipment. All exposed liquids are Class III combustibles, and Class I liquids that may be present in the room are stored inside approved fire resistance storage cabinets. This makes the existing electrical equipment acceptable as is. The ventilation system actively pulls air from penetrations above the fire door and exhausts it through vent ducts located on the opposite end of the stored oil drums. While the vent ducts are four feet from the ground, given that the Class III liquids have flash points in excess of 400 deg F and given that each time the door is opened the lower levels are purged of vapors, no concerns exist. While the room size does exceed 500 sq ft, the amount of actual storage area being used is less than 500 sq ft and given it's fire resistant construction, the available suppression system and the presence of only Class III liquids, the room is acceptable. (Ref. 8, pg 17)
#30	30-06	Paragraph 2343	NFPA 30, Paragraph 2343 requires a heat-actuated shutoff valve to prevent flow from the DG day tank in the event of a fire. (Ref. 8, pg 20, para 3)	This requirement is over-ridden by the more significant concern for the possible spurious operation of such a valve, as fuel for the down going unit could be cut off by such operation. It is desired that the down going units be able to operate even if a fire occurs due to the overriding concern for safe shutdown. (Ref. 8, pg 20, para 3)
#30	30-07	4.3.2.3.3, 2003	The code states that where a secondary tank is used to provide spill control, all piping connections shall be made above the normal maximum liquid level. Contrary to this the following connections on the FP diesel day tanks will be below the normal liquid level: Fire pump fuel supply Level Instrumentation lower leg Main Tank drain connections Secondary Tank drain connection Day Tank cross-tie connection	Relative to the fire pump fuel supply and cross-tie connections, this position is over-ridden by the NFPA-20 requirement (Section 11.4.5.3, 2003) to have the fuel supply located on the side of the tank at the 5% sump level (to facilitate gravity feed supply to the fire pump engine). The drain and instrumentation connections are needed at the bottom of the tank to ensure functionality. A sight glass is provided to monitor for secondary leakage detection. Daily system inspections are performed, including observation for fuel leakage. (EC 341220)

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**TABLE 2.1-2  
NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#30	30-08	5.7.1.2, 2003	The code states that manifolding of vent piping shall be avoided except for special purposes such as vapor recovery, vapor conservation, or air pollution control. The primary and secondary emergency vent piping will be manifolged on the FP diesel day tanks.	The code is concerned with manifolding of vent piping from alternate tank sources. The QC design will only manifold primary/secondary vents from the same tank. In addition, the vent piping has been sized to ensure pressure limitations of the system have been met. (EC 341220)
#69	69-01	Paragraph 3723	No procedures exist to address periodic air sampling to verify the ventilation system associated with the Battery Rooms are effective at reducing H <sub>2</sub> gas concentrations to at least 25% of the lower explosive limit for hydrogen (4% in air). (Ref. 9, pg 9)	The time required to build up a hydrogen concentration above 1% is ~11 months. Alarms on the ventilation system will alert Operations to the potential problem. Sampling does not provide any added value.
#72	72-01	Para. 2541, NFPA 72D	The fire alarm system requires alarms on each floor of the building to ensure all occupants are able to hear. The alarm system at Quad Cities does not fully meet this requirement. (Ref. 10, pg 17)	Fire alarms are received in the control room. The alarms indicate the location of the concern to the control room operators. The operators notify station personnel of the condition via the P.A. system which includes a fire alarm that is audible to all plant personnel. The operators address the alarm condition accordingly with the assistance of written emergency response procedures.
#72	72-02	Para. 3113, NFPA 72D	Pull stations are not distributed throughout the protected areas. (Ref. 10, pg 18)	All personnel are trained to notify the control room in the event of a fire at which time appropriate plant notifications are made via the P.A. system. The existing communication system is judged to be equivalent to the use of pull ns since phones are available and distributed throughout the protected area.
#72	72-03	NFPA 72E, Sect 3-4.1	Thermal detectors for the Drywell/Torus DP Compressors and ACAD Air Compressors are not located at the ceiling. (Ref. 10, pg 24, para 6)	The most likely fire originating in these areas would involve lube oil from the compressors. This type of fire will have a high heat release and with the area curbed to contain the oil, the heat would be localized within the curbing. The 2 thermal detectors, one on each side, have heat canopies or deflector immediately above the detectors (w/in 6 inches) and given the high localized heat, should allow sufficient heat build-up to effectively actuate the preaction system. (Ref. 10, pg 24, para 6).
#72	72-04	NFPA 72E, Sect 4-3.1	The location of the smoke detectors in the Unit 1 northwest area (Unit 2 southwest) of the RB on the 595 floor elev. Are greater than 15 ft from the edge of the beam pocket in which they are installed (Ref. 10, pg 26, para 3)	The objective of the detectors is to provide early warning of a fire in the cable trays in these areas. The detectors are installed directly above the cable penetration to the Turbine Building and would be adequate for any fire that is propagating through the cable tray. The spacing, however, is beyond NPFA guidance for coverage of a transient exposure fire from the floor. Given that transient combustibles are procedurally controlled at Quad Cities and are rarely left unattended in the area, the risk of any exposure originating from the floor is mitigated. (Ref. 10, pg 26, para 3).

**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#72	72-05	NFPA 72E, Sect 4-4.6	Detectors 080, 085 (Unit 1) and 076 (Unit 2) are installed on the bottom of concrete beams about 24 in. deep rather than in the pocket between the beams where smoke will accumulate. (Ref. 10, pg 28, para 1)	The detection system also includes detectors that are located in the pockets between the beams. While the detectors on the bottom of the concrete beams are not in compliance with NFPA guidance, given that the other detectors are present, the non-compliant detectors could be removed without any reduction in the level of protection. (Ref. 10, pg 28, para 1).
#72	72-06	NFPA 72E, Sect 4-3.1	A number of detectors in the beam pockets above MCCs (623') are not spaced properly (Ref. 10, pg 28, para 2)	Since there are typically no combustibles stored on the floor around the MCCs the most likely fire would be an electrical fire associated with the MCCs. Since the smoke detectors are located directly above the MCCs a smoke plume originating at the MCCs would likely be directed towards the detectors. Because of this, the deviation from the code (>15 ft from a beam) can be justified since response time is expected to be similar. (Ref. 10, pg 28, para 3)
#72	72-07	NFPA 72E, Sect 4-3.1	Detectors exceed spacing limitations in the U1 northwest and U2 southwest Major Cable Penetration Area (623'). (Ref. 10, pg 30, para 3)	The objective of the detectors is to provide early warning of a fire in the cable trays in these areas. The detectors are installed directly above the cable penetration to the Turbine Building and would be adequate for any fire that is propagating through the cable tray. The spacing, however, is beyond NFPA guidance for coverage of a transient exposure fire from the floor. Given that transient combustibles are procedurally controlled at Quad Cities and are rarely left unattended in the area, the risk of any exposure originating from the floor is mitigated. (Ref. 10, pg 30)
#72	72-08	Section 4-3.1, NFPA 72E	Detectors in the HPHB are not spaced in accordance with NFPA 72E. (Ref. 10, pg 45, para 3)	The most likely fire in this area is a one associated with the cables. The smoke detectors are located directly above the cable trays, which is appropriate for cable tray fires. Given the configuration, two smoke detectors mounted directly on the ceiling would provide adequate protection. The smoke detectors in this area are 3 inches below the ceiling, which is in conflict with the NFPA guidance. However, given that the detectors are immediately above the expected source of the fire, the existing locations are acceptable.
#72	72-09	NFPA 72E, Sect 3-5	Detectors in the Unit 1 and Unit 2 DG Rooms are not mounted on the ceiling and are improperly spaced. (Ref. 10, pg 50, para 1)	The most likely fire would be a diesel fuel fire which result in rapidly developing high temperatures. Since the diesel generator rooms are relatively small and given the high rate of heat released and also considering that the average heat detector coverage (380 sq ft) is less than 625 sq ft maximum coverage that the code requires, the minor deviation from the code (i.e. detectors 12 inches from ceiling) can be justified since response time is expected to be similar. (Ref. 10, pg 50 & 51).
#72	72-10	NFPA 72E, Sect 3-5	Detectors in Oil Storage Rooms exceed U.L. spacing limits. (Ref. 10, pg 55, para 2)	The most likely fire would be an oil fire which result in rapidly developing high temperatures. Since the oil storage room is relatively small with 12 ft ceilings and given the high rate of heat released and also considering that the average heat detector coverage (380 sq ft) is less than the 625 sq ft maximum coverage that the code requires, the minor deviation from the spacing requirements of the code can be justified since response time is expected to be similar. (Ref. 10, pg 50 & 51).

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#72	72-11	NFPA 72E, Sect 4-3.1	Detection in the U2 Trackway exceeds NFPA spacing requirements. (Ref. 10, pg 58, para 1)	The distance to any corner in the beam pocket is not greater than 70% of the listed spacing of 30 ft. The detector placement is adequate to effectively operate the reaction system. (Ref. 10, pg 58, para 1)
#72	72-12	NFPA 72E, Sect 3-5	Detectors above the Turbine Oil tanks are not properly spaced. (Ref. 10, pg 61, para 1)	The most likely fire would be a lube oil fire which would result in rapidly developing high temperatures. Given the high rate of heat released during an oil fire and the fact that the activation of any of the six installed detectors in the area will actuate the water spray system, the existing detector locations are adequate. (Ref. 10, pg 61).
#72	72-13	NFPA 72E, Sect 3-5	Detectors above the Hydrogen Seal Oil Units are not spaced adequately. (Ref. 10, pg 63, para 1)	The most likely fire would be an oil fire which would result in rapidly developing high temperatures. Given the high rate of heat released during an oil fire and the fact that the activation of any of the two installed detectors in the area will actuate the water spray system, the existing detector locations are adequate. (Ref. 10, pg 63).
#72	72-14	NFPA 15, Para. 4050	Fire pump day tanks are not curbed. (Ref. 10, pg 73, para 5)	The fire pump day tanks are double-lined and are elevated over 6 feet in the air. These designs features protect the tanks from rupturing by minimizing the potential for incidental contact and by preventing any unlikely contact from penetrating both liners. Given the design, curbing is no longer warranted.
#72	72-15	SER Sect. 5.5.6	Early warning detection is not provided for the Refueling floor. (Ref. 10, pg 31, para 3)	The lack of early detection on the refuel floor has been justified in GL 86-10 evaluation S040-QH-0614, rev 1 dated 7/30/00. The evaluation concluded that due to the low combustible loading the potential for fire ignition and spread is too low to justify automatic suppression systems.
#72	72-16	3-5	Heat detectors which actuate the Pre-action Systems in the Unit 1 and Unit 2 Trackway do not cover the entire area protected by Pre-action System.	The spacing of the detectors in the trackways meets the requirements of NFPA 72E except in the hatch area. This area would only have a risk of fire during use of the trackway to bring equipment into the turbine building. Administrative controls reduce the risk of fires at the time. (EC 348102).
#72-1999	72-17	1-5.2.3 & 1-5.2.6	The installation of the MXL fire alarm system under EC 330819, rev 1 resulted in the following deviation: - Using rated current values for components, the MXL secondary power supply does not have sufficient capacity to operate the system for 24 hrs under maximum quiescent load (system functioning in a non-alarm condition).	Based on the combination of the UPS with four hour batteries, 0-2212-113-BAT batteries, and field measured currents, the MXL secondary power supply provides equivalency to the code requirements of NFPA 72, Section 1-5.2.3 (QDC 4100-E-1239).
#72-1999	72-18	5-3.4.6	The installation of the MXL fire alarm system under EC 330819, rev 1 resulted in the following deviation: - The MXL system does not provide an automatic permanent visual record of required signals using an on-line printer.	Based on the redundant visual displays, electronic signal records, an available printer, and fully staffed and trained control room operators, the MXL system design provides equivalency to the code requirements. (QDC 4100-E-1239).



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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#72A	72-19	1.2.2	Square D pressure switches installed in station wetpipe systems are not UL listed under VOXZ category.	Evaluation of switch function and pressure setting found that switches installed as original design have been performing and will continue to perform design function as installed. The deviation only affects UL listing requirement and is considered administrative in nature not affecting wetpipe design function (EC 355931).
#72D	72-20	2.4.3.1	The heat detectors and manual initiation stations that initiate the CO2 systems for the EDGs and Main Generator Exciters do not have electrical supervision in their circuits.	The heat detectors and manual initiation stations that initiate the CO2 systems for the EDGs and Main Generator Exciters are functionally tested with a surveillance every 6 months (Nexus Technical Services Corporation Report 98-041).
#80	80-01	Paragraph 1-6.1 and 10-2.30	At Quad Cities, several openings contain doors that are unlabeled or unlisted. (Ref. 11, pg 5 & 6)	The access doors to the MSIV rooms are not labeled but have been justified in an exemption request to the NRC as being 1-1/2 hour rated fire doors as allowed by 10-2.1. (Ref. 11, pg 6, Dash 1) The access doors from the Auxiliary Electric Room to the Cable Tunnels (1 and 2) consist of 33" square steel manhole covers, ¼ inch thick. The plate is coated with a minimum 1 inch thick layer of Pyrocrete and has at least 3-1/2" of Thermafiber insulation on the bottom side. The Pyrocrete provides at least 3 hours of protection during a fire. Therefore, the protection provided by the access doors is sufficient. The door between the U2 DG Cell and its associated fuel oil day tank room appears to be a missing label. The door schedule shows the door as being purchased as a 3 hr door. (Ref. 11, pg 5, para 3, Dash 4). The door between the Service Bldg and the Control Rm, at the west CR wall is a security door and therefore presumable rated for fire as well. The listing information is believed to be obscured by the door hinge. (Ref. 11, pg 6, Dash 2).
#80	80-02	Paragraph 2-5.1	Of thirty-five single and double swinging doors observed at Quad Cities, only four have listed door frames. (Ref. 11, pg 6, para 1).	Based on a comparison of the unlisted door frames to UL-63 construction requirements (as documented in Ref. 11, pg 8 table 3-3.1), the unlisted frames, closer and hinges are adequate. (Ref. 11, pg 6, para 2).
#80	80-03	Section 10-1.2	The access doors to the Cable Tunnels from the Auxiliary Electric Room are not provided with latches as required by Paragraph 10-1.2 (Ref. 11, pg 9, Sect 3.6)	The purpose of a self latching door is to prevent inadvertent opening. Due to the substantial weight of the hatch covers on the access door to the cable tunnels, inadvertent opening is prevented. The code deviation is acceptable. (Ref. 11, pg 9, Sect 3.6, para 3).
#80	80-04	Paragraph 2-8.2.4, 2-8.4.2, 2-8.7.1 and 10-2.2	Use of unlabeled door closing devices. (Ref. 11, pg 10, Sect 3.7, para 1)	While not specifically labeled as the code requires, the closers are made by Russwin, LCN, Yale and Norton, who based on the manufacturers' model numbers, are all UL listed for fire doors use. (Ref. 11, pg 10, Sect 3.7, para 2).
#80	80-05	Paragraph 10-2.2	The steam chase doors are held open and do not have a self-closer as required by Paragraph 10-2.2. (Ref. 11, pg 10, Sect 3.7, para 3).	These doors are not kept shut as required by Paragraph 10-1.3, but were justified in exemption request Section 3.3 and 4.3 which was submitted to the NRC, December 18, 1984. (Ref. 11, pg 9, Sect 3.6, para 3).
#80	80-06	Paragraph 2-8.2.4, 2-8.4.2, 2-8.7.1 and 10-2.2	There are no fusible links to allow the hatches between the cable tunnels and the Aux. Electric Room to close in the event of a fire. (Ref. 11, pg 10, Sect 3.7, para 4)	This door is kept in the normally closed position and maintained in that position by administrative controls. (Ref. 11, pg 10, Sect 3.7, para 4).
#80	80-07	Paragraph 2-9.91	Minor dents in the surface of several fire doors listed in the Appendix to PLC report. (Ref. 11, pg 11, Dash 1).	These are not sufficient to affect fire door performance under fire conditions, as 1) the surface is intact, and 2) the damage has not been sufficient to alter the internal framework of the door, or warp it to the extent it will not fit the door frame. (Ref. 11, pg 11, Dash 1).

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**TABLE 2.1-2  
NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#80	80-08	Paragraph 2-8.9.1	Security hardware is attached to several fire doors listed in Appendix to PLC report. (Ref. 11, pg 11, para 2)	Because of the light weight and noncombustible construction, the installed contact switches will not degrade the fire resistance of the fire door/frame assemble. (Ref. 11, pg 11, dash 2, para 1).
#80	80-09	Paragraph 2-8.9.1	The electric strike on the doors located at the Control Room. Aux. Electric Room and the Turbine and Radwaste Buildings are not listed for fire door use. (Ref. 11, pg 11, dash 2, para 2)	UL does not list electric strikes on paired door assemblies such as these. The function of the electric strike is to provide secure entry, requiring a key card to open the door. The electric strike does not prevent the door from performing it's fire barrier function. The door will still latch and remain latched on loss of power. (Ref. 11, pg 11, dash 2, para 2).
#80	80-10	Paragraph 2-8.9.1	At Quad Cities, the four double-swinging doors with non UL listed electric strikes have been modified to accept an electric cable through a hole drilled in the door to energize the strike. (Ref. 11, pg 11, dash 2, para 3)	The hole that has been drilled into the door does not penetrate both sides and is relatively small. As such, the modification to the door will have no effect on fire endurance. Guidance to support this position is being documented in Exelon's "Penetration Seals Best Practices Inspection Guideline".
#80	80-11	Paragraph 2-8.9.1	Signs attached to fire doors. (Ref. 11, pg 11, dash 3)	NFPA 80-1975 does not allow signs on doors, however, Appendix G to the 1983 addendum to NFPA 80 was written to allow the use of small signs installed on the doors that indicate function, use of location of the doors. The signs installed at Quad Cities provide various warning such as "hearing protection required" and are attached with either screws or adhesives, similar to the methods now allows by NFPA 80-1983. In addition, the signs do not adversely affect the fire barrier function of the doors. (Ref. 11, pg 11, dash 3).
#80	80-12	Paragraph 2-8.9.1	The Control Room (south wall) door has been altered such that its UL listing is no longer valid. A 5-1/2" by 7" plate has been attached to one side of the door. (Ref. 11, pg 12, dash 2, item 2)	The plate is securely attached with machine screws and does not result in any openings in the door face. The plate does not degrade the fire rating of the door and is therefore considered acceptable. (Ref. 11, pg 12, dash 2, item 2).
#80	80-13	Paragraph 2-8.9.1	Additional manual latches attached to paired door installations. (Ref. 11, pg 13, dash 1, item 2)	These devices would aid in keeping a fire door within its frame during a fire condition and as such artery considered to enhance rather than detract from the fire door integrity. (Ref. 11, pg 13, dash 1, item 2).
#80	80-14	Paragraph 2-8.9.1	Small metal plates and handles attaches to doors. (Ref. 11, pg 13, dash 1, item 3)	The metal plates and handles are attached to the outside of the doors. The attachment method does not create a hole through the fire barrier since any holes are on one side only have been filled with machine screws. These plates and handles are similar to the signage that is now allowed by NFPA 80-1983 and do not degrade the overall fire performance of the doors. (Ref. 11, pg 13, dash 1, item 3).

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#80	80-15	Paragraph 4-5.1	Three sliding doors (#150, 175, 178A) have tracks and associated hardware without a U.L. label. (Ref. 11, pg 14, Sect 3.9.3)	While not specifically labeled as the code requires, the hardware is made by Stanley which does have UL listings for sliding door hardware similar to this. In addition, the doors themselves are UL labeled indicating that the assembly was manufactured as a fire resistant assembly. Based on the availability of UL listed / labeled equipment from the manufacturer and the fact that the other components of the assembly are labeled, it is expected the hardware meets the design requirements of the code. (Ref. 11, pg 14, Sect 3.10).
#80	80-16	Paragraph 14-1.1	There is an unused opening in the fire barrier. At the northwest corner of the Auxiliary Electric Room, there is a fire door that has been removed from service but the door has not been removed and the opening filled with construction equivalent to that of the wall. (Ref. 11, pg 14, Sect 3.10)	The door has been welded shut and the opening is covered by 8" solid concrete block. This provides a three hour barrier at this unused doorway. (Ref. 11, pg 14, Sect 3.10).
#90A	90A-01	Paragraph 4-3, App B	Not all plant HVAC systems are provided with automatic fan shutdown. (Ref. 12, pg 4, para 4)	The rooms that do not have smoke control systems installed in the associated ducts are not normally inhabited and are not normal escape routes during a fire. The rooms are equipped with smoke detection systems that will, as a minimum, actuate alarms in the control room so that the smoke/fire can be controlled as necessary. (Ref. 12, pgs 4 thru 9).
#90A	90A-03	Sect A-7	NFPA 90A specifies annual inspections of installed fire dampers. Quad Cities performs inspections every 18 months. (Ref. 12, pg 10, para 3)	Appendix A is included for information only and is not considered to be part of NFPA 90A-1976. The periodic maintenance activities are recommendations to ensure NFPA requirements are maintained. The existing inspection frequency has demonstrated that it is acceptable to extend the recommended annual inspection to at least 18 months.
#92M	92M-01	Chapter 4	Drains in the Hotwell area are plugged. (Ref. 13, pg 7, note 2)	If a large accumulation of radioactive water were to occur, it would be held in the pit until disposal arrangements could be made. Containment of radioactive material takes priority over fire protection water drainage. (Ref. 13, pg 7, note 2).
#92M	92M-02	Chapter 3	Drains in the H2 Seal Oil Unit area have been plugged. (Ref. 13, pg 7, note 5)	This can be justified due to sufficient curbing around the reservoir to contain an oil spill and nearby stairway to drain ceiling sprinkler runoff. (Ref. 13, pg 7, note 5).
#92M	92M-03	Chapter 3	There are no drains for the sprinkler system protecting the main turbine bearings. (Ref. 13, pg 9, para 3)	Lack of drains in this area is justified as 1) the area is enclosed by concrete shield walls, and 2) each system protecting the bearings has no more than four nozzles, which would result in minimal water release. (Ref. 13, pg 9, para 3).
#92M	92M-04	Chapter 5	No curbs around Crib House diesel day tanks. (Ref. 13, pg 9, para 4).	See deviation 72-14.

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**TABLE 2.1-2**  
**NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#232	232-01	Chap. 3 & 4	Use of open-shelf racks instead of enclosed file cabinets for records (Paragraph 3-1.2, 3-12.1, and Chapter 4). (Ref. 14, pg 3, Sect 3.1, para 4, subpart 1)	Correction of the noted deficiencies is not warranted due to duplication of records in the outside vault. Due to the detached location, the probability of a single fire destroying both sets of records is extremely remote. (Ref. 14, pg 5, Sect 3.1).
#232	232-02	Chap. 3 & 4	The file room HCB walls do not extend floor-to-ceiling (Paragraph 3-4.3). (Ref. 14, pg 3, Sect 3.1, para 4, subpart 2)	See justification for deviation 232-01.
#232	232-03	Chap. 3 & 4	The file room walls do not have approved file room doors (Paragraph 3-6.3.2 and Section 3-8) and are pierced from ventilation ducts (Paragraphs 3-6.3.3 and 3-11.2). ((Ref. 14, pg 4, Sect 3.1, para 4, subpart 3)	See justification for deviation 232-01.
#232	232-04	Chap. 3 & 4	Interior ceiling supports (columns supporting the third floor of the building) are unprotected steel and do not have fire-resistance equivalent to the walls (Paragraph 3-7.2(c)). (Ref. 14, pg 4, Sect 3.1, para 4, subpart 4)	See justification for deviation 232-01.
#232	232-05	Chap. 3 & 4	Electric lighting units are not vapor-proof or explosion resistant (Paragraph 3-10.3). (Ref. 14, pg 4, Sect 3.1, para 4, subpart 5)	See justification for deviation 232-01.
#232	232-06	Chap. 3 & 4	The file room contains limited work stations and access is not closely controlled (Paragraph 3-12.4). (Ref. 14, pg 4, Sect. 3.1, para 4, subpart 6)	See justification for deviation 232-01.
#232	232-07	Chap. 2	The roof of the vault is pierced for ventilation equipment (Paragraph 2-9.2(d) prohibits such penetrations). (Ref. 14, pg 6, Sect 3.2, para 5, subpart 1)	The vault is a stand alone unit that is located outside and away from the main service building. There are no overhead structures that would expose the roof to fire. The existing ventilation penetration is justified. (Ref. 1, pg 6, Sect. 3.2, para 5, subpart 1).
#232	232-08	Chap. 2	The vault is not provided with a listed vault door in accordance with Paragraph 2-10.1. (Ref. 14, pg 6, Sect 3.2, para 5, subpart 2)	The vault does not communicate with any other building and is provided with two 3-hour fire doors installed in series. The existing installation is justified. (Ref. 14, pg 6, Sect 3.2, para 5, subpart 2).
#232	232-09	Chap. 2	Vapor-proof or explosion-proof lighting is not installed in accordance with Paragraph 2-11.3. (Ref. 14, pg 6, Sect 3.2, para 5, subpart 3)	There are no explosive vapors present and the installed air conditioning system should exhaust any liquid vapors. The installation of ordinary fluorescent light fixtures is justified. (Ref. 14, pg 6, Sect 3.2, para 5, subpart 3).
#232	232-10	Chap. 2	Records are not stored in fully enclosed non combustible containers as required by Paragraph 2-12.1. (Ref. 14, pg 6, Sect 3.2, para 5, subpart 4)	The vault includes a smoke detector actuated Halon 1301 fire suppression system that will protect the records at the onset of a fire and prevent it from spreading. This provides sufficient protection to allow the existing records storage method to be acceptable. (Ref. 14, pg 6, Sect 3.2, para 5, subpart 4).

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**TABLE 2.1-2  
NFPA Code Deviations**

NFPA Code	Deviation No.	Code Section	Deviation	Justification
#601	601-01	Section 23	Supervised tours of the premises are not conducted. (Ref. 15, pg 3, para 4)	Due to the large size of the guard forced (with guards stationed in various areas), electronic and television monitoring of the property perimeter, card key entry systems, and 24-hour operation of the plant, there is no need for supervised tours. Also, card key entry doors are checked by a guard every two hours, resulting in a tour of the premises with a form of supervision (the key entry record). (Ref. 15, pg 3, para 4).
#601	601-02	Section 58	Section 58 of NFPA 601-1975 requires guards to be familiar with the fire hazards in the various plant areas. At Quad Cities, this has not been made a required part of the guard training procedure. (Ref. 15, pg 4, last para)	Operating personnel perform rounds throughout the plant. They are trained in recognizing hazards. This is not a security force job. (Ref. 15, pg 4, last para).

References:

1. An Evaluation of Organization of Industrial Fire Loss Prevention (NFPA #6) at Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, May 24, 1985, Rev. 0.
2. An Evaluation of Management Control of Fire Emergencies (NFPA #7) at Quad Cities Power Stations, Units 1 and 2 for Commonwealth Edison Company, Rev. 0, 5/24/1985.
3. An Evaluation of Standard Portable Fire Extinguishers (NFPA #10 and #10A) at Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, May 24, 1985, Rev. 0.
4. Fire Suppression Survey in Nuclear Safety Related Areas at Quad Cities Nuclear Station, Units 1 and 2 for Commonwealth Edison Company, Rev. 5, 9/30/86.
5. A Review of Fire Suppression System Surveillance procedures for Compliance with NFPA 12, 12A, 13, 15, 16, 20 and 24 in Nuclear Safety Related Areas at Quad Cities Nuclear Station, Units 1 and 2 for Commonwealth Edison Company, Rev. 0, 5/24/85.
6. An Evaluation of Standard for the Installation of Standpipe and Hose Systems (NFPA# 14) at the Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, 6/19/85, Rev. 1.
7. Outside Protection Survey for Nuclear Safety Related Areas at Quad Cities Nuclear Station, Units 1 and 2 for Commonwealth Edison Company, Rev. 0, 5/24/85.
8. An Evaluation of Flammable, Combustible, and Highly reactive Chemical Storage and Handling (NFPA #30 and 49) at Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, Rev. 0 (May 24, 1985).
9. A Survey of the Fire Hazards of Hydrogen Storage and Handling (NFPA #50A and 69) at Quad Cities Nuclear Power Station, Units 1 & 2 for Commonwealth Edison Company, Rev. 0, May 24, 1985.
10. Fire Detection and Alarm System Survey (#NFPA 72E) in Nuclear Safety Related Areas at Quad Cities Nuclear Power Station, Units 1 & 2 for Commonwealth Edison Company, Rev. 1, January 24, 1986.
11. An Evaluation of Fire Doors in Nuclear Safety Related Areas at Quad Cities Nuclear Power Station, Units 1 & 2 for Commonwealth Edison Company, Rev. 2, April 9, 1987.
12. Fire Protection Survey of HVAC Systems installed in Computer and Nuclear Safety related areas at Quad Cities Nuclear Power Station, Units 1 & 2 for Commonwealth Edison Company, Rev. 1, Nov. 19, 1985.
13. Floor Drainage Survey in Nuclear Safety Related Areas at Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, 5/24/85, Rev. 0.
14. An Evaluation of Records Storage at Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, 5/24/85, Rev. 0.
15. An Evaluation of the Security Force Response to Fire Emergencies (NFPA #601) at Quad Cities Nuclear Power Station, Units 1 and 2 for Commonwealth Edison Company, Rev. 0, May 24, 1986.
16. NFPA Code Conformance, Fire Protection Program Documentation Package, Volume 7 (Professional Loss Control, Inc code conformance evaluations for Quad Cities).
17. NFPA Code Conformance, Fire Protection Program Documentation Package, Volume 8 (Fire Suppression System Hydraulic Verification Study).
18. Evaluation of Deviation 72-19 performed under Engineering Change (EC) #355931
19. Transmittal 92-060, dated 5-26-92. .

## **2.2 Fire Protection Organization and Responsibilities**

The following sections describe the compliance of Quad Cities Station with the intent of the positions of Section A.1 of Branch Technical Position APCSB 9.5-1 regarding fire protection organization and responsibilities.

Exelon Generation Company (Exelon) is responsible for the establishment and execution of the Quad Cities Station fire protection and loss prevention program. The Exelon Fire Protection Organization is described in an approved station procedure, “Fire Protection Program”.

The fire protection and loss prevention program for Quad Cities Station was formulated using the guidance of NRC supplemental guides, NFPA codes, American National Standards Institute (ANSI) standards, consultant recommendations, insurance guidelines, and Exelon corporate policies and procedures. Using these as a basis, along with other standards judged applicable, a program tailored to the unique application of fire protection at a nuclear facility was formulated. The program is assessed by the Exelon Nuclear Oversight Department and through independent biennial and triennial fire protection audits. Results of these assessments are reported to the Station Manager.

## 2.3 General Guidelines for Plant Fire Protection

This section examines the implementation of the guidelines of Appendix A to BTP APCSB 9.5-1 as they apply to the building design and administrative controls. These guidelines are addressed again in Section 4.0 of this document on a plant zone-by-zone basis.

### 2.3.1 Building Design

#### 2.3.1.1 Plant Layout-Separation

Quad Cities Station has been divided into fire areas and equivalent fire areas for evaluation against 10 CFR 50, Appendix R criteria. Safe shutdown related equipment components and systems are provided with adequate separation as described in Section 4 of this document.

#### 2.3.1.2 Barriers

The majority of the interior finish in Quad Cities Station consists of noncombustible surfaces. All walls, structural components, and soundproofing are fire retardant or noncombustible. Roof construction is fire resistive or noncombustible and all suspended ceilings and their supports are of noncombustible construction. Class II metal roof deck construction was used at Quad Cities Station. Floor coverings in areas containing systems or equipment required for safe shutdown of the plant are generally Class I material as defined in NFPA 101, or generally a flame spread of 25 or less as defined by ASTM E-84. For fire hazard analysis purposes, floor coatings are considered non-combustible if the material has a structural base of non-combustible material, with a nominal depth not over 1/8-inch thick, and has a flame spread rating not higher than 50 as defined by ASTM E-84. Exceptions to these guidelines are evaluated for acceptability by Fire Protection Engineering on a case-by-case basis.

#### 2.3.1.3 Penetration Seals

Fire penetration seals provided in fire barriers are documented on the F-drawings (Drawing F-41 through F-198) and penetration details for the mechanical penetration seals and in the report entitled "Preliminary Review of Electrical Penetration Seal Fire Testing and Installation Programs," and test reports for the electrical penetrations. These penetrations are inspected periodically. Open flames or combustion generated smoke are not permitted for this inspection.

#### 2.3.1.4 Grouped Electrical Cables

The cabling initially installed at Quad Cities was not qualified per IEEE Standard 383-1794. New safety related cables and all cables installed in cable tray or in free-air applications are qualified to IEEE-383, IEEE-1202, NFPA 262 or equivalent. Cables installed in rigid metal conduit or in metal enclosures (ventilated or non-ventilated) cannot support sustained combustion and are not required to be qualified to IEEE-383, IEEE-1202, or NFPA 262.

Cable trays are of noncombustible construction and cable trays, raceways, and conduits are used for cabling only. Miscellaneous storage in areas housing grouped electrical cables is administratively controlled. Fire breaks are provided in horizontal cable trays as required to meet Appendix A criteria for separation of redundant divisions.

#### 2.3.1.5 Ventilation

The plant does not have a fixed smoke removal system except for the control room. Portable smoke ejectors have been provided for fire brigade use in moving smoke in areas that do not have fixed smoke removal systems. All smoke produced in potentially contaminated areas is monitored before it is released to the environment. The fresh air supply intakes to areas containing safety-related equipment are located away from the exhaust air outlets and smoke vents of other areas.

Fire dampers are used in most fire walls and barriers where ventilation ducts penetrate or equivalent protection is provided. If fire dampers are not provided, justification for not providing them is found in the approved Exemption Requests. In areas where total flooding gaseous suppression systems are used, dampers in the ventilation system are closed before agent discharge occurs.

#### 2.3.1.6 Emergency Lighting

Emergency lighting is provided to illuminate the areas housing equipment needed for safe shutdown as well as the pathways which must be taken to reach the necessary equipment. Emergency lighting consists of sealed beam units with 8-hr emergency backup power supplies. (See the Safe Shutdown Analysis Report).

#### 2.3.1.7 Communications

The communication system consists of fixed telephones and paging system. All the components of the system can be supplied with emergency power, but this could be disabled by fire. Portable radios are also available for plant communications.

The paging system and plant siren are normally used for initial notification of the fire brigade. The fire alarm tone is distinctive and can be heard in all plant areas. Portable radio communication units are also provided on site and are available for use by the fire brigade during fire emergencies. Emergency communications are monitored in the control room and at the security central and secondary alarm stations. (See the Safe Shutdown Analysis Report for a discussion of communications to achieve safe shutdown).

#### 2.3.1.8 Drainage

Drains are available to handle expected run-off from fixed water suppression operations and hose streams in many plant areas. In areas where large, fixed water suppression systems are provided, their operation may temporarily exceed the capacity of the drain system.



Most major equipment is pad or pedestal mounted to protect it from localized flooding. Suppression effects are described in detail in Section 4.0 for each fire zone. All water drains in potentially radioactive areas are routed to the radwaste system.

### 2.3.2 Administrative Controls

NFPA codes and recommendations, NRC supplemental guides deemed applicable, Exelon corporate guidance and procedures, and insurance standards were used as guidance for the development of the Quad Cities Station fire protection administrative controls. These administrative controls are used to control ignition sources and limit transient fire hazards in order to reduce the probability of a fire exposure to safe shutdown systems and equipment as well as to reduce the likelihood of a fire being initiated in any plant area. Likewise, the impact of plant modifications are assessed in order to ensure that fire protection will not be compromised by those modifications.

Quality Assurance policies and procedures are covered in the Exelon Quality Assurance Topical Report (QATR).

## 2.4 Fire Protection Systems and Equipment

### 2.4.1 Water Supply and Distribution System

#### 2.4.1.1 Water Supply and Pumps

Two automatically controlled diesel engine driven fire pumps are provided to maintain the required flow during system operation. The pumps take suction from the service water intake structure. The largest demand can be supplied for more than 2 hours since the water source is the Mississippi River. The diesel engine driven fire pumps are rated to produce 2500 gpm at 139 psi. Guidelines established in National Fire Protection Association (NFPA) 20 were generally followed for fire pump installation. Both pumps are protected by automatic water suppression systems. The pumps are arranged to actuate upon a decrease in system pressure. In addition, a normally closed 10 inch tie-in to the plant service water system is available as a non-credited back-up water supply to the fire header.

A 2-1/2" bypass line is installed around the normally-closed 10" service water cross-tie valve to provide a constant source of pressure on the fire header when the diesel fire pumps are idle. Within the 2-1/2" bypass line is a restricting orifice which serves as a leak detection device by creating a pressure drop upon excess flow, triggering an auto start of a fire diesel.

The operating status of each pump is monitored in the main plant control room. Periodic tests and inspections of each pump are conducted in accordance with established procedures to assure that the pumps remain operable.

#### 2.4.1.2 Piping, Valves, and Hydrants

An underground yard main system with multiple loops is capable of delivering the anticipated largest single fire flow including allowances for hose streams, the SSMP room cooler and service water backflow. (see calc. QDC- 4100-M-0537). The system is common to both Units 1 and 2 and is provided with valves to facilitate the isolation of portions of the system for maintenance or repairs without interrupting the supply to the remaining system. All control valves are sealed, locked, or electrically supervised in their proper position. The main yard loop is separate and independent from the service water system and is dedicated for purpose of fire protection with the exception of the SSMP during some design basis fires. Guidelines established in NFPA 24 were generally followed for the design and installation of the piping. However, most piping in the yard main loop is unlined steel. Fire protection system piping is not designed as a Seismic Category 1 system.

An inside main loop is provided in each turbine and reactor building. The inside loop supplies all automatic sprinkler systems, water spray systems, standpipe risers, and hose stations. The inside main loop is supplied directly by the underground yard main loop and is independent of other plant water systems.

Fire hydrants are installed on the yard main loop to provide a means for applying effective fire hose lines throughout the plant for use by the fire brigade. Each hydrant outlet is provided with hose threads compatible with those used by the local fire department in the event of the need for outside assistance. The flow from hydrants will cause a pressure drop in the system sufficient to start the fire pumps, which will cause an alarm in the control room. A 2-1/2" gate valve is available for each hydrant.

Established procedures are provided for the periodic flushing of the piping system as well as systematic operation of all valves and hydrants.

#### 2.4.2 Fire Detection and Alarm Systems

The fire alarm and detection systems are designed and installed under the general guidance of NFPA 72D. However, certain specific items encountered in nuclear power plants are not always addressed in NFPA codes. Where such situations occurred, deviations from code provisions were justified and documented in NFPA Code Review. The number, type, and location of detectors was determined in general in accordance with the recommendations of the manufacturer and the guidelines established in NFPA No. 72E. All fire alarms and fire detectors in safety related areas provide an audible and visual alarm in the plant control room. A printer for the fire alarm system is available in the Old Computer Room for use with surveillances and for printing alarms and troubles, if needed.

Periodic tests and inspections of each alarm system are conducted according to established procedures to assure system operability. All alarm circuits are either electrically supervised or are tested to assure operability.

#### 2.4.3 Fixed Fire Suppression Systems

##### 2.4.3.1 Water Suppression Systems

Automatic sprinkler and water spray protection is provided in many areas of the plant with emphasis on protecting equipment and operations involving combustible and flammable liquids as well as specific areas containing safety-related systems, equipment, and components. The design and installation of these systems is generally based on guidelines established in NFPA 13 and 15 giving due consideration to maintaining the ability to perform safe plant shutdown functions. However, in specific instances, it is not always possible or practical to comply with the literal provisions of the code. Where code deviations are required or are desirable, they are made under the intent of the code based on engineering judgment.(See "Fire Suppression System Hydraulic Verification Study").

Water suppression systems consist of wet pipe sprinkler, water spray, and preaction type sprinkler systems. Actuation of sprinkler systems is effected by operation of the thermal element within each head/nozzle. Operation of the preaction sprinkler systems is effected by actuation of an associated heat or smoke detection system in addition to the operation of the individual thermal element in each head/nozzle. Actuation of the open head water spray systems is effected by operation of the associated heat detection system installed in the protected area.

Steps have been taken to ensure that inadvertent water discharge from a suppression system will not affect the ability to safely shut down the plant (see Section 4.0). Piping for water suppression systems is seismically supported in areas where its failure could affect safety-related systems and components.

Each water suppression system in the turbine, reactor, and service buildings and the crib house is supplied by the inside main loops for the turbine and reactor buildings. Each system is provided with an OS&Y gate valve where the system connects to the main loop. Periodic tests and inspections of appropriate seals and alarm systems are conducted according to established procedures to assure the operability of the water suppression, control valves, and alarms.

#### 2.4.3.2 Halon Suppression Systems

Halon fire suppression systems are provided in the new computer room, the simulator room, the telephone room and the records storage vault where other forms of suppression could damage valuable equipment or records. The ability of the plant to safely shut down is not affected by inadvertent operation of the system (see Section 4.0). Guidelines established in NFPA 12A were used as general guidance in system design and installation. Periodic tests and inspections are conducted in accordance with established procedures.

#### 2.4.3.3 CO<sub>2</sub> Suppression Systems

Total flooding carbon dioxide (CO<sub>2</sub>) suppression systems are provided in the emergency diesel generator rooms, associated diesel day tank rooms, and the main Turbine-Generator exciter housings for both units. Guidelines established in NFPA 12 were used as general guidance in system design and installation with consideration given to sufficient design concentration and soak time.

All systems are arranged for automatic actuation with manual capability provided as a backup. Automatic actuation is effected by operation of thermal detectors located in the protected area. Each CO<sub>2</sub> system is designed with appropriate electrical interlocks arranged to close dampers and/or shutdown ventilation systems prior to CO<sub>2</sub> discharge. In addition, each system is provided with a predischARGE local alarm and a winter green odorant to ensure that personnel are alerted of a system discharge. Periodic tests and inspections are conducted in accordance with established procedures to assure operability of each CO<sub>2</sub> system.

#### 2.4.4 Manual Fire Suppression Equipment

##### 2.4.4.1 Manual Hose Stations

Manually operable, water-supplied hose stations are strategically located throughout the interior of the plant and are located so as to reach any location containing safety-related equipment or systems with an effective hose stream. Each hose station is equipped with 1-1/2 inch fire hose with a 1-1/2 inch nozzle. Electrically safe-type nozzles are provided where electrical equipment and cable warrant. The guidelines established in NFPA 14 were followed in the design and installation of the standpipe system. Hose outlets are provided with hose threads compatible with those used by the local fire department in the event of the need for outside assistance.

Flows from the standpipe system beyond the capacity of the service water connection will result in a system pressure drop which will cause the fire pumps to start, activating an alarm in the control room.

Periodic tests and inspections of the standpipe systems are conducted according to established procedures to assure system operability.

##### 2.4.4.2 CO<sub>2</sub> Hose Reels

Abandoned in place EC 354100.

##### 2.4.4.3 Portable Extinguishers

Portable fire extinguishers are located throughout all safety-related plant areas. The majority of extinguishers provided are of the CO<sub>2</sub> type with other type extinguishers installed only where appropriate with due consideration given to possible adverse effects on equipment located in the area. Periodic inspections and tests of portable extinguishers are conducted in accordance with established procedures to assure operability.

## **2.5 Fire Brigade**

### **2.5.1 Organization**

A fire brigade of at least five trained members is maintained on site at all times. Their responsibilities and duties are reviewed and discussed during training sessions and coordination with local fire departments is emphasized during leadership training. Local fire departments are afforded the opportunity for training in the operational precautions during fire emergencies (e.g., radiation protection and special hazards at a nuclear power plant).

Local fire departments have agreed to provide support and their response is considered in the overall fire protection program. Plant training is offered to the local fire departments.

### **2.5.2 Training**

Each member of the fire brigade is required to complete an established amount of classroom instruction and additional hands-on practical training. The Station Training Department is responsible for all fire training which covers all basic topics. In addition to the initial training program, all brigade personnel attend retraining classes on a regular basis. Training is established such that brigade members understand their duties and learn to operate as a team. Fire drills are conducted quarterly providing opportunity for fire fighting personnel to become familiar with fire fighting equipment and major areas of the plant. Drills are pre-planned and post critiqued to establish training objectives and determine how well those objectives have been met.

### **2.5.3 Equipment**

The fire brigade is provided with sufficient equipment to perform manual fire suppression operations, as required. Full personal protective gear, including self-contained breathing apparatus with reserve breathing air, is provided. Fire fighting equipment is located throughout the plant to facilitate brigade use and response. Portable smoke removal equipment is available for use by the fire brigade, if necessary.

Portable radios are used for primary communications in fire emergencies. Fire emergencies are broadcast over the plant-wide loud speaker system.

### **2.5.4 Fire Fighting Strategies**

Pre-fire plans are provided for all safety-related areas of the plant. The plans provide necessary information, including a diagram showing fire equipment located to aid the fire brigade in executing manual fire fighting operations.

**3.0  
FIRE HAZARDS ANALYSIS  
METHODOLOGY AND ASSUMPTIONS**

### 3.0 FIRE HAZARDS ANALYSIS METHODOLOGY AND ASSUMPTIONS

#### 3.1 Introduction

A systematic approach was established for the review of the fire hazards and their proximity to safety-related equipment and components necessary for safe shutdown within the area. The combustible materials, the type of fire hazard, the quantity, the combustible loading the material imposes on the area, and the fire detection and suppression capability for the area were reviewed. The effects of postulated fires on the performance of safe shutdown functions and the minimization of radioactive releases to the environment were evaluated.

Actual arrangement of the equipment and combustible materials in the areas, location of doors, provisions of the ventilation system and the penetrations in the walls were considered. Smoke removal requirements resulting from a fire in any plant area are discussed in fire pre-plans for each specific plant area.

The station was divided into separate fire areas based on the results of the zone interaction analysis (see Section 2.1 of the Safe Shutdown Analysis Report) to satisfy the requirements of 10 CFR 50, Appendix R. To aid station personnel in assessing fire hazards in each zone, the fire hazards analysis was performed on a zone-by-zone basis.



### 3.2 Assumptions and Approach

This fire hazards analysis, as updated to include the concerns in 10 CFR 50, Appendix R, is based on the following assumptions:

1. Fire areas are designated, based on as-built conditions, as those portions of a building which are separated from other areas by physical boundaries whose construction is equivalent to that of a rated fire barrier. This is necessary since the plant did not incorporate the "fire-area" concept in its original design. The intent of a physical impedance to fire spread is satisfied based on the relatively low fire loading which exists throughout the plant and the adequacy of the barriers due to other design considerations (e.g., radiation shielding, pipe whip, tornado, seismic). Fire area boundaries are either 1) 3-hour rated, 2) have an exemption request justifying the boundary, or 3) have an engineering evaluation to justify unrated components of the boundary.
2. For the purpose of facilitating the fire hazards analysis, fire areas are further subdivided into fire zones based on logical fire break points and/or substantial barriers. This approach is based on the relatively low fire loading that generally exists throughout the plant, no continuity of combustibles between fire zones (except along the access corridor on the ground floor of the turbine building) or otherwise specifically addressed in Section 4.0, and the existence of noncombustible penetration seals in electrical penetrations between zones (though other unsealed penetrations may exist).
3. The calculation of fire loads in a given fire zone is accomplished by calculating the average combustible loading in a fire zone. Although this may be unrealistic in a few instances, it does provide a quantitative measure of a fire hazard. For the evaluation of structural steel in fire barriers, localized combustible concentrations are taken into account. Also, it should be noted that on the turbine operating floor the fire loads for Fire Zones 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D are not averaged over the entire turbine floor thus providing a more conservative view of the effects of a fire in these zones.
4. This analysis is performed based on the occurrence of the design-basis fire in any zone. The design basis fire postulated for each zone is specific to the hazards and protective features therein, using the definition found in Section 1.
5. Electrical cable tray fire propagation is limited by the provision of existing noncombustible horizontal and vertical fire breaks. However, no credit is taken for them in preventing fire spread between redundant safe shutdown equipment within a fire area or zone group.
6. Radioactive waste handling systems will not be considered in the evaluation unless a hazard can result in a major release and concurrently prevent building containment features from accomplishing their intended function.

7. External fires exposing buildings containing safe shutdown equipment were also considered. Most exterior walls have no significant fire exposure. The only exterior fire exposures significant enough to warrant analysis are the outside transformers and the SBO Building.
8. Credit is taken for the primary containment boundary as a 3-hour fire-rated barrier.

### 3.3 Fire Area Identification

Appendix R states that an alternate or dedicated shutdown procedure shall exist for all areas of the plant. To conform with this requirement, Quad Cities Station Units 1 and 2 were subdivided into fire areas or equivalent fire areas. The justification for treating equivalent fire areas and zone groups as fire areas is contained in this analysis and specifically in the report, "Appendix R Reevaluation Interim Compensatory Measures and Exemption Requests." These fire areas (or equivalent fire areas) were selected because of the substantial natural separation and/or structural barriers present. Also of concern in the selection of the fire areas was the alternate shutdown path which may ultimately be used throughout a particular fire area or equivalent fire area. Each fire area is generally a composite of more than one fire zone or elevation. Table 3.3-1 lists the various fire zones located throughout Quad Cities Units 1 and 2 with cross references to the fire area of which they are a part. Also listed is a brief description of the zone and a reference to the appropriate F-drawing. Table 3.3-2 provides the same information, sorted by fire area. The location of the various fire zones in the plant is shown on Figures 3.3-1 through 3.3-6.

The following penetration seal requirements should be considered when a modification involves penetration of a fire area boundary or rated barrier.

1. All penetrations in fire rated walls should be sealed to the same rating as the wall.
2. All penetrations in unrated fire area boundaries should be sealed with noncombustible material.

By making a careful evaluation of penetration seal requirements, the fire area boundaries identified in the analysis and any other fire barrier commitments will not be violated.

TABLE 3.3-1  
INDEX TO FIRE AREAS AND ZONES

<u>Fire Zone</u>	<u>Description</u>	<u>Fire Area</u>
1.1.1.1.N	U-1 RB Basement (North Half)	RB-1N
1.1.1.1.S	U-1 RB Basement (South Half)	RB-1S
1.1.1.2	U-1 RB Ground Floor	RB-1N
1.1.1.3	U-1 RB Mezzanine Level	RB-1N
1.1.1.4	U-1 RB Main Floor	RB-1N
1.1.1.5	U-1 RB Reactor Floor	RB-1N
1.1.1.5.A	TB Vent Fan Room (658')	TB-IV
1.1.1.6	RB Refueling Floor	RB-1N
1.1.1.6.A	TB Vent Fan Room (678')	TB-IV
1.1.2.1.N	U-2 RB Basement (North Half)	RB-2N
1.1.2.1.S	U-2 RB Basement (South Half)	RB-2S
1.1.2.2	U-2 RB Ground Floor	RB-2N
1.1.2.3	U-2 RB Mezzanine Level	RB-2N
1.1.2.4	U-2 RB Main Floor	RB-2N
1.1.2.5	U-2 RB Reactor Floor	RB-2N
1.2.1	U-1 Primary Containment (Drywell)	DW-1
1.2.2	U-2 Primary Containment (Drywell)	DW-2
2.0	Main Control Room	SB-I
3.0	Cable Spreading Room	SB-I
4.0	Old Computer Room	SB-I
5.0	Safe Shutdown Make-Up Pump (SSMP) Room	TB-II
6.1.A	U-1 DC Panel Room (Small)	TB-III
6.1.B	U-1 DC Panel Room (Large)	TB-III
6.2.A	U-2 DC Panel Room (Small)	TB-I
6.2.B	U-2 DC Panel Room (Large)	TB-I
6.3	Auxiliary Electrical Equipment Room	SB-I
7.1	U-1 Battery Room	TB-III
7.2	U-2 Battery Room	TB-I
8.1	Clean and Dirty Oil Tank Room	TB-II
8.2.1.A	U-1 Condensate Pump Room	TB-III
8.2.1.B	U-2 Condensate Pump Room	TB-I
8.2.1.C	U-1 Turbine Foundation (Under Hotwell)	TB-III
8.2.1.D	U-2 Turbine Foundation (Under Hotwell)	TB-I
8.2.2.A	U-2 TB Upper Basement (CRD Pump Level)	TB-I
8.2.2.B	U-2 Radwaste Pipe Tunnel	TB-I
8.2.3.A	U-1 TB Upper Basement (CRD Pump Level)	TB-III
8.2.3.B	U-1 Radwaste Pipe Tunnel	TB-III
8.2.4	U-1 Cable Tunnel	CT-1
8.2.5	U-2 Cable Tunnel	CT-2

8.2.6.A	U-1 TB Ground Floor	TB-III
8.2.6.B	U-1 TB Ground Floor (LP Heater Bay)	TB-III
8.2.6.C	U-1/2 TB Ground Floor	TB-II
8.2.6.D	U-2 TB Ground Floor (LP Heater Bay)	TB-I
8.2.6.E	U-2 TB Ground Floor	TB-I
8.2.7.A	U-1 TB Mezzanine Floor	TB-III
8.2.7.B	U-1 TB Mezzanine Floor (LP and D Heater Bay)	TB-III
8.2.7.C	U-1/2 TB Mezzanine Floor	TB-II
8.2.7.D	U-2 TB Mezzanine Floor (LP and D Heater Bay)	TB-I
8.2.7.E	U-2 TB Mezzanine Floor	TB-I
8.2.8.A	4-kV Bus 14-1 Switchgear Area	14-1*
8.2.8.B	4-kV Bus 13-1 Switchgear Area	13-1*
8.2.8.C	4-kV Bus 24-1 Switchgear Area	24-1*
8.2.8.D	4-kV Bus 23-1 Switchgear Area	23-1*
8.2.8.E	Turbine Operating Floor	TB-IV
8.2.10	Off Gas Recombiner Level	TB-II
9.1	U-1 Emergency Diesel Generator Room	TB-III
9.2	U-2 Emergency Diesel Generator Room	EDG-2
9.3	Swing Emergency Diesel Generator Room	RB-1/2
11.1.1.A	U-1 D RHR Service Water Pump Room	TB-III
11.1.1.B	U-1 B/C RHR Service Water Pump Room	TB-V
11.1.1.C	U-1 A RHR Service Water Pump Room	TB-III
11.1.2.A	U-2 A RHR Service Water Pump Room	TB-I
11.1.2.B	U-2 B/C RHR Service Water Pump Room	TB-I
11.1.2.C	U-2 D RHR Service Water Pump Room	TB-I
11.1.3	U-1 HPCI Room	RB-1N
11.1.4	U-2 HPCI Room	RB-2S
11.2.1	U-1 RB Southwest Corner Room (1B Core Spray)	RB-1S
11.2.2	U-1 RB Southeast Corner Room (1B RHR)	RB-1S
11.2.3	U-1 RB Northwest Corner Room (1A Core Spray)	RB-1N
11.2.4	U-1 RB Northeast Corner Room (1A RHR)	RB-1N
11.3.1	U-2 RB Southwest Corner Room (2B Core Spray)	RB-2S
11.3.2	U-2 RB Southeast Corner Room (2B RHR)	RB-2S
11.3.3	U-2 RB Northwest Corner Room (2A Core Spray)	RB-2N
11.3.4	U-2 RB Northeast Corner Room (2A RHR)	RB-2N
11.4.A	Cribhouse Basement	CH
11.4.B	Cribhouse Ground Floor	CH
13.1	Guardhouse	Outside

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\* Equivalent Fire Area

14.1	Radwaste Collection and Handling Area	RW
14.1.1	U-1 Off Gas Recombiner Rooms	TB-III
14.1.2	U-2 Off Gas Recombiner Rooms	TB-I
14.3.1	Maximum Recycle Radwaste Building	RW
15.1	Security Diesel Generator Building	Outside
16.1	U-2 HRSS Building	Outside
16.2	U-1 HRSS Building	Outside
17.1.1	Main Power Transformer No. 1	Outside
17.1.2	Auxiliary Transformer 11	Outside
17.1.3	Reserve Auxiliary Transformer 12	Outside
17.2.1	Main Power Transformer No. 2	Outside
17.2.2	Auxiliary Transformer 21	Outside
17.2.3	Reserve Auxiliary Transformer 22	Outside
17.3	Spare Main Power Transformer	Outside
18.1	Technical Support Center	Outside
19.1	Service Building Offices (First Floor)	SB-II
19.2	Service Building Offices (Second and Third Floors)	SB-II
19.3	Control Room Air Handling Unit Room	SB-II
20.1	Spray Canal Lift Station	Outside
21.1	Secondary Alarm Station (SAS)	Outside
22.1	Off Gas Filter Building	OG
23.1	Central Alarm Station (CAS)	SB-II
24.1	Heating Boiler Building	Outside
25.1	Laundry, Tool and DAW Building (LTD)	Outside
26.1	Interim Radwaste Storage Facility	Outside
27.1	Robust Flex Storage Building	Outside
SBO-1	SBO Work Area	SBO
SBO-2	U-1 SBO Day Tank Room	SBO
SBO-3	U-1 SBO Diesel Generator Room	SBO
SBO-4	U-2 SBO Diesel Generator Room	SBO
SBO-5A	U-1 SBO Switchgear Room	SBO
SBO-5B	U-1 SBO Battery Room	SBO
SBO-6A	U-2 SBO Switchgear Room	SBO
SBO-6B	U-2 SBO Battery Room	SBO
SBO-7	SBO Building Stairwell	SBO
SBO-8	U-2 SBO Day Tank Room	SBO

TABLE 3.3-2  
INDEX TO FIRE ZONES BY AREA

<b>Fire Area</b>	<b>Fire Zone</b>	<b>Description</b>
<b>13-1*</b>	8.2.8.B	4-kV Bus 13-1 Switchgear Area
<b>14-1*</b>	8.2.8.A	4-kV Bus 14-1 Switchgear Area
<b>23-1*</b>	8.2.8.D	4-kV Bus 23-1 Switchgear Area
<b>24-1*</b>	8.2.8.C	4-kV Bus 24-1 Switchgear Area
<b>CH</b>	11.4.A	Cribhouse Basement
<b>CH</b>	11.4.B	Cribhouse Ground Floor
<b>DW-1</b>	1.2.1	U-1 Primary Containment (Drywell)
<b>DW-2</b>	1.2.2	U-2 Primary Containment (Drywell)
<b>OG</b>	22.1	Off Gas Filter Building
<b>Outside</b>	13.1	Guardhouse
	15.1	Security Diesel Generator Building
	16.1	U-2 HRSS Building
	16.2	U-1 HRSS Building
	17.1.1	Main Power Transformer No. 1
	17.1.2	Auxiliary Transformer 11
	17.1.3	Reserve Auxiliary Transformer 12
	17.2.1	Main Power Transformer No. 2
	17.2.2	Auxiliary Transformer 21
	17.2.3	Reserve Auxiliary Transformer 22
	17.3	Spare Main Power Transformer
	20.1	Spray Canal Lift Station
	21.1	Secondary Alarm Station (SAS)
	24.1	Heating Boiler Building
	25.1	LTD Building
	26.1	Interim Radwaste Storage Facility
	27.1	Robust Flex Storage Building
<b>SBO</b>	SBO-1	SBO Work Area
	SBO-2	U-1 SBO Day Tank Room
	SBO-3	U-1 SBO Diesel Generator Room
	SBO-4	U-2 SBO Diesel Generator Room
	SBO-5A	U-1 SBO Switchgear Room
	SBO-5B	U-1 SBO Battery Room
	SBO-6A	U-2 SBO Switchgear Room
	SBO-6B	U-2 SBO Battery Room
	SBO-7	SBO Building Stairwell
	SBO-8	U-2 SBO Day Tank Room
<b>RB-1/2</b>	9.3	Swing Emergency Diesel Generator Room
<b>RB-1N</b>	1.1.1.1.N	U-1 RB Basement (North Half)
	1.1.1.2	U-1 RB Ground Floor

\* Equivalent Fire Area

<b>RB-1N (Cont'd)</b>	1.1.1.3	U-1 RB Mezzanine Level
	1.1.1.4	U-1 RB Main Floor
	1.1.1.5	U-1 RB Reactor Floor
	1.1.1.6	RB Refueling Floor
	11.1.3	U-1 HPCI Room
	11.2.3	U-1 RB Northwest Corner Room (1A Core Spray)
	11.2.4	U-1 RB Northeast Corner Room (1A RHR)
<b>RB-1S</b>	1.1.1.1.S	U-1 RB Basement (South Half)
	11.2.1	U-1 RB Southwest Corner Room (1B Core Spray)
	11.2.2	U-1 RB Southeast Corner Room (1B RHR)
<b>RB-2N</b>	1.1.2.1.N	U-2 RB Basement (North Half)
	1.1.2.2	U-2 RB Ground Floor
	1.1.2.3	U-2 RB Mezzanine Level
	1.1.2.4	U-2 RB Main Floor
	1.1.2.5	U-2 RB Reactor Floor
	11.3.3	U-2 RB Northwest Corner Room (2A Core Spray)
	11.3.4	U-2 RB Northeast Corner Room (2A RHR)
<b>RB-2S</b>	1.1.2.1.S	U-2 RB Basement (South Half)
	11.1.4	U-2 HPCI Room
	11.3.1	U-2 RB Southwest Corner Room (2B Core Spray)
	11.3.2	U-2 RB Southeast Corner Room (2B RHR)
<b>RW</b>	14.1	Radwaste Collection and Handling Area
	14.3.1	Maximum Recycle Radwaste Building
<b>SB-I</b>	2.0	Main Control Room
	3.0	Cable Spreading Room
	4.0	Old Computer Room
	6.3	Auxiliary Electrical Equipment Room
<b>SB-II</b>	19.1	Service Building Offices (First Floor)
	19.2	Service Building Offices (Second and Third Floors)
	19.3	Control Room Air Handling Unit Room
	23.1	Central Alarm Station (CAS)
<b>TB-I</b>	8.2.1.B	U-2 Condensate Pump Room
	8.2.1.D	U-2 Turbine Foundation (Under Hotwell)
	8.2.2.A	U-2 TB Upper Basement (CRD Pump Level)
	8.2.2.B	U-2 Radwaste Pipe Tunnel



<b>TB-I (Cont'd)</b>	8.2.6.D	U-2 TB Ground Floor (LP Heater Bay)
	8.2.6.E	U-2 TB Ground Floor
	8.2.7.D	U-2 TB Mezzanine Floor (LP and D Heater Bay)
	8.2.7.E	U-2 TB Mezzanine Floor
	11.1.2.A	U-2 A RHR Service Water Pump Room
	11.1.2.B	U-2 B/C RHR Service Water Pump Room
	11.1.2.C	U-2 D RHR Service Water Pump Room
	14.1.2	U-2 Off Gas Recombiner Rooms
	6.2.A	U-2 DC Panel Room (Small)
	6.2.B	U-2 DC Panel Room (Large)
	7.2	U-2 Battery Room
<b>TB-II</b>	5.0	Safe Shutdown Make-Up Pump (SSMP) Room
	8.1	Clean and Dirty Oil Tank Room
	8.2.10	Off Gas Recombiner Level
	8.2.6.C	U-1/2 TB Ground Floor
	8.2.7.C	U-1/2 TB Mezzanine Floor
<b>TB-III</b>	8.2.1.A	U-1 Condensate Pump Room
	8.2.1.C	U-1 Turbine Foundation (Under Hotwell)
	8.2.3.A	U-1 TB Upper Basement (CRD Pump Level)
	8.2.3.B	U-1 Radwaste Pipe Tunnel
	8.2.6.A	U-1 TB Ground Floor
	8.2.6.B	U-1 TB Ground Floor (LP Heater Bay)
	8.2.7.A	U-1 TB Mezzanine Floor
	8.2.7.B	U-1 TB Mezzanine Floor (LP and D Heater Bay)
	9.1	U-1 Emergency Diesel Generator Room
	11.1.1.A	U-1 D RHR Service Water Pump Room
	11.1.1.C	U-1 A RHR Service Water Pump Room
	14.1.1	U-1 Off Gas Recombiner Rooms
	6.1.A	U-1 DC Panel Room (Small)
	6.1.B	U-1 DC Panel Room (Large)
	7.1	U-1 Battery Room
<b>TB-IV</b>	1.1.1.5.A	TB Vent Fan Room (658')
	1.1.1.6.A	TB Vent Fan Room (678')
	8.2.8.E	Turbine Operating Floor
<b>TB-V</b>	11.1.1.B	U-1 B/C RHR Service Water Pump Room
<b>CT-1</b>	8.2.4	U-1 Cable Tunnel
<b>CT-2</b>	8.2.5	U-2 Cable Tunnel
<b>EDG-2</b>	9.2	U-2 Emergency Diesel Generator Room

### 3.4 Combustible Loading Calculation

Combustible loading refers to the quantity of heat which may be released within a defined space if all exposed combustible material located in the space were to burn. As an analysis tool, combustible loading is primarily used to assess the ability of the barriers surrounding a space and any fire resistive construction contained within the space to withstand a worst case fire. The ability of such barriers and constructions to withstand fire is referred to as their fire resistivity and is measured in units of time (e.g., hours). Calculation QDC-4100-M-0691 contains the combustible loading for fire zones in the plant.

#### 3.4.1 Fire Severity

The combustible loading of an area can be converted to a fire severity figure, expressed in units of time (e.g., hours). This allows a comparison between the combustible loading and the fire resistive capabilities of the barriers or other rated construction. The relationship between combustible loading, expressed in BTU's per square foot, and fire severity, expressed in units of time, is provided by the relationship:

$$80,000 \text{ BTU/ft}^2 \text{ combustible load} = 1 \text{ hour severity}$$

This relationship is linear up to a loading of 240,000 BTU/ ft<sup>2</sup>.

The relationship between combustible loading, fire severity, and fire resistivity is illustrated by the following: If a barrier surrounding a room is of three hour fire resistive construction, it would be expected to survive a fire of three hours severity. Such a severity is represented by a combustible load of 240,000 BTU/ ft<sup>2</sup>.

It should be noted that fire severity is an analytical concept and does not necessarily relate to the duration, intensity or extent of any real fire. However it is not the only information that should be used in determining fire risk. For example, the addition of a large oil storage tank would be a considerable increase in the fire hazard, but may not cause a significant change to the combustible loading if the fire zone was large. Therefore using the specific values determined in the combustible load calculation to determine fire risk is inappropriate.

NES-MS-05.1 rev. 0, Combustible Loading Standard provides standards for dividing combustible loading into three categories. The categories are:

Low	Less than 100,000 BTU/ ft <sup>2</sup>
Medium	Between 100,000 BTU/ ft <sup>2</sup> and 200,000 BTU/ ft <sup>2</sup>
High	Greater than 200,000 BTU/ ft <sup>2</sup>

These values are the correct order of magnitude for performing fire hazard evaluations. Changes that do not change the combustible loading categories are not of significance to fire safety.

The fire severity listed in Section 4 of this document is relative to the combustible loading category of the Fire Zone. Calculation QDC-4100-M-0691 calculates the actual fire severity based on the combustible loading of the Fire Zone.

### 3.4.2 Heat Release Potential of Combustibles

The heat release potential (HRP) of any combustible is determined by multiplying its heating value per unit quantity by the quantity of the material present. The units used for quantity are selected depending on the nature of the combustibles and their usage. In general, solids are quantified in terms of weight in pounds, liquids in terms of volume in gallons, and gases in terms of volume in cubic feet. However, some deviations from this practice occur where other units are more appropriate. The HRP values used are presented in Attachment B of Calculation QDC-4100-M-0691.

### 3.4.3 Categories of Combustibles

The combustible loading in an area is usually considered to have two components; fixed (in-situ) and transient. The definition of these terms and the methodology used in determining each is discussed in subsequent sections.

#### 3.4.3.1 Fixed Combustibles

**GENERAL:** Fixed combustibles come in any of three states; solid, liquid, or gaseous. The determination of combustible loading contributed by solid materials is a straightforward process of inventorying the quantity of combustible solids in the area, and multiplying the result by the heat release potential of the material. In cases where the solid is fully or partially enclosed by non-combustible materials, a derating factor may be applied to provide a more realistic assessment of the actual heat release which may be expected. The treatment of liquids and gases, however, is complicated by their ability to flow in a gravitational field.

**DATA DEVELOPMENT:** The determination of the fixed combustible loading has been made utilizing information gathered during walkdowns of the plant and taken from design documents, vendor manuals, and other sources. The data obtained established both the nature and quantity of combustibles present in each area. Multiplying the information for each type of combustible present by the heating value for that combustible provided the heat release potential of that material. Once this information was obtained, the results were summed and the result divided by the floor area of the space being analyzed to arrive at the space's combustible loading.

**COMBUSTIBLE LIQUIDS:** Combustible liquids are generally not a concern when properly contained. When they escape their container, however, they can present a significant hazard. In consideration of this, the quantities of liquids contained in sumps, reservoirs, tanks, transformers, bearing housings, and gear boxes are included in the area combustible loading calculation. Combustible liquids can also be released into an area from pressurized piping systems which pass through it. The pressurized piping will cause oil to be sprayed into the area creating a significant fire hazard. Thus, the potential combustible loading from the failure of pressurized piping system components is added to the area combustible loading. This methodology for including the entire same quantity of oil in multiple fire zones due to the piping which passes through the area represents a more conservative approach than the previous bases for the Fire Hazard Analysis. It should also be noted that complete failure of these piping systems goes beyond the failure scenarios described in the Quad Cities UFSAR, but they are included in this calculation as an added conservatism.

**COMBUSTIBLE GASES:** Systems containing combustible gases are treated in a similar manner to liquids, as discussed above.

**ELECTRICAL CABLES:** A significant contributor to the combustible loading in many areas is the insulation and jacketing material associated with electrical cables. The determination of the amount of cable in a given fire zone is made using information from the SLICE database. The routing points used in SLICE are assigned to the appropriate fire zone along with the length of cables associated with the routing point. The length of cable are then summed for a given fire zone. This method is conservative since SLICE will credit cable lengths into the adjacent fire zones, thus assigning cable to a fire zone that may not be physically in that fire zone.

### **3.4.3.2 Transient Combustibles**

**GENERAL:** Transient combustibles are those combustibles which are moved into an area for some period of time to support a given activity and are either consumed during the activity or are removed from the area at the end of the activity. At any given time, a number of activities may be going on in a particular area. Since the start time and duration of a given activity is different from any other, the number of activities going on at any one time is quite variable. Thus, the transient combustible loading is also quite time variant. To provide a realistic and conservative projection of the transient combustible loading which might be found in each area, a task analysis process has been used.

**TASK ANALYSIS:** This process consisted of defining the activities which may be expected to occur in each area, then identifying the specific tasks associated with that activity. Using a tabulation of the combustibles associated with each of these tasks, the transient loading for the area could be projected. Since not all possible tasks could occur at any given time due to the restraints of space, manpower, operating mode and other factors, a projected worst case combination of activities formed the basis of the loading calculation for each zone. The selection of the worst case combination was based on a number of considerations including: 1) the limitation imposed on the conduct of multiple activities by the space available, 2) the selection of the worst case of any activities which are mutually exclusive, 3) and that some activities are precluded while others are in progress (e.g., spray painting is not allowed while welding is in progress). These judgements were tempered utilizing knowledge of plant operations, maintenance, and other activities.

The activities which may occur in the plant were divided into the following categories:

- Lubrication
- Maintenance
- Modification
- Contamination Control
- Services (e.g., janitorial, preservation)
- Fuel Handling

A breakdown of these activities into their associated tasks and combustibles is presented in Attachment C of QDC-4100-M-0691. Obviously, the specific amount of material introduced for any specific task can vary depending on the circumstances. The figures used are selected to be representative for a given task.

For ease in calculating the transient loading, each combustible introduced by a given task was placed in one of six categories. These categories and the associated heats of combustion are as follows:

Cellulosics	9,100 BTU/lb
Combustible liquids	20,000 BTU/lb or 155,000 BTU/gal
Combustible gases	1,500 BTU/ft <sup>3</sup>
Plastics	20,000 BTU/lb
Charcoal	15,000 BTU/lb
Filter media	3,000 BTU/lb

These heats of combustion are considered to be representative bounding values. For cellulosics, the value used is that associated with wood. For combustible liquids and plastics, the value used is a bounding value for hydrocarbons which is widely accepted for fire protection purposes. For combustible gases, the value associated with acetylene is used.

### 3.4.4 Assumptions / Engineering Judgments

The following assumptions are made in the development of the combustible loading calculation. For further explanation refer to QDC-4100-M-0691

1. To account for small, distributed quantities of combustible materials in the form of instrument parts, switch plates, flex conduit jackets, combustible parts of emergency lights, name plates, signs, snubber oil and similar items, a miscellaneous combustible loading of 400 BTU/ft<sup>2</sup> is incorporated into zone area.
2. Where ordinary combustible material is enclosed completely by noncombustible construction (e.g., paperwork in steel file cabinets or desks), the heat release potential of the combustibles will be based on a factor of 0.4 times the maximum expected heat release.
3. Where ordinary combustibles are enclosed on five sides by non-combustible construction (e.g., steel bookcases), the quantity of combustibles will be multiplied by a factor of 0.75.
4. No reductions based on degree of enclosure will be given for combustible and flammable liquids and gases.
5. Electrical power and control cables are considered to have an average heat release potential of 1750 BTU/ft of length. Instrument cables are considered to have an average heat release potential of 1122 BTU/ft of length.

6. The combustible components of electrical cables (e.g., jackets and insulation) contained in a non-combustible, enclosed raceway system (e.g., conduit, pull boxes, junction boxes) do not contribute to the combustible loading in the area.
7. The combustible loading represented by combustibles contained in ventilated electrical cabinets (e.g., switchgear, power electronic cabinets) is reduced by a factor of 0.5.
8. The combustible loading contribution of combustibles contained in closed, non-combustible, non-ventilated electrical panels and cabinets (e.g., MCCs, panel boxes, control panels, lighting panels, and similar enclosures), is encompassed in the miscellaneous combustible loading of 400 BTU/ft<sup>2</sup> (Assumption 1).
9. Where non-liquid Class-B combustibles (e.g., grease) are totally enclosed in metal gear boxes, bearing housings, valves, or sealed bearings, they do not contribute to the combustible loading in the area.
10. Offgas is considered to be non-combustible until it exits the steam jet air ejector condensers.
11. In determining the combustible loading of a given area, discrete quantities of combustibles are considered only if they exceed the following limits:

Combustible and flammable liquids	½ gallon
Cellulosics (wood, paper, cotton cloth)	2-½ pounds
Plastics	1 pound
Charcoal	1-½ pounds
Fuel gas	1 cubic foot
12. The combustible insulation in electric motors and dry transformers is considered to have negligible contribution to area combustible loading and are accounted for in the miscellaneous loading discussed in Assumption 1, above.
13. The existence of fire retardant properties by a material does not exclude it from the combustible loading determination, since such materials do burn once ignited.
14. Where trash drums are fitted with lids designed to smother fire, the heating potential of the contained material is derated by a factor of 0.25. In the absence of test data, this assumption is that these cans are only 25% efficient in preventing combustion. This assumption is considered to be reasonable given the effect of partial enclosure as cited in the bases for assumptions 2, 3, and 7.
15. The combustible content of ventilated electrical panels (e.g., switchgear) is assumed to be the combustible contribution per foot for each of the cables serving the panel multiplied by six.
16. For calculational purposes, the linear relationship between combustible load and fire severity will be assumed to exist throughout the combustible loading domain.

### 3.5 Suppression Effects Analysis

Appendix R of 10 CFR 50 requires that alternative or dedicated shutdown capability shall be provided "where redundant trains of systems required for hot shutdown located in the same fire area may be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems" (Section III.G.3.b). The NRC went on to establish four lines of inquiry that should be considered when performing a suppression effects analysis in the Inspection and Enforcement Manual, Temporary Instruction 2515/62, Rev. 1. These lines of inquiry are as follows:

1. Whether a fire in a single location (or inadvertent actuation of a fire suppression system) could cause activation of potentially damaging automatic fire suppression systems for all redundant trains, or;
2. Whether a fire in a single location could, through the production of smoke, heat, or hot gases, cause activation of potentially damaging fire suppression for all redundant trains, or;
3. Whether a fire in a single location (or inadvertent actuation or rupture of a fire suppression system) could, through local fire suppression activity, indirectly cause damage, or;
4. Whether, in response to a fire in a single location the utilization of manually controlled fire suppression systems could cause damage to all redundant trains."

The safe shutdown approach used at Quad Cities Station is based primarily upon an alternative shutdown method rather than redundant trains of equipment. For this reason, the suppression effects analysis was conducted to ensure that the alternative safe shutdown path would remain unaffected although redundant equipment might be subject to the effects of suppression discharge under conservative assumptions. The analysis included the effects of piping breaks or leakage and the use of manual hose streams. Effects of portable extinguisher use, however, were not analyzed since it is unrealistic to assume that the use of an extinguisher will affect alternative shutdown paths due to the wide physical separation between the paths.

Insulated, undamaged electrical cable will not be affected by, water spray, water accumulations, smoke, or CO<sub>2</sub> discharge. Cables which could have been damaged by an actual fire have been postulated to be unusable and the application of water to these circuits will not degrade the situation beyond that assumed in the safe shutdown analysis (see the Safe Shutdown Analysis Report).

The results of the suppression effects analysis are summarized for each fire zone in Section 4.0.

### 3.6 Structural Steel Analysis

Based on the guidance contained in Generic Letter 83-33 and Information Notice 84-09, the survivability of the structural steel beams at Quad Cities Station was evaluated to ensure fire-related structural damage would not have an adverse effect on the plant's ability to shut down. The reactor buildings, turbine building, control room, cable spread room, and AEER were reviewed in detail since they contain mechanical and electrical equipment needed to support either hot or cold shutdown. The Cribhouse and SBO Building were not reviewed since failure of steel in these buildings would not effect hot or cold shutdown. This evaluation was conducted in three steps as follows:

1. Areas with protected steel (either fire resistive cover and/or automatic sprinkler protection) were eliminated from the review.
2. The fire exposure was quantified to determine the thermal environment for the steel beams.
3. Calculations were conducted to determine heat transfer to the steel beams.

#### 3.6.1 Methodology

The first step in the evaluation was to identify those areas required for safe shutdown which contained unprotected exposed steel beams necessary to support the structure (ceiling above area). This resulted in a list of areas only in the turbine building which required evaluation. Areas which contained steel with approved fire resistive coverage and/or automatic sprinkler protection were considered adequately protected without further analysis. (The NRC accepted automatic water suppression systems in lieu of passive steel protection at Limerick Generating Station as discussed in Reference 1.) The fire detection and automatic suppression drawings in the Exemption Requests, (Figures B-1 through B-24) were used as the basis of determining where sprinkler protection was or would be provided.

The next step was to quantify the severity of the fire exposure in terms of a thermal environment seen by the structural steel element. The methodology applied in this step was that developed and applied by PLC and approved by the NRC for use at Limerick Generating Station as discussed in Reference 1. A detailed discussion of this methodology is provided in Appendix A to the Structural Steel Beam Fire Exposure Evaluation.

The generalized methodology then incorporated the specific condition (cable materials) at Quad Cities Station. The conservative assumption was made that the bulk of the cables installed in the plant was non-IEEE-383-qualified, PE/PVC jacket and insulation. Test data obtained from fire research conducted by both Factory Mutual Research Corporation (see Reference 2) and Sandia National Laboratories (see Reference 3) was used to develop heat release rates, plume temperatures and separation criteria for cable tray arrays.



With the exception of the Unit 1 and 2 battery rooms and Unit 1 and 2 125-Vdc panel rooms, all of the areas evaluated were large open areas. Therefore, only the effects of fire plumes needed to be evaluated. The structural steel supporting the ceilings and walls of the Unit 1 and 2 battery rooms, and the structural steel supporting the exterior walls of the 125 Vdc panel rooms and battery charging rooms have been fire protected with Pyrocrete 241.

Since transient combustibles were assumed to be only at floor level, the most severe fire exposure to ceiling level structural steel would be from direct plume or flame impingement from localized cable tray fires. Heat release data and temperature profile data from FMRC tests and Sandia Laboratories tests were used to develop separation criteria and plume temperatures. This yielded the separation/exposure criteria given in Appendix B to the Structural Steel Beam Fire Exposure Evaluation. The separation/exposure criteria was then used to determine which structural elements need heat transfer evaluation.

In order to determine the duration of localized exposure fires, it was necessary to evaluate the number of cables and their characteristic burning rates (mass combustion rates, and heat release rates). Cable raceway drawings indicated the number of cables in each tray, identified from reference point to reference point. (No documentation was available on subsequent cable additions to those shown on the base documents which could influence the fire exposure to the structural steel.) To translate this cable information into the mass of combustible material available to burn and subsequently into exposure duration, cable specification data supplied by Sargent & Lundy and the cable manufacturers (General Electric and Simplex) were used to quantify an "average" cable. This portion of the evaluation is attached in Appendix C to the Structural Steel Fire Exposure Evaluation (See the F.P.P.D.P.).

A Reanalysis of the Structural Steel Fire Exposure Evaluation was performed in 1998 (Calc. 9801910 ) using the original methodology and criteria to verify that the effects of changes in cable loading had been properly evaluated. In addition, new cable trays that had been installed since the 1986 evaluation were analyzed to verify that localized area temperatures would not jeopardize structural steel members. SLICE or field walkdowns were used to identify the number of cables in the cable trays.

### 3.6.2 Results

Based on the results of these evaluations, the majority of structural steel supporting the unrated walls in the general area of the turbine building would not fail due to fire exposure. When calculated structural steel temperatures exceeded 1100°F, the result was considered a failure because the load carrying ability of the steel has degraded the typical safety factor to a point where the steel can only carry its design load.

For the beams which would be exposed to temperatures higher than 1100°F, a review was performed of stresses which these beams experience due to the permanent dead load which they support. These stresses were then compared to the yield stresses at elevated temperatures of ASTM-A36 steel published in "U.S.S. Steel Design Manual" to determine if the beams can

accept higher temperatures than 1100°F without failure. Table 3.6-1 lists the beams that cannot accept the higher temperatures and the type of fire protection that was recommended and installed. Also the beams located in the battery charger rooms cannot accept the high temperature identified by the 1998 evaluation. The failure of the battery and battery charger rooms was deemed to not affect the ability of the station to safely shutdown in the event of a fire in their respective fire areas.

As part of the structural steel evaluation cable loading limits were established for selected cable trays. Cable loadings must be maintained below these limits to avoid additional potential beam failures in the event of a cable tray fire. Cables in plant trays are controlled by Calculations QDC-4100-S-0455 and 980190.

### 3.6.3 References

1. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the Operation of the Limerick Generating Station, Units 1 and 2, Supplement 2," NUREG0991, October 1984.
2. FMRC, "Categorization of Cable Flammability, Intermediate Scale Fire Tests of Cable Tray Installations," Electric Power Research Institute, EPRI NP-1881, August 1982.
3. W.H. Schmidt and F.R. Krause, "Burn Mode Analysis of Horizontal Cable Tray Fires," SAND 81-0079, NUREG/CR-2431, Sandia National Laboratories, February 1982.

TABLE 3.6-1  
BEAMS REQUIRING FIRE PROTECTION  
FOLLOWING STUDY OF BEAM STRESS  
INTERACTIONS WITH DEAD LOAD  
AT ELEVATED TEMPERATURES

<u>Beam No.</u>	<u>Fire Zone</u>	<u>Fire Protection</u>
5	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
7	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
8	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
9	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
11	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
12	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
13	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
14	8.2.6.C	Extend the existing water suppression system.
22	8.2.7.C	Fireproof the beam.
23	8.2.7.A	Fireproof beam as indicated in the structural steel analysis.
24	8.2.7.C	Fireproof the beam.
26	8.2.7.C	Fireproof the entire length of the beam.
27	8.2.7.C	Fireproof the part of the beam above the cable tray.
28	8.2.7.C	Fireproof the part of the beam above the cable tray.
29	8.2.7.C	Fireproof the part of the beam above the cable tray.
30	8.2.7.C	Fireproof the beam for 14 feet on the north end.
45	8.2.7.A	Fireproof the west end of the beam outside the battery room.

TABLE 3.6-1  
BEAMS REQUIRING FIRE PROTECTION  
FOLLOWING STUDY OF BEAM STRESS  
INTERACTIONS WITH DEAD LOAD  
AT ELEVATED TEMPERATURES

<u>Beam No.</u>	<u>Fire Zone</u>	<u>Fire Protection</u>
48	8.2.7.A	Fireproof the entire length of the beam.
51	8.2.7.A	Fireproof the entire length of the beam.
52	8.2.7.A	Fireproof the part of the beam above the cable tray.
54	8.2.7.A	Fireproof the entire length of the beam.
55	8.2.7.A	Fireproof the part of the beam above the cable tray.
57	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
58	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
59	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
62	8.2.6.C	Fireproof beam as indicated in the structural steel analysis.
68	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
69	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
74	8.2.7.C	Fireproof beam as indicated in the structural steel analysis.
75	8.2.7.C	Fireproof beam as indicated in the structural steel analysis.
76	8.2.7.C	Fireproof beam as indicated in the structural steel analysis.
81	8.2.7.E	Fireproof the entire length of the beam.
82	8.2.7.E	Fireproof the part of the beam above the cable tray.
87	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
88	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.

TABLE 3.6-1  
BEAMS REQUIRING FIRE PROTECTION  
FOLLOWING STUDY OF BEAM STRESS  
INTERACTIONS WITH DEAD LOAD  
AT ELEVATED TEMPERATURES

<u>Beam</u> <u>No.</u>	<u>Fire Zone</u>	<u>Fire Protection</u>
103	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
124	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
131	8.2.6.A	Fireproof beam as indicated in the structural steel analysis.
249	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
277	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
278	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
309	8.2.6.E	Fireproof beam as indicated in the structural steel analysis.
465	8.2.7.C	Fireproof beam as indicated in the structural steel analysis.

See the March 28, 1986 Sargent & Lundy letter “Recommendation for Fire Protection for Structural Steel Beams Appendix R Fire Protection” located in the F.P.P.D.P for additional information.

### 3.7 Penetrations

#### 3.7.1 Electrical Penetration Seal Evaluation

Wherever cables pass through barriers for which credit is taken in the Appendix R analysis or a previous commitment was made, it was demonstrated that the penetrations are sealed in a manner that preserves the integrity of the fire barriers in accordance with the requirements of Appendix A to BTP APCSB 9.5-1. Walkdowns were conducted to gather data on the penetrations. The data recorded for each penetration included the location, seal detail, and degree of cable fill. These data were reviewed to determine the adequacy of the seals. This evaluation is summarized in the report entitled, "Review of Electrical Penetrations Seal Fire Testing and Installation Program.." As a result the evaluation tests were conducted to ensure that the existing seals met the specifications of Exelon commitments. The reports on these tests are found in the F.P.P.D.P.

#### 3.7.2 Mechanical Penetration Seal Evaluation

In accordance with the Appendix R safe shutdown analysis, certain walls and floors in the reactor building, turbine building, and service building are required to have a 3-hour fire resistance rating. To justify the 3-hour rating of a wall all mechanical penetrations must be sealed and those seals must be 3-hour fire rated.

A walkdown of all mechanical penetration seals was conducted. The data from the walkdown was compared against current seal details to confirm that they apply and the adequacy of the existing seal was verified. (The data sheets verifying the adequacy of existing seals are found in F.P.P.D.P.) Barrier drawings were then developed (see drawings F-41 through F-198) based on the walkdown to show the size and location of every penetration in the fire barriers.

#### 3.7.3 Fire Damper Review (NFPA 90A)

Fire barriers carrying a 3-hour fire rating must also have 3-hour rated fire dampers in any HVAC ducts that penetrate the barrier. All barriers that were designated as being 3-hour barriers were reviewed to determine if HVAC ducts penetrated them and then a check was made to determine if fire dampers had been installed. If no damper had been installed either a fire damper was installed or an exemption request from the requirements of 10 CFR 50 Appendix R was submitted to justify not installing a damper (see Sections 3.3 and 4.3 of the Exemption Requests).

Fire dampers that have been installed in HVAC ducts that penetrate fire barriers have been designed and installed according to guidance in NFPA 90A (1976). All of these fire dampers were reviewed for compliance with criteria in NFPA 90 and justification for significant deviations was provided.

A fire damper surveillance program was established for all 3-hour rated fire dampers. This program is controlled by a fire damper surveillance procedure.

### 3.8 Design-Basis Fire Protection Commitments

Design-Basis fire protection commitments associated with Appendix R Exemption Request justifications, the station's response to Appendix A requirements, and Safety Evaluation Reports (SERs) are listed in Table 3.8-1. As noted, Table 3.8-1 lists "design-basis" related fire protection commitments. Procedural and administrative related fire protection commitments have not necessarily been listed. Where appropriate, these commitments have been entered into the fire protection commitments section of the FHA for each fire zone (see section 4). These commitments were reviewed against existing plant configurations.

The commitments listed in Table 3.8-1 are grouped (sorted) by fire zone. Commitments which are general in nature or apply to several fire zones are not assigned to a specific fire zone. Instead, they are listed as General in the fire zone column of Table 3.8-1. Commitments associated with outside areas are listed as Outside in the fire zone column.

Many of the commitments have multiple references (e.g. Exemption Request section 3.2 and SER (July 21, 1988) section 2.2.1); additional references are indicated in the comment column of the table.

Additional fire protection commitments are listed in the Fire Protection Commitment Matrix (Rev. 3). Table 3.8-1 was used in conjunction with the matrix to complete the "Commitments" section of the new Fire Hazards Analysis.

The following documents were used in the development of Table 3.8-1.

- The Quad Cities NRC approved Appendix R Exemption Requests located in Volume 4 of the FPR.
- The following SERs for Appendix A to BTP APCS 9.5-1.

July 27, 1979 Fire Protection SER.

November 5, 1980 Supplement to SER on Fire Protection

February 12, 1981 Supplement 2 to SER on Fire Protection

- The following SERs for 10CFR50, Appendix R Sections III.G and III.L and 10CFR50.48.

December 30, 1982, SER for Appendix R to 10CFR50, Sections III.G and III.L

June 23, 1983, SER for Request for Exemption from Requirements of Appendix R to 10CFR50, Section III.G.

December 1, 1987, SER for Interim Compensatory Measures and Request for Exemption from 10CFR50, Appendix R, Section III.G.1 Regarding Hot Shutdown Repairs.

April 20, 1988, Revised SER for Exemption from 10CFR50, Appendix R, Section III.G.1

December 11, 1987, SER for Exemptions from the Fire Protection Requirements of 10CFR50 Appendix R, Section III.G. (This SER was replaced in its entirety by the July 21, 1988 SER).

July 21, 1988, Revised SER for Exemptions from 10CFR50, Appendix R, Section III.G.

August 18, 1989, Exemption from Technical Requirements of Appendix R to 10CFR50 Appendix R.

May 10, 1990, Appendix R Section III.G Exemption SER Comments.

May 22, 1990, Hot Shutdown Repairs in the Event of a Fire.

February 25, 1991, Safety Evaluation of Licensee Requests for Exemptions from Certain Technical Requirements of Appendix R to 10CFR50.

May 21, 1991, Exemption from Technical Requirements of Appendix R to 10CFR50.

March 2, 1994, Safety Evaluation by the Office of Nuclear Reactor Regulation Related to a Request for Revisions to Exemptions from Fire Protection Requirements of 10 CFR Part 50, Appendix R.

September 27, 2001, Safety Evaluation for Revocation of Exemptions form the Requirements of 10 CFR Part 50, Appendix R.

Quad Cities response to the requirements of Appendix A to BTP APCSB 9.5-1 (located in Section 5 of the FHA).



**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
6/86 (Rev. 2) / 3.2.4.2	July 21, 1988 / 2.2.2	Combustibles pass between 1.1.1.1 & 1.1.1.2 at K/19.	1.1.1.1	Cable Riser has fire resistive seal.
6/86 (Rev. 2) / 3.2.4.2	July 21, 1988 / 2.0	Cable penetrations (1.1.1.1 & 8.2.4) fire resistive seals.	1.1.1.1	
6/86 (Rev. 2) / 3.2.4.2	July 21, 1988 / 2.2.2	Fixed linear thermal detection in/near torus cable trays.	1.1.1.1	Also 4.2.1, 3.2.2, 3.2.4.3, 11.2.2 of (ER)
6/86 (Rev. 2) / 3.2.4.2	July 21, 1988/2.2.2, 2.3	Auto. water suppression sys. provided for cable riser.	1.1.1.1	Below 595' slab, at cable riser. Also 11.2.2(ER)
6/86 (Rev. 2) / 3.2.4.3	July 21, 1988 / 2.2.1 & 2	Manual fire fighting equipment is credited	1.1.1.1	Also 3.2.2, 3.2.4.2, & 11.2.2 of ER, 8.2 of 88 SER
6/86 (Rev. 2) / 3.2.4.3	July 21, 1988 / 2.2.3	RHR divisional path (cables) separation >125'	1.1.1.1	
6/86 (Rev. 2) / 3.2.4.3	July 21, 1988 / 2.2.3	Concrete walls(watertight) door between redundant RHR	1.1.1.1	Between 1.1.1.1 & 11.2.4.
6/86 (Rev. 2) / 3.2.4.2	Feb. 25, 1991 / 2.1.2	Transient combustibles administratively controlled.	1.1.1.1	Also see 11.2.3.1 of the ER
6/86 (Rev.2)/11.1.1.3.1	Feb. 25, 1991 / 2.1	Elect. pens. sealed in floor of 1.1.1.2.	1.1.1.1	Also see 11.2.3.2 of ER.
	Feb. 25, 1991 / 3.0	Fire brigade able to control fire/smoke on the torus level	1.1.1.1	To allow use of supp. pool level indicators.
	Feb. 25, 1991 / 2.1.2	Fire detection provided with some exceptions.	1.1.1.1	In SAIC's evaluation.
	Feb. 25, 1991 / 2.1.2	Manual hose stations & port. extinguishers provided.	1.1.1.1	At entrance to torus level.
	Feb. 25, 1991 / 2.1.3	Control room alerted of fire condition via detection sys.	1.1.1.1	
	Feb. 25, 1991 / 2.1.3	Fire brigade to control fires using manual equipment.	1.1.1.1	
	Feb. 25, 1991 / 2.2.2	Linear detectors are provided.	1.1.1.1	Provided for cable trays per 2.2.3.
	Feb. 25, 1991 / 2.2.2	Auto. sprinkler sys. where cable trays breach ceiling.	1.1.1.1	
	Feb. 25, 1991 / 2.2.3	Transient combustibles administratively controlled.	1.1.1.1	Also see 2.2.2
6/86 (Rev. 2) / 3.2.4.3	July 21, 1988 / 2.2.3	1-hour fire resistive material on intervening cable trays.	1.1.1.1	For 20' minimum. Also 11.2.2 of ER.
6/86(Rev.2)/3.2.4.1&2	July 21, 1988 / 2.0	No combustibles pass through unsealed penetrations	1.1.1.2	1.1.1.2 and zones below(1.1.1.1, 11.2.2, etc)
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.0	Transient comb. & ignition sources admin. controlled.	1.1.1.2	
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.2.1 & 2	Fire Detection system provided throughout.	1.1.1.2	Except stm tun, airlock, 1/2trackway
6/86 (Rev. 2) / 3.2.4.2	July 21, 1988 / 2.2.2	Combustibles pass between 1.1.1.1 & 1.1.1.2 at K/19.	1.1.1.2	Cable Riser has fire resistive seal.
6/86 (Rev. 2) / 3.2.2	July 21, 1988 / 2.3	Local auto. water suppression over the DW/Torus DP Compressor.	1.1.1.2	
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.0	No combustibles pass through unsealed penetrations.	1.1.1.2	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
6/86 (Rev. 2)/11.1.1.4	Feb. 25, 1991 / 2.1	Emerg. lighting is available for reactor water level inst.	1.1.1.2	
6/86 (Rev. 2) / 8.2.2	July 21, 1988 / 8.2	Fire detectors are provided near elect. & mech. pens.	1.1.1.2	
	Feb. 25, 1991 / 2.1.2	Fire detection is provided for the zone.	1.1.1.2	Also see 11.1.1.2 & 11.2.2 of ER.
	Feb. 25, 1991 / 2.1.2	Manual fire fighting equipment is available for this zone.	1.1.1.2	Also see 11.2.3.2 of ER.
	Feb. 25, 1991 / 2.1.2	Transient combustibles administratively controlled.	1.1.1.2	
6/86 (Rev.2)/11.1.1.3.1	Feb. 25, 1991 / 2.1 & 2.2	All elect. pens. sealed in floor & ceiling w/nc matl.	1.1.1.2	Also see 11.2.3.2 of ER.
	July 27, 1979/3.1.1,5.9.6	Early warning fire detection system will be provided.	1.1.1.2	In area of MCCs & Cable penetrations to TB.
	July 27, 1979 / 3.1.5	Auto. sprinklers for supp. chamber drywell air packs.	1.1.1.2	Also see 4.3.1.4 & 5.9.6 of 79 SER.
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.1.2	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 3.1.11	Provide curbs around drywell air pack units.	1.1.1.2	To prevent spread of oil spills(5.9.6 of 79 SER)
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	1.1.1.2	Limit quantity to 5-gallon.
	July 27, 1979 / 5.9.4	Hose stations & portable extinguishers provided for area.	1.1.1.2	
	July 27, 1979 / 5.9.6	Waste oil removed from area, approved cabinets provided	1.1.1.2	Lube oil limited to 5 gallons.
	Feb. 25, 1991 / 2.1.2	Fire detection provided with some exceptions.	1.1.1.2	In SAIC's evaluation. Also see 2.2.2 & 2.2.3.
	Feb. 25, 1991 / 2.1.2	Manual hose stations & port. extinguishers provided.	1.1.1.2	Also see sections 2.2.2 & 2.2.3.
	Feb. 25, 1991 / 2.1.3	Control room alerted of fire condition via detection sys.	1.1.1.2	
	Feb. 25, 1991 / 2.1.3	Fire brigade to control fires using manual equipment.	1.1.1.2	
6/86 (Rev.2)/11.1.1.3.1	Feb. 25, 1991 / 2.1	Elect. pens. sealed in ceiling of 1.1.1.2.	1.1.1.3	
6/86 (Rev. 2)/11.1.1.4	Feb. 25, 1991 / 2.1	Emerg. lighting is available for reactor water level inst.	1.1.1.3	
6/86 (Rev. 2) / 8.2.2	July 21, 1988 / 8.2	Fire detectors are provided near elect. & mech. pens.	1.1.1.3	
6/86 (Rev. 2) / 11.1.1.3.2	Feb. 25, 1991 / 2.1.2	Fire detection is provided for the zone.	1.1.1.3	
6/86 (Rev. 2) / 11.1.1.3.2	Feb. 25, 1991 / 2.1.2	Manual fire fighting equipment is available for this zone.	1.1.1.3	Also see section 3.2.2 & 11.1.1.2 of ER.
	July 27, 1979/3.1.1,5.8.6	Early warning fire detection system will be provided.	1.1.1.3	Above MCCs & Cable pens to TB.
	July 27, 1979/3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.1.3	Also see 5.8.6 of 79 SER.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979/5.8.4	Hose stations & portable extinguishers provided for area.	1.1.1.3	
	Feb 25, 1991 / 2.1.2	Fire detection provided with some exceptions.	1.1.1.3	In SAIC's evaluation.
	Feb 25, 1991 / 2.1.2	Manual hose stations & port. extinguishers provided.	1.1.1.3	
	Feb 25, 1991 / 2.1.3	Control room alerted of fire condition via detection sys.	1.1.1.3	
	Feb 25, 1991 / 2.1.3	Fire brigade to control fires using manual equipment.	1.1.1.3	
	July 27, 1979/3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.1.4	Also see 5.8.6 of 79 SER.
	July 27, 1979/3.1.11	Remove wood boxes from control rod storage room.	1.1.1.4	Also see 5.7 of 79 SER.
	July 27, 1979/5.7.4	Hose stations & portable extinguishers provided for area.	1.1.1.4	
	July 27, 1979/5.7.6	Wood storage boxes to be removed.	1.1.1.4	This was reportedly taken care of in 1979.
	July 27, 1979/3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.1.5	Also see 5.8.6 of 79 SER.
	July 27, 1979/5.6.4	Hose stations & portable extinguishers provided for area.	1.1.1.5	
6/86 (Rev. 2) / 3.2.2	July 21, 1988 / 2.0	Manual fire fighting equipment is available for this zone.	1.1.1.6	Also 11.2.2 of ER, & 8.2 of 88 SER
	July 27, 1979/3.1.8	Early warning fire detection system will be provided.	1.1.1.6	Also see 5.5.6 of 79 SER.
	July 27, 1979/5.5.4	Hose stations & portable extinguishers provided for area.	1.1.1.6	
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.2.5	Automatic suppression at single vertical cable riser.	1.1.2.1	Below 595' floor elev. Also 11.2.2 of ER
6/86 (Rev. 2) / 4.2.2&3	July 21, 1988 / 2.2.5	Linear thermal detection in & adjacent to cable trays.	1.1.2.1	Also 4.2.7, & 11.2.2 of ER.
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.2.6	Cables & cable trays have 1-hr. fire wrap where w/in 20'	1.1.2.1	Rev. to 88 SER: cond. seals vs. wrap
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.2.5	Manual fire fighting equipment is available.	1.1.2.1	Hose reels in torus area per 4.4.2 ER
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.2.5	Manual hose reels & port. ext. on each elev. in RB.	1.1.2.1	8.2 of 88 SER
6/86 (Rev. 2) / 4.2.4.2	July 21, 1988 / 2.0	No combustibles pass through unsealed penetrations.	1.1.2.1	Cables at K/13 are only comb. to pass.
6/86 (Rev. 2) / 4.2.4.2	July 21, 1988 / 2.0	Cable penetrations to U2 Cable Tunnel & 1.1.2.2 sealed.	1.1.2.1	Sealed with fire resistive material.
6/86 (Rev. 2) / 4.2.4.2	July 21, 1988 / 2.0	Transient combustibles & ignition sources controlled	1.1.2.1	Also see 11.2.3.3 of ER.
6/86 (Rev. 2) / 4.2.4.3	July 21, 1988 / 2.2.6	Redundant RHR cables routed more than 125' apart.	1.1.2.1	
6/86 (Rev. 2) / 4.2.4.3	July 21, 1988 / 2.2.6	Intervening cables prot. w/1-hr. fire wrap or conduit.	1.1.2.1	Between No. & So. for > 20', Also 11.2.2 of ER
	Feb. 25, 1991 / 2.1.2	Fire detection is provided for the zone.	1.1.2.1	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	Feb. 25, 1991 / 2.1.2	Manual fire fighting equipment is available for this zone.	1.1.2.1	Available at entrance to torus level.
	Feb. 25, 1991 / 2.1.2	Transient combustibles administratively controlled.	1.1.2.1	
6/86 (Rev. 2) / 11.2.3.3	Feb. 25, 1991 / 2.2	Elect. pens. in ceiling of 1.1.2.1 sealed w/ nc matl.	1.1.2.1	
6/86 (Rev. 2) / 11.1.2.3.1	Feb. 25, 1991 / 2.1 & 2.2	Elect. pens. sealed in floor of 1.1.2.2.(ceiling of 1.1.2.1.)	1.1.2.1	Also see 11.2.3.4 of ER.
	Feb. 25, 1991 / 3.0	Fire brigade able to control fire/smoke on the torus level	1.1.2.1	To allow use of supp. pool level indicators.
	Feb. 25, 1991 / 2.1.2	Fire detection provided with some exceptions.	1.1.2.1	In SAIC's evaluation.
	Feb. 25, 1991 / 2.1.3	Control room alerted of fire condition via detection sys.	1.1.2.1	
	Feb. 25, 1991 / 2.1.3	Fire brigade to control fires using manual equipment.	1.1.2.1	
	Feb. 25, 1991 / 2.2.2	Linear detectors are provided.	1.1.2.1	Provided for cable trays per 2.2.3.
	Feb. 25, 1991 / 2.2.2	Auto. sprinkler sys. where cable trays breach ceiling.	1.1.2.1	
	Feb. 25, 1991 / 2.2.3	Transient combustibles administratively controlled.	1.1.2.1	Also see 2.2.2
6/86 (Rev. 2) / 11.2.3.3	Feb. 25, 1991 / 2.2	Elect. pens. in ceiling of 1.1.2.1 sealed w/nc matl.	1.1.2.2	Ceiling of 1.1.2.1 is the floor of 1.1.2.2.
	July 21, 1988 / 2.2.5	Single riser sealed with fire resistive material.	1.1.2.2	From 1.1.2.1 below.
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.2.4&5	Fire detection provided throughout.	1.1.2.2	W/exceptions(stm chase, airlock)&4.3.2,4.4.2
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.3&3.2.2	Local auto. fire supp. DW/Torus DP compressor units	1.1.2.2	(4.2.8 & 4.4.2 /ER)
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.2.4	Manual hose reels & port. ext. on each elev. in RB.	1.1.2.2	Also see 4.3.2 & 4.4.4.2 of ER., 3.2.2 / 88 SER
6/86 (Rev. 2) / 4.2.4.1	July 21, 1998 / 2.0	No combustibles pass through unsealed penetrations.	1.1.2.2	
6/86 (Rev. 2) / 4.2.4.1	July 21, 1998 / 2.0	Transient combustibles & ignition sources controlled	1.1.2.2	Also see 4.4.4.2, 11.1.2.3.1, & 11.2.3.4 of ER.
6/86 (Rev. 2) / 4.2.4.2	July 21, 1998 / 2.0	No combustibles pass through unsealed penetrations.	1.1.2.2	Cables at K/13 are only comb. to pass.
6/86 (Rev. 2) / 11.1.2.4	Feb 25, 1991 / 2.1	Emerg. lighting is available for reactor water level inst.	1.1.2.2	
6/86 (Rev. 2) / 8.2.2	July 21, 1988 / 8.2	Fire detectors are provided near elect. & mech. pens.	1.1.2.2	
	Feb. 25, 1991 / 2.1.2	Fire detection is provided for the zone.	1.1.2.2	Also see 11.1.2.2 & 11.2.2 of ER.
	Feb. 25, 1991 / 2.1.2	Manual fire fighting equipment is available for this zone.	1.1.2.2	Also 4.4.2, 11.1.2.2, & 11.2.2 of ER & 8.2 / 88 SER
	Feb. 25, 1991 / 2.1.2	Transient combustibles administratively controlled.	1.1.2.2	
6/86 (Rev. 2) / 11.1.2.3.1	Feb 25, 1991 / 2.1	Elect. pens. sealed in floor and ceiling of 1.1.2.2.	1.1.2.2	Also see 11.2.3.4 of ER.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979/3.1.1,5.9.6	Early warning fire detection system will be provided.	1.1.2.2	In area of MCCs & Cable penetrations to TB.
	July 27, 1979 / 3.1.5	Auto. sprinklers for supp. chamber drywell air packs.	1.1.2.2	Also see 5.9.6 of 79 SER.
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.2.2	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 3.1.11	Provide curbs around drywell air pack units.	1.1.2.2	To prevent spread of oil spills(5.9.6 of 79 SER)
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	1.1.2.2	Limit quantity to 5-gallon.
	July 27, 1979 / 5.9.4	Hose stations & portable extinguishers provided for area.	1.1.2.2	
	July 27, 1979 / 5.9.6	Waste oil removed from area, approved cabinets provided	1.1.2.2	Lube oil limited to 5 gallons.
	Feb. 25, 1991 / 2.1.2	Fire detection provided with some exceptions.	1.1.2.2	In SAIC's evaluation. Also see 2.2.2 & 2.2.3.
	Feb. 25, 1991 / 2.1.2	Manual hose stations & port. extinguishers provided.	1.1.2.2	Also see sections 2.2.2 & 2.2.3.
	Feb. 25, 1991 / 2.1.3	Control room alerted of fire condition via detection sys.	1.1.2.2	
	Feb. 25, 1991 / 2.1.3	Fire brigade to control fires using manual equipment.	1.1.2.2	
6/86 (Rev. 2) / 11.1.2.3.1	Feb 25, 1991 / 2.1	Elect. pens sealed in floor of 1.1.2.3 (ceiling of 1.1.2.2).	1.1.2.3	Also see 11.2.3.4 of ER.
6/86 (Rev. 2) / 11.1.2.4	Feb 25, 1991 / 2.1	Emerg. lighting is available for reactor water level inst.	1.1.2.3	
6/86 (Rev. 2) / 8.2.2	July 21, 1988 / 8.2	Fire detectors are provided near elect. & mech. pens.	1.1.2.3	
6/86 (Rev. 2) / 4.4.2	Feb. 25, 1991 / 2.1.2	Fire detection is provided for the zone.	1.1.2.3	Also 11.1.2.2 & 7.2 ER, 7.2, supp. or det 88 SER
	Feb. 25, 1991 / 2.1.2	Manual fire fighting equipment is available for this zone.	1.1.2.3	Also see 11.1.2.2 of ER.
6/86 (Rev. 2) / 4.4.4.3	Feb. 25, 1991 / 2.1.2	Transient combustibles administratively controlled.	1.1.2.3	Also see 11.1.2.3.2 of ER.
6/86 (Rev. 2) / 4.4.1.3	Feb 25, 1991 / 2.1	All electrical penetrations sealed w/ noncomb. materials.	1.1.2.3	Between levels in RB.
	July 27, 1979 / 3.1.1,5.8.6	Early warning fire detection system will be provided.	1.1.2.3	Above MCCs & Cable penetrations to TB.
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.2.3	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 5.8.4	Hose stations & portable extinguishers provided for area.	1.1.2.3	
	Feb. 25, 1991 / 2.1.2	Fire detection provided with some exceptions.	1.1.2.3	In SAIC's evaluation.
	Feb. 25, 1991 / 2.1.3	Control room alerted of fire condition via detection sys.	1.1.2.3	
	Feb. 25, 1991 / 2.1.3	Fire brigade to control fires using manual equipment.	1.1.2.3	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 21, 1988 / 5.7.4	Hose stations & portable extinguishers provided for area.	1.1.2.4	
	July 21, 1988 / 5.7.6	Wood storage boxes to be removed.	1.1.2.4	This was reportedly taken care of in 1979.
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	1.1.2.5	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 5.6.4	Hose stations & portable extinguishers provided for area.	1.1.2.5	
	July 27, 1979 / 5.12.4	Hose stations & port. ext. near containment entrance.	1.2.1	
	July 27, 1979 / 5.12.4	Drains provided to mitigate consequences of oil spill fires	1.2.1	
APCSB 9.5-1	Appendix A / F.1.a	The primary cont. is inerted w/ nitrogen during operation	1.2.1	
APCSB 9.5-1	Appendix A / F.1.a	Admin. controls enforced during refuel/maint. ops.	1.2.1	To control additional hazards.
	July 27, 1979 / 5.12.4	Hose stations & port. ext. near containment entrance.	1.2.2	
	July 27, 1979 / 5.12.4	Drains provided to mitigate consequences of oil spill fires	1.2.2	
APCSB 9.5-1	Appendix A / F.1.a	The primary cont. is inerted w/ nitrogen during operation	1.2.2	
APCSB 9.5-1	Appendix A / F.1.a	Admin. controls enforced during refuel/maint. ops.	1.2.2	To control additional hazards.
	July 27, 1979 / 3.1.5	TB sprinkler system extended to protect zone.	11.1.1.A	Also see 5.13.6 of 79 SER.
	July 21, 1988 / 13.2	1-hour fire wrap provided for swing diesel 1/2 reserve feed.	11.1.1.A	
	July 21, 1988 / 13.2	Fire hose stations & fire extinguishers are available.	11.1.1.A	
6/86 (Rev. 2) / 5.9.1	July 21, 1988 / 9.2&13.2	3-hour walls, floor, ceiling, except closed door, east wall	11.1.1.B	Door is substantial metal, watertight door.
6/86 (Rev. 2) / 5.9.2	July 21, 1988 / 13.2	Complete fire detection & auto. water supp. systems.	11.1.1.B	11.1.1.A & 11.1.1.B. Rate comp thermal
	July 27, 1979 / 3.1.5	TB sprinkler system extended to protect zone.	11.1.1.B	Also see 5.13.6 of 79 SER.
	July 21, 1988 / 13.2	Fire hose stations & fire extinguishers are available.	11.1.1.B	
	July 27, 1979 / 3.1.5	TB sprinkler system extended to protect zone.	11.1.1.C	Also see 5.13.6 of 79 SER.
	July 27, 1979 / 3.1.5	TB sprinkler system extended to protect zone.	11.1.2.A	Also see 5.13.6 of 79 SER.
	July 27, 1979 / 3.1.5	TB sprinkler system extended to protect zone.	11.1.2.B	Also see 5.13.6 of 79 SER.
	July 27, 1979 / 3.1.5	TB sprinkler system extended to protect zone.	11.1.2.C	Also see 5.13.6 of 79 SER.
	July 27, 1979 / 3.1.8	Class "A" door to be provided between U1 & U2 HPCIs	11.1.3	Also see 5.8.6 & 5.11.6 of 79 SER.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 5.11.4	Auto. water deluge sys. over the HPCI turbine & pump.	11.1.3	
	July 27, 1979 / 5.11.4	Portable extinguisher provided in each HPCI room.	11.1.3	Hose stations in torus area for backup supp.
6/86 (Rev. 2) / 4.4.4.8	July 21, 1988 / 4.2.7	Fire detection & suppression over HPCI pump & turbine.	11.1.4	
6/86 (Rev. 2) / 4.4.4.8	July 21, 1988 / 4.2.7	Manual fire fighting equipment is available.	11.1.4	
	July 27, 1979 / 3.1.8	Class "A" door to be provided between U1 & U2 HPCIs	11.1.4	Also see 5.8.6 & 5.11.6 of 79 SER.
	July 27, 1979 / 5.11.4	Auto. water deluge sys. over the HPCI turbine & pump.	11.1.4	
	July 27, 1979 / 5.11.4	Portable extinguisher provided in each HPCI room.	11.1.4	Hose stations in torus area for backup supp.
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Reinforced concrete walls w/ watertight door provided.	11.2.1	Watertight door between torus & corner room
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Cable penetrations are sealed between elevations.	11.2.1	
6/86 (Rev. 2) / 3.2.2	July 21, 1988 / 2.2.1	Fire Det. Sys. provided except above RB Eq. drain tank.	11.2.1	Linear heat per the 88 SER, also 4.2.1
	July 27, 1979 / 5.10.4	A hose station & port. ext. are located in torus area.	11.2.1	With access to the non-RHR corner rooms.
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Reinforced concrete walls w/ watertight door provided.	11.2.2	Watertight door between torus & corner room
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.0	No combustibles pass through unsealed penetrations	11.2.2	Between 11.2.2 & 1.1.1.2.
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.0	Transient comb. & ignition sources admin. controlled.	11.2.2	
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.2.1	Fire Detection System provided throughout.	11.2.2	Linear heat per the 88 SER.
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.2.1	Fire Suppression System provided throughout.	11.2.2	
6/86 (Rev. 2) / 3.2.4.1	July 21, 1988 / 2.0	11.2.2 construction will confine a fire from torus area.	11.2.2	
	July 21, 1988 / 2.2.1	Manual fire fighting equipment is credited	11.2.2	
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Cable penetrations are sealed between elevations.	11.2.2	
6/86 (Rev. 2) / 3.2.2	July 21, 1988 / 2.2.1	Fire Detection System provided throughout.	11.2.2	Linear heat per the 88 SER, also 4.2.1
	July 27, 1979 / 5.10.4	A hose station & port. ext. provided in each RHR room.	11.2.2	
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Reinforced concrete walls w/ watertight door provided.	11.2.3	Watertight door between torus & corner room
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Cable penetrations are sealed between elevations.	11.2.3	
6/86 (Rev. 2) / 3.2.2	July 21, 1988 / 2.2.1	Fire Detection System provided throughout.	11.2.3	Linear heat (88 SER), also 4.2.1, 11.1.1.2
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	11.2.3	Also see 5.8.6 of 79 SER.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 5.10.4	A hose station & port. ext. are located in torus area.	11.2.3	With access to the non-RHR corner rooms.
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Reinforced concrete walls w/ watertight door provided.	11.2.4	Watertight door between torus & corner room
6/86 (Rev. 2) / 3.2.4.3	July 21, 1988 / 2.2.3	Concrete walls(watertight) door between redundant RHR	11.2.4	Steel watertight door maintained closed.
6/86 (Rev. 2) / 3.2.1	July 21, 1988 / 2.0	Cable penetrations are sealed between elevations.	11.2.4	
6/86 (Rev. 2) / 3.2.2	July 21, 1988 / 2.2.1	Fire Detection System provided throughout.	11.2.4	Linear heat per the 88 SER, 4.2.1
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	11.2.4	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 5.10.4	A hose station & port. ext. provided in each RHR room.	11.2.4	
6/86 (Rev. 2) / 11.1.2.2	Feb. 25, 1991 / 2.1	Fire detection provided.	11.3.1	
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	11.3.1	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 5.10.4	A hose station & port. ext. are located in torus area.	11.3.1	With access to the non-RHR corner rooms.
6/86 (Rev. 2) / 4.2.2	July 21, 1988 / 2.3	Area wide automatic suppression is provided.	11.3.2	
6/86 (Rev. 2) / 4.2.1	July 21, 1988 / 2.2.4	Automatic sprinkler system provided in zone.	11.3.2	Appears to be a typo in E.R. section.
6/86 (Rev. 2) / 4.2.1	July 21, 1988 / 2.2.6	Enclosed w/reinforced concrete walls & watertight door	11.3.2	Door maintained closed.
6/86 (Rev. 2) / 4.2.4.1	July 21, 1988 / 2.2.4	Fire detection provided throughout corner rooms.	11.3.2	Linear thermal.
	July 21, 1988 / 2.2.4	Manual fire hose stations & port. extinguishers available	11.3.2	
6/86 (Rev. 2) / 4.2.4.1	July 21, 1988 / 2.0	No combustibles pass through unsealed penetrations.	11.3.2	
6/86 (Rev. 2) / 4.2.4.1	July 21, 1988 / 2.0	Transient combustibles & ignition sources controlled	11.3.2	
	July 27, 1979 / 3.1.8	Class "A" doors to be provided between U1 & U2 RBs.	11.3.2	Also see 5.8.6 of 79 SER.
	July 27, 1979 / 5.10.4	A hose station & port. ext. provided in each RHR room.	11.3.2	
6/86 (Rev. 2) / 4.2.1	July 21, 1988 / 2.2.6	Enclosed w/reinforced concrete walls & watertight door	11.3.3	Door maintained closed.
6/86 (Rev. 2) / 4.2.2&3	July 21, 1988 / 4.2.7	Fire det. provided for zone. (Also see 4.3.3 & 4.4.4.6).	11.3.3	Linear therm (not above RB eq. drn tank) 4.4.2
	July 27, 1979 / 5.10.4	A hose station & port. ext. are located in torus area.	11.3.3	With access to the non-RHR corner rooms.
6/86 (Rev. 2) / 4.2.1	July 21, 1988 / 2.2.6	Enclosed w/reinforced concrete walls & watertight door	11.3.4	Door maintained closed.
	July 27, 1979 / 5.10.4	A hose station & port. ext. provided in each RHR room.	11.3.4	



**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	11.4.A	Limit quantity to 55-gallon.& 5.21.6 of 79 SER
	July 27, 1979 / 5.21.4	Portable extinguishers & hose stations provided for area	11.4.A	
	Nov. 5, 1980 / 3.1.5(k)	Admin. procedures in place to eliminate oil storage.	11.4.A	Storage limited, safety cans, & safety cabinets.
	July 27, 1979 / 3.1.5	Sprinkler sys. to protect diesel driven fire pumps.	11.4.B	Also see 5.21.6 of 79 SER.
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	11.4.B	Limit quantity to 55-gallon.& 5.21.6 of 79 SER
	July 27, 1979 / 3.1.11	Curbs & drains for liquid storage areas in crib house.	11.4.B	Also see 5.21.6 of 79 SER.
	July 27, 1979 / 4.3.1.2	Two approved fire pumps and controllers, provided.	11.4.B	Each pump: 2500 gpm at 139 psig.
	July 27, 1979 / 4.3.1.2	An 8-hour fuel supply (diesel) provided for each pump	11.4.B	
	July 27, 1979 / 4.3.1.2	Provide a system to detect excessive make up water.	11.4.B	Water from service water sys. to fire water sys.
	July 27, 1979 / 4.3.1.3	Each pump has separate 10" discharge line.	11.4.B	
	July 27, 1979 / 5.21.4	Portable extinguishers & hose stations provided for area	11.4.B	
	Nov. 5, 1980 / 3.1.5(k)	Admin. procedures in place to eliminate oil storage.	11.4.B	Storage limited, safety cans, & safety cabinets.
	Feb. 12, 1981 / 3.1.5(k)	Flamm. liquids cabinet provided for oil storage.	11.4.B	25' and 80' from diesel fire pumps.
	Feb. 12, 1981 / 3.1.5(k)	Flam. liquid cab. contents; <25 gal. oil, <10 gal. grease	11.4.B	Amount of comb. liquid limited per NFPA 30.
APCSB 9.5-1	Appendix A / E.2.c	2 diesel driven fire pumps provided.	11.4.B	Each rated at 2500 gpm at 139 psig.
APCSB 9.5-1	Appendix A / E.2.c	Separate valved connections to loop from each pump.	11.4.B	Fire pumps suction from Mississippi River.
APCSB 9.5-1	Appendix A / E.2.c	Fire pumps generally installed per NFPA 20.	11.4.B	Alarms; trouble, pump running, fuel level, etc
APCSB 9.5-1	Appendix A / E.2.d	Fire pumps take suction from Mississippi River.	11.4.B	Storage tanks not used.
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	No safe shutdown cables or equipment in zone.	14.1.1	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Substantial shield walls w/ metal doors between zones.	14.1.1	Between 8.2.10 & 14.1.1
	July 27, 1979 / 3.1.8	Fire barriers around Electrical Eq. Room to be 3-hr.	19.1.	Includes doors, dampers, etc (5.3.6 / 79 SER).
APCSB 9.5-1	Appendix A / D.1.f	Noncombustible suspended ceilings provided.	19.1.	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / E.4	Halon 1301 protects records storage & new comp. room	19.1.	NFPA 12A reviewed & deviations justified.
	July 27, 1979 / 3.1.8	Fire barriers around Electrical Eq. Room to be 3-hr.	19.2.	Includes doors, dampers, etc (5.3.6 / 79 SER).
APCSB 9.5-1	Appendix A / D.1.f	Noncombustible suspended ceilings provided.	19.2.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hour separation between zone & U1 Turbine Building.	2.0.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	Complete early warning fire detection system.	2.0.	Alarms locally (6.3.4)
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hr. separation from other areas of the service building.	2.0.	
6/86 (Rev. 2) / 6.3.1	July 21, 1988 / 5.2	All boundary walls are 3-hr except boundary w/ 3.0.	2.0.	
6/86 (Rev. 2) / 6.3.1	July 21, 1988 / 5.2	Portable fire extinguishers are provided in zone.	2.0.	Available hose stations outside entrances
6/86 (Rev. 2) / 6.3.4	July 21, 1988 / 5.2	Control room continuously manned.	2.0.	
6/86 (Rev. 2) / 6.3.4	July 21, 1988 / 5.0	Transient combustibles & ignition sources controlled.	2.0.	
6/86 (Rev. 2) / 6.3.5	July 21, 1988 / 5.0	Local monitoring of instrumentation, from outside SB-I.	2.0.	
	July 27, 1979 / 3.1.1	Smoke detection provided in the make-up air supply.	2.0.	Also see 5.1.6 of 79 SER.
	July 27, 1979 / 3.1.4	One-inch booster reels w/ low flow nozzles	2.0.	W/ shut-off valves. ( 5.1.6 of 79 SER)
	July 27, 1979 / 3.1.7	Two Halon 1211 port. extinguishers for Control Room.	2.0.	Also see 5.1.6 of 79 SER.
	July 27, 1979 / 3.1.11	Provide UL listed floor covering in Control Room.	2.0.	Also see 5.1.6 of 79 SER.
	July 27, 1979 / 5.1.4	Smoke detectors in return air path from control room.	2.0.	
	July 27, 1979 / 5.1.4	A hose station & additional port. extinguishers provided.	2.0.	Provided in adjacent areas.
	July 27, 1979 / 5.1.4	Class "A" doors provided.	2.0.	
	July 27, 1979 / 5.1.4	3-hour dampers provided in ventilation penetrations.	2.0.	
	July 27, 1979 / 4.2	Visual & audible alarms in control rm. for det. & supp. sys.	2.0.	Also for supervisory systems.
APCSB 9.5-1	Appendix A / D.1.f	Noncombustible suspended ceilings provided.	2.0.	
APCSB 9.5-1	Appendix A / D.1.f	Fire detection provided throughout above drop ceiling.	2.0.	
APCSB 9.5-1	Appendix A / D.3.j	Cabling kept to a minimum, no cables in trenches, etc.	2.0.	Cables terminate in room
APCSB 9.5-1	Appendix A / D.3.j	No cables routed under raised central console area.	2.0.	
APCSB 9.5-1	Appendix A / D.4.d	Manual water spray systems provided for charcoal filter.	2.0.	And in TSC and HRSS buildings.
APCSB 9.5-1	Appendix A / D.4.h	Adequate SCBAs & spare bottles available for use.	2.0.	For control room personnel.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / F.2	Det. alarms & annunciation provided in control room.	2.0.	Local alarms also provided for det. systems.
APCSB 9.5-1	Appendix A / F.2	3-hour separation for control room except floor.	2.0.	Floor is 3-hr. except unrated nonc. pen. seals
APCSB 9.5-1	Appendix A / F.2	Hose stations & port. exts. provided for control room.	2.0.	See Drawing F-8-1 for location in & around rm.
APCSB 9.5-1	Appendix A / F.2	Appropriate hose station nozzles provided for control rm.	2.0.	
APCSB 9.5-1	Appendix A / F.2	Ionization det. provided above open-grid ceiling.	2.0.	
APCSB 9.5-1	Appendix A / F.2	Fire alarms throughout the plant alarm in the control rm.	2.0.	
APCSB 9.5-1	Appendix A / F.2	Control rm. vent sys. designed as a recirculation system.	2.0.	With smoke detectors in the return air ducts.
APCSB 9.5-1	Appendix A / F.2	Dampers interlocked with detection system.	2.0.	Operates as a once-through sys.
APCSB 9.5-1	Appendix A / F.2	Control room vent. sys. may be manually operated.	2.0.	To provided a purging capability if necessary.
APCSB 9.5-1	Appendix A / F.2	Cabling in control room kept to a minimum.	2.0.	No trenches or eulverts in control room floor.
APCSB 9.5-1	Appendix A / F.2	Cables are not routed under raised floor in control room	2.0.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hour separation between zone & U1 Turbine Building.	3.0.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	Complete fire detection and water suppression systems	3.0.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hr. separation from other areas of the service building.	3.0.	
	July 27, 1979 / 3.1.5	Automatic water supp. sys. in cable spreading room.	3.0.	Also see 5.2.6 of 79 SER.
	July 27, 1979 / 3.1.8	Fire barriers around Electrical Eq. Room to be 3-hr.	3.0.	Includes doors, dampers, etc (5.3.6 / 79 SER).
	July 27, 1979 / 5.2.4	Smoke detection in the return air ventilation duct.	3.0.	From cable spreading room.
	July 27, 1979 / 5.2.4	Hose stations & port extinguishers at each entrance	3.0.	
	July 27, 1979 / 5.2.6	Provide smoke detectors in the cable spreading room.	3.0.	
	July 27, 1979 / 5.2.6	Installation of a drainage system.	3.0.	
	July 27, 1979 / 5.2.6	Upgrade fire resistance of structural steel to 3-hr. rating.	3.0.	
	July 27, 1979 / 5.2.6	Install 3-hr. rated dampers in vent. penetrations.	3.0.	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 5.2.6	Access doors to be 3-hour rated fire doors.	3.0.	
APCSB 9.5-1	Appendix A / D.1.c	Cable spread room has 3-hr. barriers.	3.0.	Except some unrated noncomb. pen. seals.
APCSB 9.5-1	Appendix A / D.3.c	Water supp. provided over major cable concentrations.	3.0.	
APCSB 9.5-1	Appendix A / F.3.a.1	Wet pipe supp. is provided in the cable spread room.	3.0.	
APCSB 9.5-1	Appendix A / F.3.a.2	Manual hoses & port. exts. provided as backup supp.	3.0.	
APCSB 9.5-1	Appendix A / F.3.a.4	Two separate entrances provided to the c.s. room.	3.0.	
APCSB 9.5-1	Appendix A / F.3.a.5	All cable trays accessible for manual suppression.	3.0.	
APCSB 9.5-1	Appendix A / F.3.b	3-hr. separation provided for cable spreading room.	3.0.	Except ceiling which has unrated nonc. seals
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	Complete early warning fire detection system.	4.0.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hr. separation from other areas of the service building.	4.0.	
	July 27, 1979 / 3.1.8	Fire barriers around Electrical Eq. Room to be 3-hr.	4.0.	Includes doors, dampers, etc (5.3.6 / 79 SER).
6/86 (Rev. 2) / 5.5		Detection Provided.	5.0.	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	6.1.A	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 3.1.8	Doors to the DC equip. room to be Class "A" doors.	6.1.A	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 5.4.4	Hose stations provide water & CO2 supp. capability.	6.1.A	Port. Ext. provided near each room.
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	6.1.B	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 3.1.8	Doors to the DC equip. room to be Class "A" doors.	6.1.B	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 5.4.4	Hose stations provide water & CO2 supp. capability.	6.1.B	Port. Ext. provided near each room.
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	6.2.A	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 3.1.8	Doors to the DC equip. room to be Class "A" doors.	6.2.A	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 5.4.4	Hose stations provide water & CO2 supp. capability.	6.2.A	Port. Ext. provided near each room.
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	6.2.B	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 3.1.8	Doors to the DC equip. room to be Class "A" doors.	6.2.B	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 5.4.4	Hose stations provide water & CO2 supp. capability.	6.2.B	Port. Ext. provided near each room.
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hour separation between zone & U1 Turbine Building.	6.3.	
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	Complete early warning fire detection system.	6.3.	Alarms locally & in control room (6.2.2 & 6.2.4).

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
6/86 (Rev. 2) / 6.1	July 21, 1988 / 5.2	3-hr. separation from other areas of the service building.	6.3.	6.2.1 (ER), 3-hr sep. from TB & other SB areas
6/86 (Rev. 2) / 6.2.1	July 21, 1988 / 5.2	3-hr. separation between 6.3 & cable tunnels.	6.3.	3-hr. except fire resistive access covers.
6/86 (Rev. 2) / 6.2.2	July 21, 1988 / 5.2	Portable fire extinguishers are provided in zone.	6.3.	Available hose stations outside entrances
6/86 (Rev. 2) / 6.2.4	July 21, 1988 / 5.0	Fire Brigade to respond quickly due to proximity to 2.0.	6.3.	
6/86 (Rev. 2) / 6.2.4	July 21, 1988 / 5.0	Transient combustibles & ignition sources controlled.	6.3.	
	July 27, 1979 / 3.1.4	One-inch booster reels w/ low flow nozzles	6.3.	W/ shut-off valves.(5.3.6 of 79 SER)
	July 27, 1979 / 3.1.8	Fire barriers around Electrical Eq. Room to be 3-hr.	6.3.	Includes doors, dampers, etc(5.3.6 / 79 SER)
	July 27, 1979 / 5.3.4	Smoke detectors are provided in return air path.	6.3.	From computer room.
	July 27, 1979 / 5.3.4	Fire hose stations are located near both entrances.	6.3.	
	July 27, 1979 / 5.3.4	Portable extinguishers provide in area & adjacent areas.	6.3.	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	7.1.	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 3.1.11, 5.4.6	Provide air flow supervision for battery room exhaust.	7.1.	With an alarm in the control room.
	July 27, 1979 / 4.4.1	Elect. supervision for battery room ventilation systems.	7.1.	Alarms on air flow loss(precludes excess H2)
	July 27, 1979 / 5.4.4	Hose stations provide water & CO2 supp. capability.	7.1.	Port. Ext. provided near each room.
APCSB 9.5-1	Appendix A / F.7	NFPA 69 reviewed for battery rm. explosion prevention.	7.1.	Air flow alarms notify C.R. if loss of vent.
APCSB 9.5-1	Appendix A / F.7	Standpipe / hose / port. ext. provided for battery rms.	7.1.	See F-drawings for locations.
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	7.2.	Also see 5.4.6 of 79 SER.
	July 27, 1979 / 3.1.11, 5.4.6	Provide air flow supervision for battery room exhaust.	7.2.	With an alarm in the control room.
	July 27, 1979 / 4.4.1	Elect. supervision for battery room ventilation systems.	7.2.	Alarms on air flow loss(precludes excess H2)
	July 27, 1979 / 5.4.4	Hose stations provide water & CO2 supp. capability.	7.2.	Port. Ext. provided near each room.
APCSB 9.5-1	Appendix A / F.7	NFPA 69 reviewed for battery rm. explosion prevention.	7.2.	Air flow alarms notify C.R. if loss of vent.
APCSB 9.5-1	Appendix A / F.7	Standpipe / hose / port. ext. provided for battery rms.	7.2.	See F-drawings for locations.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 5.17.6	Fixed automatic water suppression is provided.	8.1.	Adjacent to steam pipe chase.
	July 27, 1979 / 3.1.8, 5.17.6	Provide fire dampers in HVAC penetrations.	8.1.	Also see 5.17.6 of 79 SER.
APCSB 9.5-1	Appendix A / F.8	3-hour separation provided except 2 access hatches.	8.1.	Unrated (substantial) hinged covers for hatches.
APCSB 9.5-1	Appendix A / F.8	Wet pipe supp. system provided.	8.1.	
6/86 (Rev. 2) / 5.9.2	July 21, 1988 / 13.2	Complete automatic wet pipe sprinkler system.	8.2.1.A	Also see 5.13.4 of the 79 SER. Alarms in C.R.
6/86 (Rev. 2) / 5.9.3	July 21, 1988 / 9.2	Reserve feed to swing diesel gen. has 1-hr. fire wrap.	8.2.1.A	Also see section 13.3 of the 88 SER.
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	8.2.1.A	Limit lube oil to 30-gallon.& 5.13.6 of 79 SER
	July 27, 1979 / 5.13.4	Hose stations & port. extinguishers provided for area.	8.2.1.A	
	July 27, 1979 / 5.13.4	Complete automatic wet pipe sprinkler system.	8.2.1.B	Water flow annunciation in Control Room.
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	8.2.1.B	Limit lube oil to 30-gallon.& 5.13.6 of 79 SER
	July 27, 1979 / 5.13.4	Hose stations & port. extinguishers provided for area.	8.2.1.B	
	July 27, 1979 / 5.13.4	Hose stations & port. extinguishers provided for area.	8.2.1.C	
	July 27, 1979 / 5.13.4	Hose stations & port. extinguishers provided for area.	8.2.1.D	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	No safe shutdown cables or equipment in zone.	8.2.10	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Substantial shield walls w/ metal doors between zones.	8.2.10	Between 8.2.10 & 14.1.1
	July 27, 1979 / 3.1.5	TB sprinklers extended to the control rod drive pumps	8.2.2.A	Also see 5.14.6 of 79 SER.
	July 27, 1979 / 5.14.4	Hose stations & port. extinguishers provided for area.	8.2.2.A	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 10.2	No safe shutdown cables or equipment in zone.	8.2.2.B	Exemption request 5.3 withdrawn.
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 10.2	Negligible amounts of combustible loading.	8.2.2.B	Exemption request 5.3 withdrawn.
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Automatic sprinkler protection provided.	8.2.3.A	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	No continuity of comb. between 8.2.3.A & 8.2.6.C	8.2.3.A	8.2.3.A is in the Southern Group
	July 27, 1979 / 3.1.5	TB sprinklers extended to the control rod drive pumps	8.2.3.A	Also see 5.14.6 of 79 SER.
	July 27, 1979 / 5.14.4	Hose stations & port. extinguishers provided for area.	8.2.3.A	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2, 10.2	No safe shutdown cables or equipment in zone.	8.2.3.B	No significant quantity of combustibles.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
6/86 (Rev. 2) / 6.2.1	July 21, 1988 / 5.2	3-hr. separation between 6.3 & cable tunnels.	8.2.5	3-hr. except fire resistive access covers.
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Unit 2 cable tunnel elect. seals are 3-hr. rated.	8.2.5	Exemption request 5.3 withdrawn.
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Complete detection and suppression in the cable trays.	8.2.5	Exemption request 5.3 withdrawn.
	July 21, 1988 / 10.2	Unit 1 and Unit 2 Cable Tunnels separated by 3-hr walls	8.2.5	Exemption request 5.3 withdrawn.
	July 27, 1979 / 3.1.4, 5.15.6	Additional hose at hose stations adj. to cable tunnels	8.2.5	For adequate coverage. (4.3.1.4, 79 SER).
	July 27, 1979 / 3.1.5	Cable tunnel sprinklers modified to prevent fire prop.	8.2.5	Also see 5.16.6 & 4.10 of 79 SER.
	July 27, 1979 / 4.11	Portable smoke ejectors provided.	8.2.5	
	July 27, 1979 / 5.15.4	Automatic sprinkler system provided for cable tunnel.	8.2.5	
	Nov 5, 1980 / 3.1.5 (d)	U1 cable tunnel sprinkler system is adequate.	8.2.5	To prevent propagation between trays.
	Nov 5, 1980 / 3.1.5 (d)	Single line break would take sprinkler sys. out of service.	8.2.5	Should provide adequate separation of feeds.
	Feb 12, 1981 / 3.1.5(d)	Separate sprinkler system for each div. of cables.	8.2.5	Hose stations provided w/ alternate supply.
APCSB 9.5-1	Appendix A / D.3.c	Water supp. provided over major cable concentrations.	8.2.5	
APCSB 9.5-1	Appendix A / D.3.c	Manual fire fighting eq. available from adjacent zones.	8.2.5	Available from ground floor of TB.
APCSB 9.5-1	Appendix A / E.3.d	Hose stations have adequate hose to cover cable tunnels	8.2.5	
6/86 (Rev. 2) / 5.1	July 21, 1988 / 9.2	Automatic detection and water suppression in corridor.	8.2.6.A	
	July 21, 1988 / 10.2	Fire detection & suppression above cable tunnel access	8.2.6.A	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Auto. water supp. & smoke detection sys. in corridor.	8.2.6.A	
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Unit 2 cable tunnel elect. seals are 3-hr. rated.	8.2.6.A	Exemption request 5.3 withdrawn.
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Curbed access at F/17 & F/25	8.2.6.A	Exemption request 5.3 withdrawn.
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.6.A	Above 4-kV SWGR by DG rooms (& 5.17.6)
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.6.A	High pressure heater bay, cable pens. to RB

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 3.1.5	Water supp. sys. provided for Unit 1 trackway.	8.2.6.A	Also see 5.17.6+E777 of 79 SER.
	July 27, 1979 / 3.1.8, 5.22	Rx. fd pump exhaust vents sealed (adj. to transformer)	8.2.6.A	3-hr. barriers installed. (See 5.17 of 79 SER)
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	8.2.6.A	Limit quantity to 55-gallon.
	July 27, 1979 / 3.1.11	Curbs & drains for liquid storage on TB ground floor.	8.2.6.A	Also see 5.17 of 79 SER.
	July 27, 1979 / 5.17.4	Portable extinguishers & hose stations provided.	8.2.6.A	
	July 27, 1979 / 5.17.4	Extra-hazard wet pipe spk. sys. for feed water pumps.	8.2.6.A	Pipe schedule system.
	July 27, 1979 / 5.17.6	Automatic water supp. provided for Unit 1 trackway area.	8.2.6.A	
	July 27, 1979 / 5.17.6	Exhaust vents in reactor feed pump area sealed w/3-hr.	8.2.6.A	Relocated not to expose transformers. 5.22.6
	Nov 5, 1980 / 3.1.5 (f)	Provide pre-action sprinkler sys. in trackways.	8.2.6.A	Sized for extra hazard duty.
	Nov 5, 1980 / 3.1.5 (f)	Detection sys. will comply w/ NFPA codes.	8.2.6.A	Heat shields will be provided.
APCSB 9.5-1	Appendix A / D.3.c	Water supp. provided over major cable concentrations.	8.2.6.A	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Substantial shield walls around zone.	8.2.6.B	Cable pens. sealed w/noncomb. material
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Unit 2 cable tunnel elect. seals are 3-hr. rated.	8.2.6.B	Exemption request 5.3 withdrawn.
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Supp. systems in zones adjacent to radwaste tunnel	8.2.6.B	Exemption request 5.3 withdrawn.
	July 27, 1979 / 5.17.4	Portable extinguishers & hose stations provided.	8.2.6.B	
6/86 (Rev. 2) / 5.1	July 21, 1988 / 9.2	Automatic detection and water suppression in corridor.	8.2.6.C	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Auto. water supp. & smoke detection sys. in corridor.	8.2.6.C	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	No continuity of comb. between 8.2.3.A & 8.2.6.C	8.2.6.C	8.2.6.C is in the Central Group.
	July 27, 1979 / 3.1.5	Water supp. sys. for turbine EHC oil reservoirs.	8.2.6.C	& for adj. cable risers. (Also 5.17.6 of 79 SER).
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	8.2.6.C	Limit quantity to 55-gallon.
	July 27, 1979 / 3.1.11	Curbs & drains for liquid storage on TB ground floor.	8.2.6.C	Also see 5.17 of 79 SER.
	July 27, 1979 / 5.17.4	Portable extinguishers & hose stations provided.	8.2.6.C	
	July 27, 1979 / 5.17.4	The feedwater heater bays protected by auto. sprinklers.	8.2.6.C	
	Nov 5, 1980 / 3.1.5 (k)	Areas P & T in TB protected by auto. deluge systems.	8.2.6.C	Design density: 0.3 gpm/sq. ft. for entire area.



**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / D.3.c	Water supp. provided over major cable concentrations.	8.2.6.C	Maybe 8.2.7.C as well (not specified).
APCSB 9.5-1	Appendix A / F.8	EHC systems have fire retardant fluid & sprinkler prot.	8.2.6.C	Closed head sprinkler prot. above EHC units.
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Substantial shield walls around zone.	8.2.6.D	Cable pens. sealed w/noncomb. material
6/86 (Rev. 2) / 5.3.4	July 21, 1988 / 10.2	Supp. systems in zones adjacent to radwaste tunnel	8.2.6.D	Exemption request 5.3 withdrawn.
	July 21, 1988 / 5.17.4	Portable extinguishers & hose stations provided.	8.2.6.D	
	July 21, 1988 / 5.17.4	The feedwater heater bays protected by auto. sprinklers.	8.2.6.D	
	Nov 5, 1980 / 3.1.5 (k)	Areas P & T in TB protected by auto. deluge systems.	8.2.6.D	Design density: 0.3 gpm/sq. ft. for entire area.
6/86 (Rev. 2) / 5.1	July 21, 1988 / 9.2	Automatic detection and water suppression in corridor.	8.2.6.E	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Auto. water supp. & smoke detection sys. in corridor.	8.2.6.E	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.6.E	Above 4-kV SWGR by DG rooms (& 5.17.6)
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.6.E	High pressure heater bay, cable pens. to RB
	July 27, 1979 / 3.1.5	Water supp. sys. provided for Unit 2 trackway.	8.2.6.E	Also see 5.17 of 79 SER.
	July 27, 1979 / 3.1.8, 5.22	Rx. fd pump exhaust vents sealed (adj. to transformer)	8.2.6.E	3-hr. barriers installed. (See 5.17 of 79 SER)
	July 27, 1979 / 3.1.11	Oil dispensing stations: approved cabinets.	8.2.6.E	Limit quantity to 55-gallon.
	July 27, 1979 / 3.1.11	Curbs & drains for liquid storage on TB ground floor.	8.2.6.E	Also see 5.17 of 79 SER.
	July 27, 1979 / 5.17.4	Portable extinguishers & hose stations provided.	8.2.6.E	
	July 27, 1979 / 5.17.4	Extra-hazard wet pipe spk. sys. for feed water pumps.	8.2.6.E	Pipe schedule system.
	July 27, 1979 / 5.17.6	Automatic water supp. provided for Unit 1 trackway area.	8.2.6.E	
	July 27, 1979 / 5.17.6	Exhaust vents in reactor feed pump area sealed w/3-hr.	8.2.6.E	Relocated not to expose transformers. 5.22.6
	Nov 5, 1980 / 3.1.5 (f)	Provide pre-action sprinkler sys. in trackways.	8.2.6.E	Sized for extra hazard duty.
	Nov 5, 1980 / 3.1.5 (f)	Detection sys. will comply w/ NFPA codes.	8.2.6.E	Heat shields will be provided.
APCSB 9.5-1	Appendix A / D.3.c	Water suppression provided over major cable concentrations.	8.2.6.E	
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	All penetrations in shield walls sealed w/nc. materials.	8.2.7.A	Substantial, locked, unlabeled, metal doors

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.0	Smoke detection provided for most of 8.2.7.A.	8.2.7.A	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.7.A	4-kV SWGR area on TB mezz. floor.
	July 27, 1979 / 3.1.11	Curbs around Hydrogen seal oil units.	8.2.7.A	Also see 5.18.6 of 79 SER.
	July 27, 1979 / 5.18.4	Portable extinguishers & hose stations provided.	8.2.7.A	
	July 27, 1979 / 5.18.4	Auto. deluge sys. provided for H2 seal oil units.	8.2.7.A	
	July 27, 1979 / 5.18.4	Auto. sprinkler protection provided for H2 seal oil area.	8.2.7.A	
APCSB 9.5-1	Appendix A / F.8	Hydrogen seal oil reservoirs have auto. water spray sys.	8.2.7.A	
6/86 (Rev. 2) / 5.2.4		All penetrations in shield walls sealed w/nc. materials.	8.2.7.B	Substantial, locked, unlabeled, metal doors
6/86 (Rev. 2) / 5.2.4	July 21, 1988 / 9.2	Extensive auto. sprinkler protection provided throughout.	8.2.7.B	Except west of row D.
	July 27, 1979 / 3.1.1, 5.18	Early warning fire detection system will be provided.	8.2.7.B	HP htr bay, ceiling pens. & cable pens. to RB
	July 27, 1979 / 5.18.4	Portable extinguishers & hose stations provided.	8.2.7.B	
	July 27, 1979 / 5.18.4	Sprinklers provided for the heater bays.	8.2.7.B	
6/86 (Rev. 2) / 5.2.4		All penetrations in shield walls sealed w/nc. materials.	8.2.7.C	Substantial, locked, unlabeled, metal doors
6/86 (Rev. 2) / 5.2.4		Spot detection provided in western portion of 8.2.7.C.	8.2.7.C	
	July 27, 1979 / 3.1.1, 5.18	Early warning fire detection system will be provided.	8.2.7.C	Cable pens. to RB adj to ASD Coolers
	July 27, 1979 / 3.1.11	Curbs around MG set oil cooler / pump.	8.2.7.C	Also see 5.18.6 of 79 SER (MG Set oil coolers and pumps removed).
	July 27, 1979 / 5.18.4	Portable extinguishers & hose stations provided.	8.2.7.C	
	July 27, 1979 / 5.18.4	Auto. deluge sys. provided for turbine lube oil reservoirs.	8.2.7.C	
	July 27, 1979 / 5.18.4	Auto. sprinkler protection provided for MG set oil coolers.	8.2.7.C	(MG Set oil coolers and pumps removed, but sprinkler system retained).
APCSB 9.5-1	Appendix A / F.8	Turbine oil reservoir tanks prot. by auto. water spray.	8.2.7.C	Supplemented by a ceiling-level wet pipe sys.
APCSB 9.5-1	Appendix A / F.8	Thermal det. provided for the turbine oil reservoir tanks.	8.2.7.C	
	July 27, 1979 / 3.1.1, 5.1.8	Early warning fire detection system will be provided.	8.2.7.D	HP htr bay, ceiling pens. & cable pens. to RB

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 5.18.4	Portable extinguishers & hose stations provided.	8.2.7.D	
	July 27, 1979 / 5.18.4	Sprinklers provided for the heater bays.	8.2.7.D	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.7.E	4-kV SWGR area on TB mezz. floor.
	July 27, 1979 / 3.1.5	Relocate manual pull station for H2 seal oil unit deluge	8.2.7.E	Relocate to outside the area & 5.18.6/79 SER
	July 27, 1979 / 3.1.11	Curbs around Hydrogen seal oil units.	8.2.7.E	Also see 5.18.6 of 79 SER.
	July 27, 1979 / 5.18.4	Portable extinguishers & hose stations provided.	8.2.7.E	
	July 27, 1979 / 5.18.4	Auto. deluge sys. provided for H2 seal oil units.	8.2.7.E	
	July 27, 1979 / 5.18.4	Auto. sprinkler protection provided for H2 seal oil area.	8.2.7.E	
APCSB 9.5-1	Appendix A / F.8	Hydrogen seal oil reservoirs have auto. water spray sys.	8.2.7.E	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	4-kV SWGRs for each unit sep. by partial 3-hr barrier.	8.2.8.A	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	Partial fire barrier separates div. SWGR.	8.2.8.A	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	2-hr. & 3-hr. barrier between RB & 480-V SWGR areas	8.2.8.A	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.0	3-hr. seals into bottom of SWGR.	8.2.8.A	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.0	No unsealed penetrations are located near SWGR.	8.2.8.A	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.0	No continuity of comb. between 8.2.8.E & eq. fire areas	8.2.8.A	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	MG sets are curbed to confine any liquid spill.	8.2.8.A	Oil removed from units MG Sets.
	July 21, 1988 / 12.2	Thermally actuated water spray system for local supp.	8.2.8.A	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	Separate auto. wet pipe spk. sys. at ceiling for MG sets	8.2.8.A	With spray shields for water damage.
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	Smoke detection at ceiling.	8.2.8.A	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	Manual fire fighting equipment is available for this zone.	8.2.8.A	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Smoke detection provided above 4-kV SWGR.	8.2.8.A	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.8.A	4-kV & 480-Volt SWGR areas. Also 5.19.6.
	July 27, 1979 / 3.1.11	Curbs around MG sets on turbine main operating floor	8.2.8.A	To contain oil spills. Also 5.19.6 of 79 SER. Oil removed from Units MG Sets.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
				With water-flow annunciation in the control rm. Oil removed from MG Set, sprinkler system retained.
	July 27, 1979 / 5.19.4	MG Set area protected by an auto. sprinkler sys.	8.2.8.A	
	July 27, 1979 / 5.19.4	Portable extinguishers & hose stations provided.	8.2.8.A	
	July 27, 1979 / 5.19.6	Drains to be provided for enclosed (curbed) area.	8.2.8.A	
APCSB 9.5-1	Appendix A / D.1.j	Partial fire barriers used on op. floor.	8.2.8.A	See exemption requests for details.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	3-hr. rated barrier at col. line 13 east of col. line G.	8.2.8.B	Separates U1 & U2 480-V SWGR
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	Partial fire barrier separates div. SWGR.	8.2.8.B	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	2-hr. & 3-hr. barrier between RB & 480-V SWGR areas	8.2.8.B	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 2.0	3-hr. seals into bottom of SWGR.	8.2.8.B	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 2.0	No unsealed penetrations are located near SWGR.	8.2.8.B	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 2.0	No continuity of comb. between 8.2.8.E & eq. fire areas	8.2.8.B	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	MG sets are curbed to confine any liquid spill.	8.2.8.B	Oil removed from MG Sets
	July 21, 1988 / 12.2	Thermally actuated water spray system for local supp.	8.2.8.B	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	Separate auto. wet pipe spk. sys. at ceiling for MG sets	8.2.8.B	With spray shields for water damage. Oil removed from MG Sets, sprinklers retained.
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	Smoke detection at ceiling.	8.2.8.B	
6/86 (Rev. 2) / 5.8.4.1	July 21, 1988 / 12.2	Manual fire fighting equipment is available for this zone.	8.2.8.B	
6/86 (Rev. 2) / 5.8.4.2	July 21, 1988 / 12.2	Smoke detection provided above 4-kV SWGR.	8.2.8.B	
6/86 (Rev. 2) / 5.8.4.2	July 21, 1988 / 12.2	No intervening comb. between each units SWGR.	8.2.8.B	
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.8.B	4-kV & 480-Volt SWGR areas. Also 5.19.6.
	July 27, 1979 / 3.1.11	Curbs around MG sets on turbine main operating floor	8.2.8.B	To contain oil spills. Also 5.19.6 of 79 SER. (Oil removed from MG Set. Curbs remain).

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
				With water-flow annunciation in the control rm. (Oil removed from MG Set, sprinkler system retained).
	July 27, 1979 / 5.19.4	MG Set area protected by an auto. sprinkler sys.	8.2.8.B	
	July 27, 1979 / 5.19.4	Portable extinguishers & hose stations provided.	8.2.8.B	
	July 27, 1979 / 5.19.6	Drains to be provided for enclosed (curbed) area.	8.2.8.B	
APCSB 9.5-1	Appendix A / D.1.j	Partial fire barriers used on op. floor.	8.2.8.B	See exemption requests for details.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	3-hr. rated barrier at col. line 13 east of col. Line G.	8.2.8.C	Separates U1 & U2 4kv & 480-V SWGR
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	Partial fire barrier separates div. SWGR.	8.2.8.C	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	2-hr. & 3-hr. barrier between RB & 480-V SWGR areas	8.2.8.C	With Class A fire door.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.0	3-hr. seals into bottom of SWGR.	8.2.8.C	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.0	No unsealed penetrations are located near SWGR.	8.2.8.C	
6/86 (Rev. 2) / 5.8.4.2	July 21, 1988 / 12.0	No continuity of comb. between 8.2.8.E & eq. fire areas	8.2.8.C	
6/86 (Rev. 2) / 5.8.4.2	July 21, 1988 / 12.2	MG sets are curbed to confine any liquid spill.	8.2.8.C	Oil removed from MG.Sets. Curbs remain.
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Separate auto. wet pipe spk. sys. at ceiling for MG sets	8.2.8.C	W/baffles to prevent 4-kV SWGR damage (oil removed from MG Sets, sprinkler system retained).
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Smoke detection at ceiling.	8.2.8.C	
6/86 (Rev. 2) / 5.8.4.2	July 21, 1988 / 12.2	Smoke detection provided above 4-kV SWGR.	8.2.8.C	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Manual fire fighting equipment is available for this zone.	8.2.8.C	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	No intervening comb. between SWGR divisions.	8.2.8.C	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	3-hr. barrier separates fire areas along col. G to H at 11.	8.2.8.C	Full height partial fire barrier for div. 4-kV
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.8.C	4-kV & 480-Volt SWGR areas. Also 5.19.6.
	July 27, 1979 / 3.1.11	Curbs around MG sets on turbine main operating floor	8.2.8.C	To contain oil spills. Also 5.19.6 of 79 SER. Oil removed from MG.Sets. Curbs remain.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
				With water-flow annunciation in the control rm. Oil removed from MG Sets. Sprinkler system retained.
	July 27, 1979 / 5.19.4	MG Set area protected by an auto. sprinkler sys.	8.2.8.C	
	July 27, 1979 / 5.19.4	Portable extinguishers & hose stations provided.	8.2.8.C	
	July 27, 1979 / 5.19.6	Drains to be provided for enclosed (curbed) area.	8.2.8.C	
APCSB 9.5-1	Appendix A / D.1.j	Partial fire barriers used on op. floor.	8.2.8.C	See exemption requests for details.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	Partial fire barrier separates div. SWGR.	8.2.8.D	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	3-hr. barrier between RB & 480-V SWGR areas	8.2.8.D	Except 2-hour portion.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	3-hr. seals into bottom of SWGR.	8.2.8.D	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	No unsealed penetrations are located near SWGR.	8.2.8.D	SER indicates 3-hr. rated floor.
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	No continuity of comb. between 8.2.8.E & eq. fire areas	8.2.8.D	Equivalent areas (8.2.8.A - D)
	July 21, 1988 / 12.2	No continuity of combustibles through the floor slab.	8.2.8.D	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	MG sets are curbed to confine any liquid spill.	8.2.8.D	Oil removed from MG Sets. Sprinkler system retained.
	July 21, 1988 / 12.2	Thermally actuated water spray sys for local supp.	8.2.8.D	5.10.4.1, water supp. & foam-water prot.
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Separate auto. wet pipe spk. sys. at ceiling for MG sets	8.2.8.D	W/baffles to prevent 4-kV SWGR damage. Oil removed from MG Sets. Sprinkler system retained.
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Smoke detection at ceiling.	8.2.8.D	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Smoke detection provided above 4-kV SWGR.	8.2.8.D	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	Manual fire fighting equipment is available for this zone.	8.2.8.D	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	No intervening comb. between SWGR divisions.	8.2.8.D	
6/86 (Rev. 2) / 5.8.4.3	July 21, 1988 / 12.2	3-hr. barrier separates fire areas along col. G to H at 11.	8.2.8.D	Full height partial fire barrier for div. 4-kV
	July 27, 1979 / 3.1.1	Early warning fire detection system will be provided.	8.2.8.D	4-kV & 480-Volt SWGR areas. Also 5.19.6. Oil removed from MG Sets. Sprinkler system retained.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 3.1.11	Curbs around MG sets on turbine main operating floor	8.2.8.D	To contain oil spills. Also 5.19.6 of 79 SER. Oil removed from MG Sets. Sprinkler system retained.
	July 27, 1979 / 5.19.4	MG Set area protected by an auto. sprinkler sys.	8.2.8.D	With water-flow annunciation in the control rm.
	July 27, 1979 / 5.19.4	Portable extinguishers & hose stations provided.	8.2.8.D	
	July 27, 1979 / 5.19.6	Drains to be provided for enclosed (curbed) area.	8.2.8.D	
APCSB 9.5-1	Appendix A / D.1.j	Partial fire barriers used on op. floor.	8.2.8.D	See exemption requests for details.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	No safe shutdown cables or equipment in zone.	8.2.8.E	
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.2	curbs & wet pipe sys. separates areas.	8.2.8.E	These features located in 8.2.8.A - D.
6/86 (Rev. 2) / 5.8.1	July 21, 1988 / 12.0	Electrical penetration sealed with noncombustible matl.	8.2.8.E	Floor penetrations.
	July 27, 1979 / 4.3.2	Exciters for both generators protected by CO2 sys.	8.2.8.E	On the turbine deck.
	July 27, 1979 / 5.19.4	Portable extinguishers & hose stations provided.	8.2.8.E	
APCSB 9.5-1	Appendix A / D.1.j	Partial fire barriers used on op. floor.	8.2.8.E	See exemption requests for details.
APCSB 9.5-1	Appendix A / F.8	Auto. closed head water supp. sys. for bearing lift pumps	8.2.8.E	
APCSB 9.5-1	Appendix A / F.8	Turbine bearings protected w/heat det. & auto deluge sys.	8.2.8.E	
	July 27, 1979 / 3.1.8	Upgrade penetrations in DG Rooms to 3-hr. rating.	9.1.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 3.1.8	Provide electrical supervision for door.	9.1.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 3.1.8	Provide 3-hr. rating for structural steel in DG Rooms.	9.1.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 4.3.2	Auto. total flooding CO2 system protects DG room.	9.1.	Manual & auto. actuation .
	July 27, 1979 / 4.3.2	Local & control rm. alarms for DG CO2 systems.	9.1.	
	July 27, 1979 / 5.20.2	A 3-hr. enclosure is provided for the diesel day tank.	9.1.	
	July 27, 1979 / 5.20.4	Thermostats actuate local and control alarms.	9.1.	
	July 27, 1979 / 5.20.4	Thermostats also actuate a total flooding CO2 system.	9.1.	
	July 27, 1979 / 5.20.4	Day tank rooms also protected by auto. sprinklers.	9.1.	
	July 27, 1979 / 5.20.4	Portable extinguishers & hose stations provided for area	9.1.	
APCSB 9.5-1	Appendix A / D.4.i	Dampers interlocked w/ CO2 systems.	9.1.	Interlocked to close on activation of gas sys.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / E.5.a	CO2 systems designed per NFPA 12.	9.1.	
APCSB 9.5-1	Appendix A / E.5.b	All CO2 systems have predischage alarms.	9.1.	
APCSB 9.5-1	Appendix A / E.5.c	CO2 system nozzles do not discharge directly on equip.	9.1.	
APCSB 9.5-1	Appendix A / F.9	3-hr. separation for U1 DG.	9.1.	Except around DG exhaust & air supply pipes
APCSB 9.5-1	Appendix A / F.9	Auto total flooding CO2 system for each DG.	9.1.	Manual smoke venting by port. smoke ejectors
APCSB 9.5-1	Appendix A / F.9.b	The DG day tank rooms prot. by auto. sprinkler system.	9.1.	
APCSB 9.5-1	Appendix A / F.9.b	CO2 is discharged into DG & day tank rooms	9.1.	CO2 is discharged into DG & day tank rooms
	July 27, 1979 / 3.1.8	Upgrade penetrations in DG Rooms to 3-hr. rating.	9.2.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 3.1.8	Provide electrical supervision for door.	9.2.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 3.1.8	Provide 3-hr. rating for structural steel in DG Rooms.	9.2.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 4.3.2	Auto. total flooding CO2 system protects DG room.	9.2.	Manual & auto. actuation .
	July 27, 1979 / 4.3.2	Local & control rm. alarms for DG CO2 systems.	9.2.	
	July 27, 1979 / 5.20.2	A 3-hr. enclosure is provided for the diesel day tank.	9.2.	
	July 27, 1979 / 5.20.4	Thermostats actuate local and control alarms.	9.2.	
	July 27, 1979 / 5.20.4	Thermostats also actuate a total flooding CO2 system.	9.2.	
	July 27, 1979 / 5.20.4	Day tank rooms also protected by auto. sprinklers.	9.2.	
	July 27, 1979 / 5.20.4	Portable extinguishers & hose stations provided for area	9.2.	
APCSB 9.5-1	Appendix A / D.4.i	Dampers interlocked w/ CO2 systems.	9.2.	Interlocked to close on activation of gas sys.
APCSB 9.5-1	Appendix A / E.5.a	CO2 systems designed per NFPA 12.	9.2.	
APCSB 9.5-1	Appendix A / E.5.b	All CO2 systems have predischage alarms.	9.2.	
APCSB 9.5-1	Appendix A / E.5.c	CO2 system nozzles do not discharge directly on equip.	9.2.	
APCSB 9.5-1	Appendix A / F.9	3-hr. separation for U2 DG.	9.2.	Except around DG exhaust & air supply pipes
APCSB 9.5-1	Appendix A / F.9	Auto total flooding CO2 system for each DG.	9.2.	Manual smoke venting by port. smoke ejectors
APCSB 9.5-1	Appendix A / F.9.b	The DG day tank rooms prot. by auto. sprinkler system.	9.2.	
APCSB 9.5-1	Appendix A / F.9.b	CO2 is discharged into DG & day tank rooms	9.2.	CO2 is discharged into DG & day tank rooms



**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 3.1.8	Upgrade penetrations in DG Rooms to 3-hr. rating.	9.3.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 3.1.8	Provide electrical supervision for door.	9.3.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 3.1.8	Provide 3-hr. rating for structural steel in DG Rooms.	9.3.	Also see 5.20.6 of 79 SER.
	July 27, 1979 / 4.3.2	Auto. total flooding CO2 system protects DG room.	9.3.	Manual & auto. actuation .
	July 27, 1979 / 4.3.2	Local & control rm. alarms for DG CO2 systems.	9.3.	
	July 27, 1979 / 5.20.2	A 3-hr. enclosure is provided for the diesel day tank.	9.3.	
	July 27, 1979 / 5.20.4	Thermostats actuate local and control alarms.	9.3.	
	July 27, 1979 / 5.20.4	Thermostats also actuate a total flooding CO2 system.	9.3.	
	July 27, 1979 / 5.20.4	Day tank rooms also protected by auto. sprinklers.	9.3.	
	July 27, 1979 / 5.20.4	Portable extinguishers & hose stations provided for area	9.3.	
APCSB 9.5-1	Appendix A / D.4.i	Dampers interlocked w/ CO2 systems.	9.3.	Interlocked to close on activation of gas sys.
APCSB 9.5-1	Appendix A / E.5.a	CO2 systems designed per NFPA 12.	9.3.	
APCSB 9.5-1	Appendix A / E.5.b	All CO2 systems have predischARGE alarms.	9.3.	
APCSB 9.5-1	Appendix A / E.5.c	CO2 system nozzles do not discharge directly on equip.	9.3.	
APCSB 9.5-1	Appendix A / F.9	3-hr. separation between RBs & DG 1/2.	9.3.	
APCSB 9.5-1	Appendix A / F.9	Auto total flooding CO2 system for each DG.	9.3.	
APCSB 9.5-1	Appendix A / F.9.b	The DG day tank rooms prot. by auto. sprinkler system.	9.3.	
APCSB 9.5-1	Appendix A / F.9.b	CO2 is discharged into DG & day tank rooms	9.3.	CO2 is discharged into DG & day tank rooms
6/86 (Rev. 2) / 8.2.2	July 21, 1988 / 8.2	Det. located adjacent to mech. & elect. penetrations.	Expansion Gap	Adjacent to expansion gap penetrations.
6/86 (Rev. 2) / 8.2.5	July 21, 1988 / 8.2	Manual suppression is readily available near pens.	Expansion Gap	Near mech. & elect. penetrations.
	July 27, 1979 / 3.1.2	Sys. to detect excessive make up water.	Fire Pumps	To fire water sys. from service water sys.
	July 27, 1979 / 3.1.6	Provide foam concentrate & pickup tubes.	General	Also see 4.3.1.6 of 79 SER.
	July 27, 1979 / 3.1.12	Turn-out coats will be provided for fire brigade.	General	Also see 4.12 of 79 SER.
6/86 (Rev. 2) / 12.1.1	Feb. 25, 1991 / 2.4.2	Operators trained at pulling fuses.	General	
	July 27, 1979 / 4.3.1.4	Interior hose stations located throughout the plant.	General	Reel type, w/ hose & 180 degree movement.
	July 27, 1979 / 4.3.1.5	Auto. sprinklers protect areas in TB & cable tunnel.	General	Zones 8.2.4, 8.2.5, & in TB.
	July 27, 1979 / 4.3.3	Portable extinguishers throughout the plant.	General	Dry chem. & CO2.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	July 27, 1979 / 4.4.1	Provide 3 fire service smoke ejectors & port. ducting	General	Combined capacity: 15,000 to 20,000 CFM
	July 27, 1979 / 4.4.2	Self-contained breathing equip. & cascade provided.	General	2 air packs in Radwaste, 4 in RB, plus extras.
	July 27, 1979 / 4.5	Emerg. lighting is provided.	General	Powered from 125-Volt DC station batteries.
	July 27, 1979 / 4.8	Electrical penetration seals are adequate.	General	
	July 27, 1979 / 4.8	Fire doors for safety related areas, elect. supervised.	General	Such as zones 9.1, 9.2, .9.3, etc.
	July 27, 1979 / 4.8	Other fire doors locked or admin. controlled.	General	To ensure they will be effective.
	July 27, 1979 / 4.10	In general, fire areas have 3-hr. barriers.	General	Some exceptions exist.
	July 27, 1979 / 4.11	Turn out coats provided for fire brigade use.	General	
	July 27, 1979 / 4.12	Fire brigade provided w/ & trained for breathing equip.	General	
	July 27, 1979 / 3.1.13	Air breathing facilities for 10 men for 6 hrs., 3 bottles/hr.	General	3 bottles/hour/person. See 4.1.2, 4.4.2, 3.1.12
	July 27, 1979 / 4.4.2	Breathing air: 30 air packs plus 60 extra bottles.	General	& cascade system w/six 300 cubic ft. bottles.
	July 27, 1979 / 3.2.1	In situ tests conducted for existing smoke detectors.	General	Also see 4.2 of 79 SER.
	July 27, 1979 / 4.5	Lighting backup power source provided by station DGs.	General	
	July 27, 1979 / 4.5	Seal beam emergency lighting & hand held lanterns.	General	Provided for emergency use.
	July 27, 1979 / 4.6	Communications provided: telephones, page & answer.	General	Voice-powered headset stations & port. radios
	July 27, 1979 / 6.2	Fire brigade training meets App. A to BTP 9.5-1.	General	
	July 27, 1979 / 6.3	Admin. controls minimize amount of combustibles.	General	In safety-related areas.
	July 27, 1979 / 6.4	Control of ignition sources are administratively controlled.	General	
	July 27, 1979 / 6.5	Adequate fire fighting procedures have been developed.	General	
	July 27, 1979 / 6.6	Annual audits & QA in place for fire protection program.	General	
	Nov. 5, 1980 / 3.2.1	Conduct bench tests for smoke detectors.	General	
	Feb. 12, 1981 / 3.2.1	Have detectors bench tested.	General	
	Dec. 30, 1982 / 2.3	All other plant areas (24) will meet III.G.2 of App. R. or	General	Or have an approved exemption request.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
	Dec. 30, 1982 / 2.4	The SSD makeup pump equivalent in capacity to RCIC.	General	And serves as a substitute to the RCIC.
	Dec. 30, 1982 / 3.1.6	The DGs, DG cooling water sys., etc. are available.	General	To provide alternated SSD functions.
	Dec. 30, 1982 / 3.2	Achieve cold shutdown w/in 72 hrs.	General	W/O off-site power if alternate SSD
	Dec. 30, 1982 / 3.4	Plant meets associated circuits criteria w/ mods.	General	
	Dec. 30, 1982 / 3.5	Safe shutdown procedures & manpower adequate.	General	
	Dec. 1, 1987 / 2.1	Operators trained & available in fuse pulling for SSD.	General	
	Dec. 1, 1987 / 2.2	Maintain replacement fuses and fuse pullers by DGs.	General	Emerg. lighting & manpower (& 2.2, 5/88SER)
	Dec. 1, 1987 / 2.3.1	SSD makeup pump backup water from Fire Water Sys.	General	Instead of from service water system.
	Dec. 1, 1987 / 2.3.1	Fire water sys. supply meets fire & SSD demands.	General	Simultaneously
	Dec. 1, 1987 / 2.3.2	RHR flow indication inst. available during a fire event.	General	Previously listed as not available (12/82 3.1.5)
	Dec. 1, 1987 / 2.3.4	SSD procedures include operator instruction for fuses.	General	Shedding power source loads & fuse pulling.
	Feb. 25, 1991 / 3.0	Vessel level can be monitored from multiple RB locations	General	
	Feb. 25, 1991 / 3.0	Operators have time to obtain portable lights.	General	For safe shutdown related actions.
	Feb. 25, 1991 / 2.4.2	Operators trained at pulling fuses.	General	
APCSB 9.5-1	Appendix A / A.1	Admin. Prog. compared w/ detailed recommendations.	General	
APCSB 9.5-1	Appendix A / A.3	Backup fire suppression capability & equip. provided.	General	Manual hose stations & port. extinguishers.
APCSB 9.5-1	Appendix A / A.4	Fire water supply provided by redundant fire pumps.	General	Diesel driven pumps.
APCSB 9.5-1	Appendix A / A.4	Lightning protection comparable to req. in NFPA-78.	General	
APCSB 9.5-1	Appendix A / A.5	Supp. effects analysis conducted.	General	Pipe break would not adversely affect SSD.
APCSB 9.5-1	Appendix A / A.9	Separation between shared eq. addressed in SSD Rep.	General	And addressed in Exemption Requests.
APCSB 9.5-1	Appendix A / B.1	Admin. procedure guidance in NFPA Codes reviewed.	General	See NFPA Code Review.
APCSB 9.5-1	Appendix A / B.2	Bulk storage of comb. materials per NRC guidance.	General	See Supplementary Guidance Review.
APCSB 9.5-1	Appendix A / B.3.a	Procedure in place to control ignition sources.	General	
APCSB 9.5-1	Appendix A / B.3.b	Open flame not permitted for leak testing.	General	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / B.3.c	Admin. controls for combustibles such as wood.	General	Procedure specifies acceptable materials.
APCSB 9.5-1	Appendix A / B.4	Station fire brigade self-sufficient.	General	Some training w/ other agencies.
APCSB 9.5-1	Appendix A / B.5.a	Fire prot. sys. surveillance's performed per procedure.	General	
APCSB 9.5-1	Appendix A / B.5.a	Periodic testing of fire prot. sys. & eq. per procedure.	General	
APCSB 9.5-1	Appendix A / B.5.b	Fire drills conducted per QEP 340-5.	General	One drill per shift per quarter.
APCSB 9.5-1	Appendix A / B.5.c	Fire brigade & fire dept. training compared to NRC guide	General	
APCSB 9.5-1	Appendix A / B.5.d	NFPA Codes reviewed for fire brigade activity.	General	
APCSB 9.5-1	Appendix A / D.1	Major fire hazards protected w/ fixed supp. systems.	General	
APCSB 9.5-1	Appendix A / D.1.d	HVAC work since late 1970's have low comb. finishes.	General	HVAC materials meet NFPA 90A-1976.
APCSB 9.5-1	Appendix A / D.1.e	The roofs at Quad Cities are Class 2 construction.	General	App. A required Class I
APCSB 9.5-1	Appendix A / D.1.i	Fire fighting water will not adversely affect SSD.	General	See suppression effects analysis.
APCSB 9.5-1	Appendix A / D.1.j	In general, fire areas separated by 3-hr. barriers.	General	Including pen. seals, doors, dampers, etc.
APCSB 9.5-1	Appendix A / D.1.j	Most fire doors are locked and/or alarmed.	General	Alarmed if kept in closed position.
APCSB 9.5-1	Appendix A / D.2.a	Major fire hazards have fixed fire protection.	General	
APCSB 9.5-1	Appendix A / D.2.c	Plastic (including PVC & neoprene) materials minimized	General	New safety related cables and all cables installed in cable tray or in free-air applications are qualified to IEEE-383, IEEE-1202, NFPA 262 or equivalent. Cables installed in rigid metal conduit or in metal enclosures (ventilated or non-ventilated) cannot support sustained combustion and are not required to be qualified to IEEE-383, IEEE-1202, or NFPA 262.
APCSB 9.5-1	Appendix A / D.2.d	NFPA 30 used as a guide for storage of flamm. liquids.	General	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / D.3.a	All cable trays constructed of noncomb. materials.	General	Galvanized sheet metal.
APCSB 9.5-1	Appendix A / D.3.c	Fire detection in areas containing major elect. equip.	General	
APCSB 9.5-1	Appendix A / D.3.c	Cables are waterproof type, not subject to elect. faulting	General	
APCSB 9.5-1	Appendix A / D.3.c	Manual hose stations & port. ext. in all cable areas.	General	Except cable tunnels.
APCSB 9.5-1	Appendix A / D.3.c	Alt. SSD capability avail. independent of all fire areas.	General	
APCSB 9.5-1	Appendix A / D.3.d	Cable & cable tray pens. sealed equivalent to barrier.	General	
APCSB 9.5-1	Appendix A / D.3.e	Fire stops from SER 4.9 not as significant(since App. R)	General	Existing fire stops will be maintained.
APCSB 9.5-1	Appendix A / D.3.f & g	New cables to meet IEEE-383 requirements.	General	New safety related cables and all cables installed in cable tray or in free-air applications are qualified to IEEE-383, IEEE-1202, NFPA 262 or equivalent. Cables installed in rigid metal conduit or in metal enclosures (ventilated or non-ventilated) cannot support sustained combustion and are not required to be qualified to IEEE-383, IEEE-1202, or NFPA 262.
APCSB 9.5-1	Appendix A / D.3.h	Cable trays, raceways, conduit, etc used only for cables	General	
APCSB 9.5-1	Appendix A / D.3.i	Port. vent. eq. (smoke ejectors) available for fire brigade.	General	
APCSB 9.5-1	Appendix A / D.4.a & b	Vent. sys. shuts down in a fire area, manually restarted	General	Manual restart of vent. sys. to purge smoke.
APCSB 9.5-1	Appendix A / D.4.d	Charcoal in filter systems contained in metal cabinets.	General	
APCSB 9.5-1	Appendix A / D.4.e	Separation between fresh air intakes & exhaust outlets.	General	Physical separation.
APCSB 9.5-1	Appendix A / D.4.f	Elevators enclosed with 2-hr. construction.	General	Escape & access routes are established.
APCSB 9.5-1	Appendix A / D.4.g	Existing vent. systems will be utilized to purge smoke.	General	For post fire operations.
APCSB 9.5-1	Appendix A / D.4.h	Adequate SCBAs & spare bottles available for use.	General	For fire brigade and damage control.

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / D.4.i	Dampers interlocked w/ CO2 systems.	General	Interlocked to close on activation of gas sys.
APCSB 9.5-1	Appendix A / D.5.a	Fixed emerg. lighting installed in plant per App. R.	General	At selected locations throughout the plant.
APCSB 9.5-1	Appendix A / D.5.b	Sealed beam port. hand lights provided for emerg. use.	General	Battery powered.
APCSB 9.5-1	Appendix A / D.5.c	2-way phones & a paging sys. exists throughout plant.	General	And some voice powered head set stations.
APCSB 9.5-1	Appendix A / E.1.a	Fire detection systems compared to NFPA 72D.	General	
APCSB 9.5-1	Appendix A / E.1.c	Station fire alarm is distinct from other station alarms.	General	
APCSB 9.5-1	Appendix A / E.1.d	Present fire alarm sys. connected to plant UPS.	General	
APCSB 9.5-1	Appendix A / E.2.a	Supp. systems were conservatively designed.	General	To allow for underground pipe deterioration.
APCSB 9.5-1	Appendix A / E.2.e	Hyd. calcs. show either fire pump can handle demands.	General	W/hyd. shortest leg out & 500 gpm hose.
APCSB 9.5-1	Appendix A / E.3.a	Auto. sprinklers, hose stations fed by interior loops.	General	And from interior mains.
APCSB 9.5-1	Appendix A / E.3.a	Loops & int. mains w/ min.2 connections to undergrd. loop	General	No single failure will impair primary & backup.
APCSB 9.5-1	Appendix A / E.3.a	Sprinkler/standpipe systems eq. w/OS & Y gate valves.	General	Or other approved valves.
APCSB 9.5-1	Appendix A / E.3.a	Water flow alarms provided for auto. spk.. systems.	General	Not provided for standpipe systems.
APCSB 9.5-1	Appendix A / E.3.a	Water shields or baffles for some safety-related eq.	General	Supp. effects analysis performed.
APCSB 9.5-1	Appendix A / E.3.b	Elect. supervision gen. provided for fixed supp. valves.	General	Sectional valves are not elect. supervised.
APCSB 9.5-1	Appendix A / E.3.b	Valves are sealed or locked in proper position.	General	With monthly inspections.
APCSB 9.5-1	Appendix A / E.3.c	Fixed water ext. systems installed per NFPA 13 & 15.	General	
APCSB 9.5-1	Appendix A / E.3.d	Hose stations/standpipes use rubber lined hose.	General	Hose lengths do not exceed 100'.
APCSB 9.5-1	Appendix A / E.3.d	Some standpipe / hose systems comply w/NFPA 14	General	Calcs. performed to verify adequacy of supply
APCSB 9.5-1	Appendix A / E.3.d	Hose stations gen. located outside unoccupied areas.	General	
APCSB 9.5-1	Appendix A / E.3.d	Shutoff valves for standpipes, sections of interior piping.	General	
APCSB 9.5-1	Appendix A / E.3.d	Standpipe systems installed & inspected per NFPA 14	General	
APCSB 9.5-1	Appendix A / E.3.d	Signs installed warning of hose station high pressure.	General	
APCSB 9.5-1	Appendix A / E.3.e	Elect. safety nozzles for elect. eq. / cabling areas.	General	
APCSB 9.5-1	Appendix A / E.3.f	Portable foam extinguishers provided w/ manual equip.	General	
APCSB 9.5-1	Appendix A / E.5.b	All CO2 systems have predischage alarms.	General	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / E.6	CO2 & dry chem. port. exts. avail. for Class B & C fires.	General	Standpipes gen. used in lieu of Class A exts.
APCSB 9.5-1	Appendix A / F.1.a	Local supp. system provided over specific & gen. hazards.	General	See exemption requests for specifics.
APCSB 9.5-1	Appendix A / F.1.b	Comb. & ignition sources admin. controlled.	General	
APCSB 9.5-1	Appendix A / F.1.b	Hose stations & port. CO2 exts. throughout sec. cont.	General	
APCSB 9.5-1	Appendix A / F.4.	Plant computers are not safety related.	General	
APCSB 9.5-1	Appendix A / F.5.	Auto. fire det. provided in vicinity of SWGR & MCCs.	General	Alarms in the control room.
APCSB 9.5-1	Appendix A / F.5.	Hose stations & port. exts. provided for SWGR & MCCs	General	
APCSB 9.5-1	Appendix A / F.6	In gen., SSD local panels provided w/ det. and/or supp.	General	
APCSB 9.5-1	Appendix A / F.10	Diesel fuel oil storage tanks are buried underground.	General	Meeting the 3-hr. fire separation criteria.
APCSB 9.5-1	Appendix A / F.11	Auto. sprinkler prot. &/or det. provided where appropriate	General	For safety-related pump areas & per FHA
APCSB 9.5-1	Appendix A / F.11	Hose stations & port. ext. for safety-related pump areas	General	
APCSB 9.5-1	Appendix A / F.11	Equipment pedestals, curbs & drains provided.	General	To protect safety-related equipment.
APCSB 9.5-1	Appendix A / F.11	Vent. to safety-related pump areas manually controlled.	General	Exhaust from these areas through RB stack.
APCSB 9.5-1	Appendix A / F.15	No flammable liquids stored in decontaminated areas.	General	
APCSB 9.5-1	Appendix A / F.18	Misc. areas located & prot. to minimize effects of a fire.	General	Prot. w/ port. exts. & hose stations.
APCSB 9.5-1	Appendix A / G.1	A cutting & welding permit system in place.	General	
APCSB 9.5-1	Appendix A / G.1	Hose stations & port. exts. provided throughout the plant	General	
APCSB 9.5-1	Appendix A / G.2	Detection provided in most dry resin storage areas.	General	A dry resin fire will not prevent SSD.
APCSB 9.5-1	Appendix A / G.3	Hazardous chemicals kept in proper containers.	General	With fire prot. recommendations.
APCSB 9.5-1	Appendix A / G.3	Vent. & flood prot. are provided for haz. chem. areas.	General	See NFPA 49 & 30 reviews.
APCSB 9.5-1	Appendix A / G.4	Resins & filters stored in controlled areas.	General	And kept in closed containers.
APCSB 9.5-1	Appendix A / F.1.a	Auto. det. provided for most of reactor building.	General (RB)	Sec. cont.
APCSB 9.5-1	Appendix A / G.2	Resins temporarily stored in various locations in TB.	General-TB	Away from vital equipment.
APCSB 9.5-1	Appendix A / G.2	Wet pipe sprinkler prot. provided for major resin storage	General-TB	
	July 27, 1979 / 3.1.2	Provide sep. feed to undergrd. loop, from fire pumps.	Loop	With isolation valves.
	Safety Eval. Reports	Fire Brigade being credited for fire incidents in the plant.	NA	All zones.
APCSB 9.5-1	Appendix A / F.12	Port. ext. & hose stations near new fuel storage area.	New fuel area	Located immediately outside area.
APCSB 9.5-1	Appendix A / F.12	Combustibles limited by admin. controls.	New fuel area	

**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / F.12	Rack configuration precludes criticality of total flooding.	New fuel area	Fog nozzles not used near fuel storage area
APCSB 9.5-1	Appendix A / F.12	The storage area provided w/ a drain.	New fuel area.	
6/86 (Rev. 2) / 5.1	July 21, 1988 / 9.2	Substantial shield walls, cable pens. sealed w/ nc matl	Northern Zone Gp.	W/substantial locked metal access doors.
	July 27, 1979 / 3.1.3	No interference's w/ the operation of hydrants & PIVs.	Outside	Also see 4.3.1.3 of the 79 SER.
	July 27, 1979 / 3.1.3	Gate valve to be provided for the unused hydrant port	Outside	2-1/2" gate valve. & 4.3.1.3 of the 79 SER.
	July 27, 1979 / 3.1.5	Water spray sys. for bus duct, w/in 15' of transformers.	Outside	Also see 5.22.6 of 79 SER.
	July 27, 1979 / 3.1.5	Independent water for bus duct deluge system.	Outside	Independent from transformer water spray
	July 27, 1979 / 4.3.1.3	Cross connections provided for fire prot. Loop.	Outside	
	July 27, 1979 / 4.3.1.3	Provide a separate feed to the underground F.P. loop.	Outside	To prevent a line break form isolating systems.
	July 27, 1979 / 4.3.1.3	Fire hydrants feed by exterior loop.	Outside	
	July 27, 1979 / 4.3.1.3	Fire hydrants to have post-indicator valves.	Outside	
	July 27, 1979 / 4.3.1.3	Fire hydrants to be at intervals not in excess of 400'.	Outside	
	July 27, 1979 / 4.3.1.5	Auto. deluge systems protect yard transformers & oil sys.	Outside	Also see 5.22.4 of 79 SER.
	July 27, 1979 / 5.22.4	The yard area is protected by manual fire protection.	Outside	
	July 27, 1979 / 5.22.4	Outside transformers protected by auto. deluge systems.	Outside	
APCSB 9.5-1	Appendix A / D.1.h	Water spray sys. above transformers.	Outside	
APCSB 9.5-1	Appendix A / D.1.h	Reinforced concrete wall between TB & transformers.	Outside	Plus a 6" curb.
APCSB 9.5-1	Appendix A / D.1.h	Water spray prot. of bus duct pens. at west wall of TB.	Outside	Not provided at east wall (19' separation).
APCSB 9.5-1	Appendix A / D.2.b	Outside bulk hydrogen storage properly arranged.	Outside	NFPA 50A & 6 addressed in the reviewed.
APCSB 9.5-1	Appendix A / E.2.a	Looped 10" water main surrounds the plant.	Outside	Unlined pipe was used in the buried loop.
APCSB 9.5-1	Appendix A / E.2.a	Cross connections & sectional valves provided in loop.	Outside	
APCSB 9.5-1	Appendix A / E.2.a	C-factor testing conducted every 3 years (for yard main).	Outside	
APCSB 9.5-1	Appendix A / E.2.b	Common yard main fire loops & water supplies provided.	Outside	



**Table 3.8-1**  
**DESIGN BASIS FIRE PROTECTION COMMITMENTS**

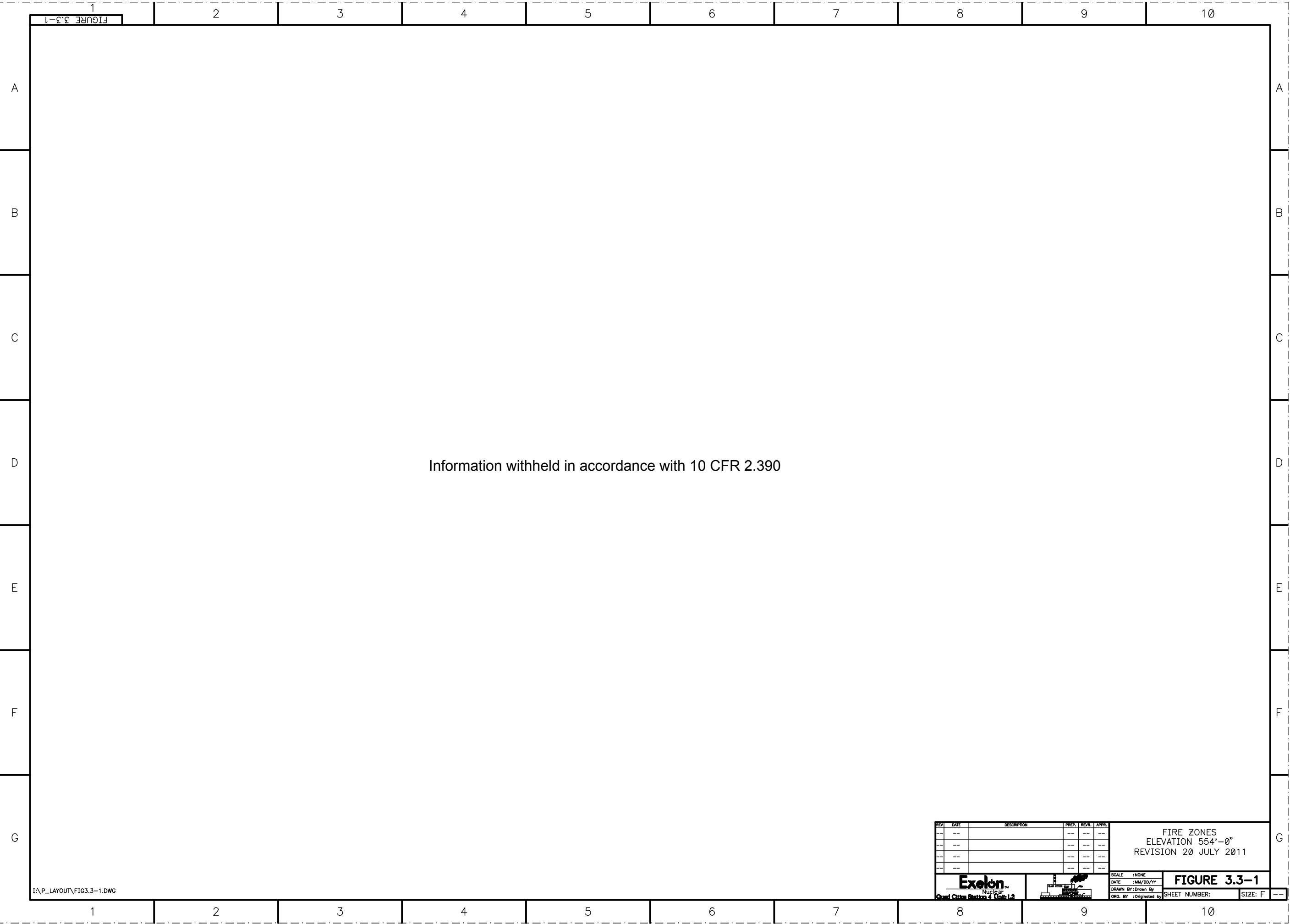
REFERENCE		Fire Protection Commitment Description	Affected Fire Zone	Comment
E.R. Date/Section	SER Date/Section			
APCSB 9.5-1	Appendix A / E.2.g	Fire hydrant spacing gen. per NFPA 24(<400 feet apart)	Outside	Except crib house area (carts w/500' of hose).
APCSB 9.5-1	Appendix A / F.16	Safety-related storage tanks located outside.	Outside	Protected by hose houses located in vicinity
APCSB 9.5-1	Appendix A / F.16	Supp for major hazards (transformers) located w/in 50'.	Outside	Within 50' of outdoor tanks.
APCSB 9.5-1	Appendix A / G.1	Acetylene, Oxygen fuel gas systems stored outside.	Outside	In designated areas w/ admin. procedures.
APCSB 9.5-1	Appendix A / F.14	Radwaste vent. sys. independent of plant vent. sys.	Radwaste	Capable of being shutdown & restarted.
APCSB 9.5-1	Appendix A / F.14	A fire in the radwaste bldg. will not prevent SSD.	Radwaste	Per the SSD analysis.
APCSB 9.5-1	Appendix A / D.1.j	Fire doors held open have fusible links in event of fire.	RB	
APCSB 9.5-1	Appendix A / F.1.b	Adequate SCBAs provided near primary cont. entrances	Sec. cont./Pri. cont	
6/86 (Rev. 2) / 5.1	July 21, 1988 / 9.2	Substantial shield walls, cable pens. sealed w/ nc matl	Southern Zone Gp.	W/substantial locked metal access doors.
APCSB 9.5-1	Appendix A / F.13	Port. fire ext. & hose stations throughout spent fuel area	Spent fuel area	
	July 27, 1979 / 3.1.5	Sprinklers, curbs, & cabinets for oil storage in TB.	TB	Also 5.17.6 of 79 SER(<5 gal.)W/drains & spk.
APCSB 9.5-1	Appendix A / D.2.b	Area hydrogen monitors provided to protect TB.	TB	Check valves in place.

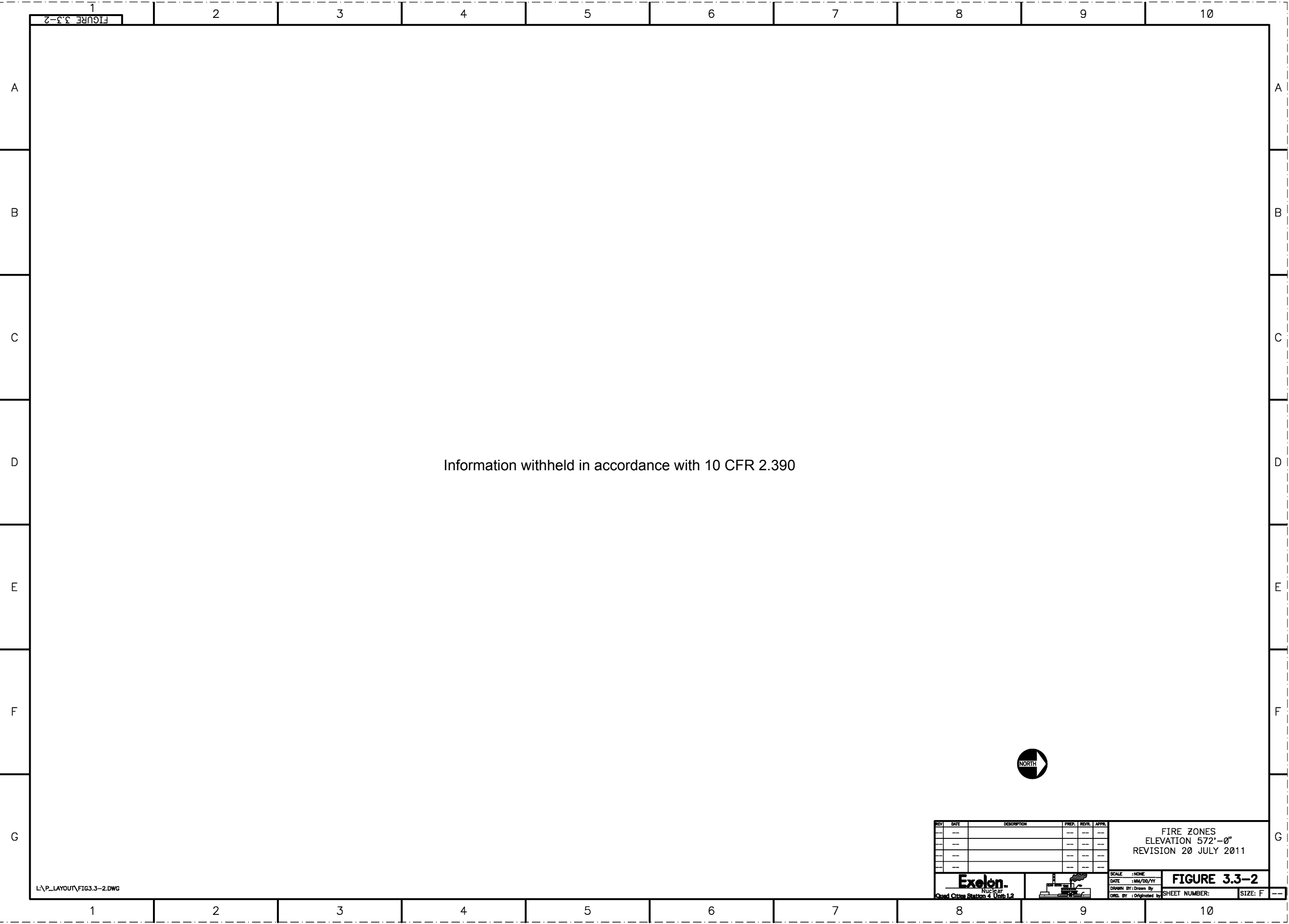
**Note 1:**Exemption requests and Safety Evaluation Reports are located in the Fire Protection Report.

**Note 2:**Fire protection commitments which are not related to the design basis for the plant are shown in the Fire Protection Commitment Matrix (Revision 3).

**Note 3:**Commitments in this table were taken from the following documents.

1. Safety Evaluation Reports related to BTP APCS 9.5-1, Appendix A.
2. Safety Evaluation Reports related to 10 CFR 50, Appendix R.
3. Appendix R exemption requests submitted by Com Ed and approved by the NRC.
4. ComEd's response to the requirements of BTP APCS 9.5-1, Appendix A (Section 5.0 of this FHA).





L:\P\_LAYOUT\FIG3.3--2.DWG

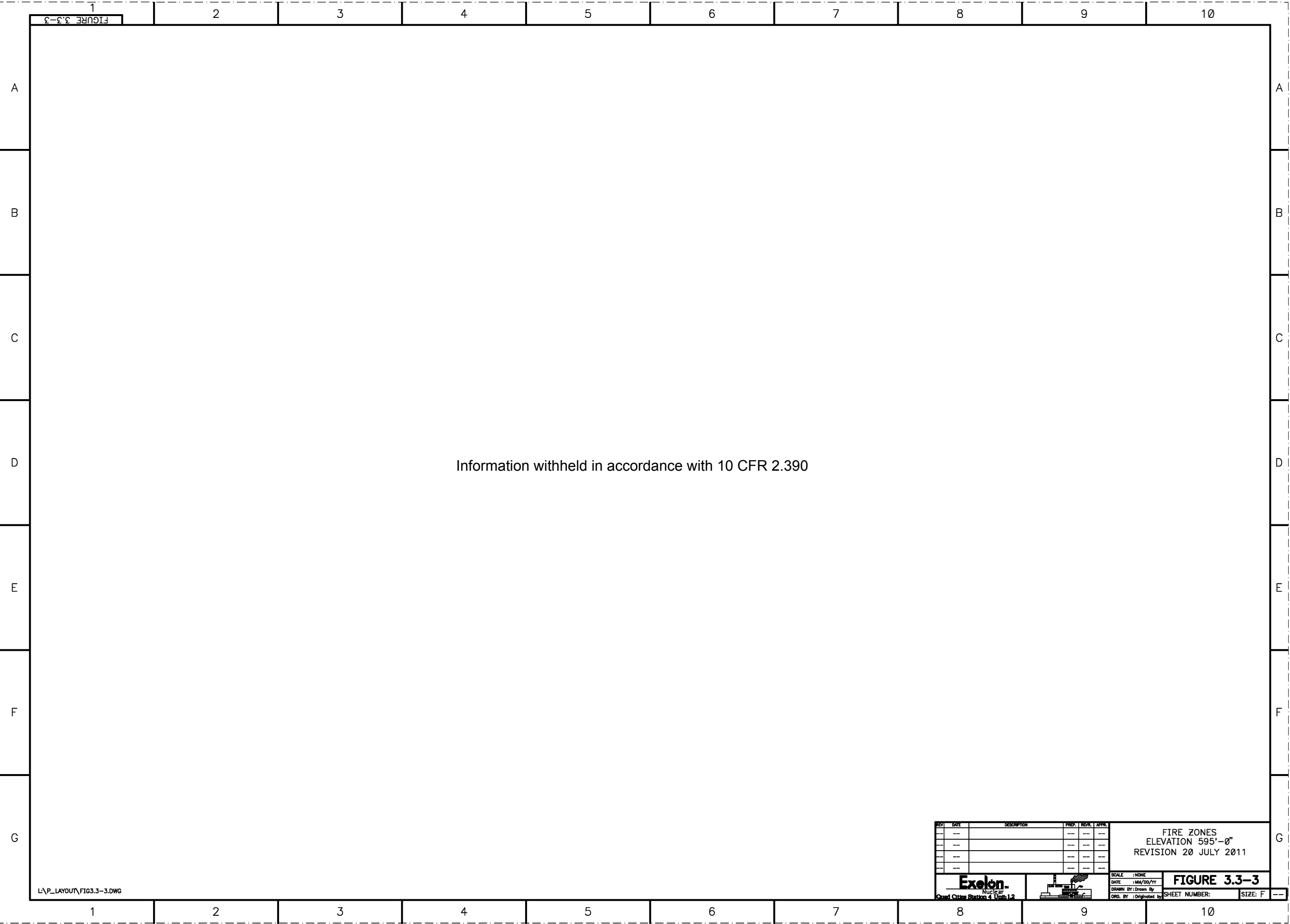
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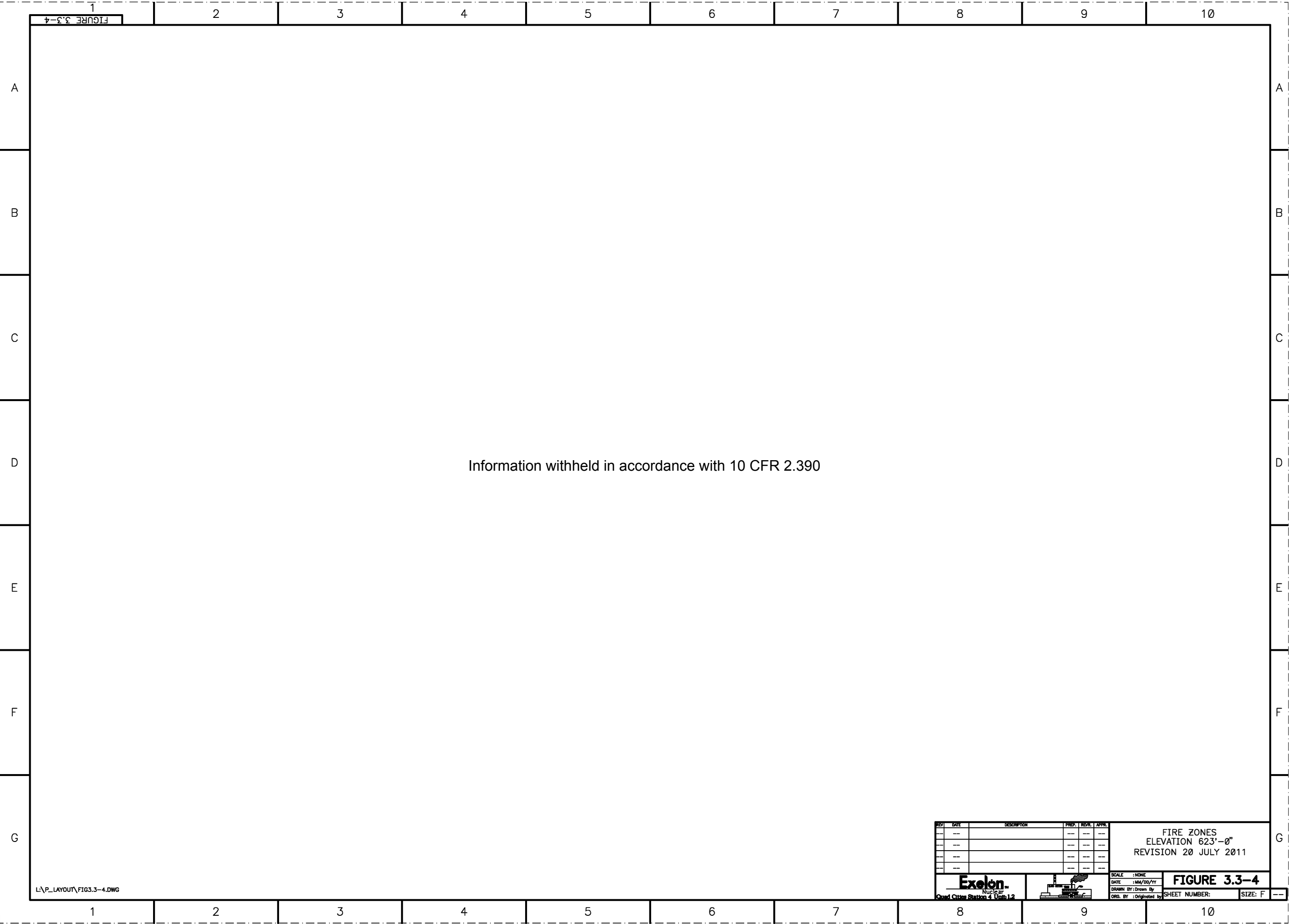
FIRE ZONES  
ELEVATION 572'-0"  
REVISION 20 JULY 2011



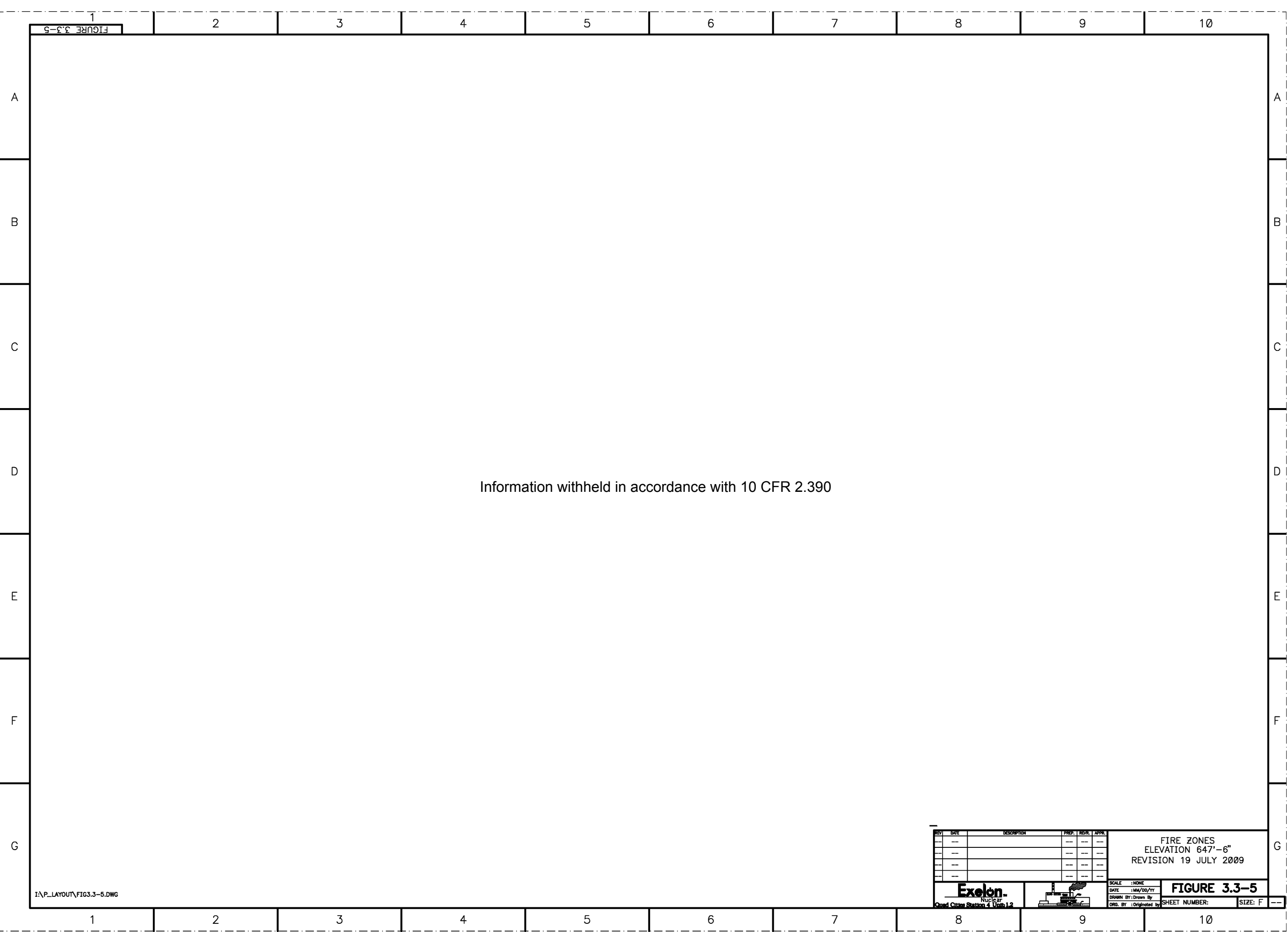
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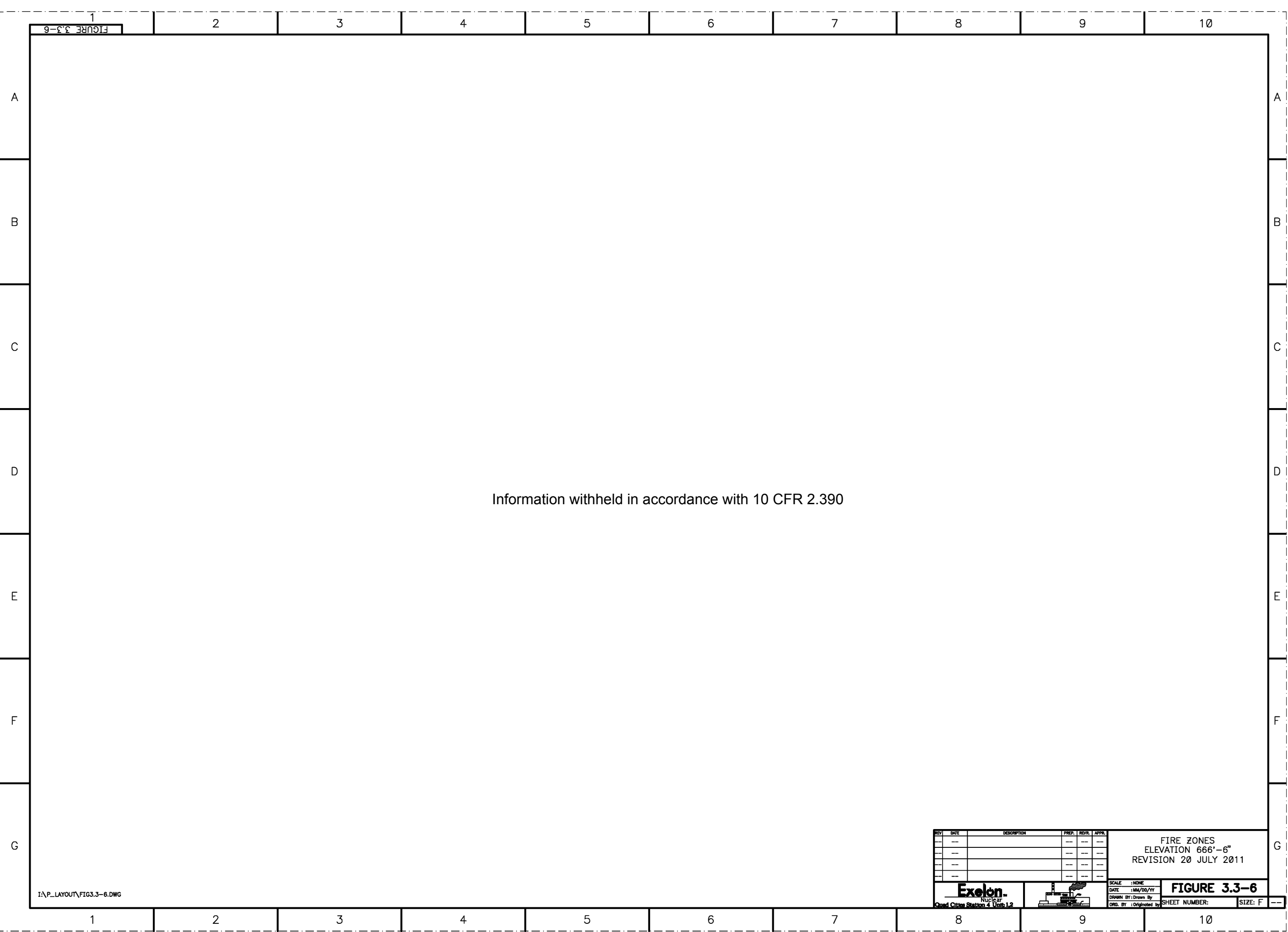
FIGURE 3.3-2  
SHEET NUMBER: SIZE: F ---





Information withheld in accordance with 10 CFR 2.390





**4.0  
FIRE HAZARDS ANALYSIS**



## 4.0 FIRE HAZARDS ANALYSIS

### 4.1 Fire Zones Without Safe Shutdown or Radioactive Release Issues

The fire zones listed below do not contain cables or equipment required by any of the safe shutdown paths and do not share a boundary with any fire area that contains cables or equipment required by any of the shutdown paths. A fire in these fire zones will not prevent achieving or maintaining safe shutdown nor will it create the potential for a significant release of radioactive material. Therefore, fire hazards analyses have not been developed for the following seven fire zones.

<u>Fire Zone</u>	<u>Description</u>	<u>Fire Area</u>
13.1	Guardhouse	Outside
15.1	Technical Support Center	Outside
18.1	Security Diesel Generator Building	Outside
17.3	Spare Main Power Transformer	Outside
20.1	Spray Canal Lift Station	Outside
21.1	Secondary Alarm Station	Outside
23.1	Central Alarm Station	SB-II
24.1	Heating Boiler Building	Outside

## 4.2 Fire Zones With Abbreviated Fire Hazards Analysis

The following sixteen zones either do not contain safe shutdown equipment, or are inerted during power operation. They have minimal impact on safe shutdown capabilities of adjacent fire areas. Therefore, an abbreviated analysis is provided.

<u>Fire Zone</u>	<u>Description</u>	<u>Fire Area</u>
1.2.1	Drywell U-1	Primary Containment
1.2.2	Drywell U-2	Primary Containment
14.1	Radwaste Collection & Handling Area	Radwaste Building
14.3.1	Max. Recycle Radwaste Building	Radwaste Building
16.1	HRSS Building U-2	Outside
16.2	HRSS Building U-1	Outside
17.1.1	U-1 Main Power Transformer	Outside
17.1.2	Auxiliary Transformer 11	Outside
17.1.3	Reserve Auxiliary Transformer 12	Outside
17.2.1	U-2 Main Power Transformer	Outside
17.2.2	Auxiliary Transformer 21	Outside
17.2.3	Reserve Auxiliary Transformer 22	Outside
19.1	Service Building Offices	SB-II
19.2	Service Building Offices	SB-II
19.3	Control Room Air Handling Unit Room	SB-II
22.1	Off Gas Filter Building	Off Gas Filter Bldg.
25.1	LTD Building	Outside
26.1	Interim Radwaste Storage Facility	Outside
27.1	Robust Flex Storage Building	Outside

### Fire Zone 1.2.1 - Unit 1 Drywell (Primary Containment)

This fire zone is shown on drawings F-2 and F-6.

#### Fire Barrier Description

The drywell wall is metal surrounded by minimum 5-foot 0-inch thick concrete extending from elevation 554 feet 0 inches to the floor elevation 690 feet 6 inches. All penetrations in this wall are sealed to give the wall a 3-hour fire rating. The drywell floor is 23-foot 6-inch thick concrete. The ceiling is a metal drywell head covered by shield plugs. The shield plugs consist of a reinforced concrete annular ring with a central core of three removable stacked shield plugs with a total thickness of 6-feet and 0-inches. The top of this shield plug is at elevation 690 feet 6 inches and the plug has a 3-hour fire rating.

In addition to this general structure, there is one removable concrete shield plug and metal equipment door and one man opening (personnel airlock). The walls of the personnel airlock room are 1-foot 6-inch thick structural concrete. The floor is 2-foot 0-inch thick concrete.

### Fire Protection Criteria and Measures

Fire protection requirements for the Unit 1 primary containment were recognized in the plant design. Reactor Protection System (RPS) cables are enclosed in metal conduit throughout the plant. In the primary containment, Essential Safety System (ESS) cables are completely enclosed in solid steel cable trays.

For the Unit 1 primary containment, penetrations constitute the fire stops with all walls being 3-hour fire walls. No specific water damage protection is afforded to equipment within the primary containment.

### Design-Basis Fire

There is no design-basis fire for the drywell since the drywell atmosphere is inerted during normal reactor operation. Justification for the standby gas treatment system lines penetrating the drywell wall is provided in Section 7.2 of the Exemption Requests. Hot and cold shutdown can be achieved as discussed in the Safe Shutdown Analysis Report (FPR, Volume 2). Administrative procedures and controls are enforced during refueling and maintenance operations to control any additional hazards that would be introduced to the primary containment area.

### Fire Suppression Effects

There are no fire suppression systems or piping in this area. Therefore, damaging effects of water release are not contemplated.

### Fire Zone 1.2.2 - Unit 2 Drywell (Primary Containment)

This fire zone is shown on drawings F-2 and F-6.

### Fire Barrier Description

The drywell wall is metal surrounded by minimum 5-foot 0-inch thick concrete extending from elevation 554 feet 0 inches to the floor elevation 690 feet 6 inches. All penetrations in this wall are sealed to give the wall a 3-hour fire rating. The drywell floor is 23-foot 6-inch thick concrete. The ceiling is a metal drywell head covered by shield plugs. The shield plugs consist of a reinforced concrete annular ring with a central core of three removable stacked shield plugs with a total thickness of 6-feet and 0-inches. The top of this shield plug is at elevation 690 feet 6 inches and the plug has a 3-hour fire rating.

In addition to this general structure, there is one removable concrete shield plug and metal equipment door and one man opening (personnel airlock). The walls of the personnel airlock room are 1-foot 6-inch thick structural concrete. The floor is 2-foot 0-inch thick concrete.

### Fire Protection Criteria and Measures

Fire protection requirements for the Unit 2 primary containment were recognized in the plant design. RPS cables are enclosed in metal conduit throughout the plant. In the primary containment, ESS cables are completely enclosed in solid steel cable trays.

For the Unit 2 primary containment, penetrations constitute the fire stops with all walls being 3-hour fire walls. No specific water damage protection is afforded to equipment within the primary containment.

### Design-Basis Fire

There is no design-basis fire for the drywell since the drywell atmosphere is inerted during normal reactor operation. Justification for the standby gas treatment system lines penetrating the drywell wall is provided in Section 7.2 of the Exemption Requests. Hot and cold shutdown can be achieved as discussed in the Safe Shutdown Analysis Report (FPR, Volume 2). Administrative procedures and controls are enforced during refueling and maintenance operations to control any additional hazards that would be introduced to the primary containment area.

### Fire Suppression Effects

There are no fire suppression systems or piping in this area. Therefore, damaging effects of water release are not contemplated.

### Fire Zone 14.1 - Radwaste Collection & Handling Area

This fire zone is shown on drawings F-20 and F-21.

### Fire Barrier Description

This fire zone shares a boundary with Fire Zones 14.3.1, 8.2.2.B, 8.2.3.B, 8.2.6.C, and 8.2.7.C. The wall separating Fire Zone 14.1 from Fire Zones 8.2.2.B and 8.2.3.B is constructed of a minimum 3-foot 0-inch thick concrete. Separation of Fire Zones 14.1 and 8.2.6.C is by minimum 3-foot 0-inch thick concrete wall that contains an unlabeled door and the wall separating Fire Zone 8.2.7.C is constructed of minimum 3-foot 0-inch thick concrete up to elevation 611-feet 6-inches and insulated metal siding above this elevation. The walls separating Fire Zone 14.1 from 14.3 are constructed of concrete or metal siding. All other walls enclosing the radwaste building are exterior walls constructed of concrete or metal siding. None of the walls enclosing Fire Zone 14.1 are fire rated.

The roofs over Fire Zone 14.1 are constructed of built-up roofing over 1-foot 0-inch to 3-foot 0-inch thick concrete or over 1-inch rigid insulation on precast channel slabs supported by structural steel. None of the roofs are fire rated.

### Safe Shutdown Equipment

There are no cables or equipment associated with any of the safe shutdown methods located in this fire zone.

### Fire Protection Criteria and Measures

There are no fire detection or automatic suppression systems installed in this fire zone. Manual fire suppression equipment, however, is installed in this fire zone. This equipment consists of hose stations, each equipped with 100 feet of hose, and portable fire extinguishers. The equipment is discussed in greater detail in Subsection 2.4.4.

### Design-Basis Fire

This fire zone is part of the Radwaste Building Fire Area. In the event of a fire in this fire zone, both hot and cold shutdown can be achieved as discussed in Section 4.12 of the Safe Shutdown Analysis Report (FPR Volume 2).

Fire Zone 14.1 shares a boundary with Fire Areas TB-I, TB-II, and TB-III. A fire is prevented from spreading into these fire areas by equivalent 3-hour fire barriers. The adequacy of these barriers in preventing fire spread is discussed in Section 5.2 of the Exemption Requests.

Combustible loading in the Radwaste Building is minimal overall, with the largest concentration being in the Control Room in the form of cable insulation and clean anti-contamination clothing (approximately 70 ft<sup>3</sup>). Other combustibles consist of small amounts of lube oil contained in equipment or stored in flammable liquids cabinets, small amounts of HDPE pipe, and limited amounts of dry active waste stored in sealed steel drums (typically 8 to 10 drums). The vast majority of radwaste handled in this building is water based and is contained in steel tanks.

Due to the substantial construction and compartmentation of this building, and the low combustible loading, a fire would not be expected to spread from the immediate area of origin. In addition, since the limited amount of dry active waste handled here is stored in sealed steel drums, and an exposure fire to these drums is improbable, a fire would not result in a significant release of contamination.

### Fire Suppression Effects

No safe shutdown paths would be affected by water damage in this area. Water runoff would be handled by the floor drains in the general area which are connected to a sump. This water is processed and stored in one of two 350,000 gallon contaminated condensate storage tanks.

Fire Zone 14.3.1 - Maximum Recycle Radwaste Building

This fire zone is shown on drawings F-20 and F-21.

Fire Barrier Description

The only other fire zone that shares a boundary with Fire Zone 14.3.1 is Fire Zone 14.1. The walls separating these two fire zones are constructed of concrete or metal siding. On the ground floor level an unlabeled door provides access to Fire Zone 14.1. All other walls enclosing this fire zone are exterior walls constructed of concrete or metal siding. None of the walls are fire rated.

The roof over the maximum recycle building is also not fire rated.

Fire Protection Criteria and Measures

There are no fire detection or automatic suppression systems installed in this fire zone. Manual suppression equipment, however, is installed in this fire zone. This equipment consists of two hose stations, each equipped with 100 feet of hose, and three portable fire extinguishers.

Design-Basis Fire

This fire zone is part of the Radwaste Building Fire Area. In the event of a fire in this fire zone, both hot and cold shutdown can be achieved as discussed in the Safe Shutdown Analysis Report (FPR Volume 2).

Fire Zone 14.3.1 does not share a boundary with any other fire area, therefore, a fire in this zone cannot impact other fire areas.

Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Water runoff would be handled by the drains in the general area which are connected to a sump. This water is processed and stored in one of two 350,000 gallon contaminated condensate storage tanks.

Fire Zone 16.1 – Unit 2 High Rad Sampling Station (HRSS)

This fire zone is a separate 2,150 ft<sup>2</sup> building, located near the northeast corner of the Unit 2 Reactor Building. It would be manned in the event of a serious reactor accident for the purpose of obtaining process samples.

### Fire Barrier Description

This fire zone shares no boundaries with other fire zones. The building is constructed of three foot thick concrete walls and a two-foot thick concrete roof to provide post accident radiation shielding. Although the walls and roof are not qualified as fire rated, they will provide a substantial barrier to spread of fire outside this zone.

### Fire Protection Criteria and Measures

There are no fire detection or automatic fire suppression systems in this fire zone. There are temperature sensors in the exhaust ventilation system which provide indication at the local control panel if the charcoal filters overheat. There is a manually controlled water spray system covering the two charcoal filters. There is a nitrogen blanketing system for the waste sample tank which would be utilized if post accident sampling were performed. There are portable fire extinguishers in the zone, and there is a fire hydrant located within 100 feet of the building.

### Design-Basis Fire

This fire zone does not contain cables or equipment required for safe shutdown as defined in the Safe Shutdown Analysis Report (FPR, Volume 2) nor does it share a boundary with any other fire zone. A fire in this zone will not impact safe shutdown.

Combustible loading in this fire zone is negligible. During post accident sampling, hydrogen buildup in the waste sample tank is contemplated, and a nitrogen blanketing system is provided.

### Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in the area. Water from manual hose streams would collect in the building sump pit.

### Fire Zone 16.2 – Unit 1 High Rad Sampling Station (HRSS)

This fire zone is a separate 2,150 ft<sup>2</sup> building, located near the southeast corner of the Unit 1 Reactor Building. It would be manned in the event of a serious reactor accident for the purpose of obtaining process samples.

### Fire Barrier Description

This fire zone shares no boundaries with other fire zones. The building is constructed of three-foot thick concrete walls and a two-foot thick concrete roof to provide post accident radiation shielding. Although the walls and roof are not qualified as fire rated, they will provide a substantial barrier to spread of fire outside this zone.

### Fire Protection Criteria and Measures

There are no fire detection or automatic fire suppression systems in this fire zone. There are temperature sensors in the exhaust ventilation system which provide indication at the local control panel if the charcoal filters overheat. There is a manually controlled water spray system covering the two charcoal filters. There is a nitrogen blanketing system for the waste sample tank which would be utilized if post accident sampling were performed. There are portable fire extinguishers in the zone, and there is a fire hydrant located within 100 feet of the building.

### Design-Basis Fire

This fire zone does not contain cables or equipment required for safe shutdown as defined in the Safe Shutdown Analysis Report (FPR, Volume 2) nor does it share a boundary with any other fire zone. A fire in this zone will not impact safe shutdown.

Combustible loading in this fire zone is negligible. During post accident sampling, hydrogen buildup in the waste sample tank is contemplated, and a nitrogen blanketing system is provided.

### Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Water from manual hose streams would collect in the building sump pit.

### Station Transformer Fire Zones (Outside)

The station transformers outside the main Unit 1 and 2 structures could possibly pose a severe fire hazard. Therefore, each transformer area has been designated as a fire zone. These transformer fire zones are denoted as follows:

<u>Description</u>	<u>Fire Zone</u>
Unit 1 Main Power Transformer	17.1.1
Unit 1 Auxiliary Transformer 11	17.1.2
Unit 1 Reserve Auxiliary Power Transformer 12	17.1.3
Unit 2 Main Power Transformer	17.2.1
Unit 2 Auxiliary Transformer 21	17.2.2
Unit 2 Reserve Auxiliary Power Transformer 22	17.2.3

These fire zones are shown on drawings F-12, F-13, and F-24.



### Fire Barrier Description

The transformers are located on individual reinforced concrete pads. Concrete block fire barriers are provided between the Auxiliary and Reserve Auxiliary units, and crushed rock sumps are provided around each transformer to contain any oil release.

### Fire Protection Measures

Each transformer is protected by an automatic water spray system which is activated through a linear thermal detection system (Protectowire brand detection). Alarms are provided which alarm locally and in the control room to indicate operation of the system. The locations of the automatic suppression systems are shown on Figures B-11, B-12, and B-23 of the Exemption Requests. A water spray system is provided for bus duct protection for transformers in zones 17.1.2 and 17.2.2.

### Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Initial suppression discharge would be handled by the crushed rock sumps surrounding the transformers. Overflow from the crushed rock areas would not affect safe shutdown because no shutdown actions are required in these areas given a transformer fire.

### Design-Basis Fire

If a fire started in any of the transformers, it would be mitigated by the water spray system. These suppression systems would prevent the spread of the fire to the turbine building. A fire involving a transformer could cause the respective unit to trip resulting in a loss of off-site power for the affected unit. An uncontrolled fire involving a Reserve Auxiliary Power Transformer 12 (Zone 17.1.3 or 17.2.3) could potentially damage SBO Diesel Generator power and control cables. However, in this scenario shutdown can be achieved regardless of the loss of the SBO power because the unit diesel generators would be available.

### Fire Zone 19.1 - Service Building Offices - Elevation 595 feet 0 inches

This fire zone is shown on drawing F-8.

### Fire Barrier Description

Fire Zone 19.1 shares a boundary with Fire Zones 4.0, 6.3, 8.2.6.A, and 19.2. The walls separating Fire Zone 19.1 from Fire Zones 4.0 and 6.3 are 3-hour fire barriers constructed of 1-foot 6-inch thick concrete. Two Class “A” fire doors in these walls allow access to Fire Zone 6.3. Fire Zone 19.1 is separated from Fire Zone 8.2.6.A by a minimum 2-foot 0-inch thick concrete wall. This wall is not fire rated. Access to the service building from the turbine building is gained through two unlabeled doors located in this wall. All other walls enclosing this fire zone are non-rated exterior walls. They are constructed of 11-5/8-inch thick concrete block supported by unprotected structural steel.

The ceiling separates Fire Zones 19.1 and 19.2. It is constructed of 6-inch thick concrete supported by exposed structural steel. The ceiling is not fire rated.

### Fire Protection Criteria and Measures

Partial detection is provided in Fire Zone 19.1. Automatic wet pipe sprinkler protection has been installed in the store room, store room office, and the paint and oil room, and a halon suppression system protects the new computer room. Manual suppression equipment has been installed throughout the fire zone. This equipment consists of hose stations, each equipped with 100 feet of hose and portable extinguishers.

### Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Most water runoff would be handled by the floor drains located in the washrooms. Minor amounts of water runoff which may enter adjacent zones such as the Auxiliary Electric Equipment Room (AEER) will not impact the operation of the safe shutdown equipment there.

Actuation of the Halon extinguishing system in the new computer room presents the remote possibility of over pressurization conditions, but it is unlikely this would cause damage to nearby zones 4.0 and 6.3. The Halon 1301 suppression agent would not damage safe shutdown equipment located in these adjacent zones.

### Fire Zone 19.2 - Service Building Offices - Elevation 609 feet 0 inch

This fire zone is shown on drawing F-8.

### Fire Barrier Description

Fire Zone 19.2 shares a boundary with Fire Zones 3.0, 8.2.7.A, 19.1, 19.3, and 23.1. The walls separating Fire Zone 19.2 from Fire Zone 3.0 are 3-hour rated fire barriers constructed of 1-foot 6-inch thick concrete. Two Class “A” fire doors in the south wall of the cable spread room allow access to Fire Zone 3.0. Fire Zone 19.2 is separated from Fire Zone 8.2.7.A by a minimum 1-foot 6-inch concrete wall. The wall is not fire rated. All other walls enclosing this fire zone are exterior walls. They are constructed of 11-5/8-inch thick concrete block supported by unprotected structural steel and they are not fire rated. Openings exist in the walls for louvers and windows.

The floor separates Fire Zones 19.2 and 19.1. It is constructed of 6-inch thick concrete supported by exposed structural steel and is not fire rated.

Part of the ceiling of Fire Zone 19.2 is the floor of Fire Zone 19.3. It is constructed of 6-inch concrete supported on exposed structural steel. The rest of the ceiling is part of the service building roof which is constructed of built-up roofing over 1-inch rigid insulation on 3-1/2-inch precast concrete slabs supported by exposed structural steel. The roof is not fire rated.

### Fire Protection Criteria and Measures

Partial detection is provided in Fire Zone 19.2, and an automatic wet pipe sprinkler system protects the records storage room. Manual suppression equipment has been installed throughout the fire zone. This equipment consists of hose stations, each equipped with 100 feet of hose, and portable extinguishers.

### Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Most water runoff would be handled by floor drains located in the washrooms. Minor amounts of water runoff which may enter adjacent zones will not impact safe shutdown equipment.

### Fire Zone 19.3 - Control Room “A” Air Handling Unit Room

This fire zone is shown on drawing F-8.

### Fire Barrier Description

Fire Zone 19.3 shares a boundary with Fire Zones 2.0 and 19.2. The wall separating Fire Zone 19.3 from Fire Zone 2.0 are 3-hour rated Control Room fire barriers constructed of 1-foot 6-inch thick concrete. The doors in this wall are Class “A” fire doors. All other walls enclosing this fire zone are exterior walls. They are constructed of 11-5/8-inch thick concrete block supported by exposed structural steel and they are not fire rated. Openings exist in the walls for louvers and an unlabeled door.

The floor of Fire Zone 19.3 is part of the ceiling of Fire Zone 19.2. It is constructed of 6-inch thick concrete supported on exposed structural steel. The floor is not fire rated.

The ceiling is part of the service building roof. It is constructed of built-up roofing over 1-inch rigid insulation on 3-1/2-inch precast concrete slabs supported by exposed structural steel. The roof is not fire rated.

#### Fire Protection Criteria and Measures

There is partial fire detection in this fire zone. Manual fire suppression equipment is installed in this fire zone. This equipment consists of one hose station, equipped with 100 feet of hose, and portable fire extinguishers.

#### Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Water runoff would be handled by the floor drains located on lower levels. Minor amounts of water runoff which may enter adjacent zones such as the Control Room will not impact the operation of safe shutdown equipment there.

#### Fire Zone 22.1 - Off Gas Filter Building Fire Area

This area is shown on General Arrangement Drawing M-11A.

#### Fire Barrier Description

The Off Gas Filter Building does not share a boundary with any other plant structure. The walls of this building are constructed of 3-foot 6-inch thick concrete below grade and insulated metal siding supported by exposed structural steel above grade. None of the walls are fire rated. The south and east walls, above grade, contain non-labeled doors and the north walls have louvers.

The roof below grade floor is 2-feet 6-inches to 4-feet 6-inches concrete with removable concrete slabs. Above the grade floor, the roof is built-up roofing over 2-inch rigid insulation on 3-1/2-inch precast concrete channel slabs. The roof is not fire rated.

#### Fire Protection Criteria and Measures

This area is protected by a manual suppression system. This system consists of fire hose stations, equipped with 100 feet of hose, and portable fire extinguishers.

### Design-Basis Fire

In the event of a fire in this area both hot and cold shutdown can be achieved as discussed in the Safe Shutdown Analysis Report (FPR, Volume 2).

This building does not share a boundary with any other fire area, therefore, a fire in this area cannot impact any other fire areas.

The existing fire hazards are not significant enough to present a problem due to the breaching of the radioactive systems and building constraints allowing a release to the environment in excess of 10 CFR 20 limits.

The potential radiological consequences of the Quad Cities Units 1 & 2 off gas system component failure have been submitted to the Atomic Energy Commission (now the Nuclear Regulatory Commission) in Table 4 of the Quad Cities Units 1 & 2 Special Report No. 1 and Supplementary Information for Dresden Units 2 & 3 Special Report No. 4A, Modified Off Gas System, Commonwealth Edison Company, June 11, 1974. No credible hypothetical fires in the off-gas system could produce doses to the public above those calculated, using very conservative assumptions, in this report.

Should a fire occur in a charcoal vessel, the temperature elements on the charcoal vessels would initiate a high temperature alarm in the control room and provide warning of a fire. In addition radiation instrumentation in the stack would provide high radiation warnings, providing further assurance that the abnormal condition would be recognized and that timely action would be taken by the operating staff.

However, in the event a fire should occur, a very conservative analysis would assume a release of 100% of the iodine from a fire in the first charcoal bed (This also conservatively assumes the loss of function of all subsequent charcoal beds) and 100% of the Noble Gas Source term, described in Table 3 of the earlier referenced report, through the station chimney. The off gas system charcoal beds are in steel vessels. However, in the unlikely event that the system integrity is not maintained, the results of this analysis would not be changed since the off gas charcoal beds are located in the off gas filter building and the off gas filter building HVAC would exhaust through the station chimney.

Assuming a fumigation accident meteorology consistent with Regulatory Guide 1.3, the resultant calculated radiological consequences at the exclusion area boundary are 447 mrem thyroid and 4.55 mrem whole body. These postulated doses are well within 10 CFR 20 limits.

### Fire Suppression Effects

There are no fixed suppression systems in this area. The use of manual hose lines or portable extinguishers will not affect safe shutdown equipment is located in this zone.

Fire Zone 25.1—Laundry, Tool and Dry Active Waste Building (LTD)

This fire zone is a separate 19,300 ft<sup>2</sup>, two-story building with a corridor connecting it to the Unit 1 Turbine Building (fire zone 8.2.6.A). It houses the low level dry active waste handling facility, the clean and dirty rad protection clothing facility, and the hot tool/equipment storage and hot machine shops.

Fire Barrier Description

There is an enclosed corridor connecting the northeast corner of the LTD building to the Unit 1 Turbine Building at the rear of the Unit 1 trackway. The Turbine Building wall in this area is concrete block, and the double doors between the areas are of metal construction without openings. These UL labeled 3hr fire doors provide a substantial barrier to fire spread between the zones. The LTD building is of noncombustible construction with concrete block exterior walls at the first level, and insulated metal panel siding on the exterior of the second level. Interior walls are of concrete block, and the second floor and roof are supported on exposed structural steel.

Fire Protection Criteria and Measures

The LTD building is protected throughout with a wet pipe sprinkler system, of appropriate design density for the hazards. There is also a manually activated water curtain system to provide exposure protection from an exterior fire involving the Unit 1 Main Transformer. The north-south corridors on both floors are maintained as combustible free areas. There are portable multi-purpose fire extinguishers located throughout the building, and hose stations located in the stairwells.

Design-Basis Fire

This fire zone does not contain cables or equipment required for safe shutdown as defined in the Safe Shutdown Analysis Report (FPR, Volume 2). The communicating boundary between it and Fire Area TB-III is a concrete block wall, which although not rated, will provide a substantial barrier to fire spread. A fire in this zone will not impact safe shutdown.

Combustible loading in this fire zone is moderate, primarily consisting of rad protection clothing, respirator equipment, low level dry active waste being processed and stored, and oil/oily waste (40 gallons) stored in multiple drums. The building is well compartmentalized via full height concrete block walls, although most interior walls are not designated fire walls. A fire originating in this building will be effectively controlled by the sprinkler system, preventing the release of contaminated materials to the environment. A Unit 1 Main Transformer fire may breach the metal panel construction at the northeast corner of the LTD building before the manual water curtain system can be activated. This would result in fire exposure to the respirator storage room; however, the LTD building wet-pipe system would limit the involvement of the combustibles there and prevent a significant release of radioactive material.

Fire Suppression Effects

No safe shutdown paths would be affected by water discharge in this area. Water from the sprinkler system or manual hose streams would be controlled by the floor drains and collect in the building sump pit.

**Fire Zone 26.1 – Interim Radwaste Storage Facility (IRSF)**

This fire zone is a separate building of 10,000 square feet that provides interim storage for radioactive waste in the event of the closure of the burial site. It provides storage for Dry Active Waste (DAW) and solid radwaste. Radioactive waste not in the final burial form is staged in the IRSF prior to shipment to radioactive waste processors.

**Fire Barrier Description**

The IRSF is a separate building that does not adjoin any power block buildings.

The storage and truck bay exterior walls and roof are reinforced concrete. The exterior walls of the control room and mechanical equipment space cement masonry units. The Floor is slab on grade. The storage area is surrounded by wall so minimum 30” thick reinforced concrete up to a height of 34 feet and is then 15” thick to the roof. The storage area is separated from the truckbay by a 30” reinforced concrete wall up to a height of 34’/ There is no separating wall above the 34’ elevation. There is an opening 7’ by 7’ at the top of this wall. The truck bay is surrounded by minimum 15” thick concrete exterior walls. Truck entrance and personnel doors are located at each end of the truckbay.

**Fire Protection Criteria and Measures**

The truckbay is protected by smoke detectors that alarm to a local alarm panel. The mechanical equipment room is protected by ionization type smoke detectors that alarm on the local panel. Supply air ducts are equipped with duct mounted smoke detectors that cause interruption of fan operation in addition to a local alarm. The IRSF control room is protected by ionization type detectors that alarm on a local panel. The local panel is connected to alarm annunciators in the main control room. There are no fire detectors in the storage ara; the likelihood of a fire in this area is acceptably low.

Portable fire extinguishers are provided in the IRSF.

**Design-Basis Fire**

This fire zone does not contain cable or equipment required for safe shutdown as defined in the Safe Shutdown Analysis Report (FPR, Volume 2). The IRSF does not communicate with any power block fire areas. A fire in this zone will not impact safe shutdown.

Combustible loading in this fire zone is moderate. The materials are DAW, which consists of the following: paper, plastics and cloth, metal, wood, concrete chippings, dirt, filter elements and other miscellaneous trash, and solid radwaste which consists of resins, sludges and higher activity filters and other higher activity material. The solid radwaste is stored in high integrity containers (HICs) or stainless steel liners. The HICs are made of high-density polyethylene.

The control room contains electrical panels and furniture. The mechanical equipment room contains electrical panels, ventilation duct insulation, and ventilation equipment. The electrical wiring is predominantly contained in conduit rather than cable trays, thus reducing the substantially the effect of the cabling on the combustible loading.

The design basis fire starts with a truck fire with the tractor in the truck bay which includes the rupture of the tractor fuel tanks and flashover into the storage area occurs which consumes all the HICs and combustibles in the truck bay and storage areas. Potential structural damage from the heat results in collapse of the roof. This is a highly unlikely scenario since the tractor is in the truck bay for less than 10 minutes to drop off or pickup a trailer containing radioactive material for shipment or storage. During the time the tractor is in the truckbay procedures require that a fire watch be set as a compensatory measure.

#### Fire Suppression Effects

Water from the sprinkler system or manual hose streams would be controlled by the floor drains or out through rollup doors in the IRSF truckbay.

#### Fire Zone 27.1 – Robust Flex Storage Building

This fire zone is a separate building of approximately 5400 square feet that contains equipment for diverse and flexible coping strategies (FLEX).

#### Fire Barrier Description

The Robust Flex Storage Building is a separate building that does not adjoin any power block buildings.

The Robust Flex Storage Building is a 60 ft by 90 ft cast-in-place reinforced concrete structure with a structural steel roof framing that supports the weight of the reinforced concrete roof. The building has small doors for personnel and large doors for Flex vehicles and equipment. The building is designed to NEI 12-06 Rev 0 and is therefore made to withstand beyond-design-basis external events.

#### Fire Protection Criteria and Measures

The Robust Flex Storage Building contains a fire detection system, which utilizes Protectowire cable run along the ceiling of the building. The Protectowire produces an alarm input into a fire alarm panel, which in turn activates a fire communicator panel (dialer). The fire communicator panel notifies an off-site monitoring company via the station's phone lines of either a fire alarm or trouble signal. The monitoring company then notifies the control room of the condition.

Dry chemical fire extinguishers are provided in the Robust Flex Storage Building.



### Design-Basis Fire

This fire zone does not contain cable or equipment required for safe shutdown as defined in the Safe Shutdown Analysis Report (FPR, Volume 2). The Robust Flex Storage Building does not directly communicate with any power block fire areas. A fire in this zone will not impact safe shutdown.

Combustible loading in this fire zone is moderate, consisting of several vehicles, including many diesel generators, and other Flex equipment, such as communications equipment. Combustible materials in the zone include diesel fuel, power cables, and plastic. A fire would be contained by the buildings exceptionally thick walls and could be effectively fought by the fire brigade.

### **4.3 Safety Related Fire Zones**

The fire zones in this section contain cables or equipment required for safe shutdown or equipment important to safety. Therefore, a fire hazards analysis is provided for each zone.

The guidance of NRC Generic Letter 86-10, Enclosure 1, provides the NRC Staff's interpretation of certain provisions of Appendix R to 10CFR50. These interpretations indicate that evaluations of this type may reflect compliance with Appendix R, eliminating the need for exemptions. Further, the NRC Staff guidance stated that these evaluations that reflect compliance (in accordance with the new NRC Staff interpretation) need not be submitted to the Staff for review.

In accordance with this guidance, Quad Cities has incorporated the previous exemption requests into this Fire Hazards Analysis as engineering evaluations. The following evaluations describe the capability of fire protection features, including fire detection, fire suppression, fire barriers, and fire area boundaries to limit the potential for a postulated fire to adversely affect the ability to achieve and maintain safe shutdown.

To provide an evaluation of Quad Cities' compliance with applicable fire protection regulations and practices, the following evaluations assume the bounding transient plus insitu combustible loading values from the new combustible load.

**Fire Zone: 1.1.1.1****Unit 1 Reactor Building Basement Floor****Fire Area:** RB-1N/RB-1S    **F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 13,314 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat detectors (linear thermal) have been installed in each cable tray and below the bottom of the cable trays.
<b>Suppression:</b>	Local area sprinkler protection is provided in the immediate vicinity of the only cable riser that passes through the ceiling in this zone. See reference [1].
<b>Manual Suppression:</b>	Portable fire extinguishers and hose stations with 100 feet of hose.
<b>Other FP features:</b>	Portions of the Division I and II cable trays, where they are routed within 20 feet of each other, are wrapped with a 1-hour fire resistive material.
<b>Suppression Effects:</b>	The safe shutdown equipment located in this zone consists of valves which will not be adversely affected by application of water or leakage of water from floor levels above since they can be operated manually. Water will collect in the basement floor where it will be removed by sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
DW-1	3 Hour [5]
TB-III	Equivalent 3 Hour [6]
TB-II	Equivalent 3 Hour [6]

**Fire Zone: 1.1.1.1****Unit 1 Reactor Building Basement Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.4*	CT-1	3 hour	3 hour [F-144]	No doors	4'-0" thick concrete
8.2.6.A*	TB-III	3 hour	noncombustible	No doors	3'-0" thick concrete ceiling
11.2.2	RB-1S	Non-rated	noncombustible, open mechanical	One watertight door.	3'-0" thick concrete
11.2.1	RB-1S	Non-rated	noncombustible, open mechanical	One watertight door.	3'-0" thick concrete
8.1*	TB-II	3 hour	3 hour [F-195]	No doors	3'-0" thick concrete ceiling
1.1.1.2	RB-1N	Non-rated	noncombustible, open mechanical	No doors	1'-0" thick concrete ceiling
11.1.3	RB-1N	Non-rated	noncombustible, open mechanical	One watertight door.	4'-0" thick concrete
11.2.4	RB-1N	Non-rated	noncombustible, open mechanical	One watertight door.	3'-0" thick concrete
11.2.3	RB-1N	Non-rated	none	One watertight door.	3'-0" thick concrete
1.2.1	DW-1	3 hour [5]	All penetrations sealed.[5]	No doors	5'-0" thick concrete
1.1.2.1	RB-2N/RB-2S	3 hour	3 hour [F-41, 42, & 43], [6]	No doors	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 1.1.1.1****Unit 1 Reactor Building Basement Floor****Fire Protection Commitments:**

Reference Section	Commitment
7, 2.2.3	Concrete walls and a substantial watertight door provided between 1.1.1.1 and 11.2.4. Also reference [4](3.2.4.3).
6, 9.2	Generally 3-hour separation provided between the reactor building and the turbine building. See references for exceptions. Also reference [6](4.2.1) for unrated seals and concrete plugs in the ceiling.
4, 3.2.1	Electrical (cable) penetrations are sealed with noncombustible material between elevations in the reactor building. Also reference [6](4.2.2), [4](3.4.1.2, 11.1.1.3.1, 11.2.3.2 & 11.3.3.1).
3, 2.3.2	Hand held light sources provided for operators. Also reference [4](11.3.1).
3, 2.1.3	Detection system to alarm Control Room of a fire condition.
6, 2.2.3	RHR divisional path cables separated by more than 125 feet. Also reference [4](3.2.4.3).
3, 2.1.2	Transient combustibles administratively controlled. Also reference [3](2.2.2, 2.2.3), [4](3.2.4.2, 3.4.4.1, & 11.2.3.1).
6, 2.2.1, 2.2.2	Manual fire fighting equipment is credited for this zone. Also reference [3](2.1.2), [4](3.2.4.3, 3.2.2, 3.4.2, 3.2.4.2, 11.2.2), & [6](8.2). Located at entrance to torus level. Fire brigade to control fires and smoke using manual eq. [3](2.1.3 & 3.0).
4, 3.2.4.2	Cable penetrations between 1.1.1.1 & 8.2.4 have fire resistive seals.
6, 2.2.2	Combustibles pass between 1.1.1.1 & 1.1.1.2 at K/19 with cable riser having fire resistive seal. Also reference [4](3.2.4.2)
6, 2.2.2, 2.3	Automatic sprinklers near cable tray at south wall of Units 1 & 2. Where cable trays breach ceiling, below 595' slab at cable riser. Also reference [2], [3](2.2.2), and [4](3.2.4.2, 11.2.2).
6, 2.2.3	Install 1-hour fire barrier between div. cable trays in Reactor Building basement. 1-hour fire resistive material on intervening cable trays for 20' minimum. Also reference [2] and [4](3.2.4.3, 3.4.2, & 11.2.2).
6, 2.2.2	Fixed linear detection in / near torus cable trays and below bottom cable tray. Also reference [2], [3](2.1.2 & 2.2.2), [4](3.2.2, 3.2.4.2, 3.2.4.3, 3.4.2, 4.2.1, & 11.2.2).
12	U1 & U2 Reactor Building separated by 3-hour barrier. Seal penetrations to adjacent Reactor Building.

**Fire Zone: 1.1.1.1****Unit 1 Reactor Building Basement Floor****Notes and References:****Number    Description**

- 1    August 18, 1989 Letter, T. Ross (NRC) to T. Kovach (CECO). Exemption from the technical requirements of Appendix R to 10 CFR Part 50 - Quad Cities Nuclear Power Station, Unit Nos. 1 and 2.
- 2    December 18, 1984 Letter, B. Rybak (CECO) to R. De
- 3    Appendix R exemption request (section 11.0) applies to this fire zone and addresses separation of redundant instrumentation. Exemption issued on 5-21-91.
- 4    Appendix R Exemption Requests: Exemption Requests 3.2 (Exemption for equivalent separation of redundant RHR trains. 12-11-87, Exemption granted 3.0).
- 5    The torus comprises a portion of the Unit 1 Primary Containment. Since it is a partially water-filled vessel, and is inert during operation, the barrier rating is not applicable.
- 6    SER, July 21, 1988.
- 7    May 10, 1990 Letter
- 8    SER, June 23, 1983.
- 10    SER, March 2, 1994.
- 11    GL 86-10 Evaluation S040-QH-0611, Rev. 1 evaluates the Unit 1 Reactor Building/Turbine Building Boundary.
- 12    GL 86-10 Evaluation S040-QH-0614, Rev. 1.

**ZONE:** 1.1.1.1      **AREA:** RB-1      **LOCATION:** RB1, Elev 554'-0"

**ZONE DESCRIPTION:** Unit 1 Torus Area, North and South

**FIRE SEVERITY:** The updated fire severity for this zone is 1.25 hours. The combustible loading is considered low.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that impacts safe shutdown equipment, then spreads to affect redundant or alternative safe shutdown equipment and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE SPREAD POTENTIAL WITHIN ZONE 1.1.1.1:**

This zone is unusual in that it is divided into a north and a south section. Fire spreading from one section to the other would adversely affect safe shutdown. Fire spread between the two sections is prevented by the low combustible loading, and by a space clear of intervening combustibles. This configuration is not in literal compliance with Appendix R requirements, but is specifically allowed by Exemption 2.4, as stated in the 07/21/88 SER. The clear space remains free of intervening combustibles, and the combustible load limit remains low.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 1.1.1.1 which are in separate fire areas or which contain safe shutdown equipment that is redundant or alternate to the equipment in this zone. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.2.1	U1 Pr Cont.	3 hour
1.1.2.1	RB-2	3 hour
1.1.1.2	RB-1	Non-rated
8.1	TB-II	3 hour
8.2.4	CT-1	3 hour
8.2.6.A	TB-III	Non-rated

**EVALUATION – ZONE 1.2.1:**

The primary containment is inerted during plant operation, so fire spread into containment is not a concern. No further evaluation is required.

**EVALUATION – ZONES 1.1.2.1, 8.1, and 8.2.4:**

Since these three fire zones are separated from Fire Zone 1.1.1.1 by 3 hour rated fire barriers, and the maximum predicted fire severity in zone 1.1.1.1 is 1.25 hours, no further evaluation is required.

**EVALUATION - ZONE 1.1.1.2:**

This zone is separated from Zone 1.1.1.1 by a 1-foot thick concrete floor. The cable risers that penetrate this floor are fire stopped. There are open mechanical penetrations in the floor; however, the lack of combustibles in the immediate vicinity of the openings and vertical vent paths limit the potential for fire spread to Zone 1.1.1.2. The low combustible loading is not sufficient to challenge the integrity of the barrier.

**EVALUATION - ZONE 8.2.6.A:**

This zone is separated from Zone 1.1.1.1 by a 3-foot thick concrete floor. All penetrations through the floor are sealed with non-combustible material. Equipment access hatches are closed with concrete floor plugs. The concrete floor plugs are not a tested configuration, but they are heavily built and fit tightly. The low combustible loading is not sufficient to challenge the integrity of the barrier.

**CONCLUSION:**

A fire originating in this zone will not spread to adjacent fire zones that contain redundant equipment. Therefore, the ability to safely shutdown the plant is assured.

**Fire Zone: 1.1.1.2****Unit 1 Reactor Building Ground Floor****Fire Area:** RB-1N**F Drawing:** F-3-1,12-1**General Elevation:** 595'-0"**Zone Area:** 11,612 Ft<sup>2</sup>**Fire Protection Features:****Detection:**

General area smoke detection coverage, with the exception of the MSIV room. Local area heat (thermal) detectors are installed above the drywell to torus DP air compressor.

**Suppression:**

A local area preaction suppression systems is provided above the drywell to torus DP air compressor. The preaction system protecting the ACAD unit is electrically disarmed.

**Manual Suppression:**

Portable fire extinguishers. Manual hose stations are located in each corner of the ground floor. Each hose station is equipped with 100 feet of hose.

**Other FP features:**

Curbs are provided around drywell air pack unit. Tops of electrical cabinets and MCCs are sealed to prevent water damage. Drywell penetrations (X-100B and X-104F) are protected by 3 hour rated enclosures. An automatic closure actuated by a smoke detector is located on the door between the MSIV room and the ground floor of the Reactor Building.

**Suppression Effects:**

Water or carbon dioxide release from piping breaks, manual hose streams, or suppression systems onto equipment in this zone can be tolerated as any adverse effects would be less severe than those determined to be acceptable for a design basis fire. Water runoff will be handled by the floor drainage system in the general area.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:****Fire Area****Barrier Description**

RB-1S	Equivalent 3 Hour [7]
DW-1	3 Hour
RB-1/2	3 Hour
TB-III	Equivalent 3 Hour [7]
TB-II	3 Hour
RB-2N	3 Hour



**Fire Zone: 1.1.1.2****Unit 1 Reactor Building Ground Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.7.B* (wall)	TB-III	3 hour	3 hour [F-45]	No doors	4'-0" thick concrete
8.2.7.C*	TB-II	3 hour	3 hour [F-46]	No doors	4'-0" thick concrete
8.2.7.B* (ceiling)	TB-III	Non-rated	noncombustible [7]	No doors	2'-0" thick concrete ceiling
1.1.1.3	RB-1N	Non-rated	noncombustible, open mechanical [7]	One Fire Damper	1'-0" thick concrete ceiling
1.1.2.2	RB-2N	3 hour	3 hour [F-49 & 50]	One 3 hour class "A"	3'-0" thick concrete
9.3*	RB-1/2	3 hour	3 hour [F-51 & 52]	One Class A door,	1'-0 and 1'-6" thick concrete wall
8.1*	TB-II	3 hour	3 hour [F-46 & 158]	No doors, one 3 hour rated damper	5'-0" thick concrete
8.2.6.C*	TB-II	3 hour	3 hour [F-46]	No doors	4'-0" thick concrete
8.2.6.A*	TB-III	3 hour	3 hour [F-44 & 45]	One 3 hour class "A" door	1'-6" thick concrete wall (south), 4'-0" (west)
1.1.1.1	RB-1N/RB-1S	Non-rated	noncombustible, open mechanical [7]	No doors	1'-0" thick concrete
11.2.4	RB-1N	Non-rated	noncombustible, open mechanical [7]	No doors	2'-0" thick concrete
11.2.2	RB-1S	Non-rated	noncombustible, open mechanical [7]	No doors	2'-0" thick concrete
1.2.1	DW-1	3 hour	3 hour [4]	No doors	5'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 1.1.1.2**

**Unit 1 Reactor Building Ground Floor**

**Fire Protection Commitments:**

Reference Section	Commitment
7, 3.2.1	Sprinkler protection will be provided over drywell to torus DP unit. Also reference [2], [4](3.2.2, & 4.2.2), [7](2.3) [8].
1, 3.1.8	Provide Class A fire doors between Unit 1 and 2 ground floor. Also reference [1](5.8.6).
1, 3.1.11	Provide curb around drywell air pack unit. Also reference [1](5.9.6).
1, 3.1.1(7)	Provide detection in area of MCC's and cable penetration to Turbine Building. Also reference [1](5.9.6).
1, 3.1.5a	Install automatic sprinkler system to protect suppression chamber drywell air packs. Also reference [1](4.3.1.4 & 5.9.6).
1, 3.1.11	Provide listed flammable liquids cabinet. Also reference [1](5.9.6). Waste oil removed from area, lube oil limited to 5 gallons. No flammable liquids cabinet provided.
7, 4.2.2	3-hour separation provided between Reactor Buildings. Seal penetration to adjacent Reactor Building except at refuel floor [3].
7, 2.2.1	Smoke detection on ground and mezz. floors in Reactor Building with exceptions(steam tunnel, etc.). Also reference [3], [7](2.2.2, 3.2.1), [4](3.2.4.1, 11.1.1.2, 11.2.2), [6](2.1.2, 2.2.2, 2.2.3).
1, 5.9.6	Install fire detectors in area of 480V MCC 18/19-5.
4, 3.2.4.1 & 2	No combustibles pass through unsealed penetrations between 1.1.1.2 and zones below.
6, 2.1.3	Control room alerted of fire condition via detection system.
4, 3.2.4.1	Transient combustibles and ignition sources are administratively controlled. Controlled to a minimum [4] (11.1.1.3.1 and 11.2.3.2), [6](2.1.2).
7, 3.2.1	Manual hose stations and portable fire extinguishers are provided for the zone. Also reference [1](5.9.4), [7](8.2), [4](3.2.2, 11.2.2, 11.2.3.2), [6](2.1.2, 2.2.2 & 2.2.3). Fire brigade to control fires using manual equipment [6](2.1.3).
4, 11.1.1.4	Emergency lighting is available for reactor water level instruments.

**Fire Zone: 1.1.1.2****Unit 1 Reactor Building Ground Floor**

- 7, 8.2 Fire detectors are provided near electrical and mechanical penetrations. Also reference [4](8.2.2).
- 4, 3.2.1 Electrical (cable) penetrations are sealed w/ noncombustible material between elevations in the reactor building. Riser to 1.1.1.1 (at K/19) sealed w/ fire resistive material. Also ref. [4](3.2.4.2, 11.1.1.3.1, 11.2.3.2) & [7](2.2.2, 4.2.2).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July, 27, 1979.
2	Based on the Fire Protection Commitment Matrix dated Feb. 28, 1992, This document indicates that sprinkler protection will be provided in the area of differential pressure system compressors. 4-10-78 (13) 1.C.
3	12-18-84 Letter from B.Rybak (CECO) to R. Denton.
4	Appendix R Exemption Requests, Section 3.2.
5	Equivalency of fire seal justified in PLC Report "Evaluation of Penetration Seal Systems at the Dresden and Quad Cities Nuclear Power Plants" Section 2.12, Dated April 21, 1987. Reference FPPDP Volume 5, Section E.
6	Appendix R exemption request 11.0 applies to this fire zone and addresses separation of redundant instrumentation. Exemption issued on 5-21-91.
7	SER, July 21, 1988.
8	GL 86-10 Evaluation S040-QH-0611, Rev. 1.
9	Left intentionally blank.
10	SER, March 2, 1994.
11	Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-137.1

**ZONE:** 1.1.1.2      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 595

**ZONE DESCRIPTION:**

Fire Zone 1.1.1.2 consists of two areas on elevation 595 of the Unit 1 Reactor Building.

- One area, the ground floor of the building, extends from the 595 foot elevation to the bottom of the floor at elevation 623 and is bounded by the exterior wall on the east and south sides of the building and by column line H to the west and 13 to the north, with the drywell in the center.
- The other area, the MSIV room, is bounded on the east by the drywell and extends from elevation 595 to elevation 623 east of column line H. West of column line H, the area extends from elevation 595 to the bottom of the floor of the 611 foot, 6 inch elevation. The west wall of this area lies along column line G. The portions of this area west of column line H are bounded by walls separating it from various zones in the Turbine Building.

The two areas of zone 1.1.1.2 are separated by reinforced concrete shield walls, however there is an unrated access through the south shield wall. This access is fitted with a non-rated door which is normally open during operations.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.1.S, 1.1.1.1.N, below	RB-1
11.2.2, 11.2.4, below	RB-1
1.1.1.3, above	RB-1
9.3, east	RB-1/2
1.1.2.2, north	RB-2
8.2.6.C, west	TB-II
8.2.7.C, west	TB-II
8.2.6.A, west	TB-III
8.2.7.B, west	TB-III
8.1, west	TB-III

**DETECTION:**

Ionization detection is provided throughout the zone with the exception of the MSIV room.

**AUTOMATIC SUPPRESSION:**

Local sprinkler protection for:

- The area of the Drywell/Torus D/P Compressors (southwest corner of the zone); and
- The area of the ACAD Air Compressor, which is located over the drywell personnel entry way.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The remainder of the fixed combustibles consists of discrete materials distributed throughout the zone. This means that the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables. Full involvement of the cables is precluded by fire stops and, in the area near the equipment hatch, by trays covered for a length of approximately twenty five feet. With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor.

Transients account for a large portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. A look at the individual tasks for each activity, shows that the combustibles involved would be in discrete "fuel packets" and would not have the spatial continuity to produce a fire capable of propagating throughout the zone. Rather, the real hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables.

Of the combustibles in this zone, virtually none are located in the MSIV room.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out. The lack of such a system in the MSIV room is of little concern due to the sparse combustibles located there.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

**FIRE SPREAD POTENTIAL:****Fire Spread Potential Within Fire Zone 1.1.1.2:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles. Fire spread between the two areas of the zone is precluded by the reinforced concrete shield walls which separate them and the extremely light combustible loading in the MSIV room. In the main portion of the zone, the combustibles are limited, with the exception of the electrical cables in the tray system. Thus, fire spread in this area is dependent on tray involvement. Should the trays become involved, the discontinuity of the exposed cables due to fire stopping or covering, the high ceiling in the area, and the vertical vent paths provided would limit the involvement to only a portion of the zone.

**Fire Spread Potential Within Fire Area RB-1:**

Fire spread to the zones below 1.1.1.2 is unlikely due to the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor, preventing downward fire spread along the cables. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could become involved and flow to the zones below via the floor openings (e.g., stairway openings).

The potential for fire spread to the zone above is limited by the reinforced concrete floor which separates the two zones and the discontinuity of combustibles. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch, pipe penetrations), the lack of combustibles in the immediate area of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Cable riser penetrations are sealed at the floor and, thus, do not provide a path for vertical fire spread.

**Fire Spread Potential To Fire Area RB-1/2:**

Fire spread to fire area RB-1/2 is unlikely due to separation by three-hour rated construction. Such construction should not be challenged by any fire which can credibly occur in zone 1.1.1.2.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II is separated from zone 1.1.1.2 by reinforced concrete barriers. The fire loading in zone 1.1.1.2 is not sufficient to challenge the integrity of the barrier separating it from the Turbine Building; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area TB-III:**

Fire area TB-III is separated from zone 1.1.1.2 by a three-hour rated, reinforced concrete, barrier and by the concrete shield walls of the MSIV room. The fire loading in zone 1.1.1.2 is not sufficient to challenge the integrity of the three-hour barrier. Thus, fire spread via this path is not credible.

The MSIV room is separated from the remainder of the zone by floor-to-ceiling, reinforced concrete, shield walls of substantial construction. These barriers have sufficient thickness to sustain a fire of significantly more than three-hour severity. However, as mentioned elsewhere, there is an unprotected access penetration through the south shield wall between column line H and the drywell shield wall. The combustible loading in the MSIV room is quite low, with no exposed electrical cables or other significant combustibles. Although the MSIV room is of substantial construction, there are unrated penetrations in the barriers separating it from the Turbine Building. These consist primarily of an air lock with non-rated doors, a non-rated steel ceiling assembly, and the steam line penetrations into Fire Area TB-III. Thus, the MSIV room is, in effect, a space of significantly reduced combustibles between the remainder of zone 1.1.1.2 and the Turbine Building; serving effectively as a zone free of intervening combustibles. In consideration of this, the propagation of a fire from the main portion of zone 1.1.1.2 into the Turbine Building is not considered credible. Should a fire originate in the MSIV room, propagation into the Turbine Building is equally unlikely due to the small and discontinuous quantities of combustible materials available. Access to the MSIV room is highly restricted during plant operations due to the high radiation field encountered there. This eliminates the potential for buildup of transients and the possible introduction of ignition sources during plant operation.

**Fire Spread Potential To Fire Area RB-2:**

Fire area RB-2 is separated from zone 1.1.1.2 by a three-hour rated barrier. The fire loading in zone 1.1.1.2 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issues identified in the SER relative to zone 1.1.1.2 are addressed below. Each issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**2.0 Separation of Redundant RHR Trains: Zones 1.1.1.1, 1.1.1.2, and 11.2.2**

**Issue:** The barrier shared by 1.1.1.1, 1.1.1.2, and 11.2.2 deviates from Appendix R with respect to separation of redundant RHR-related cables. The principle concern is the potential for fire extension between elevations.

**Evaluation:** As discussed under **Factors Influencing Fire Impact**, above, the primary fixed combustibles in zone 1.1.1.2 are electrical cables located in the overhead trays. Due to their location, these trays do not constitute a direct exposure to the barrier separating zone 1.1.1.2 from zones 1.1.1.1 and 11.2.2, both located below. This topic has been explored in the discussion of **Fire Spread Potential**, above. Based on that exploration, the possibility of fire spread to the zones below 1.1.1.2 is highly unlikely and, therefore, the separation provided is acceptable for the hazard. This finding is consistent with that of the existing SER.



14.0 Separation of Redundant Reactor Vessel Level Indicating Instrumentation: Zones  
1.1.1.2 and 1.1.1.3

**Issue:** These zones contain redundant reactor vessel level indicating instrumentation which, with respect to the separation of the instruments and their sensing lines, deviates from the separation requirements of § III.G.2 of App. R to 10 CFR 50. The principle concern is that a fire in one of these zones could spread to the adjacent fire zone and damage redundant reactor level instrumentation.

**Evaluation:** The reactor level can be read from instruments mounted on racks, two of which are in each of these zones. Separation can be considered adequate if a given fire will not result in the loss of the instruments in both zones. As discussed under **Fire Spread Potential**, fire spread between the two zones is not considered realistic and redundant instrumentation would not be lost. Thus, the existing separation is adequate for the hazard.

For a severe fire in zone 1.1.1.2, the safe shutdown procedures call for local reading of level instruments by operations personnel. These instruments are located on instrument racks in zone 1.1.1.2. The instruments on rack 2201-8 are to be used for fires in the northern portion of the zone and those on rack 2201-7 for fires in the southern portion. Accessibility of the instruments during a fire must be considered. Due to the openings in the floor separating this zone from zone 1.1.1.3, above, venting of the smoke and heat to zone 1.1.1.3 should occur. This venting, in concert with the high ceilings of zone 1.1.1.2 and its relatively large area compared to the quantity of involved combustibles should preclude smoke banking down to a level that personnel at the floor level would be adversely affected. Thus, the effects of smoke on entry at the 595 foot elevation is not considered sufficiently severe to prevent access to at least one set of instruments.

15.0 Separation of Redundant Suppression Pool Level Indicators: Zones 1.1.1.1, 1.1.1.2  
1.1.2.1 and 1.1.2.2

**Issue:** These zones do not provide 20 feet of space free of intervening combustibles between redundant components (e.g., suppression pool level instrumentation).

**Evaluation:** The safe shutdown procedure for fire in fire zone 1.1.1.2 calls for the sightglass in fire zone 1.1.1.1 for monitoring suppression chamber level. Based on the assessment of **Fire Spread Potential**, above, fire spread to zone 1.1.1.1 is not considered credible. Thus, this instrumentation should be available for performing safe shutdown operations and, therefore, adequate separation is deemed to exist.

**CONCLUSION:**

The evaluations presented above for fire zone 1.1.1.2 demonstrate that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The barrier shared by 1.1.1.1, 1.1.1.2, and 1.1.2.2 deviates from Appendix R with respect to separation of redundant RHR-related cables. However, the separation provided is sufficient for the hazard and a fire in zone 1.1.1.2 will not result in the loss of redundant RHR trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

- The separation between zone 1.1.1.2 and the Turbine Building deviates from Appendix R with respect to separation of redundant RHR-related components. However, the separation provided is sufficient for the hazard and a fire in zone 1.1.1.2 will not result in the loss of redundant RHR-related components in the Turbine Building. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.
- Zone 1.1.1.2, a zone for which alternative SS/D is provided, does not comply with Appendix R since fixed suppression and detection are not provided throughout. However, the suppression and detection provided are sufficient to assure a fire in 1.1.1.2 would not cause a loss of normal SS/D capability. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.
- The separation between zones 1.1.1.2 and 1.1.1.3 deviates from § III.G.2 of Appendix R with respect to separation of redundant reactor level instrumentation. However, the separation provided is sufficient for the hazard and a fire in zone 1.1.1.2 will not result in the loss of redundant reactor level instrumentation. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.
- The separation between zones 1.1.1.1 and 1.1.1.2 does not provide 20 feet of space free of intervening combustibles between redundant components (e.g., suppression pool level instrumentation). However, the separation provided is sufficient for the hazard and a fire in zone 1.1.1.2 will not result in the loss of redundant suppression pool level instrumentation. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 1.1.1.3****Unit 1 Reactor Building Mezzanine Level****Fire Area:** RB-1N**F Drawing:** F-4-1**General Elevation:** 623'0"**Zone Area:** 12,401 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	A general area smoke detection system is provided throughout the zone with the exception of the regenerative and nonregenerative heat exchanger rooms, the cleanup recirculation pump rooms, and the cleanup decant pump phase separator room.
<b>Suppression:</b>	None.
<b>Manual Suppression:</b>	Portable fire extinguishers and 4 hose stations equipped with 100 feet of hose.
<b>Other FP features:</b>	Tops of MCCs are sealed to prevent water damage.
<b>Suppression Effects:</b>	Water release from piping breaks and manual hose streams onto equipment in this zone can be tolerated as any adverse effects would be less severe than those determined to be acceptable for a design basis fire. Water release will travel to area floor drains.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
13-1	Equivalent 3 Hour [2]
DW-1	3 Hour
14-1	3 Hour
TB-III	3 Hour
TB-II	Equivalent 3 Hour [2]
RB-2N	3 Hour

**Fire Zone: 1.1.1.3****Unit 1 Reactor Building Mezzanine Level****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.8.A*	14-1	3 hour	3 hour [F-58 & 59]	No doors	4'-0" thick concrete
8.2.8.B*	13-1	3 hour	3 hour [F-60]	No doors	4'-0" thick concrete wall (2'-0" thick at floor)
8.2.7.C*	TB-II	3 hour	3 hr except SBT pen [F-59 & 60][2]	No doors	4'-0" thick concrete
8.2.7.B*	TB-III	3 hour	3 hour [F-58 & 59]	No doors	4'-0" thick concrete
1.1.1.4	RB-1N	Non-rated	noncombustible, open mechanical [2][8]	No doors	1'-0" thick concrete floor
1.1.1.2	RB-1N	Non-rated	noncombustible, open mechanical [2][8]	One Fire Damper	1'-0" thick concrete floor
1.2.1	DW-1	3 hour	3 hour [6]	No doors	5'-0" thick concrete wall
1.1.2.3	RB-2N	3 hour	3 hour except 4kV bus duct [2][8] [F-61 & F-62]	One Class "A" Fire Door.	2'-0" thick concrete wall

\* Secondary Containment Boundary

**Fire Zone: 1.1.1.3****Unit 1 Reactor Building Mezzanine Level****Fire Protection Commitments:**

Reference Section	Commitment
2, 6.2	No combustibles in 4-kV bus duct near fire barrier, a nonrated seal at bus duct penetration.
1,3.18 & 5.8.6	U1 and U2 Reactor Buildings separated by 3-hour barriers. Exception includes 4kV bus duct penetration. A Class A fire door will be provided in the wall separating Unit 1 and Unit 2.
5	Seal penetration to adjacent Reactor Building except at refuel floor.
5	Smoke detection provided for ground and mezz. floors in Reactor Bldg. (with exceptions). Per letter dated 12-18-84. Also ref. [4](3.2.2, 8.2.2, 11.1.1.2).
10	Electrical penetrations sealed (with noncombustible material) between elevation in the reactor building. Also reference [4](11.1.1.3.1, 11.2.3.2).
1, 5.8.6, & 3.1.1	Provide fire detectors over MCC 18-3 and near safety related MCC's and at cable penetrations (H/14 & H/18-19) to the Turbine Building.
4, 11.1.1.4	Emergency lighting is available for reactor water level instrumentation.
7, 2.1.2	Manual fire fighting equipment (hose stations and portable fire extinguishers) is available for this zone. Also reference [1](5.8.4), [4](3.2.2 & 11.1.1.2). Fire brigade to control fires using manual equipment [7](2.1.3).
7, 2.1.2	Transient combustibles and ignition sources are administratively controlled.
7, 2.1.3	Control Room alerted of fire condition via detection system.
10	U1 RB (mezz. level) separated from Turbine Bldg. by 3-hour barrier with exceptions, such as 2-hr. rated portion and 4kV bus duct penetration. Also reference [2](9.2).

**Fire Zone: 1.1.1.3****Unit 1 Reactor Building Mezzanine Level****Notes and References:****Number      Description**

- 1      SER, July 27, 1979
- 2      SER, July 21, 1988.
- 3      Equivalency of fire seal justified in PLC Report "Evaluation of Penetration Seal Systems at the Dresden and Quad Cities Nuclear Power Plants", Dated April 21, 1987. Reference FPPDP Volume 5, Section E.
- 4      Appendix R Exemption Requests, Sections 3.2, & 11.1.
- 5      Letter dated 12-18-84, B. Rybak (CECO) to R. Denton.
- 6      The following apply to this Fire Zone: Exemption Requests 3.2 (Exemption for equivalent separation of redundant RHR trains. 12-11-87 exemption granted 2.0).
- 7      SER, February 25, 1991.
- 8      GL 86-10 S040-QH-0614, Rev. 1.
- 9      GL 86-10 Evaluation S040-QH-0610, Rev. 1.
- 10     GL 86-10 Evaluation S040-QH-0611, Rev 1.
- 11     SER, March 2, 1994.

**ZONE:** 1.1.1.3      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 623

**ZONE DESCRIPTION:**

Fire Zone 1.1.1.3 consists of elevation 623 of the Unit 1 Reactor Building. The zone extends from the 623 foot elevation to the bottom of the floor at elevation 647 and is bounded -by the exterior wall of the building on the east and south sides and by column lines H to the west and 13 to the north, with the drywell in the center.

**BARRIERS:** This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.2, below	RB-1
1.1.1.4, above	RB-1
1.2.1, center	DW-1
1.1.2.3, north	RB-2
8.2.7.C, west	TB-II
8.2.7.B, west	TB-III
8.2.8.A, west	14-1
8.2.8.B, west	13-1

**DETECTION:**

With the exception of the Reactor Water Clean Up (RWCU) system areas<sup>1</sup>, fire detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:** Low

**FIRE SEVERITY:** Less than 1.25 hour

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The remainder of the fixed combustibles consists of various materials distributed with good spatial separation. Thus, the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables.

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<sup>1</sup> The RWCU heat exchanger room, the RWCU pump room, and the cleanup phase separator decant pump room.



With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor.

Transients account for a significant portion of the total combustibles which may be in the zone. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. A look at the individual tasks for each activity, shows that the combustibles involved would be in discrete "fuel packets" which would not have the continuity necessary to produce a fire capable of propagating throughout the zone. The primary hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow propagation rate of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

## **FIRE SPREAD POTENTIAL:**

### **Fire Spread Potential Within Fire Zone 1.1.1.3:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles which, with the exception of the electrical cables in the tray system, are quite limited. Thus, significant fire spread in this area is dependent on tray involvement. Since there is limited coverage of trays in this zone, fire propagation along the length of the trays is possible. However, considering the rate at which such fires propagate, there is ample time for fire brigade intervention. Considering this and the ability to provide timely brigade callout, fire spread throughout the area is not likely.

**Fire Spread Potential Within Fire Area RB-1:**

Fire spread to zone 1.1.1.2, located below 1.1.1.3, is unlikely due to separation by a floor of reinforced concrete construction and the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor, preventing downward fire spread along the cables. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could become involved and flow to the zones below via floor openings such as stairways.

The potential for fire spread to the zone above is limited by the reinforced concrete floor separating the two zones and the discontinuity of combustibles. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Cable riser penetrations are sealed at the floor and, thus, do not provide a path for vertical fire spread.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II is separated from zone 1.1.1.3 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.1.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area TB-III:**

Fire area TB-III is separated from zone 1.1.1.3 by a three-hour rated, reinforced concrete, barrier. The fire loading in zone 1.1.1.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area 14-1:**

Fire area 14-1 (zone 8.2.8.A) is separated from zone 1.1.1.3 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.1.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area 13-1:**

Fire area 13-1 (zone 8.2.8.B) is separated from zone 1.1.1.3 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.1.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area RB-2:**

Fire area RB-2 is separated from zone 1.1.1.3 by a three-hour rated barrier. The fire loading in zone 1.1.1.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issues identified in the SER relative to zone 1.1.1.3 are addressed below. Each issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

14.0 Separation of Redundant Reactor Vessel Level Indicating Instrumentation: Zones 1.1.1.2 and 1.1.1.3

**Issue:** These zones contain redundant reactor vessel level indicating instrumentation which, with respect to the separation of the instruments and their sensing lines, deviates from the separation requirements of § III.G.2 of App. R to 10 CFR 50. The principle concern is that a fire in one of these zones could spread to the adjacent fire zone and damage redundant reactor level instrumentation.

**Evaluation:** The reactor level can be read from instruments mounted on racks in zone 1.1.1.2, below. Separation can be considered adequate if a given fire will not result in the loss of the instruments on both racks. As discussed under **Fire Spread Potential**, fire spread between the two zones is not considered realistic and the redundant instrumentation would not be lost. Thus, the existing separation is adequate for the hazard.

For a severe fire in zone 1.1.1.3, the safe shutdown procedures call for local reading of level instruments by operations personnel. These instruments are located on instrument racks in zone 1.1.1.2. Accessibility of the instruments during a fire in zone 1.1.1.3 should not be a problem due to the vent paths provided for that zone. This vertical venting, along with the large building volume and the limited quantity of involved combustibles should preclude smoke banking down to a level that personnel in zone 1.1.1.2, below, would be adversely affected. Thus, the effects of fire in zone 1.1.1.3 on entry to zone 1.1.1.2 at the 595 foot elevation should not prevent access to one or both sets of instruments.

**CONCLUSION:**

The evaluations presented above for fire zone 1.1.1.3 demonstrate that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

Zone 1.1.1.3, a zone for which alternative SS/D is provided, does not comply with Appendix R since fixed suppression and detection are not provided throughout. However, the detection provided is sufficient to assure a fire in 1.1.1.3 would not cause a loss of SS/D capability. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

The separation between zones 1.1.1.2 and 1.1.1.3 deviates from § III.G.2 of Appendix R with respect to separation of redundant reactor level instrumentation. However, the separation provided is sufficient for the hazard since a fire in zone 1.1.1.3 will not result in the loss of redundant reactor level instrumentation. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

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**Fire Zone: 1.1.1.4****Unit 1 Reactor Building Main Floor****Fire Area:** RB-1N**F Drawing:** F-5-1**General Elevation:** 647'-6"**Zone Area:** 13,034 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers and hose stations equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Water release from manual hose streams or pipe breaks in this zone can be tolerated since no safe shutdown equipment is located in this zone. Water runoff would be handled by the floor drainage system in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
TB-IV	2 Hour
13-1	Equivalent 3 Hour [2]
DW-1	Equivalent 3 Hour [3]
14-1	3 Hour [2]
RB-2N	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.5.A*	TB-IV	2 hour	2 hour	No doors	1'-6" thick concrete block
1.1.1.5	RB-1N	Non-rated [2]	noncombustible, open mechanical [1]	No doors	1'-0" thick concrete
1.1.1.3	RB-1N	Non-rated [2]	noncombustible, open mechanical [1]	No doors	1'-0" thick concrete
1.2.1	DW-1	3 hour except SGBT lines	3 hour [4]	No doors	5'-0" thick concrete wall
8.2.8.B*	13-1	3 hour	3 hour (F-68 & 69)	No doors	1'-6" thick concrete
8.2.8.A*	14-1	3 hour	3 hour (F-66 & 67)	No doors	1'-6" thick concrete wall
1.1.2.4	RB-2N	3 hour	3 hour (F-73, F-74)	Two - Class "A" fire doors	2'-0" thick concrete wall

\* Secondary Containment Boundary

**Fire Zone: 1.1.1.4****Unit 1 Reactor Building Main Floor****Fire Protection Commitments:**

Reference Section	Commitment
10	3-hour separation between Reactor Building and Turbine Building at this level (with exceptions). Also reference [9](9.2).
5, 5.7.6	Wood storage boxes to be removed from zone. Reportedly removed in 1979.
7	No continuity of combustibles through vent system penetration. Vent system is metal and restrained at penetration. Also reference [3](7.2). No continuity of combustibles through SBTG penetration. No combustibles inside metal SBTG piping. Piping is mechanically restrained at penetrations.
9, 4.2.4	Electrical penetrations sealed with noncombustible materials between elevation in the Reactor Building. Also reference [4](3.4.1.3).
6	Seal penetrations to adjacent Reactor Building except at refuel floor.
5, 3.1.8 & 5.8.6	Provide Class A fire doors between Unit 1 & 2 Reactor Building main floors.

**Fire Zone: 1.1.1.4****Unit 1 Reactor Building Main Floor****Notes and References:****Number    Description**

- 1    The floor has open hatches and stairwells. The mechanical penetrations are unsealed and electrical penetrations which pass through the floor are sealed with a noncombustible material. See Exemption Request 3.2.
- 2    This is justified in Section 3.0 of the Exemption Requests.
- 3    This (Reactor Building penetrations) is justified in section 7.0 of the Exemption Requests.
- 4    GL 86-10 Evaluation S040-QH-0614, Rev. 1.
- 5    SER, July 27, 1979.
- 6    Letter dated 12-18-84, B. Rybak (CECO) to R. Denton.
- 7    GL 86-10 Evaluation S040-QH-0610, Rev. 1.
- 8    One of the doorways between 1.1.1.4 and 1.1.2.4 is protected by two fire doors. Door #175A is a normally closed fire door. This door in the open configuration does not qualify as a 3 hour rated door because the fusible link is located on only one side of the barrier. Door #175 is a normally open sliding fire door.
- 9    SER, July 21, 1988.
- 10   GL 86-10 Evaluation S040-QH-0611, Rev. 1.

**ZONE:** 1.1.1.4      **AREA:** RB-1      **LOCATION:** RB1, Elev. 647'-6"

**ZONE DESCRIPTION:** Unit 1 Reactor Building, Third Floor

**FIRE SEVERITY:** The previous fire severity was 0.13 hours and the updated fire severity for this zone is 1.25 hours. The combustible loading is still considered low.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 1.1.1.4, but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.1.2.4	RB-2	3 hour
8.2.8.A	14-1	3 hour
8.2.8.B	13-1	2 hour
1.2.1	DW-1	3 hour <sup>1</sup>
1.1.1.5.A	TB-IV	2 hour

<sup>1</sup> Barrier has 3 hour rating except for SBGTS lines.

**EVALUATION – ZONE 1.2.1:**

The primary containment is inerted during plant operation, so fire spread into containment is not a concern. No further evaluation is required.

**EVALUATION – ZONES 1.1.2.4, 8.2.8.A, 8.2.8.B, and 1.1.1.5:**

All four of these Fire Zones interface through rated fire barriers of either 2- or 3-hour construction. Given the low combustible loading and the 2- or 3-hour rated barriers, fire spread to any of the four zones is not credible.

**CONCLUSION:**

A fire originating in this fire zone will not spread to adjacent fire zones that contain redundant equipment. Therefore, the ability to safely shutdown the plant is assured.



**Fire Zone: 1.1.1.5****Unit 1 Reactor Building Reactor Floor****Fire Area:** RB-1N**F Drawing:** F-6-1**General Elevation:** 666'-6"**Zone Area:** 12,359 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers and hose stations equipped with 100 ft of hose.**Other FP features:** None**Suppression Effects:** Piping breaks or the use of manual hose streams would not affect safe shutdown capability since no equipment associated with safe shutdown is located in this zone. Water runoff should be handled by the floor drainage system in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
DW-1	3 Hour
RB-2N	Equivalent 3 Hour [3]
13-1	3 Hour
TB-IV	Equivalent 3 Hour [3]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.8.B	13-1	3 hour	3 hour	No doors	1'-0" thick concrete floor
1.2.1	DW-1	3 hour [4]	3 hour	No doors	5'-0" thick concrete wall
1.1.1.6.A*	TB-IV	3 hour	3 hour [F-115, F-116]	No doors, no dampers in HVAC ducts	1'-6" thick concrete wall
1.1.1.6	RB-1N	Non-rated [3][4]	noncombustible, open mechanical	No doors	1'-6" thick concrete ceiling
1.1.1.5.A*	TB-IV	3 hour	3 hour except HVAC duct penetration [F-115, F-116]	No doors	1'-6" thick concrete wall
1.1.1.4	RB-1N	Non-rated [4]	noncombustible, open mechanical	No doors	1'-0" thick concrete floor
1.1.2.5	RB-2N	3 hour equivalent [3][4]	3 hour(except for 3 SBTG lines)	Two Class "A" fire doors	2'-0" thick concrete wall

\* Secondary Containment Boundary

**Fire Zone: 1.1.1.5****Unit 1 Reactor Building Reactor Floor****Fire Protection Commitments:**

Reference Section	Commitment
7	3-hour separation between Reactor Bldg. and Turbine Bldg. with exceptions. Also reference [3](9.2).
6	No continuity of combustibles through SBGT penetration(s). No combustibles inside metal SBGT piping, piping is mech. restrained at penetrations.
7	3-hour separation between 1.1.1.5 and TB except for HVAC ducts penetrations. Also reference.
1, 5.6.4	Manual fire fighting equipment (hose stations and portable fire extinguishers) is provided for this zone. Also reference
2	Seal penetrations between adjacent Reactor Buildings except at refuel floor.
6	3-hour separation between 1.1.1.5 & 1.1.2.5, except 3 SBGTS lines.
1, 3.1.8 & 5.8.6	Provide Class A Fire Doors between Unit1 and 2 Reactor Floor.

**Notes and References:****Number    Description**

- 1 SER, July 27, 1979.
- 2 Letter, dated 12-18-84, B. Rybak (CECO) to R. Dent
- 3 SER, July 21, 1988.
- 4 Left intentionally blank.
- 5 GL 86-10 Evaluation S040-QH-0614, Rev. 1, Justification For Lack of Complete Fire Detection and Suppression in the Unit 1 Reactor Building.
- 6 GL 86-10 Evaluation S040-QH-0610, Rev. 1.
- 7 GL 86-10 Evaluation S040-QH-0611, Rev. 1.

**ZONE:** 1.1.1.5      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 666

**ZONE DESCRIPTION:**

Fire Zone 1.1.1.5 consists of elevation 666 of the Unit 1 Reactor Building. The zone extends from the 666 foot elevation to the bottom of the floor at elevation 690 and is bounded by the exterior walls on the east and south sides of the building and by column line H to the west and 13 to the north. The zone is divided in half along the north/south axis by the dryer/separator pit, the drywell shield wall, and the spent fuel pool. A portion of the wall along column line H is an exterior wall.

**BARRIERS:** This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.4, below	RB-1
1.1.1.6, above	RB-1
1.2.1, center	DW-1
1.1.2.5, north	RB-2
1.1.1.5.A, west	TB-IV
1.1.1.6.A, west	TB-IV
8.2.8.B, below	13-1

**DETECTION:**

Fire detection is not provided in this zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Low

**Fire Severity:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. A minor contributor to the fixed loading is the Standby Gas Treatment System (SBGTS) filter media. The remainder of the fixed combustibles consists of various materials distributed with good spatial separation. This separation means that the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables.

With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor.

Transients account for a large portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. A look at the individual tasks for each activity, shows that the combustibles involved would be in discrete "fuel packets" which would not have the continuity necessary to produce a fire capable of propagating throughout the zone. The primary hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables. Due to the construction of the zone, the trays are discontinuous from the east side to the west side.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow propagation rate of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 1.1.1.5:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles which, with the exception of the electrical cables in the tray system, are quite limited. Thus, significant fire spread in this area is dependent on tray involvement. Additionally, the splitting of the zone into east and west portions by the dryer separator pit, drywell shield wall, and spent fuel pool minimizes the likelihood of fire spread throughout the zone. Since the exposed cables are split between the east and west sides of the zone, any significant fire which may occur would be expected to be limited to only a portion of the zone. Given that no detection is provided to alert operations personnel to a fire in the area, timely fire brigade notification is unlikely and extensive cable damage could occur in the involved part of the zone.

**Fire Spread Potential Within Fire Area RB-1:**

Fire zone 1.1.1.5 is separated from zone 1.1.1.4, located below, by a non-rated reinforced concrete floor of substantial construction. A number of open penetrations, many of significant size (e.g., hatchway, stairways) penetrate the floor. Fire spread to zone 1.1.1.4 is unlikely, however, due to the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor level, preventing downward fire spread along the cables. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could become involved and flow to the zones below via floor openings such as stairways.

The potential for fire spread to zone 1.1.1.6, above, is limited by the reinforced concrete floor which separates the two zones and the discontinuity of combustibles. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely.

**Fire Spread Potential To Fire Area TB-IV:**

Fire area TB-IV is separated from zone 1.1.1.5 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.1.5 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area 13-1:**

Fire area 13-1 (zone 8.2.8.B) is separated from zone 1.1.1.5 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.1.5 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area RB-2:**

Fire area RB-2 is separated from zone 1.1.1.5 by a three-hour rated barrier. The fire loading in zone 1.1.1.5 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

None. This area does not contain any safe shutdown components and does not represent a hazard to any zones which do contain safe shutdown components.

**Fire Zone: 1.1.1.6****Reactor Building Refuel Floor****Fire Area:** RB-1N**F Drawing:** F-7-1**General Elevation:** 690'-6"**Zone Area:** 30,512 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers and manual hose stations equipped with 100 feet of hose. Hose stations are equipped with smooth bore nozzles due to criticality issues presented in SIL #152, Criticality Margins for Storage of New Fuel (3/31/76).**Other FP features:** None**Suppression Effects:** Piping breaks or the use of manual hose streams would not affect safe shutdown as no equipment associated with safe shutdown is located in this zone. Water runoff would be handled by the floor drainage system in the general area. Only smooth bore hose station nozzles are provided to ensure their use will not result in a criticality incident.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
DW-2	Equivalent 3 Hour [3]
DW-1	Equivalent 3 Hour [3]
TB-IV	Equivalent 3 Hour [3][5]
RB-2N	Equivalent 3 Hour [4]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
1.2.2	DW-2	3 hour	noncombustible	No doors	Refuel cavity floor plugs
1.2.1	DW-1	3 hour	noncombustible	No doors	Refuel cavity floor plugs
1.1.2.5	RB-2N	Non-rated [4]	noncombustible, open mechanical [4]	No doors	1'-6" thick concrete floor]
1.1.1.6.A*	TB-IV	Non-rated[5]	Non-rated[5]	No doors	1'-0" thick concrete wall
1.1.1.5	RB-1N	Non-rated [3]	noncombustible, open mechanical [3]	No doors	1'-6" thick concrete floor

\* Secondary Containment Boundary

**Fire Zone: 1.1.1.6****Reactor Building Refuel Floor****Fire Protection Commitments:**

Reference Section	Commitment
8	3-hour separation between RB and TB. Also reference [2](9.2).
1, 3.1.1	Early warning fire detection system will be provided. Also reference [1](5.5.6). The lack of complete detection has been justified [7].
3, 3.2.2	Manual fire fighting equipment is available for this zone. Also reference [1](5.5.4), [3](11.2.2) and [2](8.2).

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	SER, July 21, 1988.
3	Appendix R Exemption Requests, Section 3.2.
4	Evaluation for fire area separation between RB-1 and RB-2, ER9801567.
5	Evaluation for fire area separation between RB-1 and TB-IV, ER9801572.
6	GE Service Information Letter (SIL) #152, Criticality Margins for Storage of New Fuel, March 31, 1976.
7	GL 86-10 Evaluation S040-QH-0614, Rev. 1, Justification For Lack of Complete Fire Detection and Suppression in the Unit 1 Reactor Building.
8	GL 86-10 Evaluation S040-QH-0611, Rev. 1.

**ZONE:** 1.1.1.6      **AREA:** RB-1      **LOCATION:** RB 1, Elev. 690

**ZONE DESCRIPTION:**

Fire Zone 1.1.1.6 consists of elevation 690 of the Unit 1 and 2 Reactor Buildings. The zone extends from the 690 foot elevation to the roof of the building at elevation 737 and is bounded by the exterior walls on the east and south and north sides of the building and by column line H to the west. A portion of the column line H wall is an exterior wall. The zone is divided along the north/south axis by the dryer/separator pits, the drywell access well, and the spent fuel pools for each unit. The zone contains equipment used for handling of reactor fuel and for performing refueling operations.

**BARRIERS:** This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.5, below	RB-1
1.2.1	DW-1
1.2.2	DW-2
1.1.2.5, below	RB-2
1.1.1.6.A, west	TB-IV

**DETECTION:**

Fire detection is not provided in this zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Low

**Fire Severity:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed primarily of plastic (PMMA) panels installed around the fuel pools. The minor contributor to the fixed loading are the lubricating oils in the reactor building bridge crane. The remainder of the fixed combustibles consists of a variety of materials distributed with good spatial separation. Thus, the only fixed combustibles theoretically capable of sustaining a propagating fire from the ignition point to other portions of the zone are the plastic panels and the crane lubricants.



Transients account for a large portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The bulk of these combustibles are those associated with refueling or fuel handling and related operations. A look at the individual tasks for each activity, shows that the combustibles involved would consist of various "fuel packets" which would not have the continuity necessary to produce a fire capable of propagating throughout the zone.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Low probability of fire spread to adjacent areas;
- High ceiling which minimizes the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 1.1.1.6:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles. As mentioned above, the only fixed combustibles capable of such propagation are the plastic panels around the pools and the crane lubricants. The crane lubricants are contained in various separate bearing and gear housings and, thus, are unlikely to be spilled in sufficient quantities to pose a significant hazard. The configuration of the plastic panels and their response to high temperatures is such that propagation along them could occur. The dryer separator pits and spent fuel pools serve to minimize fire spread throughout the zone by providing spatial separation between areas containing combustibles. Given that no detection is provided to alert operations personnel to a fire in the area, timely fire brigade notification is unlikely, unless work activities, such as refueling, are in progress in the zone. Thus, considerable local damage could result.

**Fire Spread Potential Within Fire Area RB-1:**

Fire spread to the zone 1.1.1.5, located below 1.1.1.6, is unlikely due to the reinforced concrete floor which separates the two zones and the lack of continuity of combustibles penetrating the floor. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch), the lack of combustibles in the immediate vicinity of the openings make fire spread unlikely. The volume of flammable and combustible liquids are quite limited, except for the lube oil in the Reactor Building Bridge Crane. The crane contains approximately 50 gallons of lubricating oil distributed in a number of bearing housings and gear boxes. An event which could result in the spill and ignition of a significant amount of this oil is highly unlikely. Thus, the potential for a spill which could become involved and flow to the zone below via floor openings such as stairways, is minimal.

**Fire Spread Potential Within Fire Area RB-2:**

Fire spread to the zone 1.1.2.5, located below 1.1.1.6, is unlikely due to the reinforced concrete floor which separates the two zones and the lack of continuity of combustibles penetrating the floor. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch), the lack of combustibles in the immediate vicinity of the openings make fire spread unlikely. The volume of flammable and combustible liquids are quite limited, except for the lube oil in the Reactor Building Bridge Crane. The crane contains approximately 50 gallons of lubricating oil distributed in a number of bearing housings and gear boxes. An event which could result in the spill and ignition of a significant amount of this oil is highly unlikely. Thus, the potential for a spill which could become involved and flow to the zone below via floor openings such as stairways, is minimal.

**Fire Spread Potential To Fire Area TB-IV:**

Fire area TB-IV is separated from zone 1.1.1.6 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.1.6 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

None. This area does not contain any safe shutdown components and does not represent a hazard to any zones which do contain safe shutdown components.

**Fire Zone: 11.1.3****Unit 1 HPCI Room****Fire Area:** RB-1N**F Drawing:** F-9-1**General Elevation:** 554'-0"**Zone Area:** 1,439 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area linear heat (thermal) detection above the HPCI pump and turbine.
<b>Suppression:</b>	Local area deluge system above the HPCI pump and turbine.
<b>Manual Suppression:</b>	Portable fire extinguisher(s).
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	No adverse effects on safe shutdown from water release are involved as no safe shutdown equipment is located in this zone. Water would collect in the HPCI room sump pit until removed by pump to the radwaste water collection system.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
TB-II	Equivalent 3 Hour [6]
RB-2	3 Hour
CT-2	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.6.C*	TB-II	3 hour	3 hour, except for floor plugs [6]	No doors	3'-0" thick concrete
8.2.5*	CT-2	3 hour	3 hour	One Class A Door	1'-6" thick concrete wall (1'-0" thick at floor)
11.2.3	RB-1N	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
1.1.1.1	RB-1N/RB1S	Non-rated	noncombustible, open mechanical	One nonlabeled watertight door.	4'-0" thick concrete
11.1.4	RB-2S	3 hour [3][4]	3 hour [F-141]	One Class A (3-hr.)	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.1.3****Unit 1 HPCI Room****Fire Protection Commitments:**

Reference Section	Commitment
11	U1 and U2 RBs separated by 3-hour barriers.
11	Unrated seals and concrete plugs in ceiling separating RB from TB.
11	Manual fire fighting equipment is available.
1, 5.11.4	A portable extinguisher provided in each HPCI room with hose stations in torus area for backup suppression.
6	3-hour separation between RB and TB.
6	Automatic water suppression over the HPCI pump and turbine (water deluge system provided). Also reference [1] (5.11.4).
11	Fire detection over the HPCI pump and turbine.
7	Original commitment was to install a preaction system. This zone is provided with a deluge system and protectowire detection. LER 89-022, Rev.00 (12-28-89), MC-4-1(2)-90-57 (1-10-91).
1, 3.1.8, 5.8.6 & 5.11.4	Provide Class A fire door between Unit 1 and 2 HPCI rooms.

**Fire Zone: 11.1.3****Unit 1 HPCI Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	SER, July 21, 1988.
4	NRC Exemption Aug. 18, 1989.
5	Exemption for equivalent separation of redundant RHR trains. Exemption request 3.2 (12-18-84). Exemption granted (2.0) 12-11-87.
6	GL 86-10 Evaluation S040-QH-0611, Rev. 1.
7	LER 89-022, Rev.00 (12-28-89). Install Protectowire 3-30-90. LER closed 10-5-90. 1-10-91 MC-4-1(2)-90-57. LER closed 5-15-91.
8	Left intentionally blank.
9	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
10	SER, March 2, 1994.
11	GL 86-10 Evaluation S040-QH-0614, Rev. 1.

**ZONE:** 11.1.3**AREA:** RB-1**LOCATION:** RB1, Elev. 554'-0"**ZONE DESCRIPTION:** Unit 1 HPCI Room

**FIRE SEVERITY:** The previous fire severity was 1.70 hours and the updated fire severity for this zone is 2.5 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 11.1.3 which are in separate fire areas or which contain safe shutdown equipment that is redundant or alternate to the equipment in this zone. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
11.1.4	RB-2	3 hour
1.1.1.1	RB-1	Non-rated
8.2.5	CT-2	3 hour
8.2.6.C	TB-II	3 hour <sup>1</sup>

<sup>1</sup> The seals are rated for 3 hours except for the floor plugs.

**EVALUATION - ZONE 1.1.1.1:**

The HPCI room (Fire Zone 11.1.3) is adjacent to the north section of the torus area (Fire Zone 1.1.1.1). A fire which started in the HPCI room could spread through non-rated wall penetrations into the north section of the torus area. However, fixed automatic fire suppression is provided for the hazards in the HPCI room, which reduces the likelihood of this spread occurring. The torus area contains cabling for both trains of RHR equipment, one train in the north section and one in the south section. Fire spread between the north and south sections of the torus area is prevented by the low combustible loading and by a space free of intervening combustibles. A fire which originated in the HPCI room would be no more likely to spread to the south section of the torus area than one which originated in the torus area itself.

**EVALUATION - ZONE 8.2.6.C:**

Zone 8.2.6.C is separated from Zone 11.1.3 by a 3 hour barrier, except for the floor plugs. The concrete floor plugs are not a tested configuration, but they are heavily built and fit tightly. Given the 3 hour barrier and substantial floor plugs, the potential for fire spread from Zone 11.1.3 to Zone 8.2.6.C is low.

**Fire Zone: 11.2.1****Unit 1 Southwest Corner Room****Fire Area:** RB-1S**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 596 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area linear heat (thermal) detection except above the reactor building equipment drain tank.
<b>Suppression:</b>	None
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and a hose station equipped with 100 feet of hose, located in adjacent Fire Zone 1.1.1.1.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Piping breaks or use of manual hose streams would not affect safe shutdown as no equipment associated with safe shutdown is located in this zone. Water runoff would be handled by the floor drainage system in the general area or by sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-1S	Equivalent 3 Hour
TB-III	Equivalent 3 Hour at D-Htr Bay [3]
CT-1	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.4*	CT-1	3 hour	3 hour (F-144, 145, 146)	No doors	1'-0" thick concrete
8.2.6.A*	TB-III	3 hour equivalent	3 hour, except for floor plugs [3]	No doors	2'-0" thick concrete ceiling
1.1.1.1	RB-1N/RB-1S	Non-rated	noncombustible, open mechanical	One unlabeled watertight door.	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.2.1****Unit 1 Southwest Corner Room****Fire Protection Commitments:**

Reference Section	Commitment
4	Unrated seals and concrete plugs in the ceiling which separates the RB from TB.
8	3-hour separation between RB and TB with exceptions. Also reference [3] (9.2).
1, 5.10.4	Manual fire fighting equipment available with a hose station and portable extinguisher located in the torus area.
5, 3.2.1	Cable penetrations are sealed between elevations.
5, 3.2.1	Reinforced concrete walls with water tight door provided between torus and corner room.
2	Thermal line type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [3] (2.2.1, and 4.2.1) and [5] (3.2.2).

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Dent
3	SER, July 21, 1988.
4	GL 86-10 Evaluation S040-QH-0611, Rev. 1.
5	Appendix R Exemption Requests, Section 3.2.
6	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
7	SER, March 2, 1994.
8	GL 86-10 Evaluation S040-QH-0614, Rev. 1.



**ZONE:** 11.2.1      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 554

**ZONE DESCRIPTION:**

Fire Zone 11.2.1, the southwest corner room, is located on elevation 554 of the Unit 1 Reactor Building and contains the Reactor Building Equipment Drain (RBED) Tank and RBED pump and one of the unit's core spray pumps.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by exterior walls on the west side of the building along column line G and south side of the building along column line 17. The third wall of this generally triangular-shaped space consists of a wall along a southeast to northwest line which is shared by the torus area, fire zone 1.1.1.1. One wall to the east, along column line H is shared with the building elevator shaft.

The zone is divided into two areas by reinforced concrete shield walls surrounding the RBED tank.

**BARRIERS:**

This zone shares barriers with:

ZONES

1.1.1.1, north east  
8.2.4, above  
8.2.6.A, above

AREAS

RB-1  
CT-1  
TB-III

**DETECTION:**

General area linear heat detection is provided except over the RBED tank area.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The largest contributors to the fixed combustible loading in this zone are contamination control materials and lubricating oil. The rest of the fixed combustibles consists of various materials, such as ventilation system insulation.

Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification prompts fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers; and
- Availability of adequate standpipe hose lines for manual fire fighting.

### **FIRE SPREAD POTENTIAL:**

#### **Fire Spread Potential Within Fire Zone 11.2.1:**

The potential for fire spread between the two areas of the zone is inhibited by the reinforced concrete shield wall which separates them. In the core spray portion of the zone, the predominant combustibles are the lube oil in the core spray pump and motor and the control point which provides access to the RBED tank area. There are no significant quantities of combustibles in the RBED tank area.

#### **Fire Spread Potential Within Fire Area RB-1:**

Fire spread to zone 1.1.1.1 is unlikely due to the substantial, reinforced concrete, barrier which separates the two zones. A non-rated, water-tight door in the barrier provides for personnel access between the two zones. The door design is such that a combustible liquid spill in zone 11.2.1. would not flow to zone 1.1.1.1; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.1.1. However, given the distribution of combustibles in 1.1.1.1 and its high ceiling height, ignition of combustibles in that zone is unlikely. The same is true of other unsealed penetration in the barrier. The fire potential for zone 11.2.1 is not sufficient to challenge barrier integrity and fire spread is not likely.

#### **Fire Spread Potential To Fire Areas TB-III and CT-1:**

Fire area TB-III and CT-1 is separated from zone 11.2.1 by a three-hour rated, reinforced concrete, barrier. The fire loading in the zone is not sufficient to challenge the integrity of the separating barrier; thus fire spread via this path is not credible.

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**Fire Zone: 11.2.2****Unit 1 Southeast Corner Room****Fire Area:** RB-1S**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 657 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area linear heat (thermal) detection.**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Any adverse effects on safe shutdown equipment by water discharge from the sprinkler system, manual hose stream use, or piping breaks would be less severe than those determined to be acceptable for a design-basis fire. Damage to valves, room cooler, heat exchanger, and pumps by water discharge would be negligible. Water removal would be accomplished by drainage or sump pumps.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
RB-1N	Equivalent 3 Hour [3]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
1.1.1.2	RB-1N	Non-rated	noncombustible, open mechanical	No doors	2'-0" thick concrete
1.1.1.1	RB-1N/RB-1S	Non-rated	noncombustible, open mechanical	One unlabeled watertight door	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.2.2****Unit 1 Southeast Corner Room****Fire Protection Commitments:**

Reference Section	Commitment
4, 3.2.1	Cable penetrations are sealed between elevations.
4, 3.2.4.1	No combustibles pass through unsealed penetrations between 11.2.2 and 1.1.1.2.
4, 3.2.4.1	11.2.2 construction will confine a fire from the torus area.
6, 2.2.1	Fire suppression system provided throughout. Also reference [4] (3.2.4.1).
6, 2.2.1	Manual fire fighting equipment available with a hose station and portable extinguisher provided in each RHR room. Also reference [1] (5.10.4).
4, 3.2.4.1	Transient combustibles and ignition sources controlled.
4, 3.2.1	Reinforced concrete walls with water tight door provided between torus and corner room.
2	Automatic sprinklers in Division II RHR pump rooms.
2	Thermal line type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [4] (3.2.2, and 3.2.4.1) and [6] (2.2.1).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Dent
3	Exemption for equivalent separation of redundant RHR trains. Exemption request 3.2 (12-18-84). Exemption granted 2.0 (12-11-87).
4	Appendix R Exemption Requests, Section 3.2.
5	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
6	SER, July 21, 1988.
7	SER, March 2, 1994.

**ZONE:** 11.2.2      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 554

**ZONE DESCRIPTION:**

Fire Zone 11.2.2, the southeast corner room, is located on elevation 554 of the Unit 1 Reactor Building and contains the pumps and heat exchanger for one loop of the Residual Heat Removal (RHR) System.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by exterior walls on the east side of the building along column line N and the south side of the building along column line 19. The third wall of this triangular-shaped space lies along a southwest to northeast line and is shared by the torus area, fire zone 1.1.1.1.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.1, northwest	RB-1
1.1.1.2, above	RB-1

**DETECTION:**

General area linear heat detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

A general area wet-pipe sprinkler system is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The next most significant fixed combustible is the lubricating oil associated with the RHR pumps. The remainder of the fixed combustibles consists of various materials distributed throughout the zone. The only fixed combustibles capable of sustaining a fire are the electrical cables and the lube oil. The cable trays are fifteen or more feet above the floor and the tray risers from the zone above are fire stopped where they penetrate the floor. The lube oil is contained in the bearing housings of the two RHR pumps. Thus, any release of this combustible to the zone would be significantly less than the total amount present.

Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The hazard associated with transients in this zone, is the potential for a fire which may expose combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of such a fire are the electrical cables and the lubricating oil, should it be released from the bearing housings.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification should initiate fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 11.2.2:**

The potential for fire spread within the zone is limited. The fixed combustibles, with the exception of the electrical cables in the tray system and the lube oil, are small in quantity. Thus, significant fire spread in this area is dependent on tray involvement or a lube oil spill. The likelihood of tray involvement is limited due to their height above the floor and the fact that the lower tray is of solid bottom construction with a tight fitting cover. Thus, ignition of the cables in it is unlikely and its presence shields the trays above from the plume of any fire located below. The high ceiling in the area, and the vertical vent paths provided would limit the buildup of any significant stratification layer, thereby minimizing thermal layer radiation to combustibles within the zone. The lubricants in the zone are separately housed, making a spill of the entire inventory unlikely. The limited spill potential and the characteristics of oil spills on concrete substrates mean that a spill fire is unlikely and that should one occur it would be of limited severity and duration. In addition, the general area sprinkler protection will limit fire involvement to only a portion of the zone.

**Fire Spread Potential Within Fire Area RB-1:**

The potential for fire spread to zone 1.1.1.2, above, is limited by the reinforced concrete floor separating the two zones and the lack of continuity of combustibles penetrating the floor. Cable risers penetrating the floor are fire stopped at the floor, preventing upward fire spread along the cables. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Regardless, heat and smoke from fires in zone 11.2.2 would vent to zone 1.1.1.2.

Fire spread to zone 1.1.1.1 is unlikely due to the substantial reinforced concrete barrier which separates the two zones. A non-rated, water-tight door in the barrier provides for access between the two zones. The door design is such that a combustible liquid spill in zone 11.2.2. would not flow to zone 1.1.1.1; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.1.1. A similar result can be expected from unsealed penetrations in the barrier. However, given the distribution of combustibles in 1.1.1.1 and its high ceiling height, ignition of combustibles in that zone is unlikely. The fire potential for zone 11.2.2 is not sufficient to challenge the barrier and fire spread is not likely. The presence of the sprinkler system in the corner room provides further assurance that any fire which occurs will be confined to that zone.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 11.2.2 is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**2.0     Separation of Redundant RHR Trains: Zones 1.1.1.1, 1.1.1.2, and 11.2.2**

**Issue:** The barrier shared by 1.1.1.1, 1.1.1.2, and 11.2.2 deviates from Appendix R with respect to separation of redundant RHR-related cables. The principle concern is the potential for fire extension between elevations.

**Evaluation:** As discussed under **Factors Influencing Fire Impact**, above, the primary fixed combustibles in zone 11.2.2 are electrical cables located in the overhead trays and the lubricating oil in the RHR pumps. The section entitled **Fire Spread Potential**, above, explores the potential for fire spread between these zones. Based on that exploration, the possibility of fire spread to the zones adjacent to 11.2.2 is highly unlikely and, therefore, the separation provided is acceptable for the hazard. This finding is consistent with that of the existing SER.

**CONCLUSION:**

The evaluation presented above for fire zone 11.2.2 demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The barrier shared by 1.1.1.1, 1.1.1.2, and 11.2.2 deviates from Appendix R with respect to separation of redundant RHR-related cables. However, the separation provided is sufficient for the hazard and a fire in zone 11.2.2 will not result in the loss of redundant RHR trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.



**Fire Zone: 11.2.3****Unit 1 Northwest Corner Room****Fire Area:** RB-1N**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 643 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area linear heat (thermal) detection.**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose in Fire Zone 1.1.1.1.**Other FP features:** None**Suppression Effects:** Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Damage to pumps, valves, and similar equipment by water discharge would be negligible. Water removal would be accomplished by floor drains or sump pumps.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-II	Equivalent 3 Hour [5], (3 Hour at Fire Zone 8.1)
RB-2S	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.6.C*	TB-II	3 hour [5]	noncombustible, non-rated mechanical	No doors	2'-0" thick concrete
8.1*	TB-II	3 hour	3 hour	No doors	2'-0" thick concrete
11.1.3	RB-1N	Non-rated [7][8]	noncombustible, open mechanical	No doors	4'-0" thick concrete
11.3.1	RB-2S	3 hour [7][8]	3 hour (F-41, 42, 43)	One Class A door	3'-0" thick concrete
1.1.1.1	RB-1N/RB-1S	Non-rated	noncombustible, open mechanical	One nonlabeled watertight door	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.2.3****Unit 1 Northwest Corner Room****Fire Protection Commitments:**

Reference Section	Commitment
12	Unit 1 and Unit 2 RB separated by 3-hour barrier with 3-hour penetration seals.
5	Unrated seals and concrete plugs in the ceiling which separates the RB from TB.
5	3-hour separation between RB and TB with exceptions. Also reference [7] (9.2).
1, 5.10.4	Manual fire fighting equipment available with a hose station and portable extinguisher located in the torus area.
9, 3.2.1	Reinforced concrete walls with water tight door provided between torus and corner room.
9, 3.2.1	Cable penetrations are sealed between elevations.
2	Seal penetration to adjacent Reactor Building except at refuel floor.
2	Class A door between RCIC pump rooms. Also reference [1] (3.1.8 and 5.8.6).
2	Thermal linear type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [7] (2.2.1, and 11.1.1.2) and [9] (3.2.2).

**Fire Zone: 11.2.3****Unit 1 Northwest Corner Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Dent
3	SER, Feb. 25, 1991. Appendix R exemption request 11.0 applies to this fire zone and addresses separation of redundant instrumentation. Exemption issued on 5-21-91.
4	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
5	GL 86-10 Evaluation S040-QH-0611, Rev. 1.
6	GL 86-10 Evaluation S040-QH-0614, Rev. 1.
7	SER, July 21, 1988.
8	NRC Exemption Aug. 18, 1989.
9	Appendix R Exemption Requests, Section 3.2.
10	SER, March 2, 1994.
11	Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-137.

**ZONE:** 11.2.3      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 554

**ZONE DESCRIPTION:**

Fire Zone 11.2.3, the northwest corner room, is located on elevation 554 of the Unit 1 Reactor Building and contains the Reactor Core Isolation Cooling (RCIC) System turbine and pump and one of the core spray pumps.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by walls on the west side of the building along column line G and on the north side of the building along column line 13. The third wall of this generally triangular-shaped space consists of a wall along a southwest to northeast line which is shared by the torus area, fire zone 1.1.1.1.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.1, southeast	RB-1
11.1.3, west	RB-1
11.3.1, north	RB-2
8.1, above	TB-II
8.2.6.C, above	TB-II

**DETECTION:**

General area linear heat detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The two largest contributors to the fixed combustible loading in this zone are electrical cable insulation and lubricating oil. The rest of the fixed combustibles consists of small quantities of miscellaneous materials distributed throughout the zone.

Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification prompts fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers; and
- Availability of adequate standpipe hose lines for manual fire fighting.

## **FIRE SPREAD POTENTIAL:**

### **Fire Spread Potential Within Fire Zone 11.2.3:**

The potential for a severe fire within the zone is limited by the quantity and discontinuity of combustibles. The predominant combustibles are lube oil in the RCIC unit and the core spray pump and exposed electrical cables. The RCIC pump is steam turbine driven, which introduces an ignition source. The lube oil is contained in a number of separate bearing housings, with the largest containing four gallons. Thus, the involvement of a more than four gallons of the oil is a remote possibility; requiring the failure of the bearing housings on separate pieces of equipment. The cable tray in this zone is a single short section located over fifteen feet above the floor. Thus, it represents a concentrated combustible load which cannot provide for propagation throughout the zone. The high ceiling in the area, and the vertical vent paths provided serve to limit hot combustion product accumulation. Given an oil release and ignition by the steam turbine, fire damage would be expected throughout this zone.

### **Fire Spread Potential Within Fire Area RB-1:**

Fire spread to zone 1.1.1.1 is unlikely due to the presence of a substantial concrete barrier separating the two zones and the relatively low combustible loading in zone 11.2.3. The cable tray penetrating the barrier is not fire stopped, thus spread along the tray cannot be discounted. A non-rated, water-tight door in the barrier provides for access between the two zones. The door design is such that a combustible liquid spill in zone 11.2.3. would not flow to zone 1.1.1.1; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.1.1. However, given the distribution of combustibles in 1.1.1.1 and its high ceiling height, ignition of combustibles in that zone is unlikely.

Fire zone 11.1.3, the Unit 1 HPCI room, also interfaces with zone 11.2.3. The separation is provided with a substantial reinforced concrete barrier which has a number of unsealed penetrations; none of which carry cable trays. Given the configuration of zone 11.2.3 and the fact that there are no combustibles passing through the penetrations, fire spread to the HPCI room is considered unlikely.

**Fire Spread Potential To Fire Area RB-2:**

Fire area RB-2 is separated from zone 11.2.3 by three-hour rated, reinforced concrete construction. The fire loading in zone 11.2.3 is not sufficient to challenge the integrity of this barrier; thus fire spread to area RB-2 is not credible.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II is separated from zone 11.2.3 by reinforced concrete construction. The fire loading in the zone is not sufficient to challenge the integrity of this barrier. However, non-sealed penetrations would allow heat and smoke to enter area TB-II.

**Fire Zone: 11.2.4****Unit 1 Northeast Corner Room****Fire Area:** RB-1N**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 657 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area linear heat (thermal) detection.**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Damage to valves, cooler, heat exchanger, and pumps by water discharge would be negligible. Water removal would be accomplished by drainage or sump pumps.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
RB-2S	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
1.1.1.2	RB-1N	Non-rated [7][8]	noncombustible, open mechanical	No doors	2'-0" thick concrete
11.3.2	RB-2S	3 hour [7][8]	3 hour (F-41, 42, 43)	Two Class A fire doors	3'-0" thick concrete
1.1.1.1	RB-1N/RB-1S	Non-rated	noncombustible, open mechanical	One nonlabeled watertight door	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.2.4****Unit 1 Northeast Corner Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 3.1.8 & 5.8.6	Class A door provided between 11.3.2 and 11.2.4. Also reference [1] (3.1.8 and 5.8.6).
5, 3.2.1	Cable penetrations are sealed between elevations.
7, 2.2.3	Reinforced concrete walls with water tight door provided between torus and corner room. Also reference [5] (3.2.1 and 3.2.4.3).
1, 5.10.4	Manual fire fighting equipment available with a hose station and portable extinguisher provided in each RHR room.
2	Seal penetration to adjacent Reactor Building except at refuel floor.3,
3	Install UL Listed fire door between U1 RHR room (1A) and U2 RHR room (2B).
2	3-hour barrier between the two units RHR rooms.
2	Thermal line type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [7] (2.2.1 and 4.2.1) and [5] (3.2.2).

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Dent
3	LER 90-024, Rev. 00 (11-12-90).
4	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
5	Appendix R Exemption Requests, Section 3.2.
6	GL 86-10 Evaluation S040-QH-0614, Rev. 1.
7	SER, July 21, 1988.
8	NRC Exemption Aug. 18, 1989.
9	SER, March 2, 1994.



**ZONE:** 11.2.4      **AREA:** RB-1      **LOCATION:** RX 1, Elev. 554

**ZONE DESCRIPTION:**

Fire Zone 11.2.4, the northeast corner room, is located on elevation 554 of the Unit 1 Reactor Building and contains the pumps and heat exchanger for one loop of the Residual Heat Removal (RHR) System.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by an exterior wall on the east side of the building along column line N. The north wall of the area lies on column 13 and is shared by zone 11.3.2 in area RB-2. The third wall of this triangular-shaped space consists of a wall along a southeast to northwest line which is shared by the torus area, fire zone 1.1.1.1.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.1.1, southwest	RB-1
1.1.1.2, above	RB-1
11.3.2, north	RB-2

**DETECTION:**

General area linear heat detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The other predominant fixed combustible is the lubricating oil associated with the RHR pumps. The remainder of the fixed combustibles consists of various materials distributed throughout the zone. The only fixed combustibles capable of sustaining a fire are the electrical cables and the lube oil. The cable trays are fifteen or more feet above the floor and the tray risers from the zone above are fire stopped where they penetrate the floor. The lube oil is contained in the bearing housings of the two RHR pumps. Thus, any release of this combustible to the zone would be significantly less than the total amount present.

Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The hazard associated with transients in this zone, is the potential for a fire which may expose combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of such a fire are the electrical cables and the lubricating oil, should it be released from the bearing housings.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification should initiate fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 11.2.4:**

The development of a significant fire in this area is dependent on tray involvement or a lube oil spill. The likelihood of tray involvement is limited due to the height of the trays above the floor and the fact that the lower tray is of solid bottom construction with a tight fitting cover. Thus, ignition of the cables in it is unlikely and its presence shields the trays above from the plume of fires located below. The high ceiling in the area, and the vertical vent paths provided would limit the buildup of any significant stratification layer, thereby minimizing thermal layer radiation to combustibles within the zone. The lubricants in the zone are separately housed, making a spill of the entire inventory unlikely. The limited spill potential and the characteristics of oil spills on concrete substrates mean that a spill fire is unlikely and that should one occur it would be of limited severity and duration. Thus, fire involvement is expected in only a portion of the zone.

**Fire Spread Potential Within Fire Area RB-1:**

The potential for fire spread to zone 1.1.1.2, above, is limited by the reinforced concrete floor which separates the two zones and the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor, preventing upward fire spread along the cables. In locations where there are open penetrations in the floor (e.g., stairways, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Regardless, heat and smoke from fires in zone 11.2.4 would vent to zone 1.1.1.2.

Fire spread to zone 1.1.1.1 is unlikely due to the substantial reinforced concrete barrier which separate the two. A non-rated, water-tight door in the barrier provides for personnel access between the two zones. The door design is such that a combustible liquid spill in zone 11.2.4. would not flow to zone 1.1.1.1; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.1.1. In addition, there are a number of unsealed penetrations in the barrier. However, given the distribution of combustibles in 1.1.1.1 and its high ceiling height, ignition of combustibles in that zone is unlikely. The fire potential for zone 11.2.4 is not sufficient to challenge the barrier and fire spread is not likely.

**Fire Spread Potential To Fire Area RB-2:**

Fire spread to fire area RB-2 is unlikely due to separation by three-hour rated construction. Such construction would not be challenged by any fire which can credibly occur in zone 11.2.4.

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**Fire Zone: 1.1.2.1****Unit 2 Reactor Building Basement****Fire Area:** RB-2N/RB-2S    **F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 12,868 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat detectors (linear thermal) have been installed in each cable tray and below the bottom cable trays.
<b>Suppression:</b>	Local area sprinkler protection is provided in the immediate vicinity of the only cable riser that passes through the ceiling in this zone.
<b>Manual Suppression:</b>	Portable fire extinguishers and hose stations equipped with 100 feet of hose.
<b>Other FP features:</b>	Portions of the Division I and II trays, where they are routed within 20 feet of each other, are wrapped with a 1-hour fire resistive material.
<b>Suppression Effects:</b>	The safe shutdown equipment located in this zone consists of valves which will not be adversely affected by application of water or leakage of water from floor levels above since they can be operated manually. Water will collect in this area where it will be removed by sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
DW-2	3 Hour
TB-I	Equivalent 3 Hour [4], [5]
TB-II	Equivalent 3 Hour [4], [5]
RB-1N	3 Hour

**Fire Zone: 1.1.2.1****Unit 2 Reactor Building Basement****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
11.1.4	RB-2S	Non-rated	noncombustible, open mechanical	One watertight door.	4'-0" thick concrete
5.0*	TB-II	3 hour	3 hour	No doors	2'-0" thick concrete
8.2.6.C*	TB-II	3 hour	3 hour	No doors	2'-0" thick concrete
1.1.2.2	RB-2N	Non-rated [4][5]	noncombustible, open mechanical	No doors	1'-0" thick concrete ceiling
11.3.2	RB-2S	Non-rated	noncombustible, open mechanical	One watertight door.	3'-0" thick concrete
11.3.1	RB-2S	Non-rated	noncombustible, open mechanical	One watertight door.	3'-0" thick concrete
1.1.1.1	RB-1N	3 hour [4]	3 hour [F-41, 42, &	No doors	3'-0" thick concrete
1.2.2	DW-2	3 hour [4][7]	All penetrations	No doors	5'-0" thick concrete
8.2.6.E*	TB-I	Non-rated	noncombustible	No doors	4'-0" thick concrete ceiling
11.3.4	RB-2N	Non-rated	none	One watertight door.	3'-0" thick concrete
11.3.3	RB-2N	Non-rated	noncombustible, open mechanical	One watertight door.	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 1.1.2.1****Unit 2 Reactor Building Basement****Fire Protection Commitments:**

Reference Section	Commitment
5, 4.2.4.2	Transient combustibles and ignition sources are administratively controlled. Also reference [3](2.1.2, 2.2.2, & 2.2.3) and [5](11.2.3.3).
4, 2.2.5	Automatic sprinklers near cable tray at south wall of Units 1 & 2.[1]. At single vertical cable riser, below and through 595' floor elevation [5](4.2.2, 4.4.2, & 11.2.2) and [3](2.2.2).
3, 2.1.2	Fire detection is provided with some exceptions. Linear thermal detection in each torus area cable tray and below bottom cable tray [1], [3](2.2.2, 2.2.3), [4](2.2.5), [5](4.2.2, 4.2.3, 4.2.7, 4.4.2, 4.4.4.1, & 11.2.2).
6	U1 and U2 separated by 3-hour rated fire barriers at torus level. Also reference [4]9.2.
4, 8.2, 2.2.5	Manual fire fighting equipment is available for zone. Available at entrance to torus [3](2.1.2). Fire brigade to control fire & smoke using manual equip.[3](2.1.3 & 3.0).
4, 2.2.6	Cables and cable trays have conduit seals between 1.1.2.1.S and 1.1.2.1.N (instead of 1-hour wrap as in 1.1.1.1) where w/in 20 feet. [5](4.2.2, 4.4.2, 4.2.4.3, 11.2.2) Install 1-hr. fire barrier between div. cable trays in RB [1]. 1-hr. wrap provided.
5, 4.2.4.2	Cable penetrations to the U2 Cable Tunnel and 1.1.2.2 are sealed with fire resistive materials.
4, 9.2	3-hour separation between RB and TB with exceptions. Also reference [9].
4, 2.2.6	Redundant RHR cables are routed more than 125 feet apart. Also reference [5](4.2.4.3).
5, 11.2.3.3, 11.1.2.3.1 & 11.2.3.4	All electrical / cable penetrations are sealed with noncombustible materials between elevations (floors and ceilings) in the Reactor Building
3, 2.1.3	Control room alerted of fire condition via detection system.
5, 4.2.4.2	No combustibles pass through unsealed penetrations. Cables at K/13 are the only combustibles to pass between zones.

**Fire Zone: 1.1.2.1****Unit 2 Reactor Building Basement****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
2	SER, June 23, 1983.
3	SER, February 25, 1991
4	SER, July 21, 1988.
5	Appendix R Exemption Requests 4.2.
6	GL 86-10 Evaluation S040-QH-0615, Rev. 1..
7	The torus comprises a portion of the Unit 2 Primary Containment. Since it is a partially water-filled vessel, and is inert during operation, the barrier rating is not applicable.
8	SER, March 2, 1994.
9	GL 86-10 Evaluation S040-QH-0612, Rev. 1.



**ZONE:** 1.1.2.1      **AREA:** RB-2      **LOCATION:** RB2, Elev 554'

**ZONE DESCRIPTION:** Unit 2 Torus Area, North and South

**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hours. The combustible loading is still considered low.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE SPREAD POTENTIAL WITHIN ZONE 1.1.2.1:**

This zone is unusual in that it is divided into a north and a south section. Fire spreading from one section to the other would adversely affect safe shutdown. Fire spread between the two sections is prevented by the low combustible loading, and by a space clear of intervening combustibles.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 1.1.2.1 which are in separate fire areas or which contain safe shutdown equipment that is redundant or alternate to the equipment in this zone. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

<b>Zone</b>	<b>Area</b>	<b>Fire Resistance Rating</b>
1.2.2	DW-2	3 hour
1.1.1.1	RB-1	3 hour
1.1.2.2	RB-2	Non-rated
5.0	TB-II	3 hour
8.1	TB-II	3 hour
8.2.6.C	TB-II	3 hour
8.2.6.E	TB-I	Non-rated

**EVALUATION – ZONE 1.2.2:**

The primary containment is inerted during plant operation, so fire spread into containment is not a concern. No further evaluation is required.

**EVALUATION - ZONE 1.1.2.2:**

This zone is separated from Zone 1.1.2.1 by a 1-foot thick concrete floor. The cable risers that penetrate this floor are fire stopped. There are open mechanical penetrations in the floor, however, the lack of combustibles in the immediate vicinity of the openings and vertical vent paths should limit the potential for fire spread to Zone 1.1.2.2. The low combustible loading is not sufficient to challenge the integrity of the barrier.

**EVALUATION - ZONE 8.2.6.E:**

This zone is separated from Zone 1.1.2.1 by a 4-foot thick concrete floor. All penetrations through the floor are sealed with non-combustible material. Equipment access hatches are closed with concrete floor plugs. The concrete floor plugs are not a tested configuration, but they are heavily built and fit tightly. The low combustible loading is not sufficient to challenge the integrity of the barrier.

**Fire Zone: 1.1.2.2****Unit 2 Reactor Building Ground Floor****Fire Area:** RB-2N**F Drawing:** F-3-1,13-1**General Elevation:** 595'-0"**Zone Area:** 11,629 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	A general area smoke detection system is provided throughout the zone, with the exception of the MSIV room. Local area heat (thermal) detectors are installed above the drywell to torus DP air compressors.
<b>Suppression:</b>	A local area preaction system is provided above the drywell to torus DP air compressors. The ACAD unit has been taken out of service. The preaction system protecting the ACAD unit has been removed. Reference DCP 9600187.
<b>Manual Suppression:</b>	Portable fire extinguisher(s). Manual hose stations are located in each corner of the ground floor. Each hose station is equipped with 100 feet of hose.
<b>Other FP features:</b>	Curbs are provided around drywell air pack unit. Drywell penetrations (X-100F and X-104A) are protected by 3 hour rated enclosures. An automatic closure actuated by a smoke detector is located on the door between the MSIV room and the ground floor of the Reactor Building.
<b>Suppression Effects:</b>	Water or carbon dioxide release from piping breaks, manual hose streams, or suppression systems onto equipment in this zone can be tolerated as any adverse effects would be less severe than those determined to be acceptable for a design basis fire. Water runoff may be handled by the floor drainage system in the general area. MCC 28/29-5 is mounted on a 3 1/2-inch pedestal, and the cable connections on top of the panel are sealed.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2S	Equivalent 3 Hour [9]
DW-2	3 Hour
RB-1/2	3 Hour
TB-I	Equivalent 3 Hour [9]
TB-II	3 Hour
RB-1N	3 Hour

**Fire Zone: 1.1.2.2****Unit 2 Reactor Building Ground Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.7.D* (ceiling)	TB-I	Non-rated	noncombustible	No doors	2'-0" thick concrete ceiling
8.2.7.D* (wall)	TB-I	3 hour	3 hour	No doors	4'-0" thick concrete
8.2.7.C*	TB-II	3 hour	3 hour	No doors	4'-0" thick concrete
5.0*	TB-II	3 hour	3 hour (F-53)	No doors	5'-0" thick concrete
8.2.6.E* (w/o MSIV)	TB-I	3 hour	3 hour (F-54 & 57)	One Class A door.	4'-0" thick concrete(west), 1'-6" (north)
8.2.6.C*	TB-II	3 hour	3 hour (F-53)	No doors	4'-0" thick concrete
1.1.2.3	RB-2N	Non-rated [8][9]	noncombustible, open mechanical	One Fire Damper	1'-0" thick concrete
9.3*	RB-1/2	3 hour [9]	3 hour (F-52)	No doors	1'-6" thick concrete
11.3.4	RB-2N	Non-rated [8][9]	noncombustible, open mechanical	No doors	2'-0" thick concrete
11.3.2	RB-2S	Non-rated [8][9]	noncombustible, open mechanical	No doors	2'-0" thick concrete
1.1.2.1	RB-2N/RB-2S	Non-rated [8][9]	noncombustible, open mechanical	No doors	1'-0" thick concrete
1.1.1.2	RB-1N	3 hour [8][9]	3 hour (F-49 & 50)	One Class A door	3'-0" thick concrete
1.2.2	DW-2	3 hour [8][9]	3 hour	No doors	5'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 1.1.2.2****Unit 2 Reactor Building Ground Floor****Fire Protection Commitments:**

Reference Section	Commitment
5, 4.2.4.1	No combustibles pass through unsealed penetrations. Cables at K/13 are the only combustibles to pass between zones. Also reference [5](4.2.4.2).
1, 5.9.6	The suppression chamber drywell air pack units will be curbed and protected by an automatic sprinkler system. Also reference [1](3.1.5, 3.1.11, & 4.3.1.4).
1, 5.9.6	Waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Cabinet to be provided on Unit 2 Reactor mezzanine floor [1](3.1.11). No flammable liquids cabinet provided.
1, 5.9.6	Lube oil storage will be limited to a maximum container size of five gallons.
1, 5.9.6	Seal top of electrical cabinets, switchgear, and MCC's[1](3.1.10). The MCC's will be protected from water damage[1](5.9.6).
1, 5.8.6, 3.1.8	3-hour separation provided between Reactor Bldgs. [7] Provide Class A fire doors between Units 1 and 2 in the Reactor Building.
2, PF 15-1	Seal top of MCC's 28/29-5.
3, (13) 2.B.	Install automatic sprinkler system to protect the differential pressure system compressors. Also reference [9](2.3, 3.2.2), [5](4.2.2, 4.2.8, & 4.4.2).
9, 2.2.4	Smoke detection provided for zone [4], [5](4.2.2), With some exceptions (such as the steam chase, airlock, etc.)[9](2.2.5, 4.3.2, 4.4.2). Fire detectors near elect. & mech. penetrations[9](8.2),[5](8.2.2, 11.1.2.2, 11.2.2), [10](2.1.2, 2.2.2, 2.2.3).
4	Seal penetrations to adjacent Reactor Building except at refuel floor.
5, 11.2.3.3, 11.1.2.3.1 & 11.2.3.4	All electrical penetration sealed between elevations in the RB with noncombustible materials.
1, 5.9.6	Early warning fire detection system will be provided in the area of the motor control centers (including 480V MCC 28/29-5) and the cable penetrations to the turbine building.
9, 2.2.4	Manual fire fighting equipment is available for this zone. Also reference [1](5.9.4), [5](11.1.2.2, 11.2.2, 4.2.2), [9]( 8.2) and [10](2.1.2, 2.2.2, 2.2.3). Fire brigade to control fires using manual eq.[10](2.1.3).
10, 2.1.3	Control room alerted of fire condition via detection system.
10, 2.1.2	Transient combustibles and ignition sources are administratively controlled. Also reference [5](4.2.4.1, 4.4.4.2, 11.1.2.3.1 & 11.2.3.4).
6	Generally, 3-hour separation provided between TB and U2 RB. Exceptions include steam pipe chase area. Separated from TB by substantial shield walls, with locked metal doors at steam chase interface w/ 8.2.6.E

**Fire Zone: 1.1.2.2****Unit 2 Reactor Building Ground Floor**

- 5, 11.1.2.4                      Emergency lighting is available for reactor water level instruments.
- 9, 2.2.5                         Single cable riser sealed with fire resistive material. From 1.1.2.1 below.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter dated 12-27-78 from CECO to NRC.
3	Document dated 4-10-78. Rev. 3 of the Fire Protec
4	Letter dated 12-18-84, B. Rybak (CECO) to R. Denton.
5	Appendix R Exemption Requests, Section 11.1 & 11.2
6	GL 86-10 Evaluation S040-QH-0612, Rev. 1.
7	GL 86-10 Evaluation S040-QH-0615, Rev. 1.
8	NRC Exemption dated August 18, 1989.
9	SER, July 21, 1988.
10	SER, February 25, 1991
11	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
12	SER, March 2, 1994.
13	Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-136, QDC-98-138.

**ZONE:** 1.1.2.2      **AREA:** RB-2      **LOCATION:** RX 2, Elev. 595

**ZONE DESCRIPTION:**

Fire Zone 1.1.2.2 consists of two areas on elevation 595 of the Unit 2 Reactor Building.

- One area, the ground floor of the building, extends from the 595 foot elevation to the bottom of the floor at elevation 623 and is bounded by the exterior wall on the east and north sides of the building and by column line H to the west and 13 to the south, with the drywell in the center.
- The other area, the MSIV room, is bounded on the east by the drywell and extends from elevation 595 to elevation 623 east of column line H. West of column line H, the area extends from elevation 595 to the bottom of the floor of the 611 foot, 6 inch elevation. The west wall of this area lies along column line G. The portions of this area west of column line H are bounded by walls separating it from various zones in the Turbine Building.

The two areas of zone 1.1.2.2 are separated by reinforced concrete shield walls, however there is an unrated access through the south shield wall. This access is fitted with a non-rated door which is normally open during operations.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.2.1.S, 1.1.2.1.N, below	RB-2
11.3.2, 11.3.4, below	RB-2
1.1.2.3, above	RB-2
1.2.2	DW-2
9.3	RB-1/2
1.1.1.2	RB-1
8.2.6.E	TB-I
8.2.7.D	TB-I
8.2.6.C	TB-II
8.2.7.C	TB-II
5.0	TB-II

**DETECTION:**

Ionization detection is provided throughout the zone with the exception of the MSIV room.

**AUTOMATIC SUPPRESSION:**

Local sprinkler protection for:

- The area of the Drywell/Torus D/P Compressors (northwest corner of the zone); and

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The remainder of the fixed combustibles consists of discrete materials distributed with good spatial separation. This means that the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables. Full involvement of the cables is precluded by fire stops and, in the area near the equipment hatch, by trays covered for a length of approximately twenty five feet. With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor.

Transients account for a large portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. A look at the individual tasks for each activity, shows that the combustibles involved would be in discrete "fuel packets" and would not have the spatial continuity to produce a fire capable of propagating throughout the zone. Rather, the real hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables.

Of the combustibles in this zone, virtually none are located in the MSIV room.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out. The lack of such a system in the MSIV room is of little concern due to the sparse combustibles located there.



The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 1.1.2.2:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles. Spread between the two areas of the zone is precluded by the reinforced concrete shield walls which separate them and the extremely light combustible loading in the MSIV room. In the main portion of the zone, the combustibles are limited, with the exception of the electrical cables in the tray system. Thus, significant fire spread in this area is dependent on tray involvement. Should the trays become involved, the discontinuity of the exposed cables due to fire stopping or covering, the high ceiling in the area, and the vertical vent paths provided would limit the involvement to only a portion of the zone.

##### **Fire Spread Potential Within Fire Area RB-2:**

Fire spread to the zones below 1.1.2.2 is unlikely due to the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor, preventing downward fire spread along the cables. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could become involved and flow to the zones below via the floor openings (e.g., stairway openings).

The potential for fire spread to the zone above is limited by the reinforced concrete floor which separates the two zones and the discontinuity of combustibles. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch, pipe penetrations), the lack of combustibles in the immediate area of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Cable riser penetrations are sealed at the floor and, thus, do not provide a path for vertical fire spread.

**Fire Spread Potential To Fire Area RB-1/2:**

Fire spread to fire area RB-1/2 is unlikely due to separation by three-hour rated construction. Such construction should not be challenged by any fire which can credibly occur in zone 1.1.2.2.

**Fire Spread Potential To Fire Area TB-I:**

Fire area TB-I is separated from zone 1.1.2.2 by a three-hour rated, reinforced concrete, barrier and by the concrete shield walls of the MSIV room. The fire loading in zone 1.1.2.2 is not sufficient to challenge the integrity of the three-hour rated barrier separating it from the Turbine Building; thus fire spread via this path is not credible.

The MSIV room is separated from the remainder of the zone by floor-to-ceiling, reinforced concrete, shield walls of substantial construction. These barriers have sufficient thickness to sustain a fire of significantly more than three-hour severity. However, as mentioned elsewhere, there is an unprotected access penetration through the south shield wall between column line H and the drywell shield wall. The combustible loading in the MSIV room is quite low, with no exposed electrical cables or other significant combustibles. Although the MSIV room is of substantial construction, there are unrated penetrations in the barriers separating it from the Turbine Building. These consist primarily of an air lock with non-rated doors, a non-rated steel ceiling assembly, and the steam line penetrations into Fire Area TB-I. Thus, the MSIV room is, in effect, a space of significantly reduced combustibles between the remainder of zone 1.1.2.2 and the Turbine Building; serving effectively as a zone free of intervening combustibles. In consideration of this, the propagation of a fire from the main portion of zone 1.1.2.2 into the Turbine Building is not considered credible. Should a fire originate in the MSIV room, propagation into the Turbine Building is equally unlikely due to the small and discontinuous quantities of combustible materials available. Access to the MSIV room is highly restricted during plant operations due to the high radiation field encountered there. This eliminates the potential for buildup of transients and the possible introduction of ignition sources during plant operation.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II is separated from zone 1.1.2.2 by reinforced concrete barriers. The spread of fire into the Turbine Building via this avenue is not considered credible for the reasons stated above for fire area TB-I.

**Fire Spread Potential To Fire Area RB-1:**

Fire area RB-1 is separated from zone 1.1.2.2 by a three-hour rated barrier. The fire loading in zone 1.1.2.2 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issues identified in the SER relative to zone 1.1.2.2 are addressed below. Each issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**5.0 Separation of Redundant RHR Trains: Zones 1.1.2.1, 1.1.2.2, and 11.3.2**

**Issue:** The barrier shared by 1.1.2.1, 1.1.2.2, and 11.3.2 deviates from Appendix R with respect to separation of redundant RHR-related cables. The principle concern is the potential for fire extension between elevations.

**Evaluation:** As discussed under **Factors Influencing Fire Impact**, above, the primary fixed combustibles in zone 1.1.2.2 are electrical cables located in the overhead trays. Due to their location, these trays do not constitute a direct exposure to the barrier separating zone 1.1.2.2 from zones 1.1.2.1 and 11.3.2, both located below. This topic has been explored in the discussion of **Fire Spread Potential**, above. Based on that exploration, the possibility of fire spread to the zones below 1.1.2.2 is highly unlikely and, therefore, the separation provided is acceptable for the hazard. This finding is consistent with that of the existing SER.

14.0 Separation of Redundant Reactor Vessel Level Indicating Instrumentation: Zones 1.1.2.2 and 1.1.2.3

**Issue:** These zones contain redundant reactor vessel level indicating instrumentation which, with respect to the separation of the instruments and their sensing lines, deviates from the separation requirements of § III.G.2 of App. R to 10 CFR 50. The principle concern is that a fire in one of these zones could spread to the adjacent fire zone and damage redundant reactor level instrumentation.

**Evaluation:** The reactor level can be read from instruments mounted on racks, two of which are in each of these zones. Separation can be considered adequate if a given fire will not result in the loss of the instruments in both zones. As discussed under **Fire Spread Potential**, fire spread between the two zones is not considered realistic and redundant instrumentation would not be lost. Thus, the existing separation is adequate for the hazard.

For a severe fire in zone 1.1.2.2, the safe shutdown procedures call for local reading of level instruments by operations personnel. These instruments are located on instrument racks in zone 1.1.2.2. The instruments on rack 2202-58 are to be used for fires in all portions of the zone, except fires south of the south CRD bank. The instruments on rack 2202-7 are to be used in that circumstance. Accessibility of the instruments during a fire must be considered.

Rack 2202-58 is in zone 1.1.3.1, the south core spray pump room. These instruments should be accessible during fires in all except the southern portion of zone 1.1.2.2, since they are separated from the fire area by a heavy reinforced concrete floor. Although there are open penetrations in this floor, they would be a significant distance from the location of the fire and, due to the openings in the floor separating zone 1.1.2.2 from the zone above, venting of the smoke and heat to zone 1.1.2.3 should occur. This venting, in concert with the high ceilings of zone 1.1.2.2 and its relatively large area compared to the quantity of involved combustibles should preclude smoke and heat banking down to a level that personnel at the instrument rack would be affected.

Instrument rack 2202-7 is located on the north side of the drywell in zone 1.1.2.2. For a fire in the portion of the zone south of the southern CRD hydraulic units, the physical separation provided by the intervening drywell, the high ceilings of zone 1.1.2.2, and the many paths for vertical venting of heat and smoke, should allow access to rack 2202-7 for determining reactor level.

Thus, a fire in zone 1.1.2.2 should not preclude access to at least one set of reactor level instruments.

15.0 Separation of Redundant Suppression Pool Level Indicators: Zones 1.1.1.1, 1.1.1.2  
1.1.2.1 and 1.1.2.2

**Issue:** These zones do not provide 20 feet of space free of intervening combustibles between redundant components (e.g., suppression pool level instrumentation).

**Evaluation:** The safe shutdown procedure for fire in fire zone 1.1.2.2 calls for monitoring suppression pool level using the sightglass in fire zone 1.1.2.1, the torus area. Based on the assessment of **Fire Spread Potential**, above, fire spread to zone 1.1.2.1 is not considered credible. Additionally, access to the instrument should not be precluded due to the physical separation provided by the intervening floor, the high ceilings of zone 1.1.2.2, and the many paths for vertical venting of heat and smoke from the affected zone. Thus, suppression pool level instrumentation should be available for performing safe shutdown operations and, therefore, adequate separation is deemed to exist.

**CONCLUSION:**

The evaluations presented above for fire zone 1.1.2.2 demonstrate that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

- The barrier shared by 1.1.2.1, 1.1.2.2, and 1.1.3.2 deviates from Appendix R with respect to separation of redundant RHR-related cables. However, the separation provided is sufficient for the hazard and a fire in zone 1.1.2.2 will not result in the loss of redundant RHR trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.
- The separation between Zone 1.1.2.2 and the Turbine Building deviates from Appendix R with respect to separation of redundant RHR-related components. However, the separation provided is sufficient for the hazard and a fire in zone 1.1.2.2 will not result in the loss of redundant RHR-related components in the Turbine Building. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.
- The separation between zones 1.1.2.2 and 1.1.2.3 deviates from § III.G.2 of Appendix R with respect to separation of redundant reactor level instrumentation. However, the separation provided is sufficient for the hazard and a fire in zone 1.1.2.2 will not result in the loss of redundant reactor level instrumentation. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.
- The separation between zones 1.1.2.1 and 1.1.2.2 does not provide 20 feet of space free of intervening combustibles between redundant components (e.g., suppression pool level instrumentation). However, the separation provided is sufficient for the hazard and a fire in zone 1.1.2.2 will not result in the loss of redundant suppression pool level instrumentation. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 1.1.2.3****Unit 2 Reactor Building Mezzanine Floor****Fire Area:** RB-2N**F Drawing:** F-4-1**General Elevation:** 623'-0"**Zone Area:** 12,303 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	A general area smoke detection system is provided throughout the zone with the exception of the regenerative and nonregenerative heat exchanger room, the cleanup recirculation pump rooms, and the cleanup decant pump phase separator pump room.
<b>Suppression:</b>	None
<b>Manual Suppression:</b>	Portable fire extinguishers and four hose stations equipped with 100 feet of hose.
<b>Other FP features:</b>	Tops of electrical cabinets and MCCs are sealed to prevent water damage.
<b>Suppression Effects:</b>	Water release from piping breaks and manual hose streams onto equipment in this zone can be tolerated as adverse effects would be less than those determined to be acceptable for a design-basis fire.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
DW-2	3 Hour
24-1	Equivalent 3 Hour [1]
23-1	3 Hour
TB-I	Equivalent 3 Hour [1]
TB-II	Equivalent 3 Hour [1]
RB-1N	3 Hour

**Fire Zone: 1.1.2.3****Unit 2 Reactor Building Mezzanine Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.8.D*	23-1	3 hour	3 hour (F-64 & 65)	No doors	4'-0" thick concrete
8.2.7.D*	TB-I	3 hour [1][2]	3 hour (F-64, 65) except 4kV bus duct (SWGR 23-1).	No doors	4'-0" thick concrete
8.2.7.C*	TB-II	3 hour [1][2]	3 hour (F-63, 64) except SBGT.	No doors	4'-0" thick concrete
1.1.2.2	RB-2N	Non-rated. [1][2]	noncombustible, open mechanical	One Fire Damper	1'-0" thick concrete
8.2.8.C*	24-1	3 hour	3 hour	No doors	4'-0" thick concrete wall (2'-0" thick at floor)
1.1.2.4	RB-2N	Non-rated [1][2]	noncombustible, open mechanical	No doors	1'-0" thick concrete ceiling
1.2.2	DW-2	3 hour [1][2]	3 hour	No doors	5'-0" thick concrete
1.1.1.3	RB-1N	3 hour [1][2]	3 hour except 4kV bus duct [1] (F-61, 62)	One Class A door,	2'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 1.1.2.3****Unit 2 Reactor Building Mezzanine Floor****Fire Protection Commitments:**

Reference Section	Commitment
3, 5.8.6	A Class A fire door will be provided in the wall separating Unit 1 and Unit 2 at this elevation. Also reference [3](3.1.8).
3, 3.1.8	Install fire detection over cable pan areas column / row H/12 & H/7-8. Per the commitment matrix.
6, 11.1.2.2	Complete smoke detection mezz. floors in Reactor Building. Except regen., nonregen., recirc., and decant room. Also reference [5].
12	U1 and U2 reactor buildings separated by 3-hr. barrier and Class A door. Seal penetrations to adjacent Reactor Building except at refuel floor [4].
6, 11.1.2.3.1 & 11.2.3.4	All cable and electrical penetrations are sealed between elevations in the reactor building.
1, 8.2	Manual fire fighting equipment (hose reels & port. extinguishers) is available for this zone. Also reference [3](5.8.4), [6](11.1.2.2), and [7](2.1.2).
3, 5.8.6	Provide an early warning fire detection system in the area of the MCC's and at the cable penetrations to the turbine building. Install fire detection near safety related MCC's (MCC 28-3). [3](3.1.1.(b)).
13	Fire zone 1.1.2.3 is generally separated from the Turbine Building by 3-hour barriers. 3-hour separation between the TB and RB with exceptions.
7, 2.1.3	Control room alerted of fire condition via detection system.
7, 2.1.2	Transient combustibles are administratively controlled. Also reference [6](11.1.2.3.2).
8	No combustibles in 4-kV bus duct near fire barrier. Nonrated seal at bus duct penetration. No continuity of combustibles through bus duct penetration (SWGR feed from 1/2 DG).
8	No combustibles inside metal SBTG piping. Piping is mechanically restrained at penetrations. No continuity of combustibles through SBTG penetration.
6, 11.1.2.4	Emergency lighting is available for reactor water level instrumentation.



**Fire Zone: 1.1.2.3****Unit 2 Reactor Building Mezzanine Floor**

1, 8.2 Fire detectors are provided near electrical and mechanical penetrations. Also reference [6]8.2.2).

7, 2.1.3 Fire brigade to control fires using manual equipment.

**Notes and References:****Number    Description**

- 1 SER, July 21, 1988.
- 2 NRC Exemption, August 18, 1989.
- 3 SER, July 27, 1979.
- 4 Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
- 5 GL 86-10 Evaluation S040-QH-0615, Rev. 1.
- 6 Appendix R Exemption Requests, 11.1 & 11.2.
- 7 SER, February 25, 1991
- 8 GL 86-10 Evaluation S040-QH-0610, Rev. 1.
- 9 Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
- 10 SER, March 2, 1994.
- 11 Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-136.
- 12 GL 86-10 Evaluation S040-QH-0612, Rev. 1.

**ZONE:** 1.1.2.3      **AREA:** RB-2      **LOCATION:** RX 2, Elev. 623

**ZONE DESCRIPTION:**

Fire Zone 1.1.2.3 consists of elevation 623 of the Unit 2 Reactor Building. The zone extends from the 623 foot elevation to the bottom of the floor at elevation 647 and is bounded by the exterior wall on the east and north sides of the building and by column line H to the west and 13 to the south, with the drywell in the center.

**BARRIERS:** This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.2.2, below	RB-2
1.1.2.4, above	RB-2
1.2.2, center	DW-2
1.1.1.3, south	RB-1
8.2.7.C, west	TB-II
8.2.7.D, west	TB-I
8.2.8.C, west	24-1
8.2.8.D, west	23-1

**DETECTION:**

With the exception of the Reactor Water Clean Up (RWCU) system areas<sup>1</sup>, fire detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**Fire Severity:**

Less than 1.25 hour

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone consists primarily of electrical cables. The remainder of the fixed combustibles consists of various materials distributed with good spatial separation. Thus, the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables.

With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor.

Transients account for moderate portion of the total combustibles which may be in the zone. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

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<sup>1</sup> The RWCU heat exchanger room, the RWCU pump room, and the cleanup phase separator decant pump room.

A look at the individual tasks for each activity, shows that the combustibles involved would be in discrete "fuel packets" which would not have the continuity necessary to produce a fire capable of propagating throughout the zone. The primary hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow propagation rate of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

## **FIRE SPREAD POTENTIAL:**

### **Fire Spread Potential Within Fire Zone 1.1.2.3:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles which, with the exception of the electrical cables in the tray system, are quite limited. Thus, significant fire spread in this area is dependent on tray involvement. The trays containing exposed cables on this elevation are not fitted with fire stops and do not have any covered sections. Thus, fire propagation along the length of the trays is theoretically possible. When one considers the rate at which such fires propagate, there is ample time for fire brigade intervention. Considering this and the ability to provide timely brigade callout, fire spread throughout the area is not likely.

**Fire Spread Potential Within Fire Area RB-2:**

Fire spread to zone 1.1.2.2, located below 1.1.2.3, is unlikely due to separation by a floor of reinforced concrete construction and the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor, preventing downward fire spread along the cables. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could become involved and flow to the zone below via floor openings such as stairways.

The potential for fire spread to the zone above is limited by the reinforced concrete floor separating the two zones and the discontinuity of combustibles. In locations where there are open penetrations in the floor (e.g., stairways, equipment hatch, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Cable riser penetrations are sealed at the floor and, thus, do not provide a path for vertical fire spread.

**Fire Spread Potential To Fire Area TB-I:**

Fire area TB-I is separated from zone 1.1.2.3 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.2.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II is separated from zone 1.1.2.3 by a three-hour rated, reinforced concrete, barrier. The fire loading in zone 1.1.2.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area 24-1:**

Fire area 24-1 (zone 8.2.8.C) is separated from zone 1.1.2.3 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.2.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area 23-1:**

Fire area 23-1 (zone 8.2.8.D) is separated from zone 1.1.2.3 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.2.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area RB-1:**

Fire area RB-1 is separated from zone 1.1.2.3 by a three-hour rated barrier. The fire loading in zone 1.1.2.3 is not sufficient to challenge the integrity of the three-hour rated barrier; thus fire spread via this path is not credible.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issues identified in the SER relative to zone 1.1.2.3 are addressed below. Each issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**14.0**    Separation of Redundant Reactor Vessel Level Indicating Instrumentation: Zones 1.1.2.2 and 1.1.2.3

**Issue:** These zones contain redundant reactor vessel level indicating instrumentation which, with respect to the separation of the instruments and their sensing lines, deviates from the separation requirements of § III.G.2 of Appendix R to 10 CFR 50. The principle concern is that a fire in one of these zones could spread to the adjacent fire zone and damage redundant reactor level instrumentation.

**Evaluation:** The reactor level can be read from instruments mounted on racks, two of which are in each of these zones. Separation can be considered adequate if a given fire will not result in the loss of the instruments in both zones. As discussed under **Fire Spread Potential**, fire spread between the two zones is not considered realistic and the redundant instrumentation would not be lost. Thus, the existing separation is adequate for the hazard.

For a severe fire in zone 1.1.2.3, the safe shutdown procedures call for local reading of level instruments by operations personnel. These instruments are located on instrument rack 2202-58 in zone 11.3.1. Accessibility of the instruments during a fire in zone 1.1.2.3 should not be a problem due to the vertical separation of the two zones by zone 1.1.2.2 and the associated floors. Vertical venting paths for zone 1.1.2.3, along with the large building volume and the limited quantity of involved combustibles should preclude smoke banking down to a level that personnel in zone 11.3.1 would be adversely affected. Neither is fire spread to zone 11.3.1 a realistic concern due to the separation provided and the quantity and distribution of combustible materials. Thus, the effects of fire in zone 1.1.2.3 on entry to zone 1.1.2.2 at the 595 foot elevation should not prevent access to the reactor level instrumentation.

**CONCLUSION:**

The evaluations presented above for fire zone 1.1.2.3 demonstrate that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

- Zone 1.1.2.3, a zone for which alternative SS/D is provided, does not comply with Appendix R since fixed suppression and detection are not provided throughout. However, the suppression and detection provided are sufficient to assure a fire in 1.1.2.3 would not cause a loss of SS/D capability. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

The separation between zones 1.1.2.2 and 1.1.2.3 deviates from § III.G.2 of Appendix R with respect to separation of redundant reactor level instrumentation. However, the separation provided is sufficient for the hazard and a fire in Zone 1.1.2.3 will not result in the loss of redundant reactor level instrumentation. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

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**Fire Zone: 1.1.2.4****Unit 2 Reactor Building Main Floor****Fire Area:** RB-2N**F Drawing:** F-5-1**General Elevation:** 647'-6"**Zone Area:** 12,651 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers and hose stations equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Water release from manual hose streams or piping breaks in this area can be tolerated as no safe shutdown equipment is located in this zone. Water runoff would be handled by the floor drainage system in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
DW-2	Equivalent 3 Hour [7]
24-1	3 Hour
23-1	3 Hour
RB-1N	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
1.1.1.5.A*	TB-IV	2 hour [3]	2 hour (F-77)	No doors	1'-6" thick concrete, 2-hour rated block
8.2.8.D*	23-1	3 hour [3]	3 hour (F-75, 76)	No doors	1'-6" thick concrete
1.1.2.3	RB-2N	Non-rated [5][6]	noncombustible, open mechanical	No doors	1'-0" thick concrete
1.1.2.5	RB-2N	Non-rated [5][6]	noncombustible, open mechanical	No doors	1'-0" thick concrete
1.1.1.4	RB-1N	3 hour [5][6]	3 hour (F-73, 74)	Two Class A doors	2'-0" thick concrete
8.2.8.C*	24-1	3 hour [3][5]	3 hour (F-77, 78) except SBT line	One Class A door,	1'-6" thick concrete
1.2.2	DW-2	3 hour	3 hour except for SBT line [6][7]	No doors	5'-0" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 1.1.2.4****Unit 2 Reactor Building Main Floor****Fire Protection Commitments:**

Reference Section	Commitment
7	No continuity of combustibles through vent system penetration(s). Vent system is metal and restrained at penetrations.
1, 5.7.4	Manual fire fighting equipment (hose reels and portable extinguishers) is available for this zone. Also reference [5](8.2).
7	No continuity of combustibles through SBGT penetrations. No combustibles inside metal SBGT piping. Piping is mechanically restrained at penetrations.
4	3-hour separation between 1.1.2.4 and 1.2.2 except SBGT lines.
3	3-hour separation between Turbine Building and this zone with exceptions.
3	No safe shutdown cables or equipment are located in this zone. Also reference [4].
1, 5.7.6	Wood storage boxes in the area of the control rod storage room will be removed.
9	3-hour separation between Fire Zones 1.1.1.4 & 1.1.2.4 with 2 Class A fire doors and rated seals. Also reference [4]. Seal penetrations to adjacent Reactor Building except at refuel floor [2].
1, 3.1.8	Provide Class A fire doors between Units 1 and 2 Reactor Building Main Floors. Also reference [1](5.8.6).

**Fire Zone: 1.1.2.4****Unit 2 Reactor Building Main Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	GL 86-10 Evaluation S040-QH-0612, Rev. 1.
4	GL 86-10 Evaluation S040-QH-0615, Rev. 1.
5	SER, July 21, 1988.
6	NRC Exemption Aug. 18, 1989.
7	GL 86-10 Evaluation S040-QH-0610, Rev. 1.
8	Intentionally left blank
9	Intentionally left blank
10	One of the doorways between 1.1.1.4 and 1.1.2.4 is protected by two fire doors. Door #175A is a normally closed fire door. This door in the open configuration does not qualify as a 3 hour rated door because the fusible link is located on only one side of the barrier. Door #175 is a normally open sliding fire door.

**ZONE:** 1.1.2.4**AREA:** RB-2**LOCATION:** RB2, Elev. 647'-6"**ZONE DESCRIPTION:** Unit 2 Reactor Building, Third Floor

**FIRE SEVERITY:** The previous fire severity was 0.13 hours and the updated fire severity for this zone is 1.25 hours. The combustible loading is still considered low.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 1.1.2.4, but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.2.2	DW-2.	3 hour <sup>1</sup>
1.1.1.4	RB-1	3 hour
1.1.1.5.A	TB-IV	2 hour
8.2.8.C	TB-IV	3 hour
8.2.8.D	TB-IV	3 hour

<sup>1</sup> Barrier has 3 hour rating except for SBGTS lines.

**EVALUATION – ZONE 1.2.2:**

The primary containment is inerted during plant operation, so fire spread into containment is not a concern. No further evaluation is required.

**EVALUATION – ZONES 1.1.1.4, 1.1.1.5.A, 8.2.8.C, and 8.2.8.B:**

All four of these Fire Zones interface through rated fire barriers of either 2- or 3-hour construction. Given the low combustible loading and the 2- or 3-hour rated barriers, fire spread to any of the four zones is not credible.

**Fire Zone: 1.1.2.5****Unit 2 Reactor Building Reactor Floor****Fire Area:** RB-2N**F Drawing:** F-6-1**General Elevation:** 666'-6"**Zone Area:** 12,359 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers and hose stations equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Piping breaks or the use of manual hose streams would not affect safe shutdown capability since no equipment associated with safe shutdown is located in this zone. Water runoff should be handled by the floor drainage system in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
24-1	3 Hour
DW-2	3 Hour
RB-1N	Equivalent 3 Hour [6][9]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.8.C	24-1	3 hour	3 hour	No doors	1'-0" thick concrete floor
1.1.1.6.A*	TB-IV	3 hour	3 hour (F-106, 107, 108)	No doors, no dampers in HVAC ducts [5][6]	1'-6" thick concrete wall
1.1.1.5.A*	TB-IV	3 hour	3 hour except no dampers in HVAC ducts [5][6]	No doors	1'-6" thick concrete wall
1.1.1.6	RB-1N	Non-rated [5][6][9]	noncombustible, open mechanical[9]	No doors	1'-6" thick concrete ceiling
1.1.2.4	RB-2N	Non-rated [5][6]	noncombustible, open mechanical	No doors	1'-0" thick concrete floor
1.2.2	DW-2	3 hour [5][6]	3 hour	No doors	5'-0" thick concrete wall
1.1.1.5	RB-1N	3 hour equivalent	3 hour except 3 SBGT lines [3][5]	Two Class A doors	2'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 1.1.2.5****Unit 2 Reactor Building Reactor Floor****Fire Protection Commitments:**

Reference Section	Commitment
7	No continuity of combustibles through SBGT penetration. No combustibles inside metal SBGT piping. Piping is mechanically restrained at penetrations.
4	3-hour separation between 1.1.2.5 and 1.2.2.
3	3-hour separation between this zone and the turbine building except HVAC ducts (which do not have fire rated dampers). Also reference [5]9.2.
1, 5.6.4	Manual fire fighting equipment (hose reels and portable extinguishers) is provided for this fire zone. Also reference [5](8.2).
3	No safe shutdown cables or equipment are located in this zone. Also reference [4].
9	3-hour separation between fire zones 1.1.1.5 and 1.1.2.5 except SBGT lines. With two Class A fire doors [4].
4	All electrical penetrations between elevations in the reactor building are sealed with noncombustible materials.
2	Seal penetrations to adjacent Reactor Building except at refuel floor.
1, 3.1.8	Provide Class A fire doors between Units 1 and 2 Reactor Building Reactor Floors. Also reference [1](5.8.6).

**Fire Zone: 1.1.2.5****Unit 2 Reactor Building Reactor Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter dated 12-18-84, B. Rybak (CECO) to R. Denton
3	GL 86-10 Evaluation S040-QH-0612, Rev. 1.
4	GL 86-10 Evaluation S040-QH-0615, Rev. 1.
5	SER, July 21, 1988.
6	NRC Exemption Aug. 18, 1989.
7	GL 86-10 Evaluation S040-QH-0610, Rev. 1.
8	Left intentionally blank
9	Evaluation for fire area separation between RB-1 and RB-2, ER9801567.

**ZONE:** 1.1.2.5      **AREA:** RB-2      **LOCATION:** RX 2, Elev. 666

**ZONE DESCRIPTION:**

Fire Zone 1.1.2.5 consists of elevation 666 of the Unit 2 Reactor Building. The zone extends from the 666 foot elevation to the bottom of the floor at elevation 690 and is bounded by the exterior walls on the east and north sides of the building and by column line H to the west and 13 to the south. The zone is divided in half along the north/south axis by the dryer/separator pit, the drywell shield wall, and the spent fuel pool. A portion of the wall along column line H is an exterior wall.

**BARRIERS:** This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
1.1.2.4, below	RB-2
1.2.2, center	DW-2
1.1.1.5, south	RB-1
1.1.1.6, above	RB-1
1.1.1.5.A, west	TB-IV
1.1.1.6.A, west	TB-IV
8.2.8.C, below	24-1

**DETECTION:**

Fire detection is not provided in this zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**Fire Severity:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. A minor contributor to the fixed loading is the Standby Gas Treatment System (SBGTS) filter media. The remainder of the fixed combustibles consists of various materials distributed with good spatial separation. This separation means that the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables.

With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor.

Transients account for a large portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. A look at the individual tasks for each activity, shows that the combustibles involved would be in discrete "fuel packets" which would not have the continuity necessary to produce a fire capable of propagating throughout the zone. The primary hazard associated with transients in this zone is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables. Due to the construction of the zone, the trays are not continuous from the east side to the west side of the zone.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow propagation rate of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 1.1.2.5:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles which, with the exception of the electrical cables in the tray system, are quite limited. Thus, significant fire spread in this area is dependent on tray involvement. Additionally, the splitting of the zone into east and west portions by the dryer separator pit, drywell shield wall, and spent fuel pool minimizes the likelihood of fire spread throughout the zone. Since the exposed cables are split between the east and west sides of the zone, any significant fire which may occur would be expected to be limited to only a portion of the zone. Given that no detection is provided to alert operations personnel to a fire in the area, timely fire brigade notification is unlikely and extensive cable damage could occur in the involved part of the zone.



**Fire Spread Potential Within Fire Area RB-2:**

Zone 1.1.2.4, located below, is separated from zone 1.1.2.5 by a reinforced concrete floor of substantial construction. There are a number of open penetrations in the floor, some of significant size (e.g., hatchway, stairways). Fire spread to zone 1.1.2.4 is unlikely due to the lack of continuity of combustibles penetrating the floor. The cable risers are fire stopped at the floor level, preventing downward fire spread along the cables. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could become involved and flow to the zone below via floor openings.

The potential for fire spread to zone 1.1.1.6, above, is limited by the reinforced concrete floor which separates the two zones and the discontinuity of combustibles. In locations where there are open penetrations in the floor (e.g., equipment hatch, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely.

**Fire Spread Potential To Fire Area TB-IV:**

Fire area TB-IV is separated from zone 1.1.2.5 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.2.5 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area 24-1:**

Fire area 24-1 (zone 8.2.8.C) is separated from zone 1.1.2.5 by a three-hour rated, reinforced concrete barrier. The fire loading in zone 1.1.2.5 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**Fire Spread Potential To Fire Area RB-1:**

Fire area RB-1 is separated from zone 1.1.2.5 by a three-hour rated barrier. The fire loading in zone 1.1.2.5 is not sufficient to challenge the integrity of the barrier; thus fire spread via this path is not credible.

**Fire Zone: 11.1.4****Unit 2 HPCI Room****Fire Area:** RB-2S**F Drawing:** F-9-1**General Elevation:** 554'-0"**Zone Area:** 1,439 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat linear (thermal) detection above the HPCI pump and turbine.
<b>Suppression:</b>	Local area deluge system above the HPCI pump and turbine.
<b>Manual Suppression:</b>	Portable fire extinguisher(s).
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	No adverse effects on safe shutdown from water release are involved as no safe shutdown equipment is located in this zone. Water would collect in the HPCI room sump pit until removed by pump to the radwaste water collection system.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
CT-2	3 Hour
TB-II	Equivalent 3 Hour [5]
RB-1N	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.6.C*	TB-II	3 hour	3 hour except floor plugs [5]	No doors	3'-0" thick concrete
11.3.1	RB-2S	Non-rated [3][4]	noncombustible, open mechanical	No doors	4'-0" thick concrete
1.1.2.1	RB-2N	Non-rated [3][4]	noncombustible, open mechanical	One unlabeled watertight doors.	4'-0" thick concrete
8.2.5*	CT-2	3 hour	3 hour	No doors	1'-6" thick concrete wall (1'-0" thick at floor)
11.1.3	RB-1N	3 hour [3][4]	3 hour (F-141)	One class A (3-hr.) Door	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.1.4****Unit 2 HPCI Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 5.11.4	Portable extinguisher provided in each HPCI room with hose stations in torus area for backup suppression.
10	Automatic water deluge system provided per [1] (5.11.4).
3, 4.2.7	Fire detection over HPCI pump and turbine.
5	3-hour separation between RB and TB with exceptions. Also reference [3](9.2).
1, 3.1.8	Provide Class A fire door between Unit 1 and 2 HPCI rooms. Also reference [1] (5.8.6 and 5.11.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	SER, July 21, 1988.
4	NRC Exemption Aug. 18, 1989.
5	GL 86-10 Evaluation S040-QH-0612, Rev. 1.
6	Left intentionally blank.
7	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
8	SER, March 2, 1994.
9	Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-136.
10	GL 86-10 Evaluation S040-QH-0615, Rev. 1.

**ZONE:** 11.1.4**AREA:** RB-2**LOCATION:** RB2, Elev. 554'-0"**ZONE DESCRIPTION:** Unit 2 HPCI Room**FIRE SEVERITY:**

The fire severity for this zone is 2.5 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 11.1.4 which are in separate fire areas or which contain safe shutdown equipment that is redundant or alternate to the equipment in this zone. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
11.1.3	RB-1	3 hour
1.1.2.1	RB-2	Non-rated
8.2.5	CT-2	3 hour
8.2.6.C	TB-II	3 hour <sup>1</sup>

1 The seals are rated for 3 hours except for the floor plugs.

**EVALUATION - ZONE 1.1.2.1:**

The HPCI room (Fire Zone 11.1.4) is adjacent to the south section of the torus area (Fire Zone 1.1.2.1). A fire which started in the HPCI room could spread through non-rated wall penetrations into the south section of the torus area. However, fixed automatic fire suppression is provided for the hazards in the HPCI room, which reduces the likelihood of this spread occurring. The torus area contains cabling for both trains of RHR equipment, one train in the north section and one in the south section. Fire spread between the north and south sections of the torus area is prevented by the low combustible loading and by a space free of intervening combustibles. A fire which originated in the HPCI room would be no more likely to spread to the north section of the torus area than one which originated in the torus area itself.

**EVALUATION - ZONE 8.2.6.C:**

Zone 8.2.6.C is separated from Zone 11.1.4 by a 3 hour barrier, except for the floor plugs. The concrete floor plugs are not a tested configuration, but they are heavily built and fit tightly. Given the 3 hour barrier and substantial floor plugs, the potential for fire spread from Zone 11.1.4 to Zone 8.2.6.C is low.

**EVALUATION – ZONES 11.1.3 and 8.2.5:**

Since Fire Zones 11.1.3 and 8.2.5 are separated from Fire Zone 11.1.4 by 3 hour rated fire barriers, and the maximum predicted fire severity in zone 11.1.4 is 2 hours, no further evaluation is required.

**Fire Zone: 11.3.1****Unit 2 Southwest Corner Room****Fire Area:** RB-2S**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 630 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area linear heat (thermal) detection.
<b>Suppression:</b>	None
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose in the adjacent fire zone.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Damage to pumps, valves, and similar equipment by water discharge would be negligible. Water removal would be accomplished by floor drains or sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2N	Equivalent 3 Hours
TB-II	Equivalent 3 Hour [4], (3 Hour at Fire Zone 5.0)
CT-2	3 Hour
RB-1N	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
5.0*	TB-II	3 hour	3 hour	No doors	2'-0" thick concrete
8.2.6.C*	TB-II	3 hour [4]	3 hour except floor plugs	No doors	2'-0" thick concrete
8.2.5*	CT-2	3 hour	3 hour	No doors	1'-0" thick concrete
11.1.4	RB-2S	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
11.2.3	RB-1N	3 hour [6][7]	3 hour (F-41, 42, 43)	One Class A door	3'-0" thick concrete
1.1.2.1	RB-2N	Non-rated	noncombustible, open mechanical	One nonlabeled watertight door	3'-0" thick concrete wall

\* Secondary Containment Boundary

**Fire Zone: 11.3.1****Unit 2 Southwest Corner Room****Fire Protection Commitments:**

Reference Section	Commitment
5	Unit 1 and Unit 2 RB separated by 3-hour barrier with 3-hour penetration seals.
1, 5.10.4	Manual fire fighting equipment available with a hose station and portable extinguisher provided in each RHR room. Also reference [9] (11.1.2.2).
6, 2.2.6	Reinforced concrete walls with water tight door provided between torus and corner room. Also reference [9] (4.2.1).
2	Seal penetration to adjacent Reactor Building except at refuel floor.3,
2	Class A door between RCIC pump rooms. Also reference [1] (3.1.8 and 5.8.6).
2	Thermal line type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [6] (4.2.7) and [9] (4.2.2 and 11.1.2.2).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton
3	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
4	GL 86-10 Evaluation S040-QH-0612, Rev. 1.
5	GL 86-10 Evaluation S040-QH-0615, Rev. 1.
6	SER, July 21, 1988.
7	NRC Exemption Aug. 18, 1989.
8	SER, February 25, 1991
9	Appendix R Exemption Requests, Section 4.2 and 11.1.
10	SER, March 2, 1994.
11	Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-138.

**ZONE:** 11.3.1      **AREA:** RB-2      **LOCATION:** RX 2, Elev. 554

**ZONE DESCRIPTION:**

Fire Zone 11.3.1, the southwest corner room, is located on elevation 554 of the Unit 2 Reactor Building and contains the Reactor Core Isolation Cooling (RCIC) System turbine and pump and one of the core spray pumps.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by walls on the west side of the building along column line G and on the south side of the building along column line 13. The third wall of this generally triangular-shaped space consists of a wall along a southeast to northwest line which is shared by the torus area, fire zone 1.1.2.1.

**BARRIERS:**

This zone shares barriers with 4:

<u>ZONES</u>	<u>AREAS</u>
1.1.2.1, northeast	RB-2
11.1.4, west	RB-2
11.2.3, south	RB-1
8.2.5, above	TB-I
5.0, above	TB-II
8.2.6.C, above	TB-II

**DETECTION:**

General detection in the form of a linear thermal detection system is provided throughout.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The predominant contributor to the fixed combustible loading in this zone is electrical cable insulation. The second largest contributor, is lubricating oil. The rest of the fixed combustibles consist of small quantities of miscellaneous materials distributed throughout the zone.



Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification prompts fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers; and
- Availability of adequate standpipe hose lines for manual fire fighting.

### **FIRE SPREAD POTENTIAL:**

#### **Fire Spread Potential Within Fire Zone 11.3.1:**

The potential for a severe fire within the zone is limited by the quantity and distribution of combustibles. The predominant combustibles are the lube oil in the core spray pump and its associated motor and the exposed electrical cables. The lube oil is contained in a number of separate bearing housings. Thus, the involvement of a significant amount of the oil is a remote possibility; requiring the failure of the bearing housings on separate pieces of equipment. The cable tray in this zone is located over fifteen feet above the floor. Of the transients which can be expected in the zone, the volume of flammable and combustible liquids are quite limited, minimizing the likelihood of a spill which could involve a large portion of the zone.

#### **Fire Spread Potential Within Fire Area RB-2:**

The potential for fire spread to zone 1.1.2.1 is limited by the presence of a substantial concrete barrier separating the two zones and the relatively low combustible loading in zone 11.3.1. However, if the cables in the tray penetrating the separating barrier were to become involved, fire spread to zone 1.1.2.1 is a distinct possibility. The non-rated door in the barrier is designed to preclude combustible liquid flow to zone 1.1.2.1. Due to its substantial construction, the prospect of fire spread to 1.1.2.1 via the door is limited.

The potential for fire spread to zone 11.1.4 is limited by a substantial concrete barrier which separates the two zones and the relatively low combustible loading in zone 11.3.1. However, if the electrical cables in the tray penetrating the separating barrier were to become involved, fire could spread along it to zone 11.1.4.

**Fire Spread Potential To Fire Area RB-1:**

Fire area RB-2 is separated from zone 11.3.1 by three-hour rated, reinforced concrete barrier and its fire loading is not sufficient to challenge the integrity of the barrier. Thus fire spread to area RB-2 is not credible.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II is separated from zone 11.3.1 by monolithic, reinforced concrete construction. The fire loading in the zone is not sufficient to challenge the integrity of this barrier. However, non-sealed penetrations would allow fire, hot combustion gases and smoke to enter area TB-II.

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**Fire Zone: 11.3.2****Unit 2 Southeast Corner Room****Fire Area:** RB-2S**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 671 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area linear heat (thermal) detection.
<b>Suppression:</b>	General area wet pipe sprinkler system.
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown equipment by water discharge from sprinkler system, manual hose stream use, or piping breaks would be less severe than those determined to be acceptable for a design-basis fire. Damage to valves, room cooler, heat exchanger, and pumps by water discharge would be negligible. Water removal would be accomplished by drainage or sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2N	Equivalent 3 Hour [7]
RB-1N	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
11.2.4	RB-1N	3 hour [7][8]	3 hour (F-41, 42, 43)	Two Class A fire doors	3'-0" thick concrete
1.1.2.2	RB-2N	Non-rated [7][8]	noncombustible, open mechanical	No doors	2'-0" thick concrete
1.1.2.1	RB-2N/RB-2S	Non-rated	noncombustible, open mechanical	One nonlabeled watertight door.	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.3.2****Unit 2 Southeast Corner Room****Fire Protection Commitments:**

Reference Section	Commitment
4, 4.2.4.1	No Combustibles pass through unsealed penetrations.
1, 3.1.8	Class A door provided between 11.3.2 and 11.2.4. Also reference [1] (5.8.6).
4, 4.2.4.1	Transient combustibles and ignition sources controlled.
7, 2.2.7	Manual fire fighting equipment available with a hose station and portable extinguisher provided in each RHR room. Also reference [7] (2.2.4) and [1] (5.10.4).
7, 2.2.6	Reinforced concrete walls with water tight door provided between torus and corner room. Also reference [4] (4.2.1).
2	Seal penetration to adjacent Reactor Building except at refuel floor.3,
3	Install UL Listed fire door between U1 RHR room (1A) and U2 RHR room (2B).
2	3-hour barrier between the two units RHR rooms.
2	Automatic sprinklers in Division II RHR pump rooms. Also reference [7] (2.2.4 and 2.3) and [4] (4.2.1 and 4.2.2).
2	Thermal line type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [7] (4.2.7) and [4] (4.2.2 and 4.4.2).

**Fire Zone: 11.3.2****Unit 2 Southeast Corner Room****Notes and References:****Number    Description**

- 1    SER, July 27, 1979.
- 2    Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton
- 3    LER 90-024, Rev.00 (11-12-90).
- 4    Exemption for equivalent separation of redundant RHR trains. Exemption request 4.2 (12-18-84). Exemption granted 2.0 (12-11-87).
- 5    Left intentionally blank.
- 6    Left intentionally blank.
- 7    SER, July 21, 1988.
- 8    NRC Exemption Aug. 18, 1989.
- 9    SER, March 2, 1994.

**ZONE:** 11.3.2**AREA:** RB-2S**LOCATION:** RX 2, Elev. 554**ZONE DESCRIPTION:**

Fire Zone 11.3.2, the southeast corner room, is located on elevation 554 of the Unit 2 Reactor Building and contains the pumps and heat exchanger for one loop of the Residual Heat Removal (RHR) System.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by an exterior wall on the east side of the building along column line N. The south wall of the area lies on column 13 and is shared by zone 11.2.4 in area RB-1N. The third wall of this triangular-shaped space consists of a wall along a southwest to northeast line which is shared by the torus area, fire zone 1.1.2.1.S.

**BARRIERS:**

This zone shares barriers with:

**ZONES**

1.1.2.1.S, northwest

1.1.2.2, above

11.2.4, south

**AREAS**

RB-2S

RB-2N

RB-1N

**DETECTION:**

General area linear heat detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

A general area wet-pipe sprinkler system is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The next most significant fixed combustible is the lubricating oil associated with the RHR pumps. The remainder of the fixed combustibles consists of various materials distributed throughout the zone. The only fixed combustibles capable of producing a severe fire in the zone are the electrical cables and the lube oil. The cable trays are fifteen or more feet above the floor and the lower tray is fully covered. The lube oil is contained in the bearing housings of the two RHR pumps. Any release of this combustible to the zone would be significantly less than the total amount present, unless multiple and simultaneous failures of the bearing housings on separate pumps were to occur.

Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The hazard associated with transients in this zone, is the potential for a fire which may expose combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of such a fire are the electrical cables and the lubricating oil, should it be released from the bearing housings.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification should initiate fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke buildup will adversely affect access and visibility; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 11.3.2:**

With the exception of the electrical cables in the trays and the lube oil, the combustibles in this zone are quite limited and discontinuous. Thus, severe fire in this area is dependent on the involvement of the cable trays or a lube oil spill. The potential for tray involvement is limited by the height of the trays above the floor and the fact that the lower tray is of solid bottom construction with a tight fitting cover. Thus, ignition of the cables in it is unlikely and its presence shields the trays above from the plume of any fire located below. The high ceiling in the area, and the vertical vent paths provided would limit the buildup of any significant stratification layer, thereby minimizing thermal layer radiation to combustibles within the zone. The lubricants in the zone are separately housed, making a spill of the entire inventory unlikely. The limited spill potential and the characteristics of oil spills on concrete substrates mean that a spill fire is unlikely and that should one occur it would be of limited severity and duration. In addition, the general area sprinkler protection will limit fire involvement to only a portion of the zone.



**Fire Spread Potential Within Fire Area RB-2S :**

Fire spread to zone 1.1.2.1.S is unlikely due to the substantial reinforced concrete barrier which separates it from zone 11.3.2. The door design is such that a combustible liquid spill in zone 11.3.2 would not flow to zone 1.1.2.1.S; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.2.1.S. However, given the distribution of combustibles in 1.1.2.1.S and its high ceiling height, ignition of combustibles in that zone is unlikely. The fire potential for zone 11.3.2 is not sufficient to challenge the barrier and fire spread is not likely.

**Fire Spread Potential To Fire Area RB-2N :**

The potential for fire spread to zone 1.1.2.2, above, is limited by the reinforced concrete floor which separates the two zones and the lack of continuity of combustibles penetrating the floor. The cable risers which pass through the floor are fire stopped at the floor, preventing upward fire spread along the cables. In locations where there are open penetrations in the floor (e.g., stairways, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Regardless, heat and smoke from fires in zone 11.3.2 would vent to zone 1.1.2.2.

**Fire Spread Potential To Fire Area RB-1N:**

Fire spread to fire area RB-1N is unlikely due to separation by three-hour rated construction. Such construction would not be challenged by any fire which can credibly occur in zone 11.3.2.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 11.3.2 is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**5.0**     Separation of Redundant RHR Trains In The Reactor Building Unit 2: Zones 1.1.2.1, 1.1.2.2 and 11.3.2

**Issue:** These zones do not comply with Appendix R to the extent that it requires redundant components to be separated by 3-hour rated barriers. The major concern is that a fire on one elevation could develop, spread to the adjacent elevation and damage the redundant RHR train.

**Evaluation:** Zone 11.3.2 has full area fixed fire suppression (See **Automatic Suppression**, above) and is provided with a linear thermal detection system throughout. The combustibles are limited, with the combustible liquids being distributed in machinery bearing housings of substantial construction. The quantity and distribution of the combustibles does not create the potential for a fire which could visit significant damage on adjacent zones (See **Fire Spread Potential**, above), hazard the redundant train of RHR, and impair the ability to execute and maintain safe shutdown. Thus, the ability to achieve objectives of Appendix R with respect to the maintenance of safe shutdown capability is not compromised.

**CONCLUSION:**

The evaluation presented above for fire zone 11.3.2 demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The separation provided for Zone 11.3.2 is sufficient for the hazards present and a fire which could damage both safe shutdown trains is not credible. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is not compromised.

**Fire Zone: 11.3.3****Unit 2 Northwest Corner Room****Fire Area:** RB-2N**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 592 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area linear heat (thermal) detection except above the reactor building equipment drain tank.
<b>Suppression:</b>	None
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and a hose station equipped with 100 feet of hose, located in adjacent Zone 1.1.2.1.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Piping breaks or use of manual hose would not affect safe shutdown as no equipment associated with safe shutdown is located in this zone. Water runoff would be handled by the floor drainage system in the general area or by sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-I	Equivalent 3 Hour [4],
CT-2	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.5*	CT-2	3 hour	3 hour (F-142)	No doors	1'-0" thick concrete
8.2.6.E*	TB-I	3 hour [4]	3 hour except for mechanical plugs	No doors	2'-0" thick concrete
1.1.2.1	RB-2N/RB-2S	Non-rated	noncombustible, open mechanical	One unlabeled watertight door	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
1, 5.10.4	Hose station and portable extinguisher are located in the torus area.
6, 2.2.6	Reinforced concrete walls with water tight door provided between torus and corner room. Also reference [8] (4.2.1).
2	Thermal line type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [5] and [8] (4.22 & 4.2.3).

**Fire Zone: 11.3.3****Unit 2 Northwest Corner Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
4	GL 86-10 Evaluation S040-QH-0612, Rev. 1.
5	GL 86-10 Evaluation S040-QH-0615, Rev. 1.
6	SER, July 21, 1988.
7	NRC Exemption Aug, 18, 1989.
8	Appendix R Exemption Requests, Section 4.2.
9	SER, March 2, 1994.

**ZONE:** 11.3.3**AREA:** RB-2N**LOCATION:** RX 2, Elev. 554**ZONE DESCRIPTION:**

Fire Zone 11.3.3, the northwest corner room, is located on elevation 554 of the Unit 2 Reactor Building and contains the Reactor Building Equipment Drain (RBED) tank and RBED pump and one of the unit's core spray pumps.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by exterior walls on the west side of the building along column line G and north side of the building along column line 7. The third wall of this generally triangular-shaped space consists of a wall along a southwest to northeast line which is shared by the torus area, fire zone 1.1.2.1.N. One wall to the east, along column line H is shared with the building elevator shaft.

The zone is divided into two areas by reinforced concrete shield walls surrounding the RBED tank.

**BARRIERS:**

This zone shares barriers with:

ZONES

1.1.2.1.N, south east

8.2.5, above

8.2.6.E, above

AREAS

RB-2N

CT-2

TB-I

**DETECTION:**

General area linear heat detection is provided except over the RBED tank area.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The largest contributor to the fixed combustible loading in this zone is electrical cables. The second largest contributor is lubricating oil. The rest of the fixed combustibles consists of various materials, such as ventilation system insulation. These combustibles are distributed throughout the zone.

Transients account for a significant portion of the total combustibles which may be in the zone. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification prompts fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- Availability of adequate standpipe hose lines for manual fire fighting.

### **FIRE SPREAD POTENTIAL:**

#### **Fire Spread Potential Within Fire Zone 11.3.3:**

The potential for fire spread between the two areas of the zone is inhibited by the reinforced concrete shield wall which separates them. In the core spray pump portion of the zone, the predominant combustible is the lube oil in the core spray pump and motor. This oil is contained in separate bearing housings of substantial construction. Thus, multiple and simultaneous failures are necessary to release the oil to the zone environment. There are no significant quantities of combustible materials in the RBED tank area.

#### **Fire Spread Potential Within Fire Area RB-2N:**

Fire spread to zone 1.1.2.1.N is unlikely due to the substantial reinforced concrete barrier which separates the two zones. A non-rated, water-tight door in the barrier provides for personnel access between the two zones. The door design is such that a combustible liquid spill in zone 11.3.3 would not flow to zone 1.1.2.1.N; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.2.1.N. However, given the distribution of combustibles in 1.1.2.1.N and its high ceiling height, ignition of combustibles via that mechanism is unlikely. Should the cables in zone 11.3.3 become involved, spread along the cable tray and through the unsealed penetration into zone 1.1.2.1.N is possible.

A fire originating in this fire zone will not spread to adjacent fire zones that contain redundant equipment. Therefore, the ability to safely shutdown the plant is assured.

#### **Fire Spread Potential To Fire Area TB-I:**

Fire area TB-I is separated from zone 11.3.3 by a three-hour rated, reinforced concrete, barrier. The fire loading in the zone is not sufficient to challenge the integrity of the barrier; thus fire spread to the Turbine Building via this path is not credible.

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**Fire Zone: 11.3.4****Unit 2 Northeast Corner Room****Fire Area:** RB-2N**F Drawing:** F-2-1**General Elevation:** 554'-0"**Zone Area:** 657 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area linear heat (thermal) detection.
<b>Suppression:</b>	None
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Damage to pumps, valves, and other equipment by water discharge would be negligible. Water removal would be accomplished by drainage or sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
None	N/A

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.2.2	RB-2N	Non-rated [4][6]	noncombustible, open mechanical	No doors	2'-0" thick concrete
1.1.2.1	RB-2N	Non-rated	noncombustible, open mechanical	One unlabeled watertight door	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

<b>Reference</b>	<b>Section</b>	<b>Commitment</b>
1,	5.10.4	Manual fire fighting equipment available with a hose station and portable extinguisher provided in each RHR room.
5,	2.2.6	Reinforced concrete walls with water tight door provided between torus and corner room. Also reference [6] (4.2.1). Door to be maintained closed.
2		Thermal linear type heat detection in corner rooms. M4-1(2)-84-36 Task 2.23. Also reference [5] and [6] (4.2.2).



**Fire Zone: 11.3.4****Unit 2 Northeast Corner Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	Left intentionally blank.
4	Left intentionally blank.
5	GL 86-10 Evaluation S040-QH-0615, Rev. 1.
6	SER, July 21, 1988.
7	NRC Exemption Aug, 18, 1989.
8	SER, March 2, 1994.

**ZONE:** 11.3.4**AREA:** RB-2N**LOCATION:** RX 2, Elev. 554**ZONE DESCRIPTION:**

Fire Zone 11.3.4, the northeast corner room, is located on elevation 554 of the Unit 2 Reactor Building and contains the pumps and heat exchanger for one loop of the Residual Heat Removal (RHR) System.

The zone extends from the 554 foot elevation to the bottom of the floor at elevation 595 and is bounded by exterior walls on the east side of the building along column line N and the north side of the building along column line 7. The third wall of this triangular-shaped space consists of a wall along a southeast to northwest line which is shared by the torus area, fire zone 1.1.2.1.N.

**BARRIERS:**

This zone shares barriers with:

**ZONES**

1.1.2.1, southwest

1.1.2.2, above

**AREAS**

RB-2N

RB-2N

**DETECTION:**

General area linear heat detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The other predominant fixed combustible is the lubricating oil associated with the RHR pumps. The remainder of the fixed combustibles consists of various materials distributed throughout the zone. The only fixed combustibles capable of producing a severe fire in the zone are the electrical cables and the lube oil. The cable trays are fifteen or more feet above the floor and the lowest tray is fully covered. The lube oil is contained in the bearing housings of the two RHR pumps. Thus, any release of this combustible to the zone would be significantly less than the total amount present.

Transients account for a significant portion of the total combustibles which may be in the zone. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The hazard associated with transients in this zone, is the potential for a fire which may expose combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of such a fire are the electrical cables and the lubricating oil, should it be released from the bearing housings.

The installed detection system should provide for detection of fires and notification of operating personnel via Control Room annunciation. This notification should initiate fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 11.3.4:**

The combustibles are limited, with the exception of the electrical cables in the tray system and the lube oil. Thus, significant fire spread in this area is dependent on tray involvement or a lube oil spill. The likelihood of tray involvement is limited due to their height above the floor and the fact that the lower tray is of solid bottom construction with a tight fitting cover. Thus, ignition of the cables in the lower tray is unlikely and its presence shields the trays above from the plume of any fire located below. The high ceiling in the area, and the vertical vent paths provided would limit the buildup of any significant stratification layer, thereby minimizing thermal layer radiation to combustibles within the zone. The lubricants in the zone are separately housed, making a spill of the entire inventory unlikely. The limited spill potential and the characteristics of oil spills on concrete substrates mean that a spill fire is unlikely and that should one occur it would be of limited severity and duration. Thus, fire involvement is expected to encompass only a portion of the zone.

**Fire Spread Potential Within Fire Area RB-2N:**

The potential for fire spread to zone 1.1.2.2, above, is limited by the reinforced concrete floor which separates the two zones and the lack of continuity of combustibles penetrating the floor. The cable risers penetrating the floor are fire stopped at the floor, preventing upward fire spread along the cables. In locations where there are open penetrations in the floor (e.g., stairways, pipe penetrations), the lack of combustibles in the immediate vicinity of the openings and the discontinuity of combustibles in the zone would make fire spread unlikely. Regardless, heat and smoke from fires in zone 11.3.4 would vent to zone 1.1.2.1.N.

Fire spread to zone 1.1.2.1.N is unlikely due to the substantial reinforced concrete barrier which separate the two. A non-rated, water-tight door in the barrier provides for personnel access between the two zones. The door design is such that a combustible liquid spill in zone 11.3.4 would not flow to zone 1.1.2.1.N; but a severe fire could result in failure of the gasket on the door, allowing smoke and hot combustion gases to enter zone 1.1.2.1.N. In addition there are unsealed penetrations in the barrier, but no cable trays pass through them. Given the distribution of combustibles in 1.1.2.1.N and its high ceiling height, however, ignition of combustibles in that zone is unlikely. The fire potential for zone 11.3.4 is not sufficient to challenge the barrier and, despite some unsealed mechanical penetrations, fire spread is not likely.

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**Fire Zone: 9.3****Unit 1/2 Diesel Generator Room****Fire Area:** RB-1/2**F Drawing:** F-3-1**General Elevation:** 595'-0"**Zone Area:** 995 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area heat (thermal) detectors are provided to actuate the Carbon Dioxide suppression system.
<b>Suppression:</b>	The swing diesel generator room is protected by a total flooding Carbon Dioxide system. Within the swing diesel generator is an enclosure for the diesel oil day tank. The CO2 protection for this enclosure is supplemented by a wet pipe sprinkler system. Actuation of the thermal detectors either in the day tank room or diesel generator room releases CO2 in both areas.
<b>Manual Suppression:</b>	Portable fire extinguisher(s). A hose station equipped with 100 feet of hose is located near the DG access interlock in adjacent Fire Zone 1.1.1.2, and there is an exterior fire hydrant within 200 feet.
<b>Other FP features:</b>	The Day Tank Room is curbed.
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown through the discharge of water or Carbon Dioxide in this area would be no more severe than those determined to be acceptable for a design-basis fire. Water runoff would be handled by the floor drainage systems. Should actuation of the CO2 system interfere with ventilation for the diesel generator unit and cause it to shut down, the other two diesel generators would be unaffected.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2N	3 Hour
RB-1N	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.2* (south)	RB-1N	3 hour	3 hour (F-51)	One 3 hour class "A" door	1'-0" thick concrete
1.1.2.2*	RB-2N	3 hour	3 hour (F-52)	No doors	1'-6" thick concrete
1.1.1.2* (west)	RB-1N	3 hour	3 hour (F-52)	No doors	1'-6" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 9.3****Unit 1/2 Diesel Generator Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 4.3.2	Automatic total flooding CO2 system protects DG room. Manual and automatic actuation provided. Also reference [8](F.9). Manual smoke venting by portable smoke ejectors.
6, pg. 2.3-63	Provide Class A fire doors for the Unit 1/2 Diesel Generator Room. Also see the 5-24-85 PLC NFPA 80 Review.
1, 3.1.8	Protect structural steel with 3-hour rating. MOD 4-1/2-78-20 complete (for fire zones 9.1 & 9.2). There is no exposed steel in this fire zone. Also reference [1](5.20.6).
1, 3.1.8	Electrically supervise door to room. Door is electrically supervised. Also reference [1](5.20.6).
3, pg. 6	Provide fire rated barrier for louvered doors. Doors with louvers have been removed.
3, pg. 6	Install 3 hour rated fire dampers in HVAC ducts. No ducts.
3, pg. 6	Provide portable ventilation equipment. Three portable ventilators provided on fire cart.
2, 4.2.2	Provide 3 hour barriers to separate fire area 9.3 from Reactor Buildings (fire areas 1.1.1.2 and 1.1.2.2). Also reference [8](F.9).
1, 3.1.8	Fire zone 9.3 (swing diesel generator room) is separated from other fire zones by 3-hour rated construction and assemblies. Also reference [1](5.20.6).
8, F.9.b	The DG day tank rooms are protected by an automatic sprinkler system.
1, 4.3.2	Local and control room alarms required for DG CO2 systems.
1, 5.20.2	A 3 hour enclosure is provided for the diesel day tank.
1, 5.20.4	Thermostats actuate local and control room alarms, and the total flooding CO2 system.
1, 5.20.4	DG day tank room protected by automatic sprinkler system.
1, 5.20.4	Portable extinguishers and hose stations provided for area.
8, D.4.i	Dampers interlocked to close on activation of CO2 system.
8, E.5.a	CO2 systems designed per NFPA 12. Installation acceptance tests were not performed.
8, E.5.b	CO2 systems have predischage alarms. CO2 system nozzles do not discharge directly on equipment. CO2 is discharged into DG and day tank rooms. Also reference [8](E.5.c) and [8](F.9.b).

**Fire Zone: 9.3****Unit 1/2 Diesel Generator Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	SER, July 21, 1988.
3	Letter 4-10-78, CECO to NRC. Page 6 addresses the need for fire barriers in place of doors with louvers.
4	Letter 12-18-84. B. Rybak (CECO) to R. Denton
5	NTS Item 254(265)/88021-07. Perform CO2 concentration test. Item closed 2-5-92.
6	Fire Hazards Analysis / Updated Fire Hazards Analysis
7	Left intentionally blank.
8	ComEd response to the requirements of Appendix A



**ZONE:** 9.3**AREA:** RB-1/2**LOCATION:** RB1/2,Elev. 595'-0"**ZONE DESCRIPTION:** Unit 1/2 (Swing) Diesel Generator Room**FIRE SEVERITY:**

The fire severity for this fire zone is 2.5 hours (2 hours and 30 minutes). The fire severity based on the updated combustible loading is still at a level that would not challenge the rated fire barriers beyond their 3-hour rating.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 9.3 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.1.1.2 (west)	RB-1	3 hour
1.1.1.2 (south)	RB-1	3 hour
1.1.2.2	RB-2	3 hour

**EVALUATION ZONE 9.3:**

The west wall of this fire zone is a 3-hour fire rated 1'-6" thick reinforced concrete barrier that separates this zone from the unit 1 and unit 2 reactor buildings (fire zones 1.1.1.2 and 1.1.2.2). The south wall is a 3-hour fire rated 1'-0" thick reinforced concrete barrier that separates this area from the unit 1 reactor building (fire zone 1.1.1.2). The north and east walls are 1'-6" thick reinforced concrete exterior walls. The ceiling of this zone is constructed of 1'-0" thick reinforced concrete and serves as the roof of the swing diesel generator room. There is no exposed structural steel in this fire zone. The major combustible material within this fire zone is fuel oil, lube oil, and other miscellaneous combustible material associated with diesel generator support equipment. This zone is provided with a CO<sub>2</sub> fire suppression system actuated by thermal detectors. The day tank room is also provided a wet-pipe sprinkler system and overflow/tank rupture spill containment. Actuation of the detection system releases CO<sub>2</sub> regardless of the location of the fire (day tank room or diesel room). Manual fire suppression equipment is provided by an exterior hydrant within 200 feet.

**CONCLUSION:**

The combustible fire loading limits for this zone are being increased to 2-½ hours severity. The barriers separating this zone from adjacent fire zones are rated for 3-hours of fire resistance. In addition, this zone is provided with automatic fire suppression systems, which would actuate in the event of a fire in this zone and control or suppress any fire event. In addition, the systems actuation would summon the plant fire brigade would provide additional assurance that any fire originating in this zone would not grow and spread to an adjacent fire zone and damage redundant safe shutdown equipment and cables. Based on the defense in depth and the fire protection features of this zone, the increase in combustible limits for this fire zone are acceptable and will not degrade the ability to achieve safe shutdown.

**Fire Zone: 8.2.1.B****Unit 2 Condensate Pump Room****Fire Area:** TB-I**F Drawing:** F-9-1,10-1**General Elevation:** 547'-0"**Zone Area:** 4,287 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguishers and one hose station equipped with 100 feet of hose.**Other FP features:** Flammable liquids cabinet provided.**Suppression Effects:** The operation of sprinkler systems, use of manual hose streams, or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by the general area drainage system.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u><b>Fire Area</b></u>	<u><b>Barrier Description</b></u>
TB-II	See note number [1][5]

**Boundary Fire Zones:**

<u><b>Boundary Zone</b></u>	<u><b>Area</b></u>	<u><b>Barrier Rating</b></u>	<u><b>Seal Rating</b></u>	<u><b>Doors and Dampers</b></u>	<u><b>Barrier Type</b></u>
8.2.6.E	TB-I	Non-rated	noncombustible, open mechanical	No doors, open pipe chase	4'-0" thick concrete
8.2.6.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.6.C	TB-II	Non-rated[5]	noncombustible, open mechanical[5]	No doors	Open pipe chase
8.2.2.A	TB-I	Non-rated	noncombustible, open mechanical	No doors	2'-3" thick concrete
8.2.1.D	TB-I	Non-rated	noncombustible, open mechanical	One unlabeled door.	4'-0" thick concrete
11.1.2.C	TB-I	Non-rated	noncombustible	One unlabeled watertight door.	1'-6" thick concrete
11.1.2.B	TB-I	Non-rated	noncombustible	One unlabeled watertight door.	1'-6" thick concrete
11.1.2.A	TB-I	Non-rated	noncombustible	One unlabeled watertight door.	1'-6" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 8.2.1.B****Unit 2 Condensate Pump Room****Fire Protection Commitments:**

Reference Section	Commitment
5.13.4	Hose stations and portable fire extinguishers are provided for this zone.
2, 5.13.4	Complete automatic wet pipe sprinkler system provided with water flow annunciation in the control room.
2, 5.13.6	Lube oil storage will be limited to a maximum container size of thirty gallons for both fire zones 8.2.1.A and 8.2.1.B. Also reference [2](3.1.11).
2, 5.13.6	Waste oil will be excluded from the area and an NFPA approved flammable liquids storage cabinet will be provided in Turbine Building basement. Also reference [2](3.1.11).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Fire Zone 8.2.1.B does not border Fire Zone 8.2.6.C, but the north wall contains an opening to a vertical pipe chase to Fire Zone 8.2.6.C above.
2	SER, July 27, 1979.
3	There is a 1 1/2-inch hydrogen line from the Unit 2 Hydrogen Control Station, which manifolds into 4, 1-inch lines to the discharge piping of each condensate pump.
4	Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003, Rev 3.
5	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.

**ZONE:** 8.2.1.B      **AREA:** TB-I      **LOCATION:** Unit 2 TB, Elev. 547'-0"

**ZONE DESCRIPTION:** Unit 2 Condensate Pump Room

**FIRE SEVERITY:** The fire severity for this fire zone is 1.5 hours.. This additional allowance for potential transient combustibles contributes approximately half of the estimated fire loading for the zone.

**SER ISSUES:**

A review of the Safety Evaluation Reports did not uncover established combustible loading limits for this zone.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists the fire zone which is adjacent to Fire Zone 8.2.1.B but in a different fire area, and summarizes the fire resistance rating of the fire barrier. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.C	TB-II	Non-rated <sup>1</sup>

<sup>1</sup> Fire Zone 8.2.1.B communicates with Fire Zone 8.2.6.C. The two fire zones do not share a common border, but the south wall of 8.2.1.B opens to a vertical pipe chase which leads to Fire Zone 8.2.6.C located above. The floor levels of these two zones are 48 feet apart (elevations 547' to 595').

**EVALUATION:**

Fire Zone 8.2.6.C utilizes safe shutdown equipment different from that for Fire Zone 8.2.1.B. Although not directly adjacent, these zones are connected by a manlift shaft, stairs, and by a vertical pipe chase.

The potential fire and/or explosion hazard in Fire Zone 8.2.1.B which would be most likely to affect Fire Zone 8.2.6.C is the hydrogen water chemistry system. Should a hydrogen release occur, it is expected that hydrogen would rise through the mechanical openings which would expose the fire zones located above (Fire Zones 8.2.2.A and 8.2.6.C). Hydrogen leak detection is provided in Fire Zone 8.2.2.A and in the area of 8.2.6.C above the manlift, stairs, and open pipe chase. When the detection system senses a release, interlocks stop the flow of hydrogen. Should a significant release of hydrogen occur and a fire or explosion result, the substantial concrete barriers would serve to limit the structural damage to adjacent zones.

Other fire protection measures provided for Fire Zone 8.2.1.B are as follows:

- General area wet pipe sprinkler protection is provided throughout Fire Zone 8.2.1.B.
- Fire detection is provided in Fire Zone 8.2.6.C. Should products of combustion enter 8.2.6.C from a fire in Fire Zone 8.2.1.B, it would be promptly detected.
- The volume of Fire Zone 8.2.1.B is quite large (a ceiling height of approximately 25' and a reported area of 4,287 sq. ft.). Heat and smoke from a fire in Fire Zone 8.2.1.B would rise and begin filling this volume as well as entering the chase. The large volume and the physical separation between these two zones would limit the amount of heat and smoke entering Fire Zone 8.2.6.C.
- Manual fire fighting equipment is available for both of these fire zones.
- The fire brigade is trained and available to fight a fire in these zones. Pre-fire plans have been developed for these fire zones and are utilized by the fire brigade in training.

**Fire Zone: 8.2.1.D****Unit 2 Turbine Foundation****Fire Area:** TB-I**F Drawing:** F-9-1**General Elevation:** 558'-6"**Zone Area:** 3,850 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** One hose station equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** The operation of sprinkler systems, use of manual hose streams, or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by sump pumps of the general area drainage system, these drains are normally closed and would have to be unplugged for water removal.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
CT-2	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.6.E	TB-I	Non-rated	noncombustible, open mechanical	One non labeled door	Concrete block at tube pull pit
8.2.5	CT-2	3 hour	3 hour	No doors	1'-6" thick concrete
8.2.2.A	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.6.D	TB-I	Non-rated	noncombustible, open mechanical	No doors, vertical pipe chase	4'-0" thick concrete
8.2.1.B	TB-I	Non-rated	noncombustible, open mechanical	One non labeled door.	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

1, 5.13.4      Hose stations and portable fire extinguishers are provided for this zone.

**Fire Zone: 8.2.1.D****Unit 2 Turbine Foundation****Notes and References:****Number    Description**

- 1    SER, July 27, 1979.
- 2    Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003, Rev. 3.



**ZONE:** 8.2.1.D**AREA:** TB-I**LOCATION:** TB, Elev 558'-6"**ZONE DESCRIPTION:** Unit 2 Turbine Foundation**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hour (75 minutes). The combustible loading is light and is due to electrical cable insulation and transients.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone impacting safe shutdown equipment or cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.1.D which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.E	TB-I	Non-rated
8.2.5	CT-2	3 hour
8.2.2.A	TB-I	Non-rated
8.2.6.D	TB-I	Non-rated
8.2.1.B	TB-I	Non-rated

**EVALUATION - ZONE 8.2.1.D:**

A non-rated barrier constructed of concrete blocks separate this zone from Fire Zone 8.2.6.E in the condenser tube pull pit. A non-labeled door is installed in this barrier. The wall separating this zone from Fire zone 8.2.2.A is 4-foot thick concrete as is the wall separating this zone from Fire zone 8.2.1.A. Electrical penetrations in these walls are sealed with noncombustible material and open mechanical penetrations exist. A 1'-6" thick 3-hour fire rated concrete wall separates this fire zone from Fire Zone 8.2.5. A 4-foot thick concrete wall containing one unlabeled door, electrical penetrations sealed with noncombustible material, and open mechanical penetrations separate this zone from Fire Zone 8.2.1.B. The ceiling of this zone serves as the boundary with Fire Zone 8.2.6.D. The electrical penetrations in the ceiling are sealed with noncombustible material and there are open mechanical penetrations. In addition, an open pipe chase exists between these two zones.

Even though the fire-loading limit for this zone is relatively light, a wet pipe sprinkler system is provided for this zone. In addition, a hose station, equipped with 100 feet of hose is located in this fire zone.

The barriers separating this fire zone are unrated except for the boundary with the cable tunnel (fire zone 8.2.5); however, significant structural mass and thermal adsorption capability is associated with the boundaries that provides some degree of fire resistance. The existence of a suppression system provides additional assurance that a fire originating in this zone would not spread to an adjacent zone prior to extinguishment, since the suppression system would actuate, controlling or extinguishing the fire and summoning the plant fire brigade.

**CONCLUSION:**

The light combustible loading in this zone is unlikely to significantly challenge the structural boundaries due to the material of construction and the associated thermal adsorption capability. In addition, the zone is provided with a wet pipe suppression system, which would control any fire occurring in this area.

**Fire Zone: 8.2.2.A****Unit 2 Upper Basement****Fire Area:** TB-I**F Drawing:** F-10-1**General Elevation:** 572'-6"**Zone Area:** 4,711 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection coverage. Hydrogen leak detection.
<b>Suppression:</b>	General area wet pipe sprinkler system.
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose lines, or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by the general area drainage system.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-II	Equivalent 3 Hour [4]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.1.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.1.B (Floor)	TB-I	Non-rated	noncombustible, open mechanical	No doors	2'-3" thick concrete floor
8.2.6.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.6.C	TB-II	Non-rated[4]	noncombustible, open mechanical[4]	One unlabeled door	4'-0" thick concrete
11.1.2.C	TB-I	Non-rated	noncombustible	No doors	2'-3" thick concrete floor
8.2.2.B	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.1.B (North)	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete / open

\* Secondary Containment Boundary

**Fire Zone: 8.2.2.A****Unit 2 Upper Basement****Fire Protection Commitments:**

Reference Section	Commitment
1, 5.14.4	Hose stations and portable extinguishers provided for area.
1, 5.14.6	Automatic sprinklers will be extended to protect the control rod drive feed pumps. Also reference [1](3.1.5).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Left Intentionally Blank
3	Lack of complete detection and suppression for Fire Area TB-I, GL 86-10 Evaluation NTSC 98-020.003 Rev. 3.
4	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.

**ZONE:** 8.2.2.A      **AREA:** TB-I      **LOCATION:** Unit 2 TB, Elev. 572'-6"

**ZONE DESCRIPTION:** Unit 2 Upper Basement

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours. This fire severity should not challenge the fixed fire protection systems (both general area smoke detection and wet pipe sprinkler protection is provided) in the zone. Manual suppression capabilities are also provided.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists the one fire zone which is adjacent to Fire Zone 8.2.2.A but in a different fire area, and summarizes the fire resistance rating of the fire barrier. Since the barrier rating is less than the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.C	TB-II	Non-rated

**EVALUATION:**

Fire Zone 8.2.6.C utilizes different safe shutdown equipment from Fire Zone 8.2.2.A. A concrete floor on unprotected structural steel separates the two zones. There are several large openings between these zones, including a manlift and a vertical pipe chase. Fire protection measures for the hazards in Fire Zone 8.2.2.A are as follows:

- General area wet pipe sprinkler protection and smoke detection are provided throughout Fire Zone 8.2.2.A. Hydrogen leak detection is provided in the zone.
- Even with the increased combustible limits, the fire severity remains light.
- Fire detection is provided in Fire Zone 8.2.6.C. Should products of combustion enter 8.2.6.C from a fire in Fire Zone 8.2.2.A, it would be promptly detected. Hydrogen leak detectors are provided above the vertical openings from 8.2.2.A.
- Manual fire fighting equipment is available for both of these fire zones.
- The fire brigade is trained and available to fight a fire in these zones. Pre-fire plans have been developed for these fire zones and are utilized by the fire brigade in training.

**Fire Zone: 8.2.2.B****Unit 2 Radwaste Pipe Tunnel****Fire Area:** TB-I**F Drawing:** F-10-1**General Elevation:** 580'-0"**Zone Area:** 1,685 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** One hose station equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Use of manual hose streams or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by the general area drainage system.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
RW	Nonrated[6]
TB-III	Equivalent 3 Hour [1]
TB-II	Equivalent 3 Hour [1][7]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
14.1	RW	Non-rated[6]	noncombustible, open mechanical[6]	No doors	1'-6" thick concrete
8.2.6.C	TB-II	Non-rated[7]	noncombustible, open mechanical[7]	No doors	2'-8" thick concrete
8.2.2.A	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.3.B	TB-III	None	noncombustible, open mechanical	No doors	No wall

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

2, 10.2                      There are no safe shutdown cables or equipment in this zone.

**Fire Zone: 8.2.2.B****Unit 2 Radwaste Pipe Tunnel****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
0	Note: The combustible loading for this zone has been justified.
1	Appendix R Exemption Request 5.2 applies to this fire zone and involves the lack of 3-hour fire barriers between the Southern and Central Zone Groups.
2	SER, July 21, 1988.
3	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
4	SER, March 2, 1994.
5	Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003 Rev. 1.
6	Evaluation for fire area separation between TB-I and RW, ER9801573.
7	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.

**ZONE:** 8.2.2.B**AREA:** TB-I**LOCATION:** TB I, Elev. 580'-0"**ZONE DESCRIPTION:** Unit 2 Radwaste Pipe Tunnel**FIRE SEVERITY:**

The previous fire severity was 0.11 hours (6.4 minutes) and the updated fire severity for this fire zone is 1.25 hours. Based on the existing fire area separation, this fire loading should not challenge cables or equipment in the adjacent fire areas.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.2.B which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities

Zone	Area	Fire Resistance Rating
8.2.3.B	TB-III	Non-rated <sup>1</sup>
8.2.1.B	TB-I	Non-rated
8.2.2.A	TB-I	Non-rated
8.2.6.C	TB-II	Non-rated <sup>1</sup>
14.1	RW	Non-rated

<sup>1</sup>The separation between these fire zones and Fire Zone 8.2.2.B is considered to be equivalent to 3 hour. A description of the adequacy of these barriers is provided in Exemption Request 5.2.



**EVALUATION ZONE 8.2.2.B:**

This fire zone is the unit 2 turbine building radwaste piping tunnel. The east wall of this zone partially borders the radwaste building. The wall for this portion is constructed of 1'-6" thick reinforced concrete and has an open passage to the radwaste building collection and holding area. The remainder of the east wall borders the outside (below grade). The north wall is constructed of 3'-6" concrete and borders fire zones 8.2.1.B and 8.2.2.A. The remaining walls border below grade areas underneath the turbine building. The tunnel is open to the unit 1 radwaste piping tunnel on the south end. None of the zone's walls are credited as being fire rated. The ceiling of this area is the floor of fire zone 8.2.6.C and is constructed of 2'-6" thick concrete with an open hatchway and pipe chase. Due to the light fire loading associated with this fire zone, the tunnel is not provided with either a fire detection system or an automatic fire suppression system. However, manual fire suppression equipment in the form of a hose station, equipped with 100 ft. of hose, is provided in this area. The radwaste-piping tunnel's fire loading remains light with the only specifically identified combustible in the area being a half gallon of lube oil associated with the condensate backwash transfer pump.

Plant procedures controlling combustible transients and hot work assure that any new hazards that could be introduced into this area will be properly addressed. In the event of a fire occurring within this zone, the significant thermal mass associated with the boundaries and the lack of significant combustibles is likely to result in a slowly growing fire that will not propagate outside the zone due to the lack of continuity of combustibles. Due to the opening of this tunnel to adjacent fire zones, the buildup of significant amounts of hot gasses and smoke is unlikely. As such, a high degree of assurance exists that a fire originating within this area will not spread to adjacent fire zones and damage safe shutdown equipment or cables.

**Fire Zone: 8.2.6.D****Unit 2 Ground Floor****Fire Area:** TB-I**F Drawing:** F-13-1**General Elevation:** 595'-0"**Zone Area:** 14,460 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat detectors (thermal) throughout the access corridor along the west wall for suppression actuation.
<b>Suppression:</b>	General area wet pipe sprinkler system except in the access corridor along the west wall of the turbine building. Local area deluge sprinkler system located in that corridor to protect transient combustibles.
<b>Manual Suppression:</b>	Hose stations equipped with 100 feet of hose and portable fire extinguisher(s).
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose streams, or piping breaks will not adversely affect safe shutdown. The effect on safe shutdown equipment in this area would be no greater than that tolerated from a design basis fire. Water runoff would be handled by the general area drainage system, or would flow to the Turbine Condenser Pit where it could be removed via sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u><b>Fire Area</b></u>	<u><b>Barrier Description</b></u>
TB-II	Equivalent 3 Hour [12]
CT-2	3 Hour

**Boundary Fire Zones:**

<u><b>Zone</b></u>	<u><b>Area</b></u>	<u><b>Barrier Rating</b></u>	<u><b>Seal Rating</b></u>	<u><b>Doors and Dampers</b></u>	<u><b>Barrier Type</b></u>
8.2.5	CT-1	3 hour	3 hour	No doors	3'-0" thick concrete floor
8.2.1.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	Vertical pipe chases
8.2.1.B	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.2.A	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.7.D	TB-I	Non-rated	open	No doors	open
8.2.7.E	TB-I	Non-rated	noncombustible, open mechanical	No doors	1'-6" thick concrete
8.2.6.E	TB-I	Non-rated	noncombustible, open mechanical	One nonlabeled door.	3'-0" - 4'-0" thick concrete and concrete block
8.2.6.C	TB-II	Non-rated	noncombustible, open mechanical[12]	Two nonlabeled doors[12], One three-hour Class A door	4'-0" thick concrete and concrete block

\* Secondary Containment Boundary

**Fire Zone: 8.2.6.D****Unit 2 Ground Floor****Fire Protection Commitments:**

Reference Section	Commitment
10, 3.1.5.k	Areas P & T in the TB protected by automatic deluge systems. Design density: 0.3 gpm/sq.ft. for entire area.
1, 5.17.4	The feedwater heater bays protected by automatic sprinklers.
1, 5.17.4	Portable fire extinguishers and hose stations provided.
7, 10.2	Suppression systems in zones adjacent to radwaste tunnel.
7, 9.2	Substantial shield walls around zone. Cable penetrations sealed with noncombustible material. Also reference [5](5.2.4).

**Notes and References:****Number Description**

- 1 SER, July 27, 1979.
- 2 Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-84
- 3 Letter, CECO to NRC 3-29-79.
- 4 Left Intentionally Blank.
- 5 The previous FHA indicates that Exemption Request 5.2 applies to this fire zone.
- 6 NRC Exemption Aug. 18, 1989.
- 7 SER, July 21, 1988.
- 8 Left Intentionally Blank.
- 9 Left Intentionally Blank.
- 10 SER, November 5, 1980.
- 11 Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003 Rev. 3.
- 12 Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.

**ZONE:** 8.2.6.D      **AREA:** TB-I      **LOCATION:** TB2, Elev. 595'-0"

**ZONE DESCRIPTION:** Unit 2 Turbine Bldg. Ground Floor

**FIRE SEVERITY:**

The fire severity for this zone is 2.5 hours. This is primarily due to the allowance for a turbine oil system piping break.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.6.D which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.C	TB-II	3 hour <sup>1</sup>
8.2.6.E	TB-I	Non-rated
8.2.7.E	TB-I	Non-rated
8.2.7.D	TB-I	Non-rated
8.2.2.A	TB-I	Non-rated
8.2.1.B	TB-I	Non-rated
8.2.1.D	TB-I	Non-rated
8.2.5	CT-2	3 hour

<sup>1</sup> The FHA indicates a 3 hour barrier rating with noncombustible penetration seals and open mechanical penetrations.

**EVALUATION ZONE 8.2.6.D:**

This fire zone borders fire zones 8.2.1.B, 8.2.6.C, 8.2.7.C, 8.2.7.D, and 8.2.7.E. The west wall of this area is an exterior wall that is 1'-6" thick concrete except for three sections that are filled with removable concrete block to allow for equipment removal. The north wall is 4'-0" thick concrete except for a section constructed of 3'-0" thick removable concrete block. The walls along the east side of the zone are minimum 3'-0" thick concrete and the walls along the southern end are 4'-0" thick concrete except for a 6-foot wide portion that is made of removable concrete block. None of the walls surrounding this zone are credited with a fire rating. The floor of this zone is the ceiling of fire zone 8.2.1.B. This barrier is constructed of 4'-0" thick concrete with openings for stairwells, equipment removal hatches, and penetrations. The ceiling of this area separates this zone from fire zones 8.2.7.C, 8.2.7.D, and 8.2.7.E and is constructed of 1'-6" thick concrete supported on exposed structural steel and contains openings for stairwells and equipment removal hatches.

Automatic and manual fire suppression systems protect this zone. A wet pipe sprinkler system is installed throughout the zone except in the access corridor along the west wall of the turbine building and over the condenser. In that corridor, a deluge system has been installed to protect transient combustibles that are stored there. A hose station, equipped with 100 ft. of hose, and a portable CO<sub>2</sub> extinguisher are provided in this zone to support manual fire suppression activities. This fire zone has moderately heavy fire loading due to lube oil storage in the area. The other major fixed combustible is electrical cable insulation and the other combustibles to be found in the area are transient in nature such as rubber, cotton, and plastic associated with protective clothing.

A wet pipe sprinkler system protects the total zone except for the corridor where oil is stored and in this location a water spray deluge system is provided. These two sprinklers systems provide assurance that any fire that would originate in this area would be controlled and limited in growth (or extinguished) until the fire brigade arrives; therefore, a reasonable assurance that a fire originating in this fire zone will not propagate to adjacent fire zones exists.

**Fire Zone: 8.2.6.E****Unit 2 Ground Floor****Fire Area:** TB-I**F Drawing:** F-13-1**General Elevation:** 595'-0"**Zone Area:** 14,660 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area smoke detection in the corridor running along row F between column lines 4 and 12, between the reactor feed pump room and the Unit 2 diesel generator room (above the Unit 2 auxiliary transformer feeds). Thermal detectors are located in U-2 Trackway.
<b>Suppression:</b>	Local area wet pipe sprinkler system protects the reactor feedwater pumps, and in the corridor running along row F between column lines 9 and 12. Local preaction sprinkler system has been installed above the Unit 2 trackway at the north end of the fire zone actuated by thermal detectors.
<b>Manual Suppression:</b>	Hose stations, equipped with 100 feet of hose, and portable fire extinguishers.
<b>Other FP features:</b>	Flammable liquids cabinet provided. Structural Steel supporting the battery charger rooms are protected by sprinkler system.
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose lines, or piping breaks will not affect safe shutdown. The effects from these actions would be of no greater severity than those already determined to be acceptable for a design-basis fire. Water runoff would be handled by the general area drainage system.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2N	Equivalent 3 Hour [7]
TB-II	Equivalent 3 Hour [15]
EDG-2	3 Hour
CT-2	3 Hour

**Fire Zone: 8.2.6.E****Unit 2 Ground Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.1.D	TB-I	Non-rated	noncombustible, open mechanical	One non-labeled door	Concrete block at tube pull pit
8.2.1.B	TB-I	Non-rated	noncombustible, open mechanical	No doors	Open pipe chase
1.1.2.1*	RB-2N	Non-rated	noncombustible	No doors	4'-0" thick concrete floor
11.3.3*	RB-2N	3 hour	3 hour except noncombustible mechanical and plugs	No doors	2'-0" thick concrete floor
9.2	EDG-2	3-hour	3 hour(F-161, 162, 163)	Two Class A door Fire Dampers.	1'-0" thick concrete
8.2.7.E	TB-I	Non-rated	noncombustible, open mechanical	No doors	3'-0" thick concrete on exposed steel
8.2.7.D	TB-I	Non-rated	noncombustible	No doors	3'-0" thick concrete on exposed steel
8.2.6.D	TB-I	Non-rated	noncombustible, open mechanical	One nonlabeled door.	3'-0" thick (4'-0" at south wall), concrete block at tube pull pit
8.2.6.C	TB-II	Non-rated [5][15]	None[15]	No doors	Open corridor along row F
8.2.5	CT-2	3 hour	3 hour	2 personnel access hatches/doors [17]	3'-0" thick concrete floor
6.2.B	TB-I	3-hour	3-hr (F-393)	No doors	0'-5 1/2" thick concrete ceiling / floor on sprinkler protected steel
6.2.A	TB-I	3-hour	3-hr (F-393)	No doors	0'-5 1/2" thick concrete ceiling / floor on sprinkler protected steel
1.1.2.2*	RB-2N	3 hour	3 hour (F-54)	One 3 hour door at interlock.	4'-0" thick concrete wall (1'-6" thick at interlock)

\* Secondary Containment Boundary

**Fire Zone: 8.2.6.E****Unit 2 Ground Floor****Fire Protection Commitments:**

Reference Section	Commitment
7, 9.2	Automatic detection and water suppression in corridor. Also reference [9](5.1 & 5.2.4).
1, 3.1.1(9)	Install fire detection system in area of 4kV switchgear 11,12, 21, 22. Also reference [1](5.17.6).
1, 3.1.8	Relocate exhaust vents for reactor feed pump areas and seal openings. 3-hour barriers installed. Also reference [1](5.17.6 & 5.22.6). Relocated not to expose transformers.
1, 3.1.5f	Provide water suppression system for Unit 2 trackway. Also reference [1](5.17.6).
3, (8) PF 38-2	Install fire detection along H wall column row H/15-19 Unit 1 and H/7-11 Unit 2 (high pressure heater bay).
2	Complete detection on ground floor Turbine Building from col. 9 to 17 in eastern corridor and common section, including safe shutdown pump.
2	Automatic sprinkler on ground floor Turbine Building from col. 9 to 17 in eastern corridor and common section, including safe shutdown pump.
2	Detection in far north and south portions of TB corridor and in central portion of 8.2.6.C 12-14/C-F.
10, D.3.c	Water suppression provided over major cable concentrations.
1, 3.1.1	Early warning fire detection system will be provided in the HP-Heater Bay near cable penetrations to the RB.
1, 3.1.11	Oil dispensing stations to have approved cabinets and limit quantity to 55-gallons.
1, 3.1.11	Curbs and drains for liquid storage on TB ground floor. Also reference [1](5.17).
1, 5.17.4	Extra-hazard wet pipe sprinkler system for feed water pumps. Pipe schedule system.
7, 9.2	3-hour separation between RB and TB with exceptions. Also reference [4].
11, 3.1.5.f	Provide pre-action sprinkler system in trackways. Sized for extra-hazard protection.
11, 3.1.5.f	Detection system will comply with NFPA Codes. Heat shields will be provided.
1,5.17.4	Manual fire fighting equipment (portable extinguishers and hose stations) is available.



**Fire Zone: 8.2.6.E****Unit 2 Ground Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-84
3	Letter, CECO to NRC 3-29-79.
4	GL 86-10 Evaluation S040-QH-0612 Rev. 1
5	The previous FHA indicates that Exemption Request 5.2 applies to this fire zone.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	Left Intentionally Blank.
9	Left Intentionally Blank
10	ComEd response to the requirements of Appendix A
11	SER, November 5, 1980.
12	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
13	SER, March 2, 1994.
14	Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003 Rev. 1.
15	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.
16	Note: Reference cable tray loading limits in Table 3.6-2.
17	Upgrading the ceiling to a 3-hour barrier including 6" thick 3-hr rated fire seals between column lines ½ and G/H per DCP 9900175.

**ZONE:** 8.2.6.E      **AREA:** TB-I      **LOCATION:** TB 2, Elev. 595

**ZONE DESCRIPTION:**

Fire Zone 8.2.6.E consists of the north end, ground floor areas of the Unit 2 Turbine Building.

This zone extends from the 595 foot elevation to the bottom of the floor at elevation 615, and is bounded by the building exterior wall to the north. To the east, the zone is bounded by the building exterior wall and by the wall separating the Turbine Building from Reactor Building 2. To the west the zone is bounded by the building exterior wall and by the wall separating it from zone 8.2.6.D. To the south, the zone is bounded by the wall separating it from zone 8.2.6.D, the wall separating the Turbine Building from Reactor Building 2, and the interface with zone 8.2.6.C in area TB-II. Fire zone 9.2, the Unit 2 diesel generator room, projects into zone 8.2.6.E along the east wall.

The zone contains the reactor feed pump room, the HP heater room, the Unit 2 trackway, 4kV switchgear fed by the unit auxiliary and reserve auxiliary transformers, and other equipment.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.1.B, below	TB-I
8.2.5, below	CT-2
9.2, east	EDG-2
8.2.6.D, south & west	TB-I
6.2.A, 6.2.B, above	TB-I
8.2.7.D, 8.2.7.E, above	TB-I
1.1.2.2	RB-2
11.3.3, 1.1.2.1, below	RB-2
8.2.6.C	TB-II

**DETECTION:**

Smoke detection is provided in the corridor between column line 4 and zone 8.2.6.C in TB-II, in the area between the feed pump room and the diesel generator room. Thermal detectors are provided in the trackway area to activate the preaction sprinkler system.

**AUTOMATIC SUPPRESSION:**

Wet pipe sprinkler protection is provided for:

- The reactor feed pump area;
- The corridor between column line 9 and zone 8.2.6.C in area TB-II.

A preaction sprinkler system is provided in the trackway.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. A minor portion of the combustible loading is lubricating oil. The remainder of the fixed combustibles consists of various materials distributed through the zone with good spatial separation. This distribution means that the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables and the lubricating oil. The trays extend contiguously throughout the zone. The oil source is predominantly that associated with the reactor feed pumps. Although the feed pump lube oil systems are located within the confines of the feed pump room and some equipment curbing is provided, the curbing is not placed to confine spills from many potential system break points and no curbing is provided to preclude a large spill from flowing beyond the room boundaries.

Transients account for minor portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The primary hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of propagating the fire away from the area of origin. The primary fixed combustible capable of such propagation is the electrical cables.

The installed smoke detection system, where provided, should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out. The thermal detectors and sprinkler systems also provide for detection and annunciation of fires, albeit somewhat less prompt than for the areas with smoke detectors.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Limited fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 8.2.6.E:**

The potential for fire spread throughout the zone is limited by the discontinuity of combustibles and the protection provided for the reactor feed pump oil hazard. In the main portion of the area, combustibles loading is vastly made up of electrical cables in the tray system. Thus, significant fire spread in this area is dependent on tray involvement. Should the trays become involved, intervention by the fire brigade will prevent spread throughout. In the feed pump area, the potential exists for spills of large quantities (e.g., >100 gallons) of oil outside the confines of the containment system. Such a spill could result in a large exposure area including equipment outside the feed pump room, however, the feed pump room sprinkler protection will limit fire spread.

##### **Fire Spread Potential Within Fire Area TB-I:**

Fire spread to zone 8.2.6.D is unlikely due to the reinforced concrete barrier which separates the zones. Although not fire rated, the barrier is of substantial construction, exhibiting good fire resistive qualities and should not be challenged by the loading in zone 8.2.6.E.

The potential for spread to zone 8.2.7.E is reduced by the reinforced concrete floor/ceiling assembly separating it from 8.2.6.E. However, due to the numerous unprotected openings in the floor/ceiling assembly and the distribution of combustibles in zone 8.2.7.E vertical fire spread from the unsprinklered portions of 8.2.6.E is possible.

Zone 6.2.A and 6.2.B are separated from 8.2.6.E. below, by a reinforced concrete floor supported by structural steel members protected by automatic suppression system (Ref. FPR 3.6.1). The conduit and piping penetrations are 3-hour fire assemblies providing a 3-hour fire barrier. Fire spread across this barrier is unlikely.

##### **Fire Spread Potential To EDG-2:**

Fire zone 9.2, the diesel generator room, is separated from 8.2.6.E by three-hour, fire-rated construction. The combustibles in zone 8.2.6.E are not sufficient to challenge such a barrier.

Zone 8.2.7.D is located, in part, above zone 8.2.6.E. The separation between these zones consists of a reinforced concrete floor/ceiling assembly except in the HP heater bay area. The floor in that area is steel grating. The HP heater room between elevations 595 and 615 has low combustible loading except for the cable trays and risers. These risers provide a direct link between the two zones. The wall providing separation from the major hazards in zone 8.2.6.E is of substantial construction to serve as a radiation shield. Its integrity would not be challenged by the expected combustibles in zone 8.2.6.E outside the heater room. However, vertical fire spread between the zones in the HP heater bay area is a distinct possibility should the cables inside the heater room become involved.

Zone 8.2.1.B is located, in part, below zone 8.2.6.E. A reinforced concrete floor ceiling assembly separates these two zones, but the floor is penetrated by a connecting stairwell and a pipe chase. Thus, the potential exists for fire spread to 8.2.1.B if an agent, such as a combustible liquid, is involved which can flow to the lower space. However, there are no significant fixed combustibles in this area which are liquid.

**Fire Spread Potential To Fire Area TB-II:**

Zone 8.2.6.C in fire area TB-II adjoins zone 8.2.6.E of area TB-1 in the north-south corridor which runs between column lines F and G. No physical separation is provided at their juncture. The potential for fire spread between areas TB-I and TB-II is affected by a relatively limited combustible loading in this area and a wet pipe sprinkler installation. However, two large cable trays transit this corridor, linking the two areas. The corridor is provided with smoke detection which provides annunciation in the control room when a fire is detected. Based on the distribution of combustibles, the potential for large fires in zone 8.2.6.E is greater in those portions of the zone having high ceilings and large vertical vent paths; not in the corridor area which has a relatively low ceiling with no vertical vent paths. Thus, fires in the corridor are expected to be cable fires resulting from electrical fault ignition or from exposures from transient combustibles. The rate of spread of cable tray fires is low, allowing time for manual intervention before significant spread from the point of ignition occurs. The possibility of this intervention is enhanced with the presence of the smoke detection system provided. The presence of the sprinkler system should be of value in controlling any exposure fires which may occur as well as combating any cable tray fires. To reduce the possibility of propagation to area TB-II, the region of the corridor in this area is designated a "red zone" where transients are not permitted without special review and authorization. The likelihood of a fire spreading to TB-II is limited; but cannot be discounted since the activation of the sprinkler system or timely and effective fire brigade action would be needed to prevent such spread if a fire occurred near the juncture of the two areas.

**Fire Spread Potential To CT-2:**

Fire Zone 8.2.5, the Unit 2 cable tunnel, is separated from fire zone 8.2.6.E by 3-hour fire rated construction. The combustibles in zone 8.2.6.E are not sufficient to challenge this barrier.

**Fire Spread Potential To Fire Area RB-2:**

Fire area TB-I is separated from fire area RB-2 by three-hour rated barriers and the concrete shield walls of the MSIV room (zone 1.1.2.2). The three-hour rated barriers should not be challenged by the combustible loading in zone 8.2.6.E and, therefore are not a concern. The MSIV room walls have sufficient thickness to withstand a fire of significantly more than three-hour severity. However, there is an unrated penetration in one of the walls, consisting of a non-rated air lock door. The air lock itself is, in effect, a combustible free space between the MSIV room in area RB-2 and the Turbine Building. The portion of zone 8.2.6.E directly outside the air lock is the north-south corridor lying between column lines F and G. The fixed combustibles in the corridor are limited to cable trays in the overhead. Should these become involved in fire, propagation into the air lock is not expected due to the lack of intervening combustibles, the relative elevations of the cable trays and the top of the air lock doorway, and the ceiling elevation of the corridor. In consideration of this, the propagation of a fire from zone 8.2.6.E into the Reactor Building via zone 1.1.2.2 is not credible.

Zone 8.2.6.E of fire area TB-I is located, in part, above zones 1.1.2.1 and 11.3.3 in area RB-2. Separation between 8.2.6.E and the reactor building is provided by a reinforced concrete floor/ceiling assembly. This construction, bolstered by the lack of penetrations, is capable of withstanding a fire of significant severity. Considering this and the combustible loading in the portion of 8.2.6.E above 1.1.2.1 and 11.3.3, fire propagation between these zones is not credible.

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**Fire Zone: 8.2.7.D****Unit 2 Mezzanine Floor****Fire Area:** TB-I**F Drawing:** F-15-1**General Elevation:** 615'-6"**Zone Area:** 6,039 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area smoke detection around cable risers that are located in the high pressure heater bay.
<b>Suppression:</b>	General area wet pipe sprinkler system except over low pressure heaters 2A1-3101, 2A2-3101, 2A3-3101, and in the corridor along row C, the L. P. Heater Pull Space.
<b>Manual Suppression:</b>	Hose stations equipped with 100 feet of hose and portable fire extinguisher(s).
<b>Other FP features:</b>	1-hour rated fire wrap around Bus Duct to SWGR 23-1.
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose streams, or piping breaks would not adversely affect the ability to safely shut down. Water runoff would be handled by the general area drainage system or would flow to the turbine condenser pit where it could be removed via sump pumps.

**Combustible Loading Limit:**

**Analyzed Combustible Loading Category:** High  
**Equivalent Fire Severity:** 4.42 Hours

**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
23-1	Equivalent 3 Hour [7]
RB-2N	3 Hour (Equivalent 3 Hour at MSIV Room) [7]
TB-IV	Equivalent 3 Hour[13]
TB-II	Equivalent 3 Hour [14]



**Fire Zone: 8.2.7.D****Unit 2 Mezzanine Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.6.C	TB-II	Non-rated[14]	noncombustible[14]	No doors	1'-6" thick concrete
1.1.2.2*	RB-2N	Non-rated	noncombustible, open mechanical	No doors	2'-0" thick concrete floor
1.1.2.3*	RB-2N	3 hour	3 hour, except 4 kV bus duct [7]	No doors	4'-0" thick concrete
1.1.2.2*	RB-2N	3 hour[6][7]	3 hr(F-58, 59, 60)	No doors	4'-0" thick concrete
8.2.6.E	TB-I	Non-rated[13]	noncombustible[13]	No doors	Minimum 1'-6" thick concrete
8.2.6.D	TB-I	Non-rated	open	No doors	open
14.1.2	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.8.D	23-1	Non-rated[6][7]	noncombustible (3 hour under SWGR 23-1)	No doors	4'-0" thick concrete
8.2.8.E	TB-IV	Non-rated	noncombustible	No doors	4'-0" thick concrete
8.2.7.E	TB-I	Non-rated	noncombustible	One unlabeled door.	3'-0" thick concrete and concrete block
8.2.7.C	TB-II	Non-rated[14]	noncombustible[14]	One unlabeled door[14]	4'-0" thick concrete and concrete block

\* Secondary Containment Boundary

**Fire Zone: 8.2.7.D****Unit 2 Mezzanine Floor****Fire Protection Commitments:**

Reference Section	Commitment
7, 9.2	Extensive automatic sprinkler protection provided throughout. Except west of Row D. Also reference [10](5.2.4).
2	Provide 1-hour fire door at 12 and 14/G in shield wall on U1 and U2 Turbine Building mezz. floor.
2	Protect 4-kV bus duct to SWGR 23-1 with 1-hour fire barrier.
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1.
1, 5.18.4	Portable extinguishers and hose stations provided.
1, 5.18.4	Sprinklers provided in the heater bays.
7, 9.2	3-hour separation between RB and TB. Also reference [11].
1, 3.1.1	Provide fire detection in high pressure heater bays (ceiling penetrations and cable penetrations). Also reference [1](5.18).
10, 5.2.4	All penetrations in shield walls sealed with noncombustible materials. Substantial, locked, unlabeled, metal doors.
7, 6.2	Manual fire fighting equipment available in this zone.

**Fire Zone: 8.2.7.D****Unit 2 Mezzanine Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Intentionally left blank
5	Exemption Request 5.7 (12-18-84) applies to this fire zone. Exemption for lack of complete detection and suppression for enclosure of cable in a fire barrier having a 1-hour rating. Exemption granted (9.0) 12-11-87. Exemption request 5.7 was withdrawn.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	GL 86-10 Evaluation S040-QH-0613 Rev. 1.
9	Intentionally Left Blank
10	Appendix R Exemption Request 5.2
11	GL 86-10 Evaluation S040-QH-0612 Rev. 1.
12	Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation, NTSC 98-020.003 Rev. 3.
13	Evaluation for fire area separation between TB-I and TB-IV, ER9801623.
14	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.

**ZONE:** 8.2.7.D      **AREA:** TB-I      **LOCATION:** TB2, Elev. 615'-6"

**ZONE DESCRIPTION:** Unit 2 Mezzanine Floor, North-Central Section

**FIRE SEVERITY:**

The fire severity for this zone is less than 4.5 hours.

**SER ISSUES:**

The Safety Evaluation Reports do not establish combustible loading limits for this zone. The July 21, 1988, SER approves four exemptions that are either directly applicable or related to this zone. Section 3.2.2 of this SER approves non-rated components in the interface between the Unit 2 Reactor Building steam chase (Fire Zone 1.1.2.2) and this fire zone. Section 6.0 of the SER approves the non-rated penetration of the 4-kV bus duct from the Unit 2 Reactor Building to this fire zone. Section 14.0 of the SER approves non-rated components of the fire barrier between this fire zone and Zone 8.2.8.D, on the turbine operating floor. While not directly applicable, Section 9.0 of the SER approves non-rated components of the barrier between the Southern and Central Zone Groups of the Turbine Building. (This fire zone is part of the Northern Zone Group).

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.7.D which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.7.C	TB-II	Non-rated
8.2.7.E	TB-I	Non-rated
8.2.8.E	TB-IV	Non-rated
8.2.8.D	23-1	Non-rated
14.1.2	TB-I	Non-rated
8.2.6.D	TB-I	Non-rated
8.2.6.E	TB-I	Non-rated
8.2.6.C	TB-II	Non-rated
1.1.2.2	RB-II	Non-rated
1.1.2.3	RB-II	3 hour <sup>1</sup>

<sup>1</sup> The 4 kV bus duct from the 1/2 diesel generator penetrates this wall, and is not sealed.

**EVALUATION ZONE 8.2.7.D:**

Fire zone 8.2.7.D is completely enclosed by concrete walls. The wall that separates this zone from the unit 2 reactor building is constructed of 4'-0" thick reinforced concrete and is 3-hour fire rated except for a 4-kVbus duct penetration for the feed from the swing diesel generator. The west wall of this zone is constructed of 1'-6" thick concrete and removable concrete block and is an exterior wall. Part of the north wall of this zone is an exterior wall constructed of 4'-0" thick concrete. The remainder of the north wall is an interior wall separating this zone from fire zone 8.2.6.E and is constructed of 3'-0" thick concrete. The south wall is constructed of 4'-0" thick concrete and contains an unlabeled door for access to zone 8.2.7.C. The floor of this zone is constructed of minimum 1'-6" thick concrete supported on exposed structural steel and separates this zone from fire zones 8.2.6.C, 8.2.6.D, and 8.2.6.E. The ceiling of this zone separates this zone from fire zones 8.2.8.D and 8.2.8.E and is constructed of 4'-0" thick concrete supported on exposed structural steel. Both the floor and ceiling contain openings for stairways and equipment removal hatches.

This fire zone is protected by a wet pipe sprinkler system installed throughout the zone except over the low pressure heaters and in the corridor along row C. Ionization type fire detectors are installed around cable risers located in the high pressure heater bay. Hose stations, each equipped with 100 ft. of hose, and a portable CO<sub>2</sub> extinguisher are also provided in this zone to support manual fire suppression activities. Fixed fire loading in this zone is light. However, this area also has the potential of heavy fire loading due to turbine lube oil piping in the area. The fire suppression and fire detection features assure that a fire within this area would be identified and addressed by an automatic suppression system until the plant fire brigade responded. Therefore reasonable assurance exists that a fire originating in this fire zone would not progress to adjacent fire zones.

**CONCLUSION:**

Based on the type of construction, combustible content, and the fire protection features of this zone, the increase in combustible limits for this fire zone are acceptable and will not result in a fire originating within fire zone 8.2.7.D that will spread to adjacent fire zones and damage redundant or alternate safe shutdown equipment or cables.

**Fire Zone: 8.2.7.E**

**Unit 2 Mezzanine Floor**

**Fire Area:** TB-I

**F Drawing:** F-15-1

**General Elevation:** 615'-6"

**Zone Area:** 9,526 Ft<sup>2</sup>

**Fire Protection Features:**

- Detection:** General area smoke detection except above the equipment removal hatches and the feeds from the generator to the main power transformer, including over the 4kV SWGR buses 23 & 24. Local area heat (thermal) detection above the hydrogen seal oil unit and the feedwater regulating valve hydraulic units.
- Suppression:** Local area wet pipe sprinkler system in the area between rows F and G and column lines 3 and 4. Local water spray system actuated by thermal detectors protects the hydrogen seal oil unit and the feedwater regulating valve hydraulic units.
- Manual Suppression:** Hose stations equipped with 100 feet of hose and portable fire extinguisher(s).
- Other FP features:** Curbing around feed reg valve hydraulic units and hydrogen seal oil units. The floor that bounds the 125Vdc Panel Room (Fire Zone 6.2.A) and the Battery Charging Room (Fire Zone 6.2.B) has automatic suppression to protect the structural steel.
- Suppression Effects:** Water discharge in this area will not affect safe shutdown equipment. Water runoff would be handled by the general area drainage system or would travel down stairs to Fire Zone 8.2.6.E.

**Combustible Loading Limit:**

**Analyzed Combustible Loading Category:** Low

**Equivalent Fire Severity:** 1.25 Hours

**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-IV	Equivalent 3 Hour [15]
EDG-2	3 Hour

**Fire Zone: 8.2.7.E****Unit 2 Mezzanine Floor****Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.6.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	1'-6" thick concrete
9.2	EDG-2	3 hour	3 hour, except Exhaust Duct Penetration.	Two 3-hour fire dampers	0'-6" thick concrete on fire proofed steel
8.2.6.E	TB-I	Non-rated	noncombustible, open mechanical	No doors	3'-0" thick concrete
8.2.8.E	TB-IV	Non-rated[15]	noncombustible, open mechanical[15]	No doors	4'-0" thick concrete
8.2.7.D	TB-I	Non-rated	noncombustible	One unlabeled door.	3'-0" thick concrete
7.2	TB-I	3-hour	3-hr (F-397, F-398)	One class "A" fire door Three, 3-hr Fire Dampers	1'-0" thick concrete
6.2.B	TB-I	3-hour	3-hr (F-394, F-395)	One Class A door Two dampers.	1'-0" thick concrete
6.2.A	TB-I	3-hour	3-hr (F-394)	One Class "A" fire door Two, 3-hr Fire Dampers.	1'-0" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 8.2.7.E****Unit 2 Mezzanine Floor****Fire Protection Commitments:**

Reference Section	Commitment
1, 3.1.5g	Relocate manual pull station for Unit 2 Hydrogen seal unit deluge to outside of fire area. Also reference [1](5.18.6).
8, pg. 4	Install Class A fire doors to DC distribution center Unit 2.
9, 5.2.4	All penetrations in shield walls sealed with noncombustible materials. Substantial, locked, unlabeled, metal doors provided.
1, 3.1.1	Install early warning fire detection system in area of 4kV switchgear 13, 14, 23, and 24. Ionization fire detectors provided per [7](14.2). Fire detection provided for this zone except above hatches and generator feeds.
1, 5.18.4	Manual fire fighting equipment (portable extinguishers and hose stations) is available for this zone.
1, 3.1.11	Curbs around hydrogen seal oil unit. Also reference [1](5.18.6).
1, 5.18.4	Automatic deluge system provided for hydrogen seal oil unit.
1, 5.18.4	Automatic sprinkler protection provided for hydrogen seal oil area.
7, 9.2	3-hour separation between RB and TB. Also reference [5].
11, F.8	Hydrogen seal oil reservoirs protected by automatic water spray systems.

**Fire Zone: 8.2.7.E****Unit 2 Mezzanine Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Interim Compensatory Measures IV. (12-18-84).
5	GL 86-10 Evaluation S040-QH-0612 Rev. 1.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	Letter, dated 4-10-74, CECO to NRC.
9	Appendix R Exemption Request 5.2
10	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
11	ComEd response to the requirements of Appendix A
12	GL 86-10 Evaluation S040-QH-0613 Rev. 1.
13	SER, March 2, 1994.
14	Note: Reference cable tray loading limits in Table 3.6-2.
15	Evaluation for fire area separation between TB-I and TB-IV, ER9801623.
16	Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003 Rev. 3.
17	Upgrading of walls, including seals, fire door and dampers for adjacent fire zones 6.2.A, 6.2.B and 7.2 per DCP 9900175.
18	Separation Boundary for Unit 2 Diesel Generator Room 86-10 Evaluation Q-ECDS-00-0171.
19	Evaluation for presence of gas cylinders EC 401197.

**ZONE:** 8.2.7.E      **AREA:** TB-I      **LOCATION:** TB 2, Elev. 615

**ZONE DESCRIPTION:**

Fire Zone 8.2.7.E consists of the north end of the 615 foot elevation of the Unit 2 Turbine Building.

The zone extends from the 615 foot elevation to the bottom of the floor at elevation 639 and is bounded by the building exterior wall on the north, east and west sides and by the wall separating it from zone 8.2.7.D. In the north east corner, the zone is bounded, in part, by the west wall of zone 6.2.A and a portion of the south and west walls of 6.2.B and 7.2.

The zone contains various items including switchgear, a battery bank, several MCC's, compressed gas cylinders, the hydrogen seal oil unit, the stator cooling unit, and bus ducting from the main generator.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.6.D, 8.2.6.E, below	TB-I
8.2.7.D, south	TB-I
6.2.A, 6.2.B, 7.2, east and north	TB-I
8.2.8.E, above	TB-IV
9.2, below	EDG-2

**DETECTION:**

Smoke detection is provided throughout the zone except for the equipment hatch areas and the isolated phase bus duct area. Heat detection is provided above the hydrogen seal oil unit and the FWRV hydraulic unit.

**AUTOMATIC SUPPRESSION:**

A local wet pipe sprinkler system provides protection for the area between column lines F and G and column lines 3 and 5. An automatic water spray system is provided for the hydrogen seal oil unit and the FWRV hydraulic unit.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hour

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The other significant combustibles are transformer oil, lubricating oil, and hydraulic oil. The remainder of the fixed combustibles consist of various materials distributed with good spatial separation. Thus, there are several fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone. With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor. The bulk of the lubricating oil is contained in the hydrogen seal oil unit. The transformer oil is contained in two separate transformers on the west side of the zone. The hydraulic fluid is contained in a reservoir in the southeast corner of the zone. In general, dikes or curbs are not provided for spill retention. Compressed gas cylinders, some of which contain hydrogen, are also present. However, even if the cylinders were to leak, the hydrogen concentration in the room would not exceed the lower explosive limit.

Transients account for a moderate portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The real hazard associated with transients in this zone, is the potential for a localized fire which could expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables and the various oils.

The installed smoke detection system, where provided, should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out. In other areas, brigade call out could be delayed unless there was work being performed in the zone.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

**FIRE SPREAD POTENTIAL:****Fire Spread Potential Within Fire Zone 8.2.7.E:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles unless the exposed cables become ignited or there is an oil spill fire. Should the trays become involved, propagation throughout the zone could be expected, barring effective fire brigade action. In the event of an oil spill, extensive spread could occur and, if ignition occurred, significant area involvement could occur, including ignition of the cable trays.

**Fire Spread Potential Within Fire Area TB-I:**

Fire zone 8.2.6.E, below, is separated from 8.2.7.E by a reinforced concrete floor/ceiling assembly. The integrity of this barrier is compromised by a number of sizable openings, including stairways and equipment handling hatches, and smaller openings for piping and cable trays. The potential for fire spread to the zone below, 8.2.6.E, is not likely, except in the case of spill fires, due to the lack of combustibles penetrating the floor (cable risers penetrating the floor are fire stopped at the floor, preventing downward fire spread along the cables). A significant spill fire could spread to the zone below through the many uncurbed floor penetrations.

Fire zone 8.2.7.D is separated from 8.2.7.E by reinforced concrete shield walls and by portions of the turbine-generator pedestal. All of these barriers are of substantial construction and exhibit fire resistive capabilities. The combustible loading of 8.2.7.E is not sufficient to challenge these barriers. Where cable trays penetrate these walls, seals are installed to preclude fire propagation along the cables from zone to zone. The access door installed in the wall along column line 5, although not rated, is considered to be adequate for the purpose considering the distribution of combustibles in its vicinity and the ceiling heights in the area.

The potential for fire spread into zones 6.2.A, 6.2.B, and 7.2 located in the Northeast corner of the zone is unlikely due to 1' thick intervening reinforced concrete barriers which meet or exceed building code and NPFA requirements for a 3-hour fire barrier. All penetrations through these walls, including cable trays are sealed with 3-hour fire rated seals. The doors and fire dampers are Class "A" fire components designed to provide 3-hour fire resistance. Fire spread into these zones is not likely.

**Fire Spread Potential to Fire Area EDG-2:**

Fire spread to fire zone 9.2 is unlikely due to separation by three-hour rated construction. Such construction should not be challenged by any fire which can credibly occur in zone 8.2.7.E.

**Fire Spread Potential To Fire Area TB-IV:**

The potential for fire spread to the zone 8.2.8.E, above, is limited by the reinforced concrete floor/ceiling assembly which separates the two zones and the discontinuity of combustibles penetrating it. Where openings exist in the floor (e.g., stairways, equipment hatches, pipe penetrations), the lack of combustibles in the immediate area and the discontinuity of combustibles in the zone above would make fire spread unlikely. Cable riser penetrations are sealed at the floor; precluding flame spread along the cables. Although considerable smoke and combustion gases would vent to zone 8.2.8.E, fire spread is not expected.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 8.2.7.E is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

11.0 Lack of 3-Hour Barriers Between the Fire Areas 8.2.7.C, 8.2.7.E, and 8.2.8.D and Northern and Central Zone Groups.

**Issue:** The barrier shared by 8.2.7.E in TB-I and 8.2.8.E in TB-IV is not rated; nor is the barrier separating 8.2.8.E from 8.2.7.C, both of which are in TB-IV. Zones 8.2.7.C and 8.2.7.E contain redundant safe shutdown components. The principle concern is that a fire could originate in 8.2.7.E and spread to 8.2.8.E potentially spreading to 8.2.7.C and endangering redundant safe shutdown components.

**Evaluation:** This topic has been explored in the discussion of **Fire Spread Potential**, above. Based on that exploration, the possibility of fire spread to the zone 8.2.8.E from zone 8.2.7.E, below, is highly unlikely and, therefore, the separation provided is acceptable for the hazard. This finding is consistent with that of the existing SER.

**CONCLUSION:**

The evaluation presented above for fire zone 8.2.7.E demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The barrier shared by 8.2.7.E and 8.2.8.E deviates from Appendix R with respect to separation of redundant safe shutdown trains. However, the separation provided is sufficient for the hazard and a fire in zone 8.2.7.E will not result in the loss of the redundant trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 11.1.2.A****Unit 2 RHR Service Water Pump Room****Fire Area:** TB-I**F Drawing:** F-9-1**General Elevation:** 547'-0"**Zone Area:** 496 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area heat (thermal) detection.
<b>Suppression:</b>	General area wet pipe sprinkler system.
<b>Manual Suppression:</b>	Portable fire extinguishers and one hose station equipped with 100 feet of hose are located in adjacent Fire Zone 8.2.1.B.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Water removal would be accomplished with sump pumps as there are no drains located within the RHRSW cubicles.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	N/A

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.1.B (Ceiling)	TB-I	Non-rated	noncombustible	No doors	0'-11" thick concrete
8.2.1.B	TB-I	Non-rated	noncombustible	One unlabeled Watertight door.	1'-6" thick concrete
11.1.2.B	TB-I	Non-rated	noncombustible	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
1, 5.13.6	For the TB Basement floor which includes the SW Pump Rooms, waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Lube oil storage will be limited to 30 gallons. Provided in Fire Zone 8.2.1.B.
2	Smoke detection in rooms housing RHR service water pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Thermal detection is provided. See M4-1(2)-83-30 Task 2.18, 2.23.
1, 3.1.5	The turbine building sprinkler system will be extended to provide protection for the RHR service water rooms and Diesel Generator cooling pumps. Also reference [1] (5.13.6).

**Fire Zone: 11.1.2.A****Unit 2 RHR Service Water Pump Room****Notes and References:****Number    Description**

- 1    SER, July 27, 1979.
- 2    Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
- 3    Lack of complete detection and suppression for Fire Area TB-I, GL 86-10  
Evaluation NTSC 98-020.003 Rev. 3.



**ZONE:** 11.1.2.A      **AREA:** TB-I      **LOCATION:** Unit 2 TB, Elev. 547'-0"

**ZONE DESCRIPTION:** Unit 2 RHR Service Water Pump Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

All fire zones adjacent to Fire Zone 11.1.2.A are in the same fire area, and are separated by non-fire-rated walls. The walls are constructed of 4'-0" thick concrete except for the east wall which is 1'-6" thick concrete. Penetrations in these walls are sealed with noncombustible watertight materials, and there is a heavy metal watertight door in the east wall.

**CONCLUSION:**

The substantial compartment boundaries, even though not fire-rated, are not likely to be challenged by a postulated fire of 1.25 hour equivalent fire severity, particularly considering the wet pipe sprinkler protection provided for this zone. Further, since the adjoining fire zones are in the same fire area, spread of fire would not adversely impact safe shutdown capabilities.

**Fire Zone: 11.1.2.B****Unit 2 RHR Service Water Pump Room****Fire Area:** TB-I**F Drawing:** F-9-1**General Elevation:** 547'-0"**Zone Area:** 599 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area heat (thermal) detection.**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguishers and one hose station equipped with 100 feet of hose are located in adjacent Fire Zone 8.2.1.B.**Other FP features:** None**Suppression Effects:** Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Water removal would be accomplished with sump pumps as there are no drains located within the RHRSW cubicles.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:****Fire Area****Barrier Description**

None

N/A

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.1.B	TB-I	Non-rated	noncombustible	One unlabeled Watertight door.	1'-6" thick concrete
11.1.2.C	TB-I	Non-rated	noncombustible	No doors	4'-0" thick concrete
11.1.2.A	TB-I	Non-rated	noncombustible	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:****Reference Section****Commitment**

- |           |  |
|-----------|--|
| 1, 5.13.6 | For the TB Basement floor which includes the SW Pump Rooms, waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Lube oil storage will be limited to 30 gallons. Provided in Fire Zone 8.2.1.B. |
| 2         | Smoke detection in rooms housing RHR service water pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Thermal detection is provided. See M4-1(2)-83-30 Task 2.18, 2.23.   |
| 1, 3.1.5  | The turbine building sprinkler system will be extended to provide protection for the RHR service water rooms and Diesel Generator cooling pumps. Also reference [1] (5.13.6).  |

**Fire Zone: 11.1.2.B****Unit 2 RHR Service Water Pump Room****Notes and References:****Number    Description**

- 1    SER, July 27, 1979.
- 2    Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
- 3    Lack of complete detection and suppression for Fire Area TB-I, GL 86-10  
Evaluation NTSC 98-020.003 Rev. 3.

**ZONE:** 11.1.2.B      **AREA:** TB-I      **LOCATION:** Unit 2 TB, Elev. 547'-0"

**ZONE DESCRIPTION:** Unit 2 RHR Service Water Pump Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

All fire zones adjacent to Fire Zone 11.1.2.B are in the same fire area, and are separated by non-fire-rated walls. The walls are constructed of 4'-0" thick concrete except for the east wall which is 1'-6" thick concrete. Penetrations in these walls are sealed with noncombustible watertight materials, and there is a heavy metal watertight door in the east wall.

**CONCLUSION:**

The substantial compartment boundaries, even though not fire-rated, are not likely to be challenged by a postulated fire of 1.25 hour equivalent fire severity, particularly considering the wet pipe sprinkler protection provided for this zone. Further, since the adjoining fire zones are in the same fire area, spread of fire would not adversely impact safe shutdown capabilities.

**Fire Zone: 11.1.2.C****Unit 2 RHR Service Water Pump Room****Fire Area:** TB-I**F Drawing:** F-9-1**General Elevation:** 547'-0"**Zone Area:** 296 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area heat (thermal) detection.
<b>Suppression:</b>	General area wet pipe sprinkler system.
<b>Manual Suppression:</b>	Portable fire extinguishers and one hose station equipped with 100 feet of hose are located in adjacent Fire Zone 8.2.1.B.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Water removal would be accomplished with sump pumps as there are no drains located within the RHRSW cubicles.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	N/A

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.2.A	TB-I	Non-rated	noncombustible	No doors	2'-3" thick concrete ceiling
8.2.1.B (East)	TB-I	Non-rated	noncombustible	One unlabeled Watertight Door.	1'-6" thick concrete
8.2.1.B (South)	TB-I	Non-rated	noncombustible	No doors	1'-6" thick concrete
11.1.2.B	TB-I	Non-rated	noncombustible	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
1, 5.13.6	For the TB Basement floor which includes the SW Pump Rooms, waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Lube oil storage will be limited to 30 gallons. Provided in Fire Zone 8.2.1.B.
2	Smoke detection in rooms housing RHR service water pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Thermal detection is provided. See M4-1(2)-83-30 Task 2.18, 2.23.
1, 3.1.5	The turbine building sprinkler system will be extended to provide protection for the RHR service water rooms and Diesel Generator cooling pumps. Also reference [1] (5.13.6).

**Fire Zone: 11.1.2.C****Unit 2 RHR Service Water Pump Room****Notes and References:****Number    Description**

- 1    SER, July 27, 1979.
- 2    Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
- 3    Lack of complete detection and suppression for Fire Area TB-I, GL 86-10  
Evaluation NTSC 98-020.003 Rev. 3.

**ZONE:** 11.1.2.C      **AREA:** TB-I      **LOCATION:** Unit 1 TB, Elev. 547'-0"

**ZONE DESCRIPTION:** Unit 2 RHR Service Water Pump Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

All fire zones adjacent to Fire Zone 11.1.2.C are in the same fire area, and are separated by non-fire-rated walls. The walls are constructed of 4'-0" thick concrete except for the east wall which is 1'-6" thick concrete. Penetrations in these walls are sealed with noncombustible watertight materials, and there is a heavy metal watertight door in the east wall.

**CONCLUSION:**

The substantial compartment boundaries, even though not fire-rated, are not likely to be challenged by a postulated fire of 1.5 hour equivalent fire severity, particularly considering the wet pipe sprinkler protection provided for this zone. Further, since the adjoining fire zones are in the same fire area, spread of fire would not adversely impact safe shutdown capabilities.

**Fire Zone: 14.1.2****Unit 2 Off Gas Recombiner Room****Fire Area:** TB-I**F Drawing:** F-23-1**General Elevation:** 626'-6"**Zone Area:** 8,077 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Hose stations equipped with 100 feet of hose, located at elevations 648'-6" and 668'-0". Portable fire extinguisher(s) located on el. 668'-0". Hose station and portable fire extinguisher(s) located just outside the fire zone on el. 626'-0".**Other FP features:** None**Suppression Effects:** No safe shutdown paths would be affected by water release in this zone. Water runoff would be controlled through utilization of floor drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-IV	Equivalent 3 Hour[4]
TB-II	Equivalent 3 Hour [5]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.6.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.7.D	TB-I	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.10	TB-II	Non-rated[5]	noncombustible, open mechanical[5]	Two unlabeled doors[5]	4'-0" thick concrete
8.2.8.E	TB-IV	Non-rated[4]	noncombustible, open mechanical[4]	No doors	3'-0" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 14.1.2****Unit 2 Off Gas Recombiner Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Exemption Request 5.2 applies to this fire zone and involves the lack of 3-hour fire barriers between the Southern and Central Zone Groups.
2	There is a 1-inch oxygen line from the Unit 2 Oxygen Station in Fire Zone 8.2.10 to the Unit 2 offgas system in this fire zone.
3	Complete detection and suppression has not been provided in this zone. This is justified in GL 86-10 Evaluation NTSC 98-020.003 Rev. 3.
4	Evaluation for fire area separation between TB-I and TB-IV, ER9801623.
5	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.
6	Evaluation for presence of gas cylinders EC 401197.

**ZONE:** 14.1.2      **AREA:** TB-I      **LOCATION:** Unit 2 TB, Elev. 626' -6"

**ZONE DESCRIPTION:** Unit 2 Off Gas Recombiner Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 14.1.2 but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.8.E	TB-IV	3' thick concrete - Non-rated
8.2.10	TB-II	4' thick concrete - Non-rated

**EVALUATION:**

The primary concern relative to the affect on safe shutdown capability would be a fire originating in Fire Zone 14.1.2 and spreading to either of the adjacent zones.

There are no safe shutdown cables or equipment in Fire Zones 14.1.2, 8.2.8.E, or 8.2.10. Therefore, fire spread between Fire Zone 14.1.2 and either adjoining fire area would not affect safe shutdown capability.

The potential for a fire or explosion due to the Off Gas recombination process has been considered. Noncondensable gases (67 cfm of Hydrogen and 33.5 cfm of Oxygen) are removed from the Unit 2 condenser by the steam jet air ejectors, and processed in the Unit 2 Off Gas Recombiner Room (Fire Zone 14.1.2). Very little energy would be required to ignite the products involved in the process. The presence of potential ignition sources such as the catalytic converter suggests that if a release of hydrogen or a hydrogen/oxygen mixture were to occur a fire or explosion could result. The Off Gas Recombiner process is considered to be a safe operation due to the design features of the process, the substantial separation from adjacent zones, and the negative ventilation provided.

Compressed gas cylinders, some of which contain hydrogen, are present in the zone. However, even if the cylinders were to leak, the hydrogen concentration in the room would not exceed the lower explosive limit.

During turbine operation the Off Gas Recombiner Rooms are High Radiation Areas. These rooms are maintained as negative ventilation areas. Should a hydrogen release occur this negative pressure environment should prevent a buildup of hydrogen in adjacent areas. This would minimize the potential for adverse effect of a fire or explosion to adjacent fire zones.

The Off Gas Recombiner Room consists of three separate levels (three separate rooms). These rooms are located in the northwest section of the Unit 2 Turbine Building. The lowest level is on the 626'-6" elevation with the upper two levels located above. The off gas process areas are located well above any safe shutdown related cables or equipment. Hydrogen is lighter than air and should a release occur, it would begin filling the upper levels of Fire Zones 14.1.2 and 8.2.10 (these zones do not have safe shutdown equipment). The roof of Fire Zone 14.1.2 consists, in part, of built up roofing over 1-inch rigid insulation on precast concrete roof slabs supported by exposed structural steel (also for Fire Zone 8.2.10). The remainder is built up roofing over 1-inch rigid insulation on 4'-0" thick concrete. The walls are constructed of concrete to a certain level and insulated metal siding for the upper levels. This metal siding and roof panels would be the weak link in the construction in the event of an explosion thus venting the explosion to the exterior.

The Off Gas Recombiner Rooms are separated from adjacent fire zones by substantial concrete barriers (3' to 4' thick). No fire rating has been assigned to these barriers due to their open or nonrated mechanical penetrations. During operation the doors to these rooms are locked shut.

**Fire Zone: 5.0****Safe Shutdown Pump Room****Fire Area:** TB-II**F Drawing:** F-13-1**General Elevation:** 595'-0"**Zone Area:** 565 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection system.**Suppression:** None**Manual Suppression:** Portable extinguishers and hose reels equipped with 100 feet of hose are available in adjacent Fire Zone 8.2.6.C.**Other FP features:** None**Suppression Effects:** Water or Carbon Dioxide release from portable extinguishers or hose streams in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the room.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
RB-2S	3 Hour
RB-2N	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
11.3.1*	RB-2S	3 hour	3 hour	No doors	2'-0" thick concrete floor
8.2.7.C	TB-II	Non-rated	noncombustible	One 3 hour damper (#2-9472-149).	3'-0" thick concrete ceiling
8.2.6.C	TB-II	Non-rated	noncombustible	Double doors (#1005), One Damper(#2-9472-150)	0'-7 5/8" thick concrete block
1.1.2.2*	RB-2N	3 hour	3 hour [F-178]	No doors	4'-0"(east) & 5'-0"(north) thick concrete
1.1.2.1*	RB-2S	3 hour	3 hour [F-53]	No doors	2'-0" thick concrete floor

\* Secondary Containment Boundary

**Fire Zone: 5.0****Safe Shutdown Pump Room****Fire Protection Commitments:**

Reference Section	Commitment
3	Fire Zone 5.0 (which is part of fire area TB-II is separated from fire zones 1.1.2.1, 1.1.2.2, & 11.3.1 by 3 hour rated barriers. 3-hour separation provided between Fire Zone 5.0 and the steam chase.
5	Automatic sprinklers on ground floor TB from col 9 to 17 & in SSD Pump Room. Automatic sprinklers are not provided for the SSD pump room. See justification in Exemption Requests [4].
5	Complete detection on ground floor TB from col 9 to 17 in eastern corridor and common section, including safe shutdown pump room.
5	Provide 3-hour barrier around safe shutdown pump room. Not required for Appendix R. FP enhancement (12-18-84) per the FP Commitment Matrix Rev. 3.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Left Intentionally Blank.
2	SER, July 21, 1988.
3	GL 86-10 Evaluation S040-QH-0612 Rev. 1.
4	Lack of complete detection and suppression for Fire Area TB-II, GL 86-10 Evaluation NTSC 98-020.002 Rev. 3.
5	Letter B. Rybak (CECO) to R. Denton (NRC) 12-18-84

**ZONE:** 5.0      **AREA:** TB-II      **LOCATION:** TB 1/2, Elev. 595' 0"

**ZONE DESCRIPTION:** Safe Shutdown Makeup Pump Room

**FIRE SEVERITY:** The fire severity for this zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:** The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 5.0 but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. In each case, the barrier provides a 3-hour rated separation, or the adjacent zone relies on the same safe shutdown path.

Zone	Area	Fire Resistance Rating
1.1.2.1	RB-2S	3-Hour
1.1.2.2	RB-2N	3-Hour
11.3.1	RB-2S	3-Hour

**Fire Zone: 8.1****Clean and Dirty Oil Tank Room****Fire Area:** TB-II**F Drawing:** F-12-1**General Elevation:** 595'-0"**Zone Area:** 910 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguishers and hose reels equipped with 100 feet of hose are available in adjacent fire zone 8.2.6.C.**Other FP features:** The doors to the room are elevated 4'-0" above the finished floor with the walls serving as curbing.**Suppression Effects:** Sprinkler operation, piping breaks, or use of manual hose streams would not affect safe shutdown as no equipment associated with safe shutdown in this zone. Water runoff would be handled by the floor drainage system in the room.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** High**Equivalent Fire Severity:** 60.0 Hours**Boundary Fire Areas:****Fire Area**                      **Barrier Description**

TB-III                              3 Hour

RB-1N                             3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.1*	RB-1N	3 hour	3 hour	No doors	3'-0" thick concrete floor
1.1.1.2*	RB-1N	3 hour	3 hour	One 3 hour damper (#1-9472-031).	4'-0" thick concrete wall (5'-0" thick at MSIV Room)
11.2.3*	RB-1N	3 hour	3 hour	No doors	2'-0" thick concrete floor
8.2.7.C	TB-II	3 hour	3 hour	No doors, one 3 hour rated damper	3'-0" thick concrete ceiling
8.2.6.C	TB-II	3 hour	3 hr, except for metal covered hose access hatches	Two Class A doors (#108, 109).	11'-5/8" thick concrete block
8.2.6.A	TB-III	3 hour	3 hour (F-159 & 160)	No doors	5'-0" thick concrete wall

\* Secondary Containment Boundary

**Fire Zone: 8.1****Clean and Dirty Oil Tank Room****Fire Protection Commitments:**

Reference Section	Commitment
3, F.8	3-hour separation provided except for two unrated (substantial) hinged metal covers over the access hatches.
1, 5.17.4	The turbine oil storage room is protected by automatic sprinklers. Wet pipe suppression system provided [3](F.8). [6]
1, 3.1.8	Install fire rated dampers in all HVAC penetrations (to the turbine oil storage room). Also reference [1](5.17.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	SER, July 21, 1988.
3	ComEd response to the requirements of Appendix A
4	Left Intentionally Blank.
5	Lack of complete detection and suppression for Fire Area TB-II, GL 86-10 Evaluation NTSC 98-020.002 Rev. 3.
6	GL 86-10 Evaluation S040-QH-0611 Rev. 1.



**ZONE:** 8.1**AREA:** TB-II**LOCATION:** TB, Elev 595'-0"**ZONE DESCRIPTION:** Clean and Dirty Oil Tank Room**FIRE SEVERITY:**

The fire severity for this zone is 60 hours. The combustible loading is heavy and is due to the use of this zone for oil storage.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone, then spreads to affect redundant or alternative safe shutdown equipment in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.1 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.A	TB-III	3 hour
8.2.6.C	TB-II	3 hour
8.2.7.C	TB-II	3 hour
11.2.3	RB-1N	3 hour
1.1.1.1	RB-1N	3 hour
1.1.1.2	RB-1N	3 hour

**EVALUATION - ZONE 8.1:**

A 2-foot thick concrete floor that is 3-hour fire rated separates this zone from Zone 11.2.3 and a 3-foot thick concrete floor separates this zone from Fire Zone 1.1.1.1. A 3-foot thick concrete ceiling that is 3-hour fire rated separates this zone from Zone 8.2.7.C. The portion of the west wall separating this zone from Fire Zone 8.2.7.A is a 5-foot thick reinforced concrete wall with a 3-hour fire rating as is the south wall separating this zone from Fire Zone 1.1.1.2. The east wall separating this zone from Fire Zone 1.1.1.2 is a 4-foot thick reinforced concrete wall that is 3-hour fire rated. The portion of the west wall and the north wall separating this zone from Fire Zone 8.2.6.C is fire rated for 3-hours and is constructed of 11-5/8 inch concrete blocks. The walls with Fire Zone 8.2.6.C contain two Class "A" fire doors to provide access to the clean and dirty oil tank room. One door is in the west wall and the other is in the north wall. The doors are installed above a 4-foot high concrete curb, which is provided to contain oil spillage in the event of tank(s) rupture. In addition these two walls each contain a small hatchway and hose access hatches. The covers for these hatches are not fire rated, but are of substantial construction to prevent fire spread.

A wet pipe sprinkler system, including under tank coverage, is provided for this area. Hose stations located in the adjacent fire zones support manual fire suppression actions.

A fire originating within this zone would be addressed by the wet pipe suppression system. In addition, activation of the suppression system would summon the plant fire brigade. This zone is contained within 3-hour fire barriers and the area is provided sufficient overflow containment to contain any tank rupture. Floor drains within the oil tank room are able to handle water runoff from the sprinkler system. Therefore, the growth of any fire originating within this fire zone would be controlled and prevented from spreading to an adjacent fire zone.

**CONCLUSION:**

The heavy combustible loading in the oil tank room is addressed by a wet pipe suppression system, which would control any fire occurring in this area.

**Fire Zone: 8.2.10****Off Gas Recombiner Room****Fire Area:** TB-II**F Drawing:** F22-1,23-1**General Elevation:** 626'-6"**Zone Area:** 8,511 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers and hose stations equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Water release from hose line used in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. No safe shutdown equipment is located in this area. Water runoff would be controlled through utilization of floor drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-IV	Equivalent 3 Hour [1][9]
TB-III	Equivalent 3 Hour [1]
TB-I	Equivalent 3 Hour [1][10]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.8.E	TB-IV	Non-rated[8]	noncombustible, open mechanical[8]	No doors	0'-5 5/8" thick concrete block walls (0'-8" ceiling)
8.2.7.C	TB-II	Non-rated	noncombustible, open mechanical	No doors	0'-6" thick concrete floor (open on east side)
14.1.2	TB-I	Non-rated[9]	noncombustible, open mechanical[9]	Two unrated doors[9]	4'-0" thick concrete
14.1.1	TB-III	Non-rated	noncombustible, open mechanical	Two unrated doors.	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
2, 9.2	Substantial shield walls with metal doors between zones. Also reference [3](5.2.4).
2, 9.2	No safe shutdown cables or equipment in zone. Also reference [3](5.2.4).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Appendix R Exemption Request 5.2 applies to this fire zone and involves the lack of 3-hour fire barriers between the Southern and Central Zone Groups.
2	SER, July 21, 1988.
3	Left Intentionally Blank.
4	November 5, 1991 ComEd letter requested new combustible loading limits for specific fire zones).
5	Oxygen lines enter area from outside, routed to the Unit 1 and Unit 2 oxygen control stations.
6	SER, March 2, 1994.
7	Lack of complete detection and suppression for Fire Area TB-II, GL 86-10 Evaluation NTSC 98-020.002 Rev. 3.
8	86-10 evaluation supplement for NTSC 98-020.002 Revision 3, Justification for lack of detection and fixed suppression in Fire Zone 8.2.10, EC 368863.
9	Evaluation for fire area separation between TB-II and TB-IV, ER9801622.
10	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.

**ZONE:** 8.2.10**AREA:** TB-II**LOCATION:** TB, Elev 626'-6"**ZONE DESCRIPTION:** Off Gas Recombiner Room**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hour. The combustible loading is light and is due primarily to ventilation filters and transients.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.10 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.8.E	TB-IV	Non-rated
8.2.7.C	TB-II	Non-rated
14.1.2	TB-I	Non-rated
14.1.1	TB-III	Non-rated

**EVALUATION - ZONE 8.2.10:**

A non-rated barrier constructed of a 6-inch thick concrete floor separates this zone from Fire Zone 8.2.7.C. In addition, a portion of the zone is open to the upper spaces of Fire Zone 8.2.7.C. The boundary with Fire Zone 8.2.8.E is an unrated wall constructed of 5-5/8" thick concrete block. Boundaries with Fire Zones 14.1.1 and 14.1.2 are unrated walls constructed of 4'-0" thick concrete and a ceiling of 6" thick concrete. Fire Zone 8.2.10 is provided with hose stations and portable fire extinguishers to support manual fire suppression activities. No automatic fire suppression systems or fire detection is provided for this zone due to the very light fire loading. The opening of this zone to Fire Zone 8.2.7.C provides a substantial space volume to absorb the heat and combustion products of a fire occurring within Fire Zone 8.2.10.

The fire loading in Fire Zone 8.2.10 consists of isolated locations of combustible material separated from adjacent locations by spatial distances of negligible combustible loading. Thus a fire occurring within this fire zone is fuel limited and not likely to spread to adjacent fire zones.

**CONCLUSION:**

The light combustible loading in this zone is unlikely to significantly challenge the structural boundaries due to the significant volume available to absorb fire effects and the spatial separation of combustibles from adjacent combustibles.

**Fire Zone: 8.2.6.C****Unit 1/2 Ground Floor****Fire Area:** TB-II**F Drawing:** F-12-1,F-13-1**General Elevation:** 595'-0"**Zone Area:** 17,622 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection coverage. Hydrogen leak detection by manlifts.
<b>Suppression:</b>	Local automatic wet-pipe suppression systems in the eastern corridors that connect Fire Zone 8.2.6.C with Fire Zones 8.2.6.A and in the common section between the two corridors east of column line E and in the area bounded by column/row 12-13/D-E. Local area wet pipe sprinkler system over the resin storage areas. Pre-action systems are over the two EHC areas and cable risers.
<b>Manual Suppression:</b>	Water hose stations each equipped with 100 feet of hose, foam units, wheeled dry chemical units, and portable extinguishers.
<b>Other FP features:</b>	The Carbon Dioxide storage tank is located in this area. One partial fire barrier separating the south wall of the south pipe chase and the U-1 CRD pump level.
<b>Suppression Effects:</b>	Water release in this zone (including drainage from upper levels of the plant) would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general area

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2N	3 Hours
RW	Nonrated [14]
RB-2S	Equivalent 3 Hour [7]
RB-1N	Equivalent 3 Hour [7]
TB-III	Equivalent 3 Hour [7]
TB-I	Equivalent 3 Hour [15]
CT-2	3 Hour [17]

**Fire Zone: 8.2.6.C****Unit 1/2 Ground Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
14.1	RW	Non-rated[14]	noncombustible, open mechanical[14]	One unlabeled Double door.[14]	3'-0" thick concrete
8.2.6.B	TB-III	Non-rated [6][7]	noncombustible, open mechanical	Two unlabeled doors.	4'-0" thick concrete
8.2.6.D	TB-I	Non-rated[15]	noncombustible, open mechanical[15]	Two unlabeled doors[15], One three-hour Class A door	4'-0" thick concrete
8.2.6.E	TB-I	Non-rated[15]	none [5][15]	No doors	Open corridor along row F.
8.1	TB-II	3 hour	3 hr except metal covered hose hatches (F-159,160)	Two Class A doors	0'-11 5/8" thick concrete block
5.0	TB-II	Non-rated	noncombustible	Double fire doors One 3 hour damper	0'-7 5/8" thick concrete block
1.1.1.2*	RB-1N	3 hour	3 hour (F-46)	No doors	4'-0" thick concrete wall
11.3.1*	RB-2S	3 hour	3 hour except floor plugs	No doors	2'-0" thick concrete
11.2.3*	RB-1N	3 hour	noncombustible, non-rated mechanical	No doors	2'-0" thick concrete
8.2.5	CT-2	3 hour	3 hour	1 equipment access hatch/door [17]	3'-0" thick concrete
8.2.6.A	TB-III	Non-rated	none [5]	No doors	Open corridor along row F
8.2.3.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	2'-8" thick concrete
8.2.7.D	TB-I	Non-rated[15]	noncombustible[15]	No doors	1'-6" thick concrete
1.1.2.2*	RB-2N	3 hour	3 hour (F-53)	No doors	4'-0" thick concrete
8.2.7.C	TB-II	Non-rated	noncombustible, open mechanical	No doors	0'-6" thick concrete ceiling on exposed steel
8.2.1.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	0'-11" thick concrete block enclosed pipe chase
11.1.3	RB-1N	3 hour	3 hour except for floor plugs [6]	One Class A Door	3'-0" thick concrete
11.1.4	RB-2S	3 hour	3 hour except for floor plugs [6]	No doors	3'-0" thick concrete



**Fire Zone: 8.2.6.C****Unit 1/2 Ground Floor**

8.2.3.A	TB-III	Non-rated [9]	noncombustible, open mechanical	One unlabeled door	4'-0" thick concrete floor
8.2.1.B	TB-I	Non-rated[15]	noncombustible, open mechanical[15]	No doors	connected by an open pipe chase
8.2.2.A	TB-I	Non-rated[15]	noncombustible, open mechanical[15]	One unlabeled door	4'-0" thick concrete floor
1.1.2.1*	RB-2N	3 hour	3 hour	No doors	2'-0" thick concrete
8.2.7.B	TB-III	Non-rated	noncombustible	No doors	1'-6" thick concrete
8.2.2.B	TB-I	Non-rated[15]	noncombustible, open mechanical[15]	No doors	2'-8" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 8.2.6.C****Unit 1/2 Ground Floor****Fire Protection Commitments:**

Reference Section	Commitment
2	Detection in far north and south portions of TB corridor and in central portion of 8.2.6.C 12-14/C-F.
1, 3.1.5e	Install sprinkler system in area of EHC reservoirs and adjacent cable riser area. Also reference [1](5.17.6).
1, 3.1.11	Provide curbs and drains by flammable liquid storage area on TB ground floor. Also reference [1](5.17). Flammable liquids stored in oil storage room. No additional curbs or drains provided.
1, 3.1.11	Provide listed flammable liquids cabinet for Turbine Building ground floor. Limit quantity to 55-gallons. Flammable liquids stored in oil storage room. No flammable liquids cabinet provided.
3, (8) PF 38-2	Install fire detection along H wall column row H/15-19 Unit 1 and H/7-11 Unit 2 (high pressure heater bay).
2	Wet pipe fire suppression for U2 cables, Turbine Building ground floor at 12-13/G-H.
2	Complete detection on ground floor Turbine Building from col. 9 to 17 in eastern corridor and common section, including safe shutdown pump.
2	Automatic sprinkler on ground floor Turbine Building from col. 9 to 17 in eastern corridor and common section.
8	Provide Class A fire doors to other fire areas. The only reference noted is the previous FHA, pg. 2.3-51.
2	3-hour barrier around safe shutdown pump room. (Verify no important cabling in western portion of 8.2.6.C or add detection and/or automatic sprinkler). Not required for Appendix R. FP enhancement(12-18-84) per the FP Commitment Matrix Rev. 3.
10, F.8	EHC systems have fire retardant fluid and sprinkler protection. Closed head sprinkler protection provided above EHC units.
7, 9.2	Automatic detection and water suppression provided in corridor. Also reference [5](5.1 & 5.2.4).
7, 9.2	No continuity of combustibles between fire zones 8.2.3.A and 8.2.6.C. Also reference [5](5.2.4).
1, 5.17.4	Portable extinguishers and hose stations provided.
1, 5.17.4	The feedwater heater bays protected by automatic sprinklers.
7, 9.2	3-hour separation between TB and RB with exceptions. Also reference [4], [18].
10, D.3.c	Water suppression provided over major cable concentrations (the Appendix A response [10] did not specifically identify 8.2.7.C as a zone bound to this requirement).
2	Seal vertical cable penetrations from U2 cable tunnel thru metal hatch near col/row F/12 and F/25 with substantial fire stop.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-84
3	Letter, CECO to NRC 3-29-79.
4	GL 86-10 Evaluation S040-QH-0611 Rev. 1
5	Exemption Request 5.2 (12-18-84), Exemption for the lack of complete 3-hour fire barrier between TB zone groups. Revised to Southern and Central Zone Groups (6-25-86). Exemption granted (9.0) 12-11-87. Also reference Section 5.1 of the Exemption Requests.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	The existing Fire Hazards Analysis was the only referenced by the Fire Protection Commitment Matrix for certain commitments.
9	A partial one-hour barrier separates the vertical pipe chase adjacent to the west U-1 LP heater bay entrance from zone 8.2.3.A. This barrier protects 1/2 DGCWP cables inside the chase from direct flame impingement. No damper has been installed in the penetrating HVAC ductwork per SE-96-076.
10	ComEd response to the requirements of Appendix A
11	Left Intentionally Blank.
12	SER, November 5, 1980.
13	Lack of complete detection and suppression for Fire Area TB-II, GL 86-10 Evaluation NTSC 98-020.002 Rev. 3.
14	Evaluation for fire area separation between TB-II and RW, ER9801574.
15	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.
16	Note: Reference cable tray loading limits in Table 3.6-2.
17	Equipment access hatch/door #304 is a class "A" fire rated door with a 3-hour fire label (Ref. 9900174).
18	GL 86-10 Evaluation S040-QH-0612 Rev. 1.

**ZONE:** 8.2.6.C      **AREA:** TB-II      **LOCATION:** TB1/2, Elev. 595'-0"

**ZONE DESCRIPTION:** Unit 1/2 Turbine Bldg Ground Floor

**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.6.C which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.A	TB-III	Non-rated
8.2.6.B	TB-III	Non-rated
8.2.6.D	TB-I	Non-rated
8.2.6.E	TB-I	Non-rated
8.1	TB-II	3 hour <sup>1</sup>
5.0	TB-II	Non-rated
1.1.1.2	RB-1	3 hour
11.3.1	RB-2	3 hour <sup>2</sup>
11.2.3	RB-1	3 hour <sup>3</sup>
8.2.5	CT-2	3 hour
8.2.2.B	TB-I	Non-rated
8.2.3.B	TB-III	Non-rated
14.1	RW	Non-rated
1.1.2.2	RB-2	3 hour
8.2.7.C	TB-II	Non-rated
8.2.1.A	TB-III	Non-rated
11.1.3	RB-1	3 hour <sup>2</sup>
11.1.4	RB-1	3 hour <sup>2</sup>
8.2.3.A	TB-III	Non-rated
8.2.2.A	TB-I	3 hour <sup>5</sup>
8.2.1.B	TB-I	Non-rated
8.2.7.D	TB-I	Non-rated

<sup>1</sup> The FHA indicates a 3 hour seal rating except for metal covered hose hatches.

<sup>2</sup> The FHA indicates a 3 hour seal rating except for floor plugs.

<sup>3</sup> The FHA indicates a 3 hour barrier rating, but no seal rating.

<sup>5</sup> The FHA indicates a 3 hour barrier rating with noncombustible penetration seals and open mechanical penetrations.

**EVALUATION ZONE 8.2.6.C:**

This fire zone shares boundaries on elevation 595'-0" with fire zones 8.2.2.B, 8.2.6.A, 8.2.6.B, 8.2.6.D, 8.2.6.E, 8.1, 8.2.7.C, 5.0, the radwaste building, and the unit 1 and unit 2 reactor buildings. The walls that separate this zone from fire zones 8.2.6.B and 8.2.6.D are 4'-0" thick reinforced concrete shield walls. All cable penetrations in these walls are sealed, but the wall is not credited as being fire rated. The boundary between this zone and fire zone 8.1 consists of two 3-hour fire rated 11-5/8" thick concrete block walls. Fire zone 5.0 is separated from this zone by 7-5/8" thick concrete block walls. The wall shared with the radwaste building is minimum 3'-0" thick concrete and contains an unrated door for access between the zones. The wall shared with the reactor building is 4'-0" thick concrete and is 3-hour fire rated. Separation of this zone from fire zones 8.2.6.A and 8.2.6.E is by an open corridor that runs along row F. The floor of this zone is the ceiling of fire zone 8.2.2.B and is constructed of 2'-8" thick concrete with open hatchways and a pipe chase. The ceiling of this area is the floor of fire zone 8.2.7.C and 8.2.7.D and is constructed of 6" thick concrete supported on exposed structural steel and containing openings for stairways and equipment removal hatches.

Fire detection and automatic fire suppression systems are provided to protect this fire zone. Hydrogen detection is provided near the manlifts to alert the Control Room and isolate the supply should a leak occur in the piping at the condensate pump level (Zones 8.2.1.A and 8.2.1.B). Automatic suppression systems are installed in the eastern corridors that connect with fire zones 8.2.6.A and 8.2.6.E and in the common section between the corridors east of column line E and in the area bounded by rows 12-13 and column lines D-E. A wet pipe sprinkler system is over the resin storage area. Hose stations, each equipped with 100 ft. of hose and portable CO<sub>2</sub> extinguishers are also provided in this zone to support manual fire suppression activities. Fire loading in this fire zone is low with the primary combustible loading being from EHC fluid reservoirs and cable insulation. Additional combustible loading is established by a minor amount of lube oil, resin storage, and duct liner insulation. A wet pipe sprinkler system protects the majority of this fire zone and the areas containing the principal hazards. The automatic fire detection and suppression system provided for this zone assure that any fire that would occur here will be alarmed, suppression would be initiated, and fire growth controlled (or fire extinguished) until the arrival of the fire brigade. Therefore, reasonable assurance exists that any fire that occurs in this zone would not propagate to adjacent zones.

**CONCLUSION:**

Based on the type of construction, combustible content, and the fire protection features of this zone, a fire originating within fire zone 8.2.6.C will not spread to adjacent fire zones and damage redundant or alternate safe shutdown equipment or cables.

**Fire Zone: 8.2.7.C****Unit 1/2 Mezzanine Floor****Fire Area: TB-II****F Drawing: F14-1,15-1****General Elevation: 615'-6"****Zone Area: 14,133 Ft<sup>2</sup>****Fire Protection Features:**

<b>Detection:</b>	Local area smoke detection near the cable penetrations from the reactor building to the turbine building and in the west end of the zone bounded by rows C and D and columns 12 and 14. Local area heat (thermal) detection around the turbine oil tanks.
<b>Suppression:</b>	Local area wet pipe sprinkler systems cover the entire zone east of row D and over the resin storage areas. Local area water spray system protects the turbine oil tanks.
<b>Manual Suppression:</b>	Water hose stations equipped with 100 feet of hose and portable fire extinguishers.
<b>Other FP features:</b>	Partial fire proofing on structural steel at the ceiling. Catch basins are provided for the turbine lube oil storage tanks. 1-hour rated fire wrap around Bus Duct to SWGR 13-1.
<b>Suppression Effects:</b>	Water release from the fixed suppression systems, manual hose streams, or piping breaks in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water runoff would be handled by the general area drainage system as well as stairways to lower levels.

**Combustible Loading Limit:****Analyzed Combustible Loading Category: High****Equivalent Fire Severity: 4.5 Hours****Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
24-1	Equivalent 3 Hour [18]
23-1	Equivalent 3 Hour [18]
14-1	Equivalent 3 Hour [18]
13-1	Equivalent 3 Hour [18]
RW	Nonrated [17]
RB-2N	Equivalent 3 Hour [7]
RB-1N	Equivalent 3 Hour [7]
TB-IV	Equivalent 3 Hour [18]
TB-III	Equivalent 3 Hour [7]
TB-I	Equivalent 3 Hour [19]

**Fire Zone: 8.2.7.C****Unit 1/2 Mezzanine Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.6.C	TB-II	Non-rated	noncombustible, open mechanical	No doors	0'-6" thick concrete
8.2.7.B	TB-III	Non-rated[6][7]	noncombustible	One unlabeled door.	4'-0" thick concrete
8.2.7.D	TB-I	Non-rated[19]	noncombustible[19]	One unlabeled door[19]	4'-0" thick concrete
8.2.8.E	TB-IV	Non-rated[18]	noncombustible, open mechanical[18]	No doors	4'-0" thick concrete.
8.2.8.C	24-1	Non-rated[18]	noncombustible (3 hour under SWGR)[18]	No doors	4'-0" thick concrete
8.2.8.B	13-1	Non-rated[18]	noncombustible (3 hour under SWGR)[18]	No doors	4'-0" thick concrete
14.1	RW	Non-rated[17]	noncombustible[17]	No doors	1'-6" thick concrete
8.2.8.A	14-1	Non-rated[18]	noncombustible[18]	No doors	4'-0" thick concrete
8.2.10	TB-II	Non-rated	noncombustible, open mechanical	No doors	0'-6" thick concrete (open wall)
8.1	TB-II	3 hour [1](3.1.8)	3 hour	No doors, one 3 hour rated damper	3'-0" thick concrete floor
5.0	TB-II	Non-rated	noncombustible	No doors, one 3 hour rated damper	3'-0" thick concrete
1.1.1.2*	RB-1N	3 hour	3 hour	No doors	4'-0" thick concrete
1.1.2.2*	RB-2N	3 hour	3 hour	No doors	4'-0" thick concrete
1.1.1.3*	RB-1N	3 hour (F-58, 59,	3 hr except 2 line pens. [6][7]	No doors	4'-0" thick concrete
1.1.2.3*	RB-2N	3 hour	3 hr except 1 line pen. [6][7]	No doors	4'-0" thick concrete
8.2.8.D	23-1	Non-rated[18]	noncombustible[18]	No doors	4'-0" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 8.2.7.C****Unit 1/2 Mezzanine Floor****Fire Protection Commitments:**

Reference Section	Commitment
7, 14.2	The area directly below 8.2.8.D has detection and suppression.
1, 3.1.1	Provide early warning fire detection by cable penetration near MG oil cooler. Also reference [1](5.18). (Oil cooler replaced by ASD water cooler. Detection system unchanged).
8, (40)PF 35-1	Install fire detectors over cable tray between column 12-14 & G-H.
2	Provide 1-hour fire door at 12 and 14/G in shield wall on U1 and U2 Turbine Building mezz. floor.
2	Detection to areas beneath SWGR's 24-1 and 13-1, and northern portion of 8.2.7.A.
2	Provide detection in 12-14/C-D of Turbine Building mezz. floor. Also reference [7](14.2).
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1.
5, 5.2.4	All penetrations in shield walls sealed with noncombustible materials. Substantial. locked, unlabeled, metal doors.
5, 5.2.4	Spot detection provided in western portion of 8.2.7.C.
7, 14.2	Fire detection installed above cable penetrations from RB to TB.
7, 14.2	Fire detection above MG Set oil coolers and pumps. Column / Row 11-15 / G-H. (Oil coolers and pumps removed. Detection remains in place).
7, 14.2	Fixed water suppression in zone except column / row 9-17 / C-D. Combustible loading is minimal in this area.
1, 3.1.11	Provide curb around MG set oil cooler and pump. Also reference [1](5.18.6). (Oil coolers and pumps removed).
9	Manual fire fighting equipment (portable extinguishers and hose stations) is available in this zone. Also reference [1](5.18.4).
12, F.8	Thermal detection provided for the turbine oil reservoir tanks.
9, 5.10.3	No safe shutdown equipment in this zone.
7, 14.2	There are safe shutdown cables in this zone.

**Fire Zone: 8.2.7.C****Unit 1/2 Mezzanine Floor**

- |           |   |
|-----------|---|
| 1, 3.1.10 | Protect tops of electrical cabinets, SWGR, & MCCs from water damage. Also reference [1](5.18.6).                                |
| 1, 5.18.4 | Automatic deluge system provided for turbine lube oil reservoirs.   |
| 1, 5.18.4 | Automatic sprinkler protection provided for MG set oil coolers. Oil coolers removed. sprinkler system left in place.            |
| 7, 9.2    | 3-hour separation between RB and TB. Also reference [4], [11].  |
| 12, F.8   | Turbine oil reservoir tanks protected by automatic water spray. Supplemented by a ceiling-level wet pipe system.                |
| 7, 14.2   | Local automatic water spray for turbine oil reservoirs. Actuated by thermal detectors. Also reference [9](5.10.2.2 & 5.10.4.2). |

**Notes and References:****Number      Description**

- |    |   |
|----|---|
| 1  | SER, July 27, 1979.   |
| 2  | Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8  |
| 3  | Letter, CECO to NRC 3-29-79.  |
| 4  | GL 86-10 Evaluation S040-QH-0611 Rev. 1.  |
| 5  | Exemption Request 5.2 (12-18-84), Exemption for the lack of complete 3-hour fire barrier between TB zone groups. Revised to Southern and Central Zone Groups (6-25-86). Exemption granted (9.0) 12-11-87. |
| 6  | NRC Exemption Aug. 18, 1989.  |
| 7  | SER, July 21, 1988.   |
| 8  | Letter, CECO to NRC, dated 12-27-78.  |
| 9  | GL 86-10 Evaluation S040-QH-0613 Rev. 1.  |
| 10 | Left Blank Intentionally.   |
| 11 | GL 86-10 Evaluation S040-QH-0612 Rev. 1.  |
| 12 | ComEd response to the requirements of Appendix A  |
| 13 | Left Intentionally Blank.   |
| 14 | SER, March 2, 1994.   |
| 15 | Note: Reference cable tray loading limits in Table 3.6-2.   |
| 16 | Lack of complete detection and suppression for Fire Area TB-II, GL 86-10 Evaluation NTSC 98-020.002 Rev. 3.   |
| 17 | Evaluation for fire area separation between TB-II and RW, ER9801574.  |
| 18 | Evaluation for fire area separation between TB-II and TB-IV, ER9801622.   |
| 19 | Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.  |
| 20 | Evaluation for presence of gas cylinders EC 401197.   |

**ZONE:** 8.2.7.C      **AREA:** TB-II      **LOCATION:** TB 1/2, Elev. 611

### **ZONE DESCRIPTION:**

Fire Zone 8.2.7.C consists of the central section of the Turbine Building on the 611 foot elevation.

The zone extends from the 611 foot elevation to the bottom of the floor at elevation 639 and is bounded by the reactor building walls to the east, by the walls separating it from zone 8.2.7.D to the north and 8.2.7.B to the south.

The zone contains two sets of 480 Vac switchgear, several MCC's, compressed gas cylinders, the turbine lube oil reservoirs, the TBCCW pumps and heat exchangers, a battery bank, and ASD coolers.

### **BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.7.D, north	TB-I
5.0, 8.1, 8.2.6.C, below	TB-II
8.2.10, west	TB-II
8.2.7.B, south	TB-III
8.2.8.A, above	14-1 <sup>1</sup>
8.2.8.B, above	13-1 <sup>2</sup>
8.2.8.C, above	24-1 <sup>3</sup>
8.2.8.D, above	23-1 <sup>4</sup>
8.2.8.E, above	TB-IV
1.1.1.2, 1.1.1.3, east	RB-1
1.1.2.2, 1.1.2.3, east	RB-2

### **DETECTION:**

Smoke detection is provided near the cable penetrations from the reactor buildings and in the area bounded by column lines C and D and 12 and 14. Thermal detection is provided over the turbine oil reservoirs, and the ASD coolers.

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<sup>1</sup> Equivalent Fire Area, as defined in Section 1.4

<sup>2</sup> Ibid

<sup>3</sup> Ibid

<sup>4</sup> Ibid

**AUTOMATIC SUPPRESSION:**

A local wet pipe sprinkler system provides protection for the entire zone east of column line D and over the resin storage areas. A water spray system provides protection for the turbine oil reservoirs.

**COMBUSTIBLE LOADING:**

Calculated Value: High

**FIRE SEVERITY:**

Less than 4.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of lubricating oil. The other significant combustibles are electrical cables, and transformer oil. The remainder of the fixed combustibles consist of various materials distributed throughout the zone. Thus, there are several fixed combustibles capable of producing serious fires and propagating fire from the ignition area to other portions of the zone. The bulk of the lubricating oil is contained in the turbine oil reservoirs. The transformer oil is contained in two separate transformers on the west side of the zone, one on the north end and one on the south. With the exception of tray risers from the zones below, the cable trays are fifteen or more feet above the floor. In general, catch basins or curbs are provided for spill retention in the immediate vicinity of equipment containing large volumes of oil. These spill containment features are not designed to cope with major equipment failure, failures in piping or fittings routed outside their boundaries, or failures in pressurized components which may produce a spray or stream of oil. Compressed gas cylinders, some of which contain hydrogen, are present in the zone. However, even if the cylinders were to leak, the hydrogen concentration in the room would not exceed the lower explosive limit.

Transients account for a small fraction of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The primary hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of producing a serious fire and propagating the fire away from the area of origin. As mentioned above, the combustibles capable of such propagation are the electrical cables and the various oils.

The installed smoke detection system, where provided, should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out. In other areas, brigade call out could be delayed unless personnel are working in the area and report the fire.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

**FIRE SPREAD POTENTIAL:****Fire Spread Potential Within Fire Zone 8.2.7.C:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles unless the exposed electrical cables in the tray system become ignited or there is an oil spill fire. Should the cable trays become involved, propagation throughout large portions of the zone would not be expected unless the sprinkler system failed to perform effectively. Without actuation of the sprinklers, effective action must be taken by the fire brigade to preclude general area involvement. In the event of a large oil spill outside of a containment boundary, extensive oil spread could be expected and, if ignited, significant area involvement could result, including ignition of the electrical cables.

**Fire Spread Potential Within Fire Area TB-II:**

Fire zone 8.2.6.C, below, is separated from 8.2.7.C by a reinforced concrete floor/ceiling assembly. The integrity of this barrier is compromised by a number of sizable openings, including stairways and pipe chases. There are also smaller openings for piping and cable trays. The potential for fire spread to zone 8.2.6.C, below, is limited, except in the case of large oil spill fires. The cable risers penetrating the floor provide a path for fire propagation, but downward fire spread is a slow process; offering significant time for extinguishment. Fire involving an oil spill outside the containment curbs, could spread to the zone below through uncurbed floor penetrations.

The potential for fire spread to zone 5.0, below, is limited by the 3-hour rated, reinforced concrete, floor/ceiling assembly which separates the two.

The potential for fire spread into zone 8.1, located below the southeast corner of zone 8.2.7.C is limited by the presence of a three-hour rated barrier. Although the fire severity for the area is high, the barriers should not be challenged by a fire in zone 8.2.7.C since, the vertical vent paths to the open turbine deck serve to limit the accumulation of hot combustion products and, thereby, limit radiant feedback from superheated combustion gases within the zone. Actuation of the sprinkler system should provide further assurance that the barriers would not be challenged.

Fire spread into zone 8.2.10, to the west and above portions of 8.2.7.C, is somewhat limited by the reinforced concrete floor/ceiling assembly which provides vertical separation between the two zones. A large fire in 8.2.7.C, however, is likely to spread to or at least damage the equipment in 8.2.10 due to their shared ceiling and the open zone interface on the east side of 8.2.10.

**Fire Spread Potential To Fire Area TB-I:**

Fire zone 8.2.7.D in area TB-I bounds zone 8.2.7.C on the north. The zones are separated by a reinforced concrete shield wall with excellent fire resistive capability. The wall is penetrated by a personnel doorway, fitted with a non-rated steel door, and by a number of cable trays which are sealed at the barrier. Because of the lack of combustible floor and wall finish in the area of the door, the lack of combustibles immediately inside it, and the height of the ceiling on the 8.2.7.C side of the door, fire spread to zone 8.2.7.D via this avenue is not credible. The area around these systems is protected by a curb, but no curb is provided in front of the door. However, a curb is provided inside the door. Thus, flaming or non-ignited oil could flow into 8.2.7.D. Direct fire spread to zone 8.2.7.D via oil spread is not expected if the automatic suppression system installed in the area functions in a timely manner.

**Fire Spread Potential To Fire Area TB-III:**

Fire zone 8.2.7.B in area TB-III bounds zone 8.2.7.C on the south. The zones are separated by a reinforced concrete shield wall with excellent fire resistive capability. The wall is penetrated by a personnel doorway, fitted with a non-rated steel door, and by a number of cable trays which are sealed at the barrier. Because of the lack of combustible floor and wall finish in the area of the door and the lack of combustibles immediately inside it, fire spread to zone 8.2.7.D via this avenue is not credible. This, coupled with the installed suppression system should minimize the prospect of fire spread to zone 8.2.7.B.

**Fire Spread Potential To Fire Area TB-IV:**

The potential for fire spread to zone 8.2.8.E, above, is limited by the substantial, reinforced concrete, floor/ceiling assembly which separates the two zones. There are a number of penetrations in this assembly, however. Among these are stairway and piping penetrations. Although there is a discontinuity of combustibles penetrating this assembly, the possible severity of a fire in 8.2.7.C makes spread to 8.2.8.E via the unprotected penetrations a distinct possibility. The scarcity of combustibles in this portion of 8.2.8.E provides some benefit relative to limiting the involvement of 8.2.8.E.

**Fire Spread Potential To Equivalent Fire Areas 14-1, 13-1, 24-1 and 23-1:**

Equivalent fire areas 14-1, 13-1, 24-1, and 23-1 (formerly known, respectively, as fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D) are separated from 8.2.7.C by a reinforced concrete floor/ceiling assembly. However, openings exist in the floor (e.g., pipe penetrations). These penetrations are equipped with non-combustible seals. These separation features, coupled with the vertical vent paths from 8.2.7.C to 8.2.8.E and 8.2.10, and the provision for automatic suppression over the most significant exposing hazard on 8.2.7.C, make the potential for direct fire spread to these zones from a fire in 8.2.7.C unlikely.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 8.2.7.C is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

11.0 Lack of 3-Hour Barriers Between the Fire Areas 8.2.7.C, 8.2.7.E, and 8.2.8.D<sup>5</sup> and Northern and Central Zone Groups.

**Issue:** The barrier separating 8.2.8.E in TB-IV from 8.2.7.C in TB-II, the central zone group, from the turbine operating floor (zone 8.2.8.E) is not rated. Zones 8.2.7.C and 8.2.7.E contain safe shutdown cables. The principle concern is that a fire could originate in 8.2.7.C, spread to 8.2.8.E, and ultimately spread to 8.2.7.E, endangering redundant safe shutdown components.

**Evaluation:** This concern has been explored in the discussion of **Fire Spread Potential**, above. Based on that exploration, the possibility of fire spread to zone 8.2.8.E from zone 8.2.7.C, below, is possible, should a significant fire occur. However, the scarcity of combustibles in 8.2.8.E between the vent paths from 8.2.7.C and the floor openings connecting 8.2.8.E and 8.2.7.E would preclude spread to 8.2.7.E which is located below the turbine operating floor and a considerable distance (i.e., > 100 feet) from 8.2.7.C. Therefore, the separation provided is acceptable for the hazard. This finding is consistent with that of the existing SER.

**CONCLUSION:**

The evaluation presented above for fire zone 8.2.7.C demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The barrier shared by 8.2.7.C and 8.2.8.E deviates from Appendix R with respect to separation of redundant safe shutdown trains. However, the separation provided is sufficient for the hazard and a fire in zone 8.2.7.C will not result in the loss of the redundant trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

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<sup>5</sup> The SER cites zone 8.2.8.D, but the narrative indicates that the zone of concern is actually 8.2.8.E. Thus, the following will address 8.2.8.E.

**Fire Zone: 8.2.1.A****Unit 1 Condensate Pump Room****Fire Area:** TB-III**F Drawing:** F-9-1,10-1**General Elevation:** 547'-0"**Zone Area:** 4,274 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguishers and one hose station equipped with 100 feet of hose.**Other FP features:** Power feed to 1/2 diesel generator cooling water pump is protected by a one hour fire wrap. Flammable liquids cabinet provided.**Suppression Effects:** The operation of sprinkler systems, use of manual hose lines, or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by the general area drainage system.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:****Fire Area****Barrier Description**

TB-V

3 Hour Except Watertight Door [5]

TB-II

Equivalent 3 Hour (Open Pipe Chase to 8.2.6.C) [1]

**Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.6.C	TB-II	Non-rated[1]	noncombustible, open mechanical	No doors	0'-11" thick concrete block enclosed pipe chase
8.2.6.A	TB-III	Non-rated	noncombustible, open mechanical	No doors, open pipe chase	4'-0" thick concrete
11.1.1.C	TB-III	Non-rated	noncombustible	One unlabeled watertight door.	1'-6" thick concrete
8.2.6.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
11.1.1.B	TB-V	3 hour [6]	3 hour (F-139)	One unlabeled watertight door.	1'-6" thick concrete
8.2.1.C	TB-III	Non-rated	noncombustible, open mechanical	One unlabeled door.	4'-0" thick concrete
11.1.1.A	TB-III	Non-rated	noncombustible	One unlabeled watertight door.	1'-6" thick concrete
8.2.3.A	TB-III	Non-rated	noncombustible, open mechanical	Open at upper basement level.	2'-3" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 8.2.1.A****Unit 1 Condensate Pump Room****Fire Protection Commitments:**

Reference Section	Commitment
2, 5.13.4	Hose stations and portable fire extinguishers are provided for this zone.
6, 13.2	Complete automatic wet pipe sprinkler system provided with alarms to the control room. Also reference [2](5.13.4) & [5](5.9.2).
2, 5.13.6	Lube oil storage will be limited to a maximum container size of thirty gallons for both fire zones 8.2.1.A and 8.2.1.B. Also reference [2](3.1.11).
6, 9.2	1-hour fire rated wrap provided for the Unit 2 alternate (reserve) feed to DG 1/2 cooling water pump and its cubicle cooler in Unit 1 portion of TB. Also reference [3], [5](5.9.3) and [6](13.2 & 13.3).
2, 5.13.6	Waste oil will be excluded from the area and an NFPA approved flammable liquids storage cabinet will be provided in Turbine Building basement. Also reference [2](3.1.11).

**Notes and References:****Number**   **Description**

- 1 Fire Zone 8.2.1.A does not border Fire Zone 8.2.6.C, but the north wall contains an opening to a vertical pipe chase to Fire Zone 8.2.6.C above with a 1-hour barrier installed in the opening.
- 2 SER, July 27, 1979.
- 3 Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
- 4 Exemption request 5.7 (12-18-84). Exemption granted 11.0 (12-11-87). Exemption for lack of complete detection and suppression for enclosure of cable in a fire barrier having a 1-hour rating. Located in Volume 4 of the FPR. This exemption was deemed unnecessary and withdrawn.
- 5 Exemption Request 5.9 (12-18-84). Exemption granted 12.0 (12-11-87). Exemption for lack of complete 3-hour barriers between fire area 11.1.1.B and the Southern Group. Located in Volume 4 of the FPR.
- 6 SER, July 21, 1988.
- 7 Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
- 8 Intentionally left blank
- 9 SER, March 2, 1994.
- 10 Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
- 11 A 1 hour fire wrap is installed to protect the 1/2 Emergency Diesel Generator Cooling Water Pump Cables. However, full detection and suppression has not been provided for this zone. This is justified with GL 86-10 Evaluation S040-QH-0609.

**ZONE:** 8.2.1.A**AREA:** TB-III**LOCATION:** TB 1, Elev. 547**ZONE DESCRIPTION:**

Fire Zone 8.2.1.A consists of the condensate pump room on elevation 547 of the Unit 1 Turbine Building.

Zone 8.2.1.A, the basement floor of the building, extends from the 547 foot elevation to elevation 572 and is bounded by the exterior building wall on the south, by zone 8.2.1.C to the east, by zones 11.1.1.A, 11.1.1.B, and 11.1.1.C and the building exterior wall to the west, and by the building exterior wall and zone 8.2.3.A to the north.

The zone contains the condensate pumps, the condensate booster pumps, and the condensate transfer pumps for Unit 1.

**BARRIERS:**

This zone shares barriers with:

ZONES

11.1.1.A, 11.1.1.C, west  
8.2.1.C, east  
8.2.3.A, north and above  
8.2.6.A, 8.2.6.B, above  
8.2.6.C, above  
11.1.1.B, inside 8.2.1.A

AREAS

TB-III  
TB-III  
TB-III  
TB-III  
TB-II  
TB-V

**DETECTION:**

None.

**AUTOMATIC SUPPRESSION:**

Area wet pipe sprinkler system.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed primarily of electrical cables. The second and third most prominent combustibles, contributing only a fraction of the loading associated with the cables, are hydrogen and lubricating oil, respectively. The remainder of the fixed combustibles consists of various materials distributed with good spatial separation. Thus, the only fixed combustibles capable of sustaining a severe fire in the zone are the electrical cables or the lubricating oil. Full involvement of the cables is possible, depending on the location of the ignition source. In most instances, full involvement would be precluded by a fire stop located approximately at the north/south mid point of the room. The cable trays are fifteen or more feet above the floor.

Hydrogen constitutes the second largest quantity of fuel. This quantity of hydrogen is not normally in the room but, could be released in the room given the failure of a hydrogen system component. The oil is distributed among twelve separate pieces of equipment and a combustible liquid storage locker. The lubricants in the machinery is contained in bearing housings of substantial construction, with the largest single quantity of oil in a housing being two gallons. Thus, a large spill fire capable of causing full area involvement is unlikely.

Transients account for a significant portion of the combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The hazard associated with transients in this zone is the potential for a localized fire which may expose combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables.

Although no detection system is provided, actuation of the sprinkler system would notify operating personnel via a Control Room annunciation. This notification should prompt fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility; and
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade performance would be hampered by the need to access the compartment from above.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 8.2.1.A:**

The potential for fire spread within the zone is limited by the quantities and discontinuity of combustibles, with the exception of the cable trays. Thus, significant fire spread in this area is dependent on tray involvement. Should the trays become involved, combustion could continue to burnout or until limited by suppression. The high ceiling in the area and the vertical vent paths would limit the rate of propagation in the tray system and, barring an exposure fire under the fire stop, involvement of only a portion of the zone's cables would be expected. Proper functioning of the sprinkler system should limit fire development.

**Fire Spread Potential Within Fire Area TB-III:**

The potential for fire spread to zone 8.2.3.A is limited by the reinforced concrete floor/ceiling assembly separating the zones vertically. However, the lack of physical horizontal separation between these zones at the southern boundary of 8.2.3.A and the unprotected penetrations in the floor/ceiling assembly (e.g., stairway openings) render damage to components in zone 8.2.3.A from a fire in 8.2.1.A a distinct possibility, even if fire propagation to that zone did not occur.

The potential for fire spread to zone 8.2.6.A, above, is limited by the reinforced concrete floor/ceiling assembly which separates the two zones. The floor/ceiling assembly is penetrated by an equipment hatch which is plugged with a reinforced concrete plug of substantial construction. Although not fire-rated, this barrier exhibits good fire resistive characteristics and should not be challenged by a fire in zone 8.2.6.A.

Fire zone 8.2.6.B is located above zone 8.2.1.A and is separated from it by a barrier of reinforced concrete construction. The combustible loading in zone 8.2.1.A is not sufficient to challenge this barrier. However, there are open mechanical penetrations in the barrier. Thus, fire spread to zone 8.2.6.B is a possibility if the sprinkler system in 8.2.1.A does not function properly.

The potential fire and/or explosion hazard in Fire Zone 8.2.1.A which would be most likely to affect adjacent zones, is the hydrogen water chemistry system. Should a hydrogen release occur, it is expected that hydrogen would rise through the mechanical openings which would expose the fire zones located above (Fire Zones 8.2.3.A and 8.2.6.C). Hydrogen leak detection is provided in Fire Zone 8.2.3.A and in the area of 8.2.6.C above the manlift, stairs, and open pipe chase. When the detection system senses a release, interlocks stop the flow of hydrogen. Should a significant release of hydrogen occur and a fire or explosion result, the substantial concrete barriers would serve to limit the structural damage to adjacent zones.

Fire zones 11.1.1.A and 11.1.1.C are separated from 8.2.1.A by 3-hour rated fire barriers. To preclude common cause failure of the ECCS related components in these zones from flooding in 8.2.1.A, water tight doors are installed in the personnel access doorways. These doors are of substantial steel construction (they are submarine doors), but are not fire-rated. Other penetrations into these zones are provided with fire rated penetration seals. The possibility of fire spread into these zones from 8.2.1.A, then, becomes a question of the effectiveness of the water tight doors in preventing fire spread. The design of these doors is such that, even when exposed to severe fire conditions, they would remain in place. The only failure mechanism of concern then would be the loss of the door gasket (rubber) when exposed to fire conditions. Loss of the gasket would allow combustion gases to enter the uninvolved zone. This performance under fire conditions was proven during a severe battery fire aboard the U.S.S. Cochino (SS-349). The high ceilings and vertical vent paths in zone 8.2.1.A would preclude the doors being exposed to high temperature combustion gases evolved by a fire anywhere but in the immediate vicinity of the door. A fire in the immediate vicinity of the door (say an oil spill fire) could result in gasket failure after a prolonged exposure. The conditions for such an exposure do not exist in zone 8.2.1.A, thus, fire spread into zones 11.1.1.A or 11.1.1.C would not be expected. The sprinkler system installed in 8.2.1.A provides further assurance that such is the case.

Fire zone 8.2.1.C is located due east of zone 8.2.1.A and is separated from it by a reinforced concrete barrier of substantial construction. This barrier has penetrations in it for personnel access, cable trays, and piping. Due to the high ceiling and vertical vent paths in zone 8.2.1.A and the distribution of combustibles, a fire challenging the barrier separating these zones is not realistic. However, should the cables penetrating the wall become involved, and the sprinklers in 8.2.1.A fail to function properly, fire spread to 8.2.1.C is a possibility.

**Fire Spread Potential To Fire Area TB-II:**

Fire zone 8.2.6.C is located above the north end of zone 8.2.1.A and is connected to it by a man-lift access and by a stairwell. The barrier separating these zones at elevation 595 is of heavy reinforced concrete construction and exhibits good fire resistive characteristics. Although a fire in 8.2.1.A would not challenge this barrier, openings in it compromise its effectiveness in containing fire. Most notable among these is the opening for the man-lift structure and belt. This opening, in addition to being a clear space through which combustion gases and smoke can readily pass, is penetrated by the combustible man-lift belt. Thus, a direct route and a combustible for communicating fire between zones exists, and fire spread to 8.2.6.C from 8.2.1.A is a definite possibility. The sprinklers in 8.2.1.A serve to reduce the probability of such an occurrence.

**Fire Spread Potential Within Fire Area TB-V:**

Fire zone 11.1.1.B, Fire Area TB-V, is separated from 8.2.1.A by 3-hour rated fire barriers. To preclude common cause failure of the ECCS related components in this zone from flooding in 8.2.1.A, a water tight door is installed in the personnel access doorway. This door is of substantial steel construction (they are submarine doors), but are not fire-rated. Other penetrations into this zone are provided with fire rated penetration seals. The possibility of fire spread into this zone from 8.2.1.A, then, becomes a question of the effectiveness of the water tight door in preventing fire spread. The design of this door is such that, even when exposed to severe fire conditions, it would remain in place. The only failure mechanism of concern then would be the loss of the door gasket (rubber) when exposed to fire conditions. Loss of the gasket would allow combustion gases to enter the uninvolved zone. This performance under fire conditions was proven during a severe battery fire aboard the U.S.S. Cochino (SS-349). The high ceilings and vertical vent paths in zone 8.2.1.A would preclude the door being exposed to high temperature combustion gases evolved by a fire anywhere but in the immediate vicinity of the door. A fire in the immediate vicinity of the door (say an oil spill fire) could result in gasket failure after a prolonged exposure. The conditions for such an exposure do not exist in zone 8.2.1.A, thus, fire spread into zones 11.1.1.B would not be expected. The sprinkler system installed in 8.2.1.A provides further assurance that such is the case.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 8.2.1.A is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

10.0 Lack of 3-Hour Barriers Between Fire Zones 8.2.1.A and 11.1.1.B and the Rest of the Southern Zone Group

**Issue:** Fire zones 8.2.1.A and 11.1.1.B are separated from each other by 3-hour fire rated construction except for the connecting personnel access door. The principle concern is that compliance with the requirements of Section III.G.2 with regard to redundant safe shutdown components is not achieved.

**Evaluation:** As discussed under **Factors Influencing Fire Impact**, above, the primary fixed combustibles in zone 8.2.1.A are electrical cables located in the overhead trays. Due to their location, these trays do not constitute a direct exposure to the barrier separating zone 8.2.1.A from zone 11.1.1.B. This topic has been explored in the discussion of **Fire Spread Potential**, above. Based on that exploration, the possibility of fire spread to zone 11.1.1.B is unlikely and, therefore, the separation provided is acceptable for the hazard. This finding is consistent with that of the existing SER.

Additionally, electrical cables for redundant SS/D equipment in zone 11.1.1.B are routed through zone 8.2.1.A. This cable is protected by a one-hour rated fire wrap and the area is sprinklered. Considering this, a fire in 8.2.1.A will not compromise the integrity of this SS/D cable. Thus, the objectives of Appendix R to 10 CFR 50 are satisfied.

**CONCLUSION:**

The evaluation presented above for fire zone 8.2.1.A demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The barrier shared by 8.2.1.A and 11.1.1.B deviates from Appendix R with respect to separation of redundant safe shutdown related cables. However, the separation provided is sufficient for the hazard and a fire in zone 8.2.1.A will not result in the loss of redundant SS/D trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 8.2.1.C****Unit 1 Turbine Foundation****Fire Area:** TB-III**F Drawing:** F-9-1**General Elevation:** 558'-6"**Zone Area:** 3,850 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** One hose station equipped with 100 feet of hose.**Other FP features:** None

**Suppression Effects:** The operation of sprinkler systems, use of manual hose streams, or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by sump pumps of the general area drainage system, these drains are normally closed and would have to be unplugged for water removal.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
CT-2	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.6.A	TB-III	Non-rated	noncombustible, open mechanical	One non labeled door.	Concrete block at tube pull pit
8.2.5	CT-2	3 hour	3 hour	No doors	1'-6" thick concrete
8.2.3.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.6.B	TB-III	Non-rated	noncombustible, open mechanical	No doors, open pipe chase	4'-0" thick concrete
8.2.1.A	TB-III	Non-rated	noncombustible, open mechanical	One non labeled door.	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
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1, 5.13.4	Hose stations and portable fire extinguishers are provided for this zone.
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**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3
.	



**ZONE:** 8.2.1.C      **AREA:** TB-III      **LOCATION:** TB, Elev 558'-6"

**ZONE DESCRIPTION:** Unit 1 Turbine Foundation

**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hours. The combustible loading is light and is due to electrical cable insulation and transients.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone impacting safe shutdown equipment or cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.1.C which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6. A	TB-III	Non-rated
8.2.5	CT-2	3 hour
8.2.3. A	TB-III	Non-rated
8.2.6. B	TB-III	Non-rated
8.2.1. A	TB-III	Non-rated

**EVALUATION - ZONE 8.2.1.C:**

A non-rated barrier constructed of concrete blocks separate this zone from Fire Zone 8.2.6.A in the condenser tube pull pit. A non-labeled door is installed in this barrier. The wall separating this zone from Fire zone 8.2.3.A is 4-foot thick concrete as is the wall separating this zone from Fire zone 8.2.1.A. Electrical penetrations in these walls are sealed with noncombustible material and open mechanical penetrations exist. A 1'-6" thick 3-hour fire rated concrete wall separates this fire zone from Fire Zone 8.2.5. A 4-foot thick concrete wall containing one unlabeled door, electrical penetrations sealed with noncombustible material, and open mechanical penetrations separate this zone from Fire Zone 8.2.1.A. The ceiling of this zone serves as the boundary with Fire Zone 8.2.6.B. The electrical penetrations in the ceiling are sealed with noncombustible material and there are open mechanical penetrations. In addition, an open pipe chase exists between these two zones.

Even though the fire-loading limit for this zone is relatively light, a wet pipe sprinkler system is provided for this zone. In addition, a hose station, equipped with 100 feet of hose is located in this fire zone.

The barriers separating this fire zone are unrated except for the boundary with the cable tunnel (fire zone 8.2.5); however, significant structural mass and thermal adsorption capability is associated with the boundaries that provides some degree of fire resistance. The existence of a suppression system provides additional assurance that a fire originating in this zone would not spread to an adjacent zone prior to extinguishment, since the suppression system would actuate, controlling or extinguishing the fire and summoning the plant fire brigade.

**CONCLUSION:**

The light combustible loading in this zone is unlikely to significantly challenge the structural boundaries due to the material of construction and the associated thermal adsorption capability. In addition, the zone is provided with a wet pipe suppression system, which would control any fire occurring in this area.

**Fire Zone: 8.2.3.A****Unit 1 Upper Basement****Fire Area:** TB-III**F Drawing:** F-10-1**General Elevation:** 572'-6"**Zone Area:** 4,713 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection coverage. Hydrogen leak detection.
<b>Suppression:</b>	General area pre-action sprinkler system.
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and one hose station equipped with 100 feet of hose.
<b>Other FP features:</b>	Power feed to 1/2 diesel generator cooling water pump is protected by a one hour fire wrap. One partial one hour fire barrier at the north wall vertical pipe chase.
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose streams, or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by the general area drainage system.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
TB-II	Equivalent 3 Hour [3]

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.1.A (South)	TB-III	Non-rated	noncombustible	No doors	4'-0" thick concrete / open
8.2.1.C	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.6.C	TB-II	Non-rated [3]	noncombustible, open mechanical [5]	One unlabeled door	4'-0" thick concrete
8.2.6.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
11.1.1.C	TB-III	Non-rated	noncombustible	No doors	2'-0" thick concrete
8.2.3.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.1.A (Floor)	TB-III	Non-rated	noncombustible, open mechanical	No doors	2'-3" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 8.2.3.A****Unit 1 Upper Basement****Fire Protection Commitments:**

Reference Section	Commitment
6, 9.2	No continuity of combustibles between Fire Zones 8.2.3.A (of the southern group) and 8.2.6.C. Also reference [3](5.2.4).
1, 5.14.4	Hose stations and portable extinguishers provided for area.
2	1-hour protection of Unit 2 alternate feed to DG 1/2 cooling water pump and its cubicle cooler in U1 portion on TB.
1, 5.14.6	Automatic sprinklers will be extended to protect the rod drive feed pumps. Also reference [1](3.1.5), [3](5.2.4) and [6](9.2).

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Exemption Request 5.2 applies to this fire zone and involves the lack of 3-hour fire barriers between the Southern and Central Zone Groups. Also see section 9.0 of the July 21, 1988 SER.
4	Exemption Request 5.7
5	A partial one -hour barrier separates the vertical pipe chase along the south wall (Zone 8.2.6.A) and 8.2.3.A. This barrier protects 1/2 DGCWP cables inside the chase from direct flame impingement. No damper has been installed in the penetrating HVAC ductwork per SE-96-076.
6	SER, July 21, 1988.
7	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.

**ZONE:** 8.2.3.A      **AREA:** TB-III      **LOCATION:** TB III, Elev. 572'-6"

**ZONE DESCRIPTION:** Unit 1 Upper Basement

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists fire zones adjacent to Fire Zone 8.2.3.A, which are in separate fire areas or which contain redundant safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6C	TB-II	Non-rated

**EVALUATION:**

The primary concern relative to the affect on safe shutdown capability would be a fire originating in Fire Zone 8.2.3.A and spreading to adjacent zones which contain components used for safe shutdown in the event of a fire in 8.2.3.A. Fire Zone 8.2.6.C, located in Fire Area TB-II, contains components which are credited for safe shutdown of Units 1 and 2.

The previous FHA described the separation between 8.2.3.A and 8.2.6.C as equivalent to a 3 hour barrier and was described in Exemption Request 5.2. Exemption Request 5.2 applies to the separation between the Southern and Central Zone Groups.

An evaluation was performed concerning the interface between these zones. A 4'-0" thick concrete floor on unprotected structural steel separates these zones. Openings in the floor include, a manlift, open stairs, and a pipe hatch. Regardless of these openings, the consequences of a fire in this zone would not adversely impact safe shutdown components or cables located in Fire Zone 8.2.6.C based on the following factors:

- General area wet pipe sprinkler protection and smoke detection are provided throughout Fire Zone 8.2.2.A. Hydrogen leak detection is provided in the zone. The hydrogen leak detection system is interlocked with the hydrogen system providing safeguards which will limit the release of hydrogen.
- Fire detection is provided in Fire Zone 8.2.6.C. Should products of combustion enter 8.2.6.C from a fire in Fire Zone 8.2.3.A, it would be promptly detected. Hydrogen leak detectors are also provided in Fire Zone 8.2.6.C above the vertical openings from 8.2.3.A.
- Except for openings for the manlift, pipe chase, and the door to the stairs, a substantial 4'-0" thick concrete floor on structural steel separates these two zones.
- Manual fire fighting equipment is available for both of these fire zones.
- Should products of combustion travel from Fire Zone 8.2.3.A to 8.2.6.C, the fire brigade is available and properly trained to intervene. Such intervention combined with the fixed protection should provide adequate protection of the safe shutdown equipment located in Fire Zone 8.2.6.C. Pre-fire plans have been developed for these fire zones and are utilized by the fire brigade in training.
- As discussed above, Exemption Request 5.2 and Section 9.2 of the July 21, 1988 SER provide additional details concerning the adequacy of the separation between these two zones. Therefore, the increase in the combustible loading limit for Fire Zone 8.2.3.A should not impact the ability to achieve and maintain a safe shutdown.

**Fire Zone: 8.2.3.B****Unit 1 Radwaste Pipe Tunnel****Fire Area:** TB-III**F Drawing:** F-10-1**General Elevation:** 580'-0"**Zone Area:** 1,685 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** One hose station equipped with 100 feet of hose, located at column 13.**Other FP features:** None**Suppression Effects:** Use of manual hose streams or piping breaks will not affect safe shutdown as no safe shutdown equipment is located in this zone. Water runoff would be handled by the general area drainage system.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
TB-I	Equivalent 3 Hour [1]
RW	Nonrated[6]
TB-II	Equivalent 3 Hour [1]

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
14.1	RW	Non-rated[6]	noncombustible, open mechanical[6]	No doors	3'-0" thick concrete
8.2.2.B	TB-I	None	noncombustible, open mechanical	No doors	No wall
8.2.6.C	TB-II	Non-rated [1]	noncombustible, open mechanical	No doors	2'-8" thick concrete
8.2.3.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
2, 9.2	No safe shutdown cables or equipment in zone. No significant quantity of combustibles. Also reference [1](5.2.4) and [2](10.2).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Appendix R Exemption Request 5.2 applies to this fire zone and involves the lack of 3-hour fire barriers between the Southern and Central Zone Groups.
2	SER, July 21, 1988.
3	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
4	SER, March 2, 1994.
5	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
6	Evaluation for fire area separation between TB-III and RW, ER9801580.



**ZONE:** 8.2.3.B      **AREA:** TB-III      **LOCATION:** TB III, Elev. 580'-0"

**ZONE DESCRIPTION:** Unit 1 Radwaste Pipe Tunnel

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours. Based on the existing fire area separation, this fire loading should not challenge cables or equipment in the adjacent fire areas.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.3.B which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities

Zone	Area	Fire Resistance Rating
8.2.3.A	TB-III	Non-rated
8.2.2.B	TB-I	None (no wall)
8.2.6.C	TB-II	Non-rated
14.1	RW	Non-rated

**EVALUATION ZONE 8.2.3.B:**

This fire zone is the unit 1 turbine building radwaste piping tunnel. The east wall of this zone partially borders the radwaste building. The wall for this portion is constructed of 3'-0" thick reinforced concrete and has an open passage to the radwaste building collection and holding area. The remainder of the east wall borders the outside (below grade). The south wall is constructed of 1'-6" thick concrete and borders fire zone 8.2.3.A. The remaining walls border below grade areas underneath the turbine building. The tunnel is open to the unit 2 portion of the radwaste piping tunnel on the north end. None of the zone's walls are credited as being fire rated. The ceiling of this area is the floor of fire zone 8.2.6.C and is constructed of 3'-0" thick concrete with an open hatchway and pipe chase. The radwaste piping tunnel contains no safe shutdown cables or equipment associated with any safe shutdown methodology. There are no automatic fire detection or automatic fire suppression systems installed in this fire zone. There is, however, a hose station, equipped with 100 ft. of hose, provided to support manual fire suppression activity if required. The radwaste-piping tunnel's (fire zone 8.2.3.B) fire loading limit is low, however the only specifically identified combustible identified within the tunnel is a half-gallon of lube oil associated with the condensate backwash transfer pump. In the event of a fire occurring within this zone, the significant thermal mass associated with the boundaries and the lack of significant combustibles is likely to result in a slowly growing fire that will not propagate outside the zone due to the lack of continuity of combustibles. Due to the opening of this tunnel to adjacent fire zones, the buildup of significant amounts of hot gasses and smoke is unlikely. As such, a high degree of assurance exists that a fire originating within this area will not spread to adjacent fire zones and damage safe shutdown equipment or cables.

**Fire Zone: 8.2.6.A****Unit 1 Ground Floor****Fire Area:** TB-III**F Drawing:** F-12-1**General Elevation:** 595'-0"**Zone Area:** 15,440 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area smoke detection coverage between the reactor feed pump room and the Unit 1 diesel generator room (above the Unit 1 auxiliary transformer feeds), and in the corridor running along row G from column line 24 to column line 14.
<b>Suppression:</b>	Local area wet pipe sprinkler system protects the reactor feedwater pumps, and in the corridor from column line 14 to 17. Local preaction sprinkler system has been installed above the Unit 1 trackway at the south end of the fire zone actuated by thermal detectors.
<b>Manual Suppression:</b>	Water hose stations equipped with 100 feet of hose and portable fire extinguishers. Fire carts also available in this area.
<b>Other FP features:</b>	Flammable liquids cabinet provided. The access hatches are curbed to prevent fluid borne fire spread across the fire boundary. The Unit 1 and the Unit 2 cable tunnel hatches are class "A" fire rated doors with a 3-hour fire label (Ref. DCP 9900059, and DCP 9900174 respectively).
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose lines or piping breaks will not adversely affect safe shutdown. The effects from these actions would be of no greater severity than those already determined to be acceptable for a design-basis fire. Water runoff would be handled by the general area drainage system.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-1S	Equivalent 3 Hour [7]
SB-II	Nonrated[15]
SB-I	3 Hour
TB-II	Equivalent 3 Hour [5] (3 Hour at Fire Zone 8.1)
CT-2	3 Hour
CT-1	3 Hour
RB-1N	3 Hour

**Fire Zone: 8.2.6.A****Unit 1 Ground Floor****Boundary Fire Zones:**

<b>Boundary Zone</b>	<b>Area</b>	<b>Barrier Rating</b>	<b>Seal Rating</b>	<b>Doors and Dampers</b>	<b>Barrier Type</b>
8.2.7.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	3'-0" thick concrete on exposed steel
6.1.B	TB-III	3 hour	3-hr (F-386)	No doors	0'-5 1/2" thick concrete ceiling on sprinkler protected steel
8.2.6.B	TB-III	Non-rated	noncombustible, open mechanical	One unlabelled door.	3'-0" thick concrete (concrete block at pull pit)
9.1	TB-III	3 hour	3 hour (F-152, 153, 154)	One class A fire door, Two 3 hour dampers.	1'-0" thick concrete
6.3	SB-I	3 hour [6][7]	3 hour (F-127)	One 3 hour damper	2'-0" thick concrete
19.1	SB-II	Non-rated[15]	noncombustible, open mechanical[15]	Unlabeled double doors, One 3 hour damper.[15]	2'-0" thick concrete
8.2.4	CT-1	3 hour [6][7]	3 hour	1 equipment access hatch/door 1 personnel access hatch/door (16)	3'-0" thick concrete (4'-0" at TW-1)
6.1.A	TB-III	3 hour	3-hr (F-386)	No doors	0'-5 1/2" thick concrete ceiling on sprinkler protected steel
8.2.6.C	TB-II	Non-rated	none [5]	No doors	Open corridor along row F
8.2.1.C	TB-III	Non-rated	noncombustible, open mechanical	One non-labeled door	Concrete block at tube pull pit
1.1.1.2*	RB-1N	3 hour [7]	3 hour (F-44, F-45)	One Class A fire door,	4'-0" thick concrete (1'-6" thick at interlock)
8.2.7.B	TB-III	Non-rated	noncombustible	No doors	Minimum 1'-6" thick concrete
3.0	SB-I	3 hour	3 hour (F-131)	No doors	2'-0" thick concrete
1.1.1.1*	RB-1N/RB-1S	3 hour [6][7]	noncombustible	No doors	3'-0" thick concrete
11.2.1*	RB-1S	3 hour equivalent	3 hour	No doors	2'-0" thick concrete
19.2	SB-II	Non-rated[15]	noncombustible, open mechanical[15]	No doors	2'-0" thick concrete
8.2.1.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	Open pipe chase
8.2.5	CT-2	3 hour [6][7]	3 hour	1 equipment access hatch/door 1 personnel access hatch/door (16)	3'-0" thick concrete (4'-0" at TW-1)

\* Secondary Containment Boundary

**Fire Zone: 8.2.6.A****Unit 1 Ground Floor****Fire Protection Commitments:**

Reference Section	Commitment
5, 5.2.4	Smoke detection provided for major electrical safe shutdown equipment and in corridor.
1, 3.1.1(9)	Install fire detection system in area of 4kV switchgear 11,12, 21, 22 (by DG room) & [1](5.17). And provided by high pressure heater bay (cable penetrations to RB).
1, 3.1.5.f	Install sprinkler system in area of Unit 1 trackway. Also reference [1](5.17.6). Also provided adjacent to steam pipe chase.
1, 3.1.8	Relocate exhaust vents for reactor feed pump areas and seal openings. 3-hour barriers installed. Also reference [1](5.17.6 & 5.22.6). Relocated not to expose transformers.
3, (8) PF 38-2	Install fire detection along H wall column row H/15-19 Unit 1 and H/7-11 Unit 2 (high pressure heater bay).
2	Complete detection on ground floor Turbine Building from col. 9 to 17 in eastern corridor and common section, including safe shutdown pump.
2	Automatic sprinkler on ground floor Turbine Building from col. 9 to 17 in eastern corridor and common section, including safe shutdown pump.
2	Seal vertical cable penetrations from U2 cable tunnel thru metal hatch near col/row F/12 and F/25 with substantial fire stop.
2	Detection in far north and south portions of TB corridor and in central portion of 8.2.6.C 12-14/C-F.
8, (40) PF-58-1	3 smoke ejectors will be provided. 3 smoke ejectors on fire cart in Unit 1 Trackway.
10	Provide Class A fire doors to other fire areas. The only reference noted is the previous FHA, pg. 2.3-51.
7, 10.2	Fire detection and suppression above cable tunnel access points.
12, D.3.c	Water suppression provided over major cable concentrations.
7, 10.2	Unit 2 cable tunnel electrical seals are 3-hour rated.
7, 10.2	Curbed access at F/17 & F/25 with metal checkered plate.
1, 3.1.11	Oil dispensing stations with approved cabinets. Quantity limited to 55-gallons.
1, 3.1.11	Curbs and drains for liquid storage on TB ground floor. Also reference [1](5.17).
1, 5.17.4	Portable extinguishers and hose stations provided.
1, 5.17.4	Extra-hazard wet pipe sprinkler system provided for feed water pumps. (Pipe schedule system).
7, 9.2	Generally, 3-hour separation between TB and RB. Also reference [4].
11, 3.1.5.f	Provide pre-action sprinkler system in trackways. Sized for extra hazard protection.
11, 3.1.5.f	Detection system will comply with NFPA Codes. Heat shields will be provided.
7, 9.2	Automatic detection and water suppression provided in corridor. Also reference [5](5.1 & 5.2.4).

**Fire Zone: 8.2.6.A****Unit 1 Ground Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
5	Exemption Request 5.2 (12-18-84), Exemption for the lack of complete 3-hour fire barrier between TB zone groups. Revised to Southern and Central Zone Groups (6-25-86). Exemption granted (9.0) 12-11-87. Also reference Section 5.1.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	Letter, CECO to NRC, dated 12-27-78.
9	GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
11	SER, November 5, 1980.
12	ComEd response to the requirements of Appendix A
13	Note: Reference cable tray loading limits in Table 3.6-2.
14	Intentionally Left Blank.
15	Evaluation for fire area separation between SB-II and TB-III, ER9801620.
16	Equipment access hatches/doors #300 & 301 and personnel access hatches/doors #302 & 303 are class "A" fire rated doors with a 3-hour fire label (Ref. DCP 9900174 & DCP 9900591)
17	Upgrading of the ceiling between column lines 24/25 and G/H to a 3-hour barrier, including 6" thick 3-hr rated fire seals per DCP 9900027 / DCN 001905M.

**ZONE:** 8.2.6.A      **AREA:** TB-III      **LOCATION:** TB III, Elev. 595'-0"

**ZONE DESCRIPTION:** Unit 1 Ground Floor (Trackway)

**FIRE SEVERITY:**

The fire severity for this fire zone is approximately 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists fire zones adjacent to Fire Zone 8.2.6.A, which are in separate fire areas or which contain redundant safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.1.1.1	RB-1	3 hour
1.1.1.2	RB-1	3 hour
11.2.1	RB-1	3 hour
3.0	SB-I	3 hour
6.3	SB-I	3 hour
19.1	SB-II	Non-rated
19.2	SB-II	Non-rated
8.2.5	CT-2	3 hour
8.2.6.C	TB-II	Equivalent 3 hour
8.2.4	CT-1	3 hour

**EVALUATION ZONE 8.2.6.A:**

The primary concern relative to the effect on safe shutdown capability would be a fire originating in Fire Zone 8.2.6.A and spreading to adjacent zones which contain components used for safe shutdown in the event of a fire in 8.2.6.A.

Fire Area SB-II, which includes fire zones 19.1 and 19.2, contains no cables which are credited for safe shutdown of Units 1 and 2. Fire spread from Fire Zone 8.2.6.A into these adjacent zones would not impact Unit 2 safe shutdown. Fire spread from 8.2.6.A into zones 19.1 and 19.2 would not preclude Unit 1 safe shutdown.

Fire zones 3.0 and 6.3 are separated from Fire Zone 8.2.6.A by 3-hour rated construction. Since the fire severity limit for zone 8.2.6.A is less than the ratings of these barriers, satisfactory fire separation is provided.

The fire zone 1.1.1.2 in Fire Area RB-1 is separated from Fire Zone 8.2.6.A by substantial reinforced concrete barriers which provide protection equivalent to that provided by a 3-hour rated barrier. The increased fire loading limit in zone 8.2.6.A is less than the effective fire resistivity of the barriers separating it from 1.1.1.2. More information on this interface can be found in Exemption Request 3.3 and Section 3 of the July 21, 1988 SER.

Fire zones 8.2.4, 8.2.5 and 8.2.6.C, utilize different safe shutdown paths and are separated from Fire Zone 8.2.6.A by a combination of construction and other fire protection features which is considered equivalent to the required 3 hour separation.

Fire Zone 8.2.4 is the Unit 1 Cable Tunnel and runs under Fire Zone 8.2.6.A. Separation is provided between these zones by a concrete floor at least 3'-0" thick. The floor is considered to provide a 3 hour boundary. All access hatches are curbed. Equipment hatch #300 and personnel hatch #302 are class "A" fire rated.

Fire Zone 8.2.5 is the Unit 2 Cable Tunnel and runs under Fire Zone 8.2.6.A. Separation is provided between these zones by a 3'-0" thick (4'-0" thick at the trackway) concrete floor. The floor is considered to provide a fire resistivity of at least three hours. All access hatches are curbed to prevent fluid borne fire spread across fire boundary. Equipment access hatch #301 and personnel access hatch #303 are class "A" fire rated doors with a 3-hour fire label (Ref. DCP 9900174). Their performance is enhanced by the provision of automatic fire suppression on each side. Section 10 of the July 21, 1988 Safety Evaluation Report discusses the separation between these fire zones in more detail.

Fire Zone 8.2.6.C interfaces with Fire Zone 8.2.6.A via a connecting corridor with no separating barrier. In lieu of a barrier, more than 50 feet of the corridor has been provided with automatic sprinkler protection and a detection system. The sprinkler provides for suppression of fires occurring in this area and the detection provides for early notification of a fire, thereby facilitating prompt fire brigade response. The increase in the combustible loading limit for Fire Zone 8.2.6.A in the area of the connecting corridor should not challenge the combination of fire protection features provided. Further information on the separation of these zones can be found in Section 9.3 of the July 21, 1988 SER.



Fire Zones 1.1.1.1 and 11.2.1 are separated from Fire Zone 8.2.6.A by substantial reinforced concrete floor/ceiling assemblies (3'-0" thick for 1.1.1.1 and 2'-0" thick for 11.2.1). The portion of this barrier above zone 11.2.1 has a removable concrete plug. This plug is located in the floor of the D-Heater Bay portion of 8.2.6.A and provides fire resistive capability of at least three hours based on its thickness. The D-Heater Bay is provided with fixed fire detection and suppression systems. Based on the foregoing, the increase in the combustible loading limit for Fire Zone 8.2.6.A does not present a threat of fire spread to zones 1.1.1.1 and 11.2.1 (For more information see Exemption Request 3.3 and Section 3 of the July 21, 1988 SER).

The potential for fire spread into zones 6.1.A and 6.1.B located in the southeast corner of the zone is unlikely due to 6" thick intervening reinforce concrete ceiling supported by structural steel members protected by automatic suppression system (Ref. FPR 3.6.1). The concrete barrier meets or exceeds building code and NFPA requirements for a 3-hour fire barrier. All penetrations through the floor is sealed with 3-hour fire rated seals. Fire spread to these zones is not likely.

**Fire Zone: 8.2.6.B****Unit 1 Ground Floor****Fire Area:** TB-III**F Drawing:** F-12-1**General Elevation:** 595'-0"**Zone Area:** 14,660 Ft<sup>2</sup>**Fire Protection Features:****Detection:**

Local area heat detectors in L. P. Heater Pull Space.

**Suppression:**

General area wet pipe sprinkler system except in the corridor along row C. Local area deluge sprinkler system located along row C in L. P. Heater Pull Space and is actuated by thermal heat detectors.

**Manual Suppression:**

Four hose stations each equipped with 100 feet of hose, and portable fire extinguisher(s) staged right outside this zone during power operation.

**Other FP features:**

None

**Suppression Effects:**

The operation of sprinkler systems, use of manual hose streams, or piping breaks will not affect safe shutdown, as there is no safe shutdown equipment located in this area. Water runoff would be handled by the general area drainage system, sump pumps, or would flow into the condenser pit.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:****Fire Area****Barrier Description**

RW

Nonrated[10]

TB-II

Equivalent 3 Hour [7]

CT-2

3 Hour

**Fire Zone: 8.2.6.B****Unit 1 Ground Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.7.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	3'-0" thick concrete
14.1.1	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
14.1	RW	Non-rated[10]	noncombustible[10]	No doors	3'-0" thick concrete
8.2.1.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.3.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.1.C	TB-III	Non-rated	open	No doors	4'-0" thick concrete w/ vertical pipe chase
8.2.5	CT-2	3 hour	noncombustible	No doors	3'-0" thick concrete
8.2.7.B	TB-III	Non-rated	open	No doors	open
8.2.6.C	TB-II	Non-rated [6][7]	noncombustible, open mechanical	Two unlabeled doors.	4'-0" thick concrete and concrete block
8.2.6.A	TB-III	Non-rated	noncombustible, open mechanical	One unlabeled door.	3'-0" - 4'-0" thick concrete and concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
7, 10.2	Suppression systems in zones adjacent to radwaste tunnel.
7, 10.2	Unit 2 cable tunnel electrical seals are 3-hour rated.
7, 9.2	Substantial shield walls around zone. Cable penetrations sealed with noncombustible material. Also reference [5](5.2.4).
1, 5.17.4	Portable fire extinguishers and hose stations provided.
8	Provide Class A fire doors to other fire areas. The only reference noted is the previous FHA, pg. 2.3-51.

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Intentionally left blank
5	Exemption Request 5.2 (12-18-84), Exemption for the lack of complete 3-hour fire barrier between TB zone groups. Revised to Southern and Central Zone Groups (6-25-86). Exemption granted (9.0) 12-11-87.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
9	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
10	Evaluation for fire area separation between TB-III and RW, ER9801580.
11	Evaluation for moving extinguishers outside of heater bays during power operation EC 618200.

**ZONE:** 8.2.6.B      **AREA:** TB-III      **LOCATION:** TB1, Elev. 595'-0"

**ZONE DESCRIPTION:** Unit 1 Turbine Bldg. Ground Floor

**FIRE SEVERITY:**

The fire severity for this fire zone is 2.5 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.6.B which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.6.A	TB-III	Non-rated
8.2.6.C	TB-II	Non-rated
8.2.7.B	TB-III	Non-rated
8.2.5	CT-2	3 hour
8.2.1.C	TB-III	Non-rated
8.2.7.A	TB-III	Non-rated
14.1.1	TB-III	Non-rated
8.2.3.A	TB-III	Non-rated
8.2.1.A	TB-III	Non-rated
14.1	RW	Non-rated

**EVALUATION ZONE 8.2.6.B:**

Fire zones 8.2.6.A, 8.2.6.C, 8.2.7.B, 8.2.5, 8.2.1.C, and 8.2.3.A bound this fire zone. The boundaries between this zone and fire zone 8.2.6.A are minimum 3'-0" thick concrete and removable concrete block shield walls. Separation of this zone 8.2.6.B and fire zone 8.2.6.C is by minimum 4'-0" thick concrete and concrete block walls. The west wall along column line C is a 1'-6" thick concrete and concrete block exterior wall. None of the walls surrounding this fire zone are credited as being fire rated. The floor of this zone is the ceiling of fire zones 8.2.5 and 8.2.3.A. The portion of the floor over the unit 2 cable tunnel (fire zone) is 3'-0" thick concrete with electrical penetrations sealed. Above fire zone 8.2.3.A (radwaste piping tunnel) the floor is constructed of 4'-0" thick concrete and has openings for stairwells and equipment removal hatches. The ceiling of this zone, which is the floor of fire zone 8.2.7.B, is constructed of minimum 2'-6" thick concrete supported by unprotected structural steel and contains openings for stairways. Neither the floor nor ceiling of fire zone 8.2.6.B is credited as being fire rated.

This fire zone is protected with automatic fire detection and suppression systems. The entire zone except the corridor along row C and over the condenser is protected by an automatic wet pipe sprinkler system. A water spray system is installed along row C. Four hose stations, each equipped with 100 ft. of hose, are provided in this area to support manual fire suppression activities. A fire extinguisher is staged outside of the main entrance to 8.2.6.B during power operation. This fire zone has moderately heavy fire loading due to allowance for a turbine oil system piping break. The major fixed combustible is electrical cable insulation and the other combustibles to be found in the area are transient in nature such as rubber, cotton, and plastic associated with protective clothing. A wet pipe sprinkler system protects the total zone except for the corridor along row C where a water spray deluge system is provided. These two sprinklers systems provide assurance that any fire that would originate in this area would be controlled and limited in growth (or extinguished) until the fire brigade arrives; therefore, a reasonable assurance that a fire originating in this fire zone will not propagate to adjacent fire zones exists.

**Fire Zone: 8.2.7.A****Unit 1 Mezzanine Floor****Fire Area:** TB-III**F Drawing:** F-14-1**General Elevation:** 615'-6"**Zone Area:** 9,368 Ft<sup>2</sup>**Fire Protection Features:**

**Detection:** General area smoke except above the equipment removal hatches and the feeds from the generator to the main power transformer, including over the 4kV SWGR buses 13 & 14. Local area heat (thermal) detection above the hydrogen seal oil unit and the feedwater regulating valve hydraulic units.

**Suppression:** Local area wet pipe sprinkler system in the area between rows F and G and column lines 22 and 23. Local water spray system protects the hydrogen seal oil unit and the feedwater regulating valve hydraulic units.

**Manual Suppression:** Water hose stations equipped with 100 feet of hose and portable fire extinguishers.

**Other FP features:** The floor that bounds with the U1 DG (Fire Zone 9.1) has had fire proofing applied to the structural steel. Curbing has been installed around the feed reg valve hydraulic units and hydrogen seal oil units. The floor that bounds with the 125VDC Panel Room (Fire Zone 6.1.A) and the Battery Charging Room (Fire Zone 6.1.B) has automatic suppression to protect the structural steel.

**Suppression Effects:** Water discharge in this area will not affect safe shutdown as any adverse effects on hot shutdown equipment would be of no greater severity than those already determined to be acceptable for a design-basis fire. Water runoff would be handled by the general area drainage system or would travel down stairs to Fire Zone 8.2.6.A. Switchgear panel 13 and 14 are not sealed nor installed on pedestals, and MCCs 18-2 and 19-2 are installed on 3-1/2-inch pedestals with the tops of panels sealed.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
SB-II	Equivalent 3 Hour [12]
SB-I	3 Hour
TB-IV	Equivalent 3 Hour [13]

**Fire Zone: 8.2.7.A****Unit 1 Mezzanine Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.8.E	TB-IV	Non-rated[13]	noncombustible, open mechanical[13]	No doors	4'-0" thick concrete
3.0	SB-I	3 hour	3 hour (F-131)	No doors	2'-0" thick concrete
19.2	SB-II	Non-rated[12]	noncombustible[12]	No doors	2'-0" thick concrete
8.2.6.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	3'-0" thick concrete
8.2.6.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	3'-0" thick concrete
9.1	TB-III	3 hour	3 hour except exhaust duct penetration	No doors	0'-6" thick concrete on fire proofed steel
2.0	SB-I	3 hour	3 hour	One Class A fire door.	2'-0" thick concrete
8.2.7.B	TB-III	Non-rated	noncombustible, open mechanical	One unlabeled door.	3'-0" thick concrete
7.1	TB-III	3 hour	3-hr (F-389, F-390)	One class "A" fire Door Three, 3-hr Fire Dampers	1'-0" thick concrete
6.1.B	TB-III	3 hour	3-hr (F-387, F-388)	One Class A door, two 3 hour rated dampers	1'-0" thick concrete
6.1.A	TB-III	3 hour	3-hr (F-388)	One Class A door, two 3 hour rated dampers	1'-0" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 8.2.7.A****Unit 1 Mezzanine Floor****Fire Protection Commitments:**

Reference Section	Commitment
10, F.8	Hydrogen seal oil reservoirs have automatic water spray system.
7, 9.2	3-hour separation between RB and TB with exceptions. Also reference [9].
1, 5.18.4	Automatic sprinkler protection provided for hydrogen seal oil area.
1, 5.18.4	Automatic deluge system provided for the hydrogen seal oil units.
1, 5.18.4	Portable extinguishers and hose stations provided.
1, 3.1.11	Curbs around hydrogen seal oil units. Also reference [1](5.18.6).
5, 5.2.4	All penetrations in shield walls sealed with noncombustible materials. Substantial, locked, unlabeled, metal doors provided.
2	Provide detection in areas beneath SWGR's 24-1 and 13-1, and northern portion of 8.2.7.A.
8, pg.4	Install Class A fire doors to DC distribution center Unit 1 and Unit 2.
1, 3.1.1	Install fire detection system in area of 4kV switchgear 13, 14, 23, and 24. Smoke detection provided for most of fire zone 8.2.7.A. [5](5.2.4).

**Fire Zone: 8.2.7.A****Unit 1 Mezzanine Floor****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Intentionally left blank
5	Exemption Request 5.2 (12-18-84) applies to this fire zone. Exemption for the lack of complete 3-hour fire barrier between TB zone groups. Revised to Southern and Central Zone Groups (6-25-86). Exemption granted (9.0) 12-11-87.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	Letter, dated 4-10-74, CECO to NRC.
9	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
10	ComEd response to the requirements of Appendix A
11	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
12	Evaluation for fire area separation between SB-II and TB-III, ER9801620.
13	Evaluation for fire area separation between TB-III and TB-IV, ER9801624.
14	Intentionally left blank
15	Upgrading of walls, including seals, fire door and dampers for adjacent fire zones 6.1.A, 6.1.B and 7.1 per DCP 9900027 / DCN 001905M.
16	Evaluation for presence of gas cylinders EC 401197.

**ZONE:** 8.2.7.A

**AREA:** TB-III

**LOCATION:** TB 1, Elev. 615

**ZONE DESCRIPTION:**

Fire zone 8.2.7.A consists of the south end of the 615 foot elevation of the Unit 1 Turbine Building.

The zone extends from the 615 foot elevation to the bottom of the floor at elevation 639 and is bounded by the building exterior wall on the east and west sides, by the wall separating it from the Service Building on the south side, and by the wall separating it from zone 8.2.7.B. on the north. In the south east corner, the zone is bounded, in part, by the west wall of zone 6.1.A and a portion of the north and west walls of 6.1.B and 7.1.

The zone contains various items of switchgear, several MCC's, compressed gas cylinders, the hydrogen seal oil unit, the stator cooling unit, and bus ducting from the main generator.

**BARRIERS:**

This zone shares barriers with:

ZONES

8.2.6.B, 8.2.6.A, 9.1, below

8.2.7.B, north

6.1.A, 6.1.B, 7.1, east and south

8.2.8.E, above

AREAS

TB-III

TB-III

TB-III

TB-IV

**DETECTION:**

Smoke detection is provided throughout the zone except for the equipment hatch areas and the isolated phase bus duct area. Heat detection is provided above the hydrogen seal oil unit.

**AUTOMATIC SUPPRESSION:**

A local wet pipe sprinkler system provides protection for the area between column lines F and G and column lines 21 and 23. Local water spray protection is provided for the hydrogen seal oil unit. A local water deluge system is provided for the hydraulic unit for the feed water regulator valve positioners.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of electrical cables. The other significant combustibles, each of which contribute only a fraction of the loading contributed by the cables, are transformer oil, lubricating oil, and hydraulic oil. The remainder of the fixed combustibles consist of various materials distributed with good spatial separation. Thus, there are several fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone. With the exception of tray risers from the zones below and drops to switchgear units, the cable trays are fifteen or more feet above the floor. The bulk of the lubricating oil is contained in the hydrogen seal oil unit. The transformer oil is contained in two separate transformers on the west side of the zone. The hydraulic fluid is contained in a reservoir in the northeast corner of the zone. Dikes or curbs are provided for spill retention around equipment containing large quantities of combustible liquids, but are not provided around floor openings such as stairways or in a position to contain fluids from piping systems. Compressed gas cylinders, some containing hydrogen, are in the zone. However, even if the cylinders were to leak, the hydrogen concentration in the room would not exceed the lower explosive limit.

Transients account for a fraction of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The real hazard associated with transients in this zone, is the potential for a localized fire which could expose combustibles capable of propagating the fire away from the area of origin. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables and the various oils.

The installed smoke detection system, where provided, should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out. In other areas, brigade call out could be delayed unless there was work being performed in the zone.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

**FIRE SPREAD POTENTIAL:****Fire Spread Potential Within Fire Zone 8.2.7.A:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles unless the exposed cables become ignited or there is an oil spill fire. Should the trays become involved, propagation throughout the zone could be expected, barring effective fire brigade action. In the event of an oil spill, extensive spread could occur and, if ignition occurred, significant area involvement could result, including ignition of the cable trays.

**Fire Spread Potential Within Fire Area TB-I:**

Fire zone 8.2.6.A, below, is separated from 8.2.7.A by a reinforced concrete floor/ceiling assembly. The integrity of this barrier is compromised by a number of sizable openings, including stairways and equipment handling hatches, and smaller openings for piping and cable trays. The potential for fire spread to the zone below, 8.2.6.A, is not likely, except in the case of spill fires, due to the lack of combustibles penetrating the floor (cable risers penetrating the floor are fire stopped at the floor, preventing downward fire spread along the cables). A significant spill fire could spread to the zone below through the many uncurbed floor penetrations.

Fire spread to fire zone 9.1 is unlikely due to separation by three-hour rated construction. Such construction should not be challenged by any fire which can credibly occur in zone 8.2.7.A.

Fire zone 8.2.7.B is separated from 8.2.7.A by reinforced concrete shield walls and by portions of the turbine-generator pedestal. All of these barriers are of substantial construction and exhibit fire resistive capabilities. The combustible loading of 8.2.7.A is not sufficient to challenge these barriers. Where cable trays penetrate these walls, seals are installed to preclude fire propagation along the cables from zone to zone. The access door installed in the wall along column line 21, although not rated, is considered adequate for the purpose given the distribution of combustibles in its vicinity and the ceiling heights in the area.

**Fire Spread Potential To Fire Area TB-IV:**

The potential for fire spread to zone 8.2.8.E, above, is limited by the reinforced concrete floor/ceiling assembly which separates the two zones and the discontinuity of combustibles penetrating it. Where openings exist in the floor (e.g., stairways, equipment hatches, pipe penetrations), the lack of combustibles in the immediate area and the discontinuity of combustibles in the zone above would make fire spread unlikely. Cable riser penetrations are sealed at the floor; precluding flame spread along the cables. Although considerable smoke and combustion gases would vent to zone 8.2.8.E, fire spread is not expected.

**Fire Spread Potential to Fire Area TB-III:**

The potential for fire spread into zones 6.1.A, 6.1.B, and 7.1, located in the southeast corner of the zone is limited by the presence of intervening reinforced concrete barriers. Although these barriers are not rated, they do exhibit significant fire resistive capability. The cable tray penetrations through these walls are stopped to preclude fire spread along the cables and the ventilation openings are protected with fire dampers. Fire spread to these zones is not likely.

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**Fire Zone: 8.2.7.B****Unit 1 Mezzanine Floor****Fire Area:** TB-III**F Drawing:** F-14-1**General Elevation:** 615'-6"**Zone Area:** 6,075 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area smoke detection around cable risers that are located in the high pressure heater bay.
<b>Suppression:</b>	General area wet pipe sprinkler system except over low pressure heaters 1A1-3101, 1A2-3101, 1A3-3101, and in the corridor along row C, the L. P. Heater Pull Space.
<b>Manual Suppression:</b>	Hose stations equipped with 100 feet of hose and portable fire extinguisher(s) staged right outside the fire zone during power operation.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	The operation of sprinkler systems, use of manual hose, or piping breaks would not adversely affect the ability to safely shut down. Water runoff would be handled by the general area drainage system or would flow to the turbine condenser pit where it could be removed via sump pumps.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** High**Equivalent Fire Severity:** 4.7 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
14-1	Equivalent 3 Hour [14]
RW[13]	Nonrated
RB-1N	3 Hour (Equivalent 3 Hour at MSIV Room) [7].
TB-IV	Equivalent 3 Hour [14]
TB-II	Equivalent 3 Hour [7]



**Fire Zone: 8.2.7.B****Unit 1 Mezzanine Floor****Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.2* (floor)	RB-1N	Non-rated	noncombustible [11]	No doors	2'-0" thick concrete
8.2.6.C	TB-II	Non-rated	noncombustible	No doors	1'-6" thick concrete
14.1.1	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
1.1.1.3*	RB-1N	3 hour [6][7]	3 hr (F-59, 60) [6][7]	No doors	4'-0" thick concrete
1.1.1.2*	RB-1N	3 hour	3 hour (F-45)	No doors	4'-0" thick concrete
8.2.8.E	TB-IV	Non-rated[14]	noncombustible, open mechanical[14]	No doors	4'-0" thick concrete
8.2.8.A	14-1	Non-rated[14]	noncombustible(3 hour 14-1 to DG1 feed)[8][14]	No doors	4'-0" thick concrete ceiling
8.2.6.B	TB-III	Non-rated	open	No doors	open
8.2.6.A	TB-III	Non-rated	noncombustible, open mechanical	No doors	Minimum 1'-6" thick concrete
8.2.7.C	TB-II	Non-rated[6][7]	noncombustible	One unlabeled door.	4'-0" thick concrete
8.2.7.A	TB-III	Non-rated	noncombustible, open mechanical	One unlabeled door.	3'-0" thick concrete
14.1	RW	Non-rated[13]	noncombustible[13]	No doors	1'-6" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
1, 5.18.4	Sprinklers provided for the heater bays.
1, 5.18.4	Portable extinguishers and hose reels provided.
7, 9.2	Extensive automatic sprinkler protection provided throughout except west of Row D. Also reference [5](5.2.4).
5, 5.2.4	All penetrations in shield walls are sealed with noncombustible materials. Substantial, locked, unlabeled, metal doors.
7	Fixed automatic water suppression is provided. Adjacent to the steam pipe chase. Also reference.
7, 9.2	U1 RB (Mezz. level) separated from TB by 3-hour barrier. Also reference [8].
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1.
2	Provide 1-hour fire door at 12 and 14/G in shield wall on U1 and U2 Turbine Building mezz. floor. Rated fire doors are not provided. Justification is provided in Exemption Request 5.2 [5](5.2).
1, 3.1.1	Provide fire detection in high pressure heater bays (cable penetrations and ceiling penetrations). Also reference [1](5.18).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Interim Compensatory Measures IV. (12-18-84).
5	Exemption Request 5.2 (12-18-84) applies to this fire zone. Exemption for the lack of complete 3-hour fire barrier between TB zone groups. revised to Southern and Central Zone Groups (6-25-86). Exemption 9.0 granted 12-11-87.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.

- 8 GL 86-10 Evaluation S040-QH-0611 Rev. 1.
- 9 SER, Feb. 25, 1991. Appendix R exemption request 11.0 applies to this fire zone and addresses separation of redundant instrumentation. Exemption issued on 5-21-91.
- 10 Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
- 11 Evaluation for fire area separation between TB-III and RW, ER9801580.
- 12 Evaluation for fire area separation between TB-III and TB-IV, ER9801624.
- 13 Evaluation for moving extinguishers outside of heater bays during power operation EC 618200.

**ZONE:** 8.2.7.B      **AREA:** TB-III      **LOCATION:** TB1, Elev. 615'-6"

**ZONE DESCRIPTION:** Unit 1 Mezzanine Floor, South-Central Section

**FIRE SEVERITY:**

The fire severity for this zone is 4.7 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.7.B which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.7.A	TB-III	Non-rated
8.2.7.C	TB-II	Non-rated
8.2.8.A	TB-IV	Non-rated
8.2.8.E	TB-IV	Non-rated
14.1	RW	Non-rated
14.1.1	TB-III	Non-rated
8.2.6.A	TB-III	Non-rated
8.2.6.B	TB-III	Non-rated
8.2.6.C	TB-II	Non-rated
1.1.1.2	RB-I	Non-rated
1.1.1.3	RB-I	3 hour

**EVALUATION:**

Fire zone 8.2.7.B is completely enclosed by concrete walls. The boundary wall that separates this zone from the unit 1 reactor building is constructed of 4'-0" thick concrete with all penetrations sealed with 3-hour rated fire material. The west wall of this zone is constructed of 1'-6" thick concrete and removable concrete block and is an exterior wall. Part of the south wall of this zone is an exterior wall constructed of 4'-0" thick concrete. The remainder of the south wall is an interior wall separating this zone from fire zone 8.2.7.A and is constructed of 3'-0" thick concrete. The north wall is constructed of 4'-0" thick concrete and contains an unlabeled door for access to/from fire zone 8.2.7.C. The floor of this zone is constructed of 1'-6" thick concrete supported on exposed structural steel and separates this zone from fire zones 8.2.6.A, 8.2.6.B, and 8.2.6.C. The ceiling separates this zone from fire zones 8.2.8.A and 8.2.8.E and is constructed of 4'-0" thick concrete supported on exposed structural steel. Both the floor and ceiling contain openings for stairwells and equipment removal hatches. A 4-kV bus duct penetration (SWGR 14-1 feed from diesel generator 1) is contained in the barrier separating this fire zone from 8.2.8.A and 3-hour fire rated seals have been installed at the bottom of 4-kV switchgear 14-1.

This zone is protected by an automatic wet pipe sprinkler system throughout the fire zone except over low pressure heaters and in the corridor along row C. Ionization type fire detectors are installed around cable risers that are located in the high pressure heater bay. Also present in the zone is manual suppression system equipment consisting of hose stations, each equipped with 100 ft. of hose. A fire extinguisher is staged outside of the main entrance to 8.2.7.B during power operation. Fixed fire loading in this zone is light. However, this area also has the potential of heavy fire loading due to turbine lube oil piping in the area. The fire suppression and fire detection features assure that a fire within this area would be identified and addressed by an automatic suppression system until the plant fire brigade responded. Therefore reasonable assurance exists that a fire originating in this fire zone would not progress to adjacent fire zones.

**Fire Zone: 9.1****Unit 1 Diesel Generator Room****Fire Area:** TB-III**F Drawing:** F-12-1**General Elevation:** 595'-0"**Zone Area:** 1,089 Ft<sup>2</sup>**Fire Protection Features:**

- Detection:** General area heat (thermal) detectors are provided to actuate the Carbon Dioxide suppression system.
- Suppression:** A wet pipe sprinkler system is provided in the day tank room. The Unit 1 diesel generator room and day tank room are protected by an automatic total flooding CO<sub>2</sub> system supplied from the CO<sub>2</sub> storage tank / unit actuated by thermal detectors.
- Manual Suppression:** A hose reel and portable fire extinguisher(s) are located outside the entrance to the zone in adjacent Fire Zone 8.2.6.A.
- Other FP features:** The day tank room is curbed. Fire proofing provided for structural steel.
- Suppression Effects:** Water or Carbon Dioxide release in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design-based fire. Water runoff would be controlled through utilization of floor drains in the general area.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
CT-1	3 Hour
CT-2	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.5	CT-2	3 hour	3 hour	No doors	3'-0" thick concrete
8.2.7.A	TB-III	3 hour	3 hour rated except exhaust duct penetration	No doors	0'-6" thick concrete on fire proofed steel
8.2.6.A	TB-III	3 hour	3 hour (F-152 ,153 & 154)	Two Class "A" fire doors, Two Dampers.	1'-0" thick concrete
8.2.4	CT-1	3 hour	3 hour	No doors	3'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 9.1****Unit 1 Diesel Generator Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 5.20.2	A 3 hour enclosure is provided for the diesel day tank.
1, 3.1.8	Electrical supervision of the Unit 1 Diesel Generator Room Doors. Also reference [1](5.20.6).
1, 5.20.4	Carbon Dioxide Suppression System is provided for DG1. Manual and automatic actuation of system provided. Manual smoke venting by portable smoke ejectors. Also reference [1](4.3.2), and [8](F.9).
4, 24.B (pg. 6)	Provide fire rated barrier for louvered doors. Doors with louvers removed.
4, 24.C (pg. 6)	Install 3 hour rated fire dampers in HVAC ducts. Addressed in 7-31-85 PLC NFPA 90A Review.
4, 24.E (pg. 6)	Provide portable ventilation equipment. Three portable ventilators provided on fire cart.
1, 5.20.6	Provide 3-hour rated barriers such as walls, floors, ceilings (includes fire proofing of steel) , Class A doors, and penetrations to separate fire zone 9.1 from surrounding zones. Also reference [1](3.1.8), and [8](F.9).
1, 4.3.2	Local and control room alarms required for DG CO2 systems.
8, F.9.b	The DG day tank rooms are protected by an automatic sprinkler system.
1, 5.20.4	Thermostats actuate local and control room alarms, and the total flooding CO2 system.
1, 5.20.4	DG day tank room protected by automatic sprinkler system.
1, 5.20.4	Portable extinguishers and hose stations provided for area.
8, D.4.i	Dampers interlocked to close on activation of CO2 system.
8, E.5.a	CO2 systems designed per NFPA 12.
8, E.5.b	CO2 systems have predischage alarms. CO2 system nozzles do not discharge directly on equipment. CO2 is discharged into DG and day tank rooms. Also reference [8](E.5.C) and [8](F.9.b).
7, 10.1.1	Emergency lighting will be placed to allow fuse replacement during blackout conditions.

**Fire Zone: 9.1****Unit 1 Diesel Generator Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	SER, July 21, 1988.
3	NRC Exemption Aug. 18, 1989, Sec. III (9).
4	Letter 4-10-78, pg. 6 24.B, 24.C from CECO to NRC.
5	Letter 12-18-84, B. Rybak (CECO) to R. Denton (NRC). Recommends alt. power feed for DG 1.
6	Perform CO2 concentration test. 10-7-88 open item 254(265)/88021-06. Item closed 2-5-92. DG 1 system failed test. DG 1 system modified (different nozzles and set point changed to increase system discharge time) and tested. Item closed 9-15-95. NRC Inspection Report 254(265)/88021, pg. 20.
7	Exemption Request 10.1
8	ComEd response to the requirements of Appendix A
9	Lack of complete detection and suppression for Fire Area TB-II, NDIT QDC-98-133.



**ZONE:** 9.1      **AREA:** TB-III      **LOCATION:** TB III, Elev. 595'-0"

**ZONE DESCRIPTION:** Unit 1 Diesel Generator Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 2.5 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 9.1 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.4	TB-III	3 hour
8.2.6.A	TB-III	3 hour
8.2.7.A	TB-III	3 hour <sup>1</sup>
8.2.5	CT-2	3 hour
8.2.4	CT-1	3 hour

<sup>1</sup> FHA indicates barrier and seal rating of 3 hour except for exhaust duct penetration.

**EVALUATION ZONE 9.1:**

This fire zone is separated from the rest of the plant by 3-hour fire barriers. The walls separating this zone from fire zone 8.2.6.A is constructed of 1'-0" thick concrete and contains a Class A fire for access to the zone. The east wall is an unrated exterior wall constructed of 1'-6" thick concrete. The floor separates this fire zone from the unit 1 and unit 2 cable tunnels (fire zones 8.2.4 and 8.2.5) and is constructed of 3'-0" thick concrete. The ceiling separates this zone from fire zone 8.2.7.A and is constructed of 6" thick concrete supported on fire proofed structural steel. The barriers bounding adjacent fire zones are rated for 3 hours of fire resistance. The major combustible material within this fire zone is fuel oil, lube oil, and other miscellaneous combustible material associated with diesel generator support equipment. This zone is provided with a CO<sub>2</sub> fire suppression system actuated by thermal detectors. The day tank room is provided a wet-pipe sprinkler system and overflow/tank rupture spill containment. Manual fire suppression equipment is provided near the entrance to this fire zone.

**CONCLUSION:**

The combustible fire loading limits for this zone are being increased to 2-½ hours severity. The barriers separating this zone from adjacent fire zones are rated for 3-hours of fire resistance. In addition, this zone is provided with automatic fire suppression systems, which would actuate in the event of a fire in this zone and control or suppress any fire event. In addition, the systems actuation would summon the plant fire brigade would provide additional assurance that any fire originating in this zone would not grow and spread to an adjacent fire zone and damage redundant safe shutdown equipment and cables. Based on the defense in depth and the fire protection features of this zone, the increase in combustible limits for this fire zone are acceptable and will not degrade the ability to achieve safe shutdown.

**Fire Zone: 11.1.1.A****Unit 1 RHR Service Water Pump Room****Fire Area:** TB-III**F Drawing:** F-9-1**General Elevation:** 547'-0"**Zone Area:** 496 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area heat (thermal) detection.**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguishers and a hose station equipped with 100 feet of hose are located in adjacent Fire Zone 8.2.1.A.**Other FP features:** 1-hour wrap provided for U2 alternate feed to DG 1/2 cooling water pump and its cubicle cooler in U1 portion of Turbine Building [3].**Suppression Effects:** Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Water removal would be accomplished with sump pumps as there are no drains located within the RHRSW cubicles.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:****Fire Area**                      **Barrier Description**

TB-V                                  3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.1.A (Ceiling)	TB-III	Non-rated	noncombustible	No doors	0'-11" thick concrete
8.2.1.A (wall)	TB-III	Non-rated	noncombustible	One unrated watertight door.	1'-6" thick concrete
11.1.1.B	TB-V	3 hour [5]	3 hour	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.1.1.A****Unit 1 RHR Service Water Pump Room****Fire Protection Commitments:**

Reference Section	Commitment
4, 13.2	1-hour fire wrap provided for swing diesel 1/2 reserve feed.
4, 13.2	Fire hose stations and fire extinguishers are available.
2	Detection in DG 1 and DG 1/2 cooling water pump area.
2	1-hour protection of U2 alternate feed to DG 1/2 cooling water pump and its cubicle cooler in U1 portion of Turbine Building.
2	Smoke detection in rooms housing RHR service water pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Thermal detection is provided. See M4-1(2)-83-30 Task 2.18, 2.23.
1, 5.13.6	For the TB Basement floor which includes the SW Pump Rooms, waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Lube oil storage will be limited to 30 gallons. Provided in Fire Zone 8.2.1.A.
1, 3.1.5	The turbine building sprinkler system will be extended to provide protection for the RHR service water rooms and Diesel Generator cooling pumps. Also reference [1] (5.13.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	Left Intentionally Blank.
4	SER, July 21, 1988.
5	NRC Exemption Aug. 18, 1989.
6	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.

**ZONE:** 11.1.1.A      **AREA:** TB-III      **LOCATION:** Unit 1 TB, Elev. 547'-0"

**ZONE DESCRIPTION:** Unit 1 RHR Service Water Pump Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hour.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 11.1.1.A but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
11.1.1.B	TB-V	3 Hour

**EVALUATION:**

Since Fire Zone 11.1.1.B is separated from Fire Zone 11.1.1.A by a 3 hour rated fire barrier, and the maximum predicted fire severity in zone 11.1.1.A is 1.25 hour, no further evaluation is required.

**Fire Zone: 11.1.1.C****Unit 1 RHR Service Water Pump Room****Fire Area: TB-III****F Drawing: F-9-1****General Elevation: 547'-0"****Zone Area: 305 Ft<sup>2</sup>****Fire Protection Features:**

<b>Detection:</b>	General area heat (thermal) detection.
<b>Suppression:</b>	General area wet pipe sprinkler system.
<b>Manual Suppression:</b>	Portable fire extinguishers and a hose station equipped with 100 feet of hose is located in adjacent Fire Zone 8.2.1.A.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Water removal would be accomplished with sump pumps as there are no drains located within the RHRSW cubicles.

**Combustible Loading Limit:****Analyzed Combustible Loading Category: Low****Equivalent Fire Severity: 1.25 Hours****Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
TB-V	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.3.A	TB-III	Non-rated	noncombustible	No doors	2'-0" thick concrete
8.2.1.A	TB-III	Non-rated	noncombustible	One Unlabeled Watertight Door.	1'-6" thick concrete
8.2.1.A (North)	TB-III	Non-rated	noncombustible	No doors	1'-6" thick concrete
11.1.1.B	TB-V	3 hour [3][4]	3 hour (F-140)	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
2	Smoke detection in rooms housing RHR service water pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Thermal detection is provided. See M4-1(2)-83-30 Task 2.18, 2.23.
1, 5.13.6	For the TB Basement floor which includes the SW Pump Rooms, waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Lube oil storage will be limited to 30 gallons. Provided in Fire Zone 8.2.1.A.
1, 3.1.5	The turbine building sprinkler system will be extended to provide protection for the RHR service water rooms and Diesel Generator cooling pumps. Also reference [1] (5.13.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Denton.
3	SER, July 21, 1988.
4	NRC Exemption Aug. 18, 1989.
5	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.

**ZONE:** 11.1.1.C      **AREA:** TB-III      **LOCATION:** Unit 1 TB, Elev. 547'-0"

**ZONE DESCRIPTION:** Unit 1 RHR Service Water Pump Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 11.1.1.C, but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
11.1.1.B	TB-V	3 Hour

**EVALUATION:**

Since Fire Zone 11.1.1.C is separated from Fire Zone 11.1.1.B by a 3-hour rated fire barrier, and the maximum predicted fire severity in zone 11.1.1.C is 1 hour, no further evaluation is required.



**Fire Zone: 14.1.1****Unit 1 Off Gas Recombiner Room****Fire Area:** TB-III**F Drawing:** F-22-1**General Elevation:** 626'-6"**Zone Area:** 8,077 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None

**Manual Suppression:** Hose stations equipped with 100 feet of hose, located at elevations 648'-6" and 668'-0". Portable fire extinguisher(s) located on el. 668'-0". Hose station and portable fire extinguisher(s) located just outside the fire zone on el. 626'-0".

**Other FP features:** None

**Suppression Effects:** No safe shutdown paths would be affected by water release in this zone. Water runoff would be controlled through utilization of floor drains in the general area.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-IV	Equivalent 3 Hour [2][7]
TB-II	Equivalent 3 Hour [2]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.6.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete
8.2.10	TB-II	Non-rated [2]	noncombustible, open mechanical	Two unlabeled doors.	4'-0" thick concrete
8.2.8.E	TB-IV	Non-rated [2][7]	noncombustible, open mechanical[7]	No doors	3'-0" thick concrete
8.2.7.B	TB-III	Non-rated	noncombustible, open mechanical	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 14.1.1****Unit 1 Off Gas Recombiner Room****Fire Protection Commitments:**

Reference Section	Commitment
2, 9.2	Provide substantial shield walls w/ metal doors between zones 8.2.10 and 14.1.1. Also reference [1](5.2.4).
2, 9.2	No safe shutdown cables or equipment in this zone. Also reference [1](5.2.4).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Exemption Request 5.2 applies to this fire zone and involves the lack of 3-hour fire barriers between the Southern and Central Zone Groups.
2	SER, July 21, 1988.
3	ComEd Request letter dated November 5, 1991.
4	There is a 1-inch oxygen line from the Unit 1 Oxygen Station in Fire Zone 8.2.10 to the Unit 1 offgas system in this fire zone.
5	SER, March 2, 1994.
6	Lack of complete detection and suppression for Fire Area TB-III, GL 86-10 Evaluation NTSC 98-020.001 Rev. 3.
7	Evaluation for fire area separation between TB-III and TB-IV, ER9801624.
8	Evaluation for presence of gas cylinders EC 401197.

**ZONE:** 14.1.1      **AREA:** TB-III      **LOCATION:** Unit 1 TB, Elev. 626'-6"

**ZONE DESCRIPTION:** Unit 1 Off Gas Recombiner Room

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 14.1.1 but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.8.E	TB-IV	3' thick concrete - Non-rated
8.2.10	TB-II	4' thick concrete - Non-rated

**EVALUATION:**

The primary concern relative to the affect on safe shutdown capability would be a fire originating in Fire Zone 14.1.1 and spreading to either of the adjacent zones.

There are no safe shutdown cables or equipment in Fire Zones 14.1.1, 8.2.8.E, or 8.2.10. Therefore, fire spread between Fire Zone 14.1.2 and either adjoining fire area would not affect safe shutdown capability.

The potential for a fire or explosion due to the Off Gas recombination process has been considered. Noncondensable gases (67 cfm of Hydrogen and 33.5 cfm of Oxygen) are removed from the Unit 1 condenser by the steam jet air ejectors, and processed in the Unit 1 Off Gas Recombiner Room (Fire Zone 14.1.2). Very little energy would be required to ignite the products involved in the process. The presence of potential ignition sources such as the catalytic converter suggests that if a release of hydrogen or a hydrogen/oxygen mixture were to occur a fire or explosion could result.

The Off Gas Recombiner process is considered to be a safe operation due to the design features of the process, the substantial separation from adjacent zones, and the negative ventilation provided.

Compressed gas cylinders, some of which contain hydrogen, are present in the zone. However, even if the cylinders were to leak, the hydrogen concentration in the room would not exceed the lower explosive limit.

During turbine operation the Off Gas Recombiner Rooms are High Radiation Areas. These rooms are maintained as negative ventilation areas. Should a hydrogen release occur this negative pressure environment should prevent a buildup of hydrogen in adjacent areas. This would minimize the potential for adverse effect of a fire or explosion to adjacent fire zones.

The Off Gas Recombiner Room consists of three separate levels (three separate rooms). These rooms are located in the northwest section of the Turbine Building. The lowest level is on the 626'-6" elevation with the upper two levels located above. The off gas process areas are located well above any safe shutdown related cables or equipment. Hydrogen is lighter than air and should a release occur, it would begin filling the upper levels of Fire Zones 14.1.1 and 8.2.10 (these zones do not have safe shutdown equipment). The roof of Fire Zone 14.1.1 consists, in part, of built up roofing over 1-inch rigid insulation on precast concrete roof slabs supported by exposed structural steel (also for Fire Zone 8.2.10). The remainder is built up roofing over 1-inch rigid insulation on 4'-0" thick concrete. The walls are constructed of concrete to a certain level and insulated metal siding for the upper levels. This metal siding and roof panels would be the weak link in the construction in the event of an explosion thus venting the explosion to the exterior.

The Off Gas Recombiner Rooms are separated from adjacent fire zones by substantial concrete barriers (3' to 4' thick). No fire rating has been assigned to these barriers due to their open or nonrated mechanical penetrations. During operation the doors to these rooms are locked shut.

**Fire Zone: 1.1.1.5.A****Turbine Building Vent Fan Room****Fire Area:** TB-IV**F Drawing:** F-16-1**General Elevation:** 658'-10"**Zone Area:** 4,848 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguishers are provided in the zone.**Other FP features:** None

**Suppression Effects:** There are no fixed suppression systems in this area. Manual Carbon Dioxide extinguishers are located in this zone, but, since no safe shutdown equipment is in the zone, there is no effect on safe shutdown.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
23-1	Nonrated
24-1	Nonrated
13-1	Nonrated
14-1	Nonrated
RB-2N	3 Hour [2]
RB-1N	3 Hour [2]

**Fire Zone: 1.1.1.5.A****Turbine Building Vent Fan Room****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.2.4*	RB-2N	2 hour [2]	2 hour	No doors	1'-6" thick concrete, 2-hour rated block
1.1.2.5*	RB-2N	3 hour [2]	3 hour except no dampers in HVAC ducts	No doors	1'-6" thick concrete
1.1.1.5*	RB-1N	3 hour [2]	3 hour except HVAC duct penetration (F-115,F-116)	No doors	1'-6" thick concrete
1.1.1.4*	RB-1N	2 hour [2]	2 hour	No doors	1'-6" thick concrete
8.2.8.E	TB-IV	Non-rated	noncombustible, open mechanical	No doors	1'-0" thick concrete (partially open)
8.2.8.D	23-1	Non-rated	noncombustible	No doors	0'-6" thick concrete
8.2.8.C	24-1	Non-rated	noncombustible	No doors	0'-6" thick concrete
8.2.8.B	13-1	Non-rated	noncombustible	No doors	0'-6" thick concrete
8.2.8.A	14-1	Non-rated	noncombustible	No doors	0'-6" thick concrete
1.1.1.6.A	TB-IV	Non-rated	noncombustible, open mechanical	No doors	1'-0" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

<b>Reference Section</b>	<b>Commitment</b>
3	Combustible loading is light.
3	No safe shutdown cables or equipment are located in zone.
3	3-hour separation between RB and TB with exceptions.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Letter dated 12-18-84, B. Rybak (CECO) to R. Denton.
2	GL 86-10 Evaluation S040-QH-0612 Rev. 1.
3	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
4	SER, July 21, 1988.

**ZONE:** 1.1.1.5.A      **AREA:** TB-IV      **LOCATION:** TB1/2, Elev. 658'-10"

**ZONE DESCRIPTION:** Unit 1/2 TB/RB Vent Floor

**FIRE SEVERITY:** The fire severity for this zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 1.1.1.5.A, but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
8.2.8.A	14-1	Non-rated
8.2.8.B	13-1	Non-rated
8.2.8.C	24-1	Non-rated
8.2.8.D	23-1	Non-rated
1.1.1.4	RB-1	3 hour <sup>1</sup>
1.1.1.5	RB-1	3 hour <sup>1</sup>
1.1.2.5	RB-2	3 hour <sup>1</sup>
1.1.2.4	RB-2	3 hour <sup>1</sup>

<sup>1</sup> The barrier rating is 3 hour but with noncombustible penetration seals and unprotected HVAC ducts.

**EVALUATION:**

Since Zone 1.1.1.5.A contains no safe shutdown equipment, fire spread to any single adjacent zone will not impair safe shutdown capabilities. However, a fire originating in Zone 1.1.1.5.A, then spreading to two or more zones containing redundant or alternate safe shutdown equipment could adversely affect the ability to achieve and maintain safe shutdown. This potential has been evaluated.

The interface between Zone 1.1.1.5.A and Fire Areas RB-1 or RB-2 is a 3 hour barrier with noncombustible penetration seals and HVAC duct openings that do not contain fire dampers. Given the low combustible loading, the potential for fire spread from Zone 1.1.1.5.A to Fire Areas RB-1 or RB-2 is considered low.

Zone 1.1.1.5.A is separated from Zones 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D by a 6 inch concrete floor/ceiling with equipment removal hatches and stairways. A qualitative review of the interaction and separation between Zone 1.1.1.5.A and Zones 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D indicates the potential for concurrent fire spread to these zones is low based on the following:

- Zone 1.1.1.5.A is located above Zones 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D;
- the combustible loading in Zone 1.1.1.5.A is low and does not include lube oil which can migrate to zones below through openings; and
- these zones are open to the turbine deck which provides a large volume for venting smoke and hot gases.



**Fire Zone: 1.1.1.6.A****Turbine Building Vent Fan Room****Fire Area:** TB-IV**F Drawing:** F-16-1**General Elevation:** 678'-10"**Zone Area:** 2,685 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s) and two manual hose stations each equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** Water release in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. No safe shutdown equipment is in this area. Water runoff would be controlled through utilization of floor drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2N	3 Hour
RB-1N	3 Hour Equivelant[4]

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.6*	RB-1N	Non-rated[4]	Non-rated[4]	No doors	1'-0" thick concrete
1.1.1.5.A	TB-IV	Non-rated	noncombustible, open mechanical	No doors	1'-0" thick concrete, metal grating
8.2.8.E	TB-IV	Non-rated	noncombustible	No doors	1'-0" thick concrete
1.1.2.5*	RB-2N	3 hour [2]	3 hour	No doors, no dampers in HVAC ducts [3]	1'-6" thick concrete
1.1.1.5*	RB-1N	3 hour [2]	3 hour (F-114, 115, 116)	No doors, no dampers in HVAC ducts [3]	1'-6" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
2	3-hour separation between RB and TB.

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	Letter dated 12-18-84, B. Rybak (CECO) to R. Denton
2	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
3	SER, July 21, 1988.
4	Evaluation for fire area separation between RB-1 and TB-IV, ER9801572.

**ZONE:** 1.1.1.6.A    **AREA:** TB-IV    **LOCATION:** TB1/2, Elev. 678'-10"

**ZONE DESCRIPTION:** Unit 1/2 Turbine Bldg. Vent Fan Room

**FIRE SEVERITY:** The fire severity for this zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 1.1.1.6.A, but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.1.1.5	RB-1	3 hour
1.1.2.5	RB-2	3 hour

**EVALUATION:**

Since Fire Zones 1.1.1.5 and 1.1.2.5 are separated from Fire Zone 1.1.1.6.A by a 3 hour rated fire barrier, and the maximum predicted fire severity in zone 1.1.1.6.A is 0.5 hours, no further evaluation is required.

**Fire Zone: 8.2.8.E****Turbine Operating Floor****Fire Area:** TB-IV**F Drawing:** F17-1,18-1**General Elevation:** 639'-0"**Zone Area:** 58,356 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat (thermal) detection used to activate turbine bearing water spray systems. Thermal detectors in the exciter housings actuate the CO2 system.
<b>Suppression:</b>	Local area water sprays system protects turbine bearings 1 through 9 in both the Unit 1 and Unit 2 turbines. Local area wet pipe sprinkler system above the bearing lift pumps on each unit. Automatic CO2 system protects the exciter housings for each unit.
<b>Manual Suppression:</b>	Hose stations, each equipped with 100 feet of hose and portable fire extinguishers.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Water or Carbon Dioxide discharge in this zone would not affect safe shutdown since no safe shutdown equipment is located in this zone. Water runoff would be handled by the floor drainage system in the general area.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
23-1	Equivalent 3 Hour [10]
24-1	Equivalent 3 Hour [10]
13-1	Equivalent 3 Hour [10]
14-1	Equivalent 3 Hour [10]
TB-III	Equivalent 3 Hour [15]
TB-II	Equivalent 3 Hour [13]
TB-I	Equivalent 3 Hour [14]

**Fire Zone: 8.2.8.E****Turbine Operating Floor****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.6.A	TB-IV	Non-rated	noncombustible	No doors	1'-0" thick concrete
1.1.1.5.A	TB-IV	Non-rated	noncombustible, open mechanical	No doors	1'-0" thick concrete (partially open)
8.2.7.E	TB-I	Non-rated[14]	noncombustible, open mechanical[14]	No doors	4'-0" thick concrete
8.2.7.D	TB-I	Non-rated[14]	noncombustible, open mechanical[14]	No doors	4'-0" thick concrete
8.2.8.D	23-1	Non-rated [10]	none	No doors	No wall (waterspray)
8.2.7.C	TB-II	Non-rated[13]	noncombustible, open mechanical[13]	No doors	4'-0" thick concrete
8.2.7.B	TB-III	Non-rated[15]	noncombustible, open mechanical[15]	No doors	4'-0" thick concrete
8.2.7.A	TB-III	Non-rated[15]	noncombustible, open mechanical[15]	No doors	4'-0" thick concrete
8.2.10	TB-II	Non-rated[13]	noncombustible, open mechanical[13]	No doors	0'-5 5/8" thick concrete block wall (0'-8" ceiling)
14.1.2	TB-I	Non-rated[14]	noncombustible[14]	No doors	3'-0" thick concrete
14.1.1	TB-III	Non-rated[15]	noncombustible[15]	No doors	3'-0" thick concrete
8.2.8.C	24-1	Non-rated [10]	none	No doors	No wall (waterspray)
8.2.8.B	13-1	Non-rated [10]	none	No doors	No wall (waterspray)
8.2.8.A	14-1	Non-rated [10]	none	No doors	No wall (waterspray)

\* Secondary Containment Boundary

**Fire Zone: 8.2.8.E****Turbine Operating Floor****Fire Protection Commitments:**

Reference Section	Commitment
12, F.8	Turbine bearings protected with heat detection and automatic deluge system.
12, F.8	Automatic closed head water suppression system provided for bearing lift pumps.
11, 3.1.6(b)	Foam system control panel properly relocated. Foam system replaced with water spray system per [7](12.2).
1, 5.19.4	Portable extinguishers and hose stations provided.
1, 4.3.2	Exciters for both generators protected by CO2 system.
7, 12.2	Foam-water system, curbs, and wet pipe system provided in zones 8.2.8.A-D separate these zones from 8.2.8.E. Foam water system replaced with water spray system per [7](12.2). Also reference [10](5.8.1).
7, 12.2	No safe shutdown cables or equipment located in zone. Also reference [10](5.8.1).
5, 5.1	Electrical penetrations in TB operating floor sealed with noncombustible material. Also reference [10](5.8.1).

**Notes and References:**

<u>Number</u>	<u>Description</u>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Interim Compensatory Measures IV. (12-18-84).
5	Appendix R Exemption Requests
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	The previous FHA indicates that Exemption Request
9	Letter from CECO to NRC dated 4-10-78.
10	Exemption Request 5.8 (12-18-84). Exemption for lack of complete 3-hour barriers between equivalent fire areas 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D on the TB operating floor. Exemption 12.0 granted 12-11-87.
11	SER, February 12, 1981.
12	ComEd response to the requirements of Appendix A
13	Evaluation for fire area separation between TB-II and TB-IV, ER9801622.
14	Evaluation for fire area separation between TB-I and TB-IV, ER9801623.
15	Evaluation for fire area separation between TB-III and TB-IV, ER9801624.

**ZONE:** 8.2.8.E      **AREA:** TB-IV      **LOCATION:** TB, Elev 639'-0"

**ZONE DESCRIPTION: Turbine Operating Floor**

**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.8.E which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.1.1.6.A	TB-IV	Non-rated
1.1.1.5.A	TB-IV	Non-rated
8.2.7.E	TB-I	Non-rated
8.2.7.D	TB-I	Non-rated
8.2.8.D	23-1	Non-rated
8.2.7.C	TB-II	Non-rated
8.2.7.B	TB-III	Non-rated
8.2.7.A	TB-III	Non-rated
8.2.10	TB-II	Non-rated
14.1.2	TB-I	Non-rated
14.1.1	TB-III	Non-rated
8.2.8.C	24-1	Non-rated
8.2.8.B	13-1	Non-rated
8.2.8.A	14-1	Non-rated

**EVALUATION - ZONE 8.2.8.E:**

Fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C, 8.2.8.D, 8.2.7.A, 8.2.7.B, 8.2.7.C, 8.2.7.D, 8.2.7.E, 8.2.10, 14.1.1, and 14.1.2 bound fire zone 8.2.8.E. The water spray protecting the curbed area around MG sets 1A-202-51, 1B-202-51, 2A-202-51, and 2B-202-51 and the wet pipe sprinkler system above each MG set (MG sets abandoned in place) accomplishes separation of fire zone 8.2.8.E from fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.E. The rest of the fire zone is bounded by exterior walls constructed of insulated metal siding except for those walls that separate fire zone 8.2.8.E from fire zones 8.2.10, 14.1.1, and 14.1.2. The boundary walls with fire zones 14.1.1 and 14.1.2 are constructed of minimum 3'-0" thick concrete and exposed structural steel while the wall separating fire zone 8.2.10 is a 5-5/8-inch concrete block wall. The floor separates fire zone 8.2.8.E from fire zone 8.2.7.A, 8.2.7.B, 8.2.7.C, 8.2.7.D, and 8.2.7.E. It is constructed of minimum 8" thick concrete supported on exposed structural steel. This floor contains numerous penetrations for stairwells, equipment removal hatches, pipe and electrical penetrations. The ceiling is the portion of the turbine building roof and is constructed of built-up roofing on 1" rigid insulation over precast concrete channel slabs supported on exposed structural steel. Neither the floor nor the ceiling of fire zone 8.2.8.E is fire rated.

Automatic fire detection and automatic fire suppression systems protect Fire Zone 8.2.8.E. Local area heat (thermal) detection is used to activate the turbine bearing water spray systems, and thermal detectors actuate a CO<sub>2</sub> suppression system in the exciter housing. Water spray systems protect turbine bearings 1 through 9 in both the Unit 1 and 2 turbines, and a wet pipe sprinkler system is provided above the bearing lift pumps on each unit. Hose stations, equipped with 100 feet of hose, a foam cart and portable CO<sub>2</sub> fire extinguishers are provided in this fire zone to support manual fire suppression activities if required.

**CONCLUSION:**

The most significant hazard in this fire zone is from a turbine bearing oil fire or exciter fire. These areas are protected with automatic suppression systems. The remaining combustibles in the fire zone are widely dispersed and separated by spatial distances with negligible intervening fire loading. As such any fire occurring in fire zone 8.2.8.E is likely to be confined to the area of origination and not spread to adjacent fire zones



**Fire Zone: 6.1.A****Unit 1 DC Panel Room****Fire Area:** TB-III**F Drawing:** F-14-1**General Elevation:** 615'-6"**Zone Area:** 141 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection system.
<b>Suppression:</b>	None.
<b>Manual Suppression:</b>	Portable fire extinguishers.
<b>Other FP features:</b>	None
<b>Suppression Effects:</b>	Water release would not result in adverse effects greater than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general area outside the room in Zone 8.2.7.A. There are no floor drains located within the room.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u><b>Fire Area</b></u>	<u><b>Barrier Description</b></u>
TB-III	3 hour

**Boundary Fire Zones:**

<u><b>Boundary Zone</b></u>	<u><b>Area</b></u>	<u><b>Barrier Rating</b></u>	<u><b>Seal Rating</b></u>	<u><b>Doors and Dampers</b></u>	<u><b>Barrier Type</b></u>
8.2.6.A	TB-III	3 hour	3 hr (F-386)	No doors	0'-5" thick concrete on sprinkler protected steel
7.1	TB-III	Non-rated	noncombustible	No doors	0'-6" thick concrete ceiling
8.2.7.A	TB-III	3 hour	3 hr (F-388)	One Class A fire door Two, 3-hr. wall dampers	1'-0" thick concrete
6.1.B	TB-III	Non-Rated	noncombustible	No doors	0'-7 5/8" thick concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

<b>Reference Section</b>	<b>Commitment</b>
1, 5.4.4	Hose stations provide water and carbon dioxide suppression capability. Portable extinguishers are provided near each room.
1, 5.4.6	Install Class A fire doors to DC distribution center Unit 1 & Unit 2. Also reference [1](3.1.8).
1, 5.4.6	Install automatic (early warning) fire detection system in the D.C. equipment rooms. Also reference [1](3.1.1).

**Fire Zone: 6.1.A     Unit 1 DC Panel Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
0	Note: Reference cable tray loading limits in Table 3.6-2.
1	SER July 27, 1979
2	Left Intentionally Blank.
3	An engineering evaluation of the lack of a complete 3-hour fire barrier separating redundant or alternative safe shutdown components was submitted to the NRC for concurrence, and an exemption from Appendix R requirements was granted in SER Section 9, dated July 21, 1988. The evaluation was based in part on the combustible loading of this zone.
4	Upgrading the floor and west wall, including fire proofing of the structural steel and 6" thick 3-hr rated fire seals per DCP 9900027 / DCN 001905M. This excludes the 7 5/8" concrete masonry walls.

**ZONE:** 6.1.A**AREA:** TB-III**LOCATION:** Unit 1 TB1, Elev.615'-6"**ZONE DESCRIPTION:** Unit 1 DC Panel Room**FIRE SEVERITY:** The fire severity for this zone is 1.25 hours.**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The potential for fire spread to zone 8.2.6.A, below 6.1.A, is unlikely due to the 3-hour fire resistant reinforced concrete floor on sprinkler protected structural steel members separating the two zones. The floor penetrations and openings are sealed with 3-hour rated fire assemblies. These combine to provide a 3-hour fire barrier.

The potential for fire spread to zone 7.1, above, is unlikely due to the reinforced concrete ceiling separating the two zones. However, there are unsealed penetrations in the ceiling, which could allow fire to Zone 7.1. If fire does spread from 6.1.A to 7.1 both zones are within fire area BC-1 and there will be no adverse impact to safe shutdown capabilities.

Fire Zone 6.1.A and Fire Zone 6.1.B are separated by a non-rated 7 5/8" concrete masonry block wall having numerous mechanical and electrical penetrations filled with noncombustible sealing material. Each concrete masonry unit is constructed using expanded shale aggregate with an equivalent thickness of 4.04 inches providing a minimum of 2-hr fire rating based on minimum equivalent thickness tables for concrete masonry walls (Ref. NCMA TEK 7-3; Uniform Building Code, '91 ED.; NFPA Code; UL). Since the maximum predicted fire severity in these two adjacent zones is 1-hour, fire spread across these boundaries is unlikely.

Zone 8.2.7.A is separated from 6.1.A by a 3-hour fire reinforced concrete wall with all penetrations, cable tray, fire dampers and door having a fire resistance of 3 hours. Fire spread across this barrier is unlikely.

**CONCLUSION:**

Fire spread to the adjoining fire zones 7.1 and 6.1.B is not likely, However 7.1 and 6.1.B are within the same fire area therefore fire spread would not adversely impact safe shutdown capabilities. Also, fire spread to the adjoining zones 8.2.6.A and 8.2.7.A is not likely because combustible loading will not challenge the 3 hour fire rated fire barrier between the zones.

**Fire Zone: 6.1.B****Unit 1 DC Panel Room****Fire Area:** TB-III**F Drawing:** F-14-1**General Elevation:** 615'-6"**Zone Area:** 530 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection system.**Suppression:** None.**Manual Suppression:** Portable fire extinguishers.**Other FP features:** None**Suppression Effects:** Water release would not result in adverse effects greater than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general area outside the room in Zone 8.2.7.A. There are no floor drains located within the room.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
SB-I	3 Hour
TB-III	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
3.0	SB-I	3 hour	3 hour [F-131]	No doors	2'-0" thick concrete
7.1	TB-III	Non-rated	noncombustible	No doors	0'-6" thick concrete ceiling
8.2.6.A	TB-III	3-hour	3-hr (F-386)	No doors	0'-5 1/2" thick concrete floor on sprinkler protected steel
6.1.A	TB-III	Non-Rated	noncombustible	No doors	0'-7 5/8" thick concrete block
2.0	SB-I	3 hour	3 hour [F-131 & 135]	No doors	2'-0" thick concrete
8.2.7.A	TB-III	3 hour	3 hr (F-387, F-388)	One Class A door, two 3 hour rated dampers	1'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 6.1.B****Unit 1 DC Panel Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 5.4.4	Hose stations provide water and carbon dioxide suppression capability. Portable extinguishers are provided near each room.
1, 5.4.6	Install automatic (early warning) fire detection system in D.C. distribution center. Also reference [1](3.1.1).
1, 5.4.6	Install Class A fire doors to DC distribution center Unit 1 & Unit 2. Also reference [1](3.1.8).
1, 4.10	Fire Zone 6.1.B (which is part of Fire Area TB-III) is separated from Fire Area SB-I (specifically fire zones 2.0 & 3.0) by 3-hour rated barriers.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER July 27, 1979
2	Note: Reference cable tray loading limits in Table 3.6-2.
3	Left Intentionally Blank.
4	Upgrading of the floor and walls, including fire proofing of the structural steel and 6" thick 3-hr rated fire seals per DCP 9900027 / DCN 001905M. This excludes the 7 5/8" concrete masonry walls.

**ZONE:** 6.1.B      **AREA:** TB-III      **LOCATION:** Unit 1 TB1, Elev.615'-6"

**ZONE DESCRIPTION:** Unit 1 DC Panel Room

**FIRE SEVERITY:** The fire severity for this zone is 1.25 hours.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zone which are adjacent to Fire Zone 6.1.B but in different fire areas, and summarizes the fire resistance rating of the fire barrier for each. If the fire barrier rating exceeds the predicted fire severity, based on the increased combustible loading limits, then the spread of fire to the adjoining area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance
2.0	SB-I	3 Hour
3.0	SB-I	3 Hour
8.2.6.A	TB-III	3 Hour
8.2.7.A	TB-III	3 Hour

The walls and floor, including door, dampers and penetrations of fire zone 6.1.B provide a fire resistance of 3 hours. This excludes the 7 5/8" concrete masonry walls.

**EVALUATION:**

Since Fire Zone 2.0 is separated from Fire Zone 6.1.B by a 2-foot thick reinforced concrete wall, which is considered a 3-hour fire barrier. Since the maximum predicted fire severity in Zone 6.1.B is 1.25 hours and Zone 2.0 is 1.25 hours, fire spread across this boundary is unlikely.

Fire Zone 3.0 is separated from Fire Zone 6.1.B by a 2-foot thick reinforced concrete wall, which is considered a 3-hour fire barrier. The maximum predicted fire severity in Zone 3.0 is 6 hours, which exceeds the fire resistance rating of the barrier between the zones. Fire Zone 3.0 is equipped with general area smoke detection, a wet pipe sprinkler system, and a closed-head water spray system in the cable trays. This installed detection and suppression systems will provide prompt control over fire growth and notification to the fire brigade prior to a significant challenge to the fire barrier.

Except for the non-rated 7 5/8" concrete masonry block walls between Fire Zone 6.1.B and Fire Zone 6.1.A, the walls and floors of Fire Zone 6.1.B are 3-hour barriers. Since the maximum predicted fire severity in any of these zones is 1 ½ hours, fire spread across these boundaries is unlikely.

Fire Zone 6.1.A and Fire Zone 6.1.B are separated by a non-rated 7 5/8" concrete masonry block wall having numerous mechanical and electrical penetrations filled with noncombustible sealing material. Each concrete masonry unit is constructed using expanded shale aggregate with an equivalent thickness of 4.04 inches providing a minimum of 2-hr fire rating based on minimum equivalent thickness tables for concrete masonry walls (Ref. NCMA TEK 7-3; Uniform Building Code, '91 ED.; NFPA Code; UL). Since the maximum predicted fire severity in these two adjacent zones is 1-hour, fire spread across these boundaries is unlikely.

**CONCLUSION:**

Fire spread to the adjoining fire zones 7.1 and 6.1.A is not likely, however 7.1 and 6.1.A are within the same fire area therefore fire spread would not adversely impact safe shutdown capabilities. Also, fire spread to the adjoining zones 8.2.6.A and 8.2.7.A is not likely because combustible loading will not challenge the 3 hour fire rated fire barrier between the zones.

Fire Zone: 7.1

**Unit 1 Battery Room****Fire Area:** TB-III**F Drawing:** F-14-1**General Elevation:** 628'-6"**Zone Area:** 671 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection system.**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s).**Other FP features:** The ceiling is 0'-6" thick reinforced concrete roof on fire proofed structural steel members and provides a fire resistance of 3-hours.**Suppression Effects:** Water release would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general area outside the battery room in zone 8.2.7.A. There are no floor drains located in zone 7.1.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
SB-I	3 Hour
TB-III	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
6.1.B	TB-III	Non-Rated	Non-Combustible	No doors	0'-6" thick concrete floor.
6.1.A	TB-III	Non-Rated	Non-Combustible	No doors	0'-6" thick concrete floor.
8.2.7.A	TB-III	3 hour	3 hr (F389, F390)	one class "A" fire Door Three, 3 hr Fire Dampers	1'-0" thick concrete
2.0	SB-I	3 hour	3 hour [F-392, F-393)	No doors	2'-0" thick concrete

\* Secondary Containment Boundary



**Fire Zone: 7.1****Unit 1 Battery Room****Fire Protection Commitments:**

Reference Section	Commitment
4, F.7	NFPA 69 reviewed for battery room explosion prevention. Air flow alarms notify control room if loss of ventilation.
1, 5.4.4	Hose stations provide water and carbon dioxide suppression capability. Portable extinguishers provided near room. Standpipe, hose, & port. extinguishers provided for battery rooms. [4](F.7).
2	Flammable battery spacer material was installed. This commitment was apparently closed by accounting for it in the FHA combustible loading information.
1, 3.1.11	Install supervisory circuits to battery room HVAC circuits with an alarm in control room. Electrical supervision for battery room ventilation systems which alarms in air flow loss [1](4.4.1). Air flow supervision for exhaust [1](3.1.11 & 5.4.6).
6	Provide Class A fire doors to battery room.
1, 3.1.1	Provide early warning fire detection in Battery Rooms. Also reference [1](5.4.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
0	An engineering evaluation of the lack of a complete 3-hour fire barrier separating redundant or alternative safe shutdown components was submitted to the NRC for concurrence, and an exemption from Appendix R requirements was granted in SER Section 9, dated July 21, 1988. The evaluation was based in part on the combustible loading of this zone.
1	SER July 27, 1979
2	Inspection open Items 8-20-84, 254/84011-04, 265/8
3	Appendix R Exemption Requests. See section 5.2 which addresses the lack of 3-hour separation between southern and central zone group.
4	ComEd response to the requirements of Appendix A
5	Left Intentionally Blank.
6	Upgrading the ceiling and walls, including fire proofing of the structural steel, 6" thick 3-hr rated fire seals and incorporation of class "A" fire door and dampers per DCP 9900027 / DCN 001905M.

**ZONE:** 7.1    **AREA:** TB-III**LOCATION:** Unit 1 TB I, Elev. 628'-6"**ZONE DESCRIPTION:** Unit 1 Battery Room**FIRE SEVERITY:** The fire severity for this fire zone is 1.25 hours.**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 7.1 but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
2.0	SB-I	3 hour
8.2.7.A	TB-III	2 hour

**EVALUATION:**

Since Fire Zone 2.0 is separated from Fire Zone 7.1 by a 3 hour rated fire barrier, and the maximum predicted fire severity in zone 7.1 is 1.25 hour, no further evaluation is required.

Fire Zone 8.2.7.A is separated from Fire Zone 7.1 by a 1-foot thick reinforced concrete wall, which is considered a 3-hour fire barrier. Since the maximum predicted fire severity in Zone 7.1 is 1.25 hours and Zone 8.2.7.A is 1.25 hours, fire spread across this boundary is unlikely.

**Fire Zone: 6.2.A****Unit 2 DC Panel Room****Fire Area:** TB-I**F Drawing:** F-15-1**General Elevation:** 615'-6"**Zone Area:** 132 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection system.
<b>Suppression:</b>	None.
<b>Manual Suppression:</b>	Portable fire extinguishers.
<b>Other FP features:</b>	Structural Steel coated with fireproofing.
<b>Suppression Effects:</b>	Water release would not result in adverse effects greater than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general area outside the room in Zone 8.2.7.E. There are no floor drains located within the room.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-I	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.6.E	TB-I	3-hour	3-hr (F-393)	No doors	0'-5 1/2" thick concrete floor on sprinkler protected steel
7.2	TB-I	Non-rated	noncombustible	No doors	0'-6" thick concrete ceiling
8.2.7.E	TB-I	3-hour	3-hr (F-394)	One Class A door, Two, 3-hr. dampers.	1'-0" thick concrete
6.2.B	TB-I	Non-Rated	noncombustible	No doors	0'-7 5/8" thick concrete block

**Fire Protection Commitments:**

Reference Section	Commitment
1, 5.4.4	Hose stations provide water and carbon dioxide suppression capability. Portable extinguishers are provided near each room.
1, 5.4.6	Install Class A fire doors to DC distribution center Unit 1 & Unit 2. Also reference [1](3.1.8).
1, 5.4.6	Install automatic (early warning) fire detection system in D.C. distribution center. Also reference [1](3.1.1).

**Fire Zone: 6.2.A****Unit 2 DC Panel Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
0	Note: The combustible loading for this zone has been justified.
1	SER July 27, 1979
2	Note: Reference cable tray loading limits in Table 3.6-2.
3	Left Intentionally Blank.
4	Upgrading the floor and west wall, including fire proofing of the structural steel and 6" thick 3-hr rated fire seals per DCP 9900175. This excludes the 7 5/8" concrete masonry walls.

**ZONE:** 6.2.A**AREA:** TB-I**LOCATION:** TB 2, Elev. 615**ZONE DESCRIPTION:**

Fire Zone 6.2.A consists of the DC panel room on elevation 615 of the Unit 2 Turbine Building.

The zone extends from the 615 foot elevation to the bottom of the floor at elevation 628 and is bounded by the building exterior wall on the north side, by the walls separating it from zone 6.2.B on the east and south sides, and by the wall separating it from zone 8.2.7.E to the west. The zone is bounded above by a floor/ceiling assembly which separates it from the battery room (Zone 7.2). Separation from zone 8.2.6.E, below, is also provided by a floor/ceiling assembly.

The area contains battery chargers and direct current electrical panels.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.6.E, below	TB-I
7.2, above	TB-I
6.2.B, east and south	TB-I
8.2.7.E, west	TB-I

**DETECTION:**

Area smoke detection is provided.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hour

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is predominately composed of electrical cables. The remainder of the fixed combustibles consists of miscellaneous materials distributed about the zone. Thus, the only fixed combustibles capable of producing a severe fire in the zone are the electrical cables. The cable trays are located approximately eight feet above the floor.

Transients account for a significant fraction of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers; and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 6.2.A:**

The main combustibles in this zone are the electrical cables in the tray system. Thus, a severe fire in this area is dependent on tray involvement. Should the trays become involved, propagation throughout the tray system could be expected due to the continuity of combustibles, the clearance to the ceiling, and the room size, unless prompt and effective fire brigade response were to occur.

##### **Fire Spread Potential Within Fire Area TB-I:**

The potential for fire spread to the zone above, 7.2, is limited by the reinforced concrete floor which separates the zones. An unsealed penetration in the floor provides for some venting of heat and smoke to 7.2, however. Thus spread to 7.2 via this route is possible.

Fire Zone 6.2.A and Fire Zone 6.2.B are separated by a non-rated 7 5/8" concrete masonry block wall having numerous mechanical and electrical penetrations filled with noncombustible sealing material. Each concrete masonry unit is constructed using expanded shale aggregate with an equivalent thickness of 4.04 inches providing a minimum of 2-hr fire rating based on minimum equivalent thickness tables for concrete masonry walls (Ref. NCMA TEK 7-3; Uniform Building Code, '91 ED.; NFPA Code; UL). Since the maximum predicted fire severity in these two adjacent zones is 1-hour, fire spread across these boundaries is unlikely.

Zone 8.2.7.E is separated from 6.2.A by a 3-hour fire reinforced concrete wall with all penetrations, cable tray, fire dampers and door having a fire resistance of 3 hour. Fire spread across this barrier is unlikely.

The potential for fire spread to zone 8.2.6.E, below 6.2.A, is unlikely due to the 3-hour fire resistant reinforced concrete floor on sprinkler protected structural steel members separating the two zones. The floor penetrations and openings are sealed with 3-hour rated fire assemblies. These combine to provide a 3-hour fire barrier.

**Fire Zone: 6.2.B****Unit 2 DC Panel Room****Fire Area:** TB-I**F Drawing:** F-15-1**General Elevation:** 615'-6"**Zone Area:** 528 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection system.
<b>Suppression:</b>	None.
<b>Manual Suppression:</b>	Portable fire extinguishers.
<b>Other FP features:</b>	Structural Steel coated with Fireproofing.
<b>Suppression Effects:</b>	Water release would not result in adverse effects greater than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general area outside the room in Zone 8.2.7.E. There are no floor drains located within the room.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-I	3 Hour
EDG-2	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
7.2	TB-I	Non-rated	noncombustible	No doors	0'-6" thick concrete ceiling
9.2	EDG-2	3 hour	3 hour	No doors	0'-6" thick concrete floor on fire proofed steel
8.2.7.E	TB-I	3 hour	3 hr (F-394, F-395)	One Class A door, two 3-hr. hour rated dampers	1'-0" thick concrete
8.2.6.E	TB-I	3 hour	3 hr (F-393)	No doors	0'-5 1/2" thick concrete floor on sprinkler protected steel
6.2.A	TB-I	Non-Rated	noncombustible	No doors	0'-7 5/8" thick concrete block

**Fire Zone: 6.2.B****Unit 2 DC Panel Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 5.4.4	Hose stations provide water and carbon dioxide suppression capability. Portable extinguishers are provided near each room.
1, 5.4.6	Install Class A fire doors to DC distribution center Unit 1 & Unit 2. Also reference [1](3.1.8).
1, 5.4.6	Install automatic (early warning) fire detection system in D.C. distribution center. Also reference [1](3.1.1).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
0	Note: The combustible loading for this zone has been justified.
1	SER July 27, 1979
2	Note: Reference cable tray loading limits in Table 3.6-2.
3	Left Intentionally Blank.
4	Upgrading of the floor and walls, including fire proofing of the structural steel and 6" thick 3-hr rated fire seals per DCP 9900175. This excludes the 7 5/8" concrete masonry walls.



**ZONE:** 6.2.B**AREA:** TB-I**LOCATION:** TB 2, Elev. 615**ZONE DESCRIPTION:**

Fire Zone 6.2.B is one of the two DC panel rooms on elevation 615 of the Unit 2 Turbine Building.

The zone extends from the 615 foot elevation to the bottom of the floor at elevation 628 and is bounded by the building exterior walls on the north and east sides, by the walls separating it from zone 6.2.A on the west and north sides, and by the wall separating it from zone 8.2.7.E to the south and west. The zone is bounded above by a floor/ceiling assembly which separates it from the battery room, zone 7.2, above. Separation from zone 8.2.6.E and 9.2, below, is provided by a floor/ceiling assembly.

The area contains one division of battery chargers and direct current electrical panels.

**BARRIERS:**

This zone shares barriers with:

ZONES

8.2.6.E, below

9.2, below

7.2, above

6.2.A, west and north

8.2.7.E, west and south

AREAS

TB-I

EDG-2

TB-I

TB-I

TB-I

**DETECTION:**

Area smoke detection is provided.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hour

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is overwhelmingly composed of electrical cables. The remainder of the fixed combustibles consists of miscellaneous materials distributed about the zone. Thus, the only fixed combustibles capable of producing a severe fire in this zone are the electrical cables. The cable trays are located approximately eight feet above the floor.

Transients account for a small fraction of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to 3-hour fire resistant concrete barrier with 3-hour fire rated seals, fire dampers and door, and
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 6.2.B:**

The main combustibles in this zone are the electrical cables in the tray system. Thus, any severe fire in this area is dependent on their involvement. Should the trays become involved, propagation throughout the tray system could be expected due to the continuity of combustibles involved, the clearance to the ceiling, and the room size, unless prompt fire brigade response were to occur.

##### **Fire Spread Potential Within Fire Area TB-I:**

The potential for fire spread to zone 7.2, above, is limited by the reinforced concrete floor which separates the zones. Due to unsealed penetrations in the floor, however, fire spread cannot be discounted.

Fire Zone 6.2.A and Fire Zone 6.2.B are separated by a non-rated 7 5/8" concrete masonry block wall having numerous mechanical and electrical penetrations filled with non-combustible sealing material. Each concrete masonry unit is constructed using expanded shale aggregate with an equivalent thickness of 4.04" providing a minimum of 2-hr fire rating based on minimum equivalent thickness tables for concrete masonry walls (Ref. NCMA TEK 7-3; Uniform Building Code, '91ED.; NFPA Code; UL). Since the maximum predicted fire severity in these two adjacent zones is 1-hour, fire spread across these boundaries is unlikely.

Zone 8.2.7.E is separated from 6.2.B by a 3 hour fire reinforced concrete wall with all penetrations, cable tray, fire dampers and door having a fire resistance of 3 hours. Fire spread across these two adjacent zones barrier is unlikely.

The potential for fire spread to zone 8.2.6.E, below 6.2.B, is unlikely due to the 3-hour fire resistant reinforced concrete floor on sprinkler protected structural steel members separating the two zones. The floor penetrations and openings are sealed with 3-hour rated fire assemblies. These combine to provide a 3-hour fire barrier.

Zone 9.2, below, is separated from zone 6.2.B by a three-hour rated floor/ceiling assembly. The combustible loading in zone 6.2.B is not sufficient to challenge this barrier.

**Fire Zone: 7.2****Unit 2 Battery Room****Fire Area:** TB-I**F Drawing:** F-15-1**General Elevation:** 628'-6"**Zone Area:** 660 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection system.**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s).**Other FP features:** Room and piping penetrations are curbed with a 3-inch curb. The ceiling is 6" thick reinforced concrete roof on fire proofed structural steel members and provides a fire resistance of 3-hours.**Suppression Effects:** Water release would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water runoff would travel through piping penetrations (curbed 3-inches) to Fire Zones 6.2.A and 6.2.B, below. Water travel to these zones can be tolerated. Water runoff would be controlled through utilization of floor drains in the general area outside the battery room in zone 8.2.7.E. There are no floor drains or openings available for runoff in zone 7.2."**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-I	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
6.2.B	TB-I	Non-rated	noncombustible	No doors	0'-6" thick concrete floor
6.2.A	TB-I	Non-rated	noncombustible	No doors	0'-6" thick concrete floor
8.2.7.E	TB-I	3-hour	3-hr (F-397, F-398)	One class "A" fire door Three, 3-hr floor Fire Dampers	1'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 7.2****Unit 2 Battery Room****Fire Protection Commitments:**

Reference Section	Commitment
4, F.7	NFPA 69 reviewed for battery room explosion prevention. Air flow alarms notify control room if loss of ventilation.
1, 5.4.4	Hose stations provide water and carbon dioxide suppression capability. Portable extinguishers provided near room. Standpipe, hose, & port. extinguishers provided for battery rooms. Also reference 4](F.7).
2	Flammable battery spacer material was installed. This commitment was apparently closed by accounting for it in the FHA combustible loading information.
1, 3.1.11	Install supervisory circuits to battery room HVAC circuits. For battery room exhaust / ventilation systems with alarms to control room on air flow loss. Also reference [1](4.4.1 & 5.4.6).
6	Provide Class A fire doors to battery room.
1, 3.1.1	Provide early warning fire detection in Battery Rooms. Also reference [1](5.4.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
0	Note: The combustible loading for this zone has been justified.
1	SER, July 27, 1979.
2	Inspection open Items 8-20-84, 254/84011-04, 265/8
3	Appendix R Exemption Request. Sections 5.2 and 5.
4	ComEd response to the requirements of Appendix A
5	Left Intentionally Blank.
6	Upgrading the ceiling and walls, including fire proofing of the structural steel, 6" thick 3-hr rated fire seals and incorporation of Class "A" fire door and dampers per DCP 9900175

**ZONE:** 7.2                      **AREA:** TB-I                      **LOCATION:** Unit 2 TB, Elev. 628'-6"

**ZONE DESCRIPTION:** Unit 2 Battery Room

**FIRE SEVERITY:** The fire severity for this fire zone is 1.25 hour.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

All fire zones adjacent to Fire Zone 7.2 are in the same fire area with the exception of 8.2.7.E. The barrier with zone 8.2.7.E is 3-hour rated and all other adjacent fire zone barriers are non-rated. Fire spread from Fire Zone 7.2 to 8.2.7.E is not likely because the combustibles on zone 8.2.7.E are not sufficient to challenge the barrier. Redundant safe shutdown capability is provided for this zone

**Fire Zone: 8.2.4****Unit 1 Cable Tunnel****Fire Area:** CT-1**F Drawing:** F-11-1**General Elevation:** 588'-0"**Zone Area:** 2,592 Ft<sup>2</sup>**Fire Protection Features:****Detection:**

General area smoke detection coverage.

**Suppression:**

General area wet pipe sprinkler system and closed head water spray nozzles provided in the cable trays.

**Manual Suppression:**

A hose station equipped with 100 feet of hose. An additional 100 ft. of fire hose is provided at primary access. Portable fire extinguisher(s) located in adjacent Fire Zone 8.2.6.A above.

**Other FP features:**

Access hatches/doors are curbed to prevent fluid born fire spread across fire boundary. Equipment access hatch and personnel access hatch are class "A" fire rated doors with a 3-hour fire label with exception to Hatch to Fire Zone 6.3. (Ref. DCP 990059).

**Suppression Effects:**

Water release in this zone (including drainage from upper levels of the plant) from sprinkler system operation, hose line use, or piping breaks would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water will not affect undamaged insulated cable. Only cables are present in this zone. Water runoff would be controlled through utilization of floor drains located in the cable tunnel.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** High**Equivalent Fire Severity:** 2.9 Hours**Boundary Fire Areas:****Fire Area****Barrier Description**

SB-I	Equivalent 3 Hour [7][12]
RB-1S	3 Hour
TB-III	3 Hour
CT-2	3 Hour

**Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.1*	RB-1N/RB-1S	3 hour	3 hour (F-144)	No doors	4'-0" thick concrete wall
4.0	SB-I	3 hour[10]	Gap filled with noncombustible material [7][12]	No doors	Sealed intervening cable raceway
9.1	TB-III	3 hour [3][4]	3 hour	No doors	3'-0" thick concrete ceiling
8.2.6.A	TB-III	3 hour	3 hour	1 equipment access hatch 1 personnel access hatch (13)	3'-0" concrete ceiling (4'-0" at U1 Trackway)
6.3	SB-I	3 hour [3][4][10]	3 hour (F-190)	Non-rated steel hatchway cover [10][12]	1'-0" thick concrete ceiling
11.2.1	RB-1S	3 hour	3 hour (F-144, 145, & 146)	No doors	1'-0" thick concrete floor
8.2.5	CT-2	3 hour [3](Sec. III.9) ,[4](Sec. 10)	3 hour (F-148, 149, 150, 151)	No doors	0'-11 5/8" thick concrete block wall

\* Secondary Containment Boundary

**Fire Zone: 8.2.4****Unit 1 Cable Tunnel****Fire Protection Commitments:**

Reference Section	Commitment
4, 10.2	Cable tunnel electrical penetrations sealed with 3-hour seals except steel access plates. Also reference [8](5.1). Steel access plates between 8.2.4 & 8.2.6.A are 3-hour rated [13].
1, 3.1.5d	Modify sprinkler system to prevent propagation between cable trays. Also reference [1](4.10 and 5.15.6).
1, 3.1.4	Provide additional hose on adjacent hose stations by Unit 1 cable tunnel for adequate coverage. Also reference [1](4.3.1.4 and 5.15.6). Hose stations have adequate hose to cover cable tunnel [9](E.3.d).
5, (13)12.C pg.3	Provide portable ventilation equipment for use in this zone. Portable smoke ejectors provided per [1](4.11).
1, 3.1.1(8)	Provide fire detection in Unit 1 cable tunnel. Also reference [1](5.15.6), [4](10.2) and [8](5.1).
9, D.3.c	Manual fire fighting equipment available from adjacent zones (from the ground floor).
4, 10.2	Cable tunnels have complete fire detection and water suppression. Also reference [8](5.1).
4, 10.2	Cable tunnels are separated by 3-hour rated construction. Also reference [1](4.10)[13].
4, 5.2	3-hour separation between fire zone 6.3 and cable tunnels except fire resistive access covers. Also reference [1](3.1.8 and 5.3.6) and [8](6.2.1). This includes doors, dampers, etc.
1, 5.15.4	Automatic sprinkler system provided for cable tunnel.
4, 9.2	3-hour separation between the reactor building and turbine building. Between cable tunnels and reactor building. Also reference [11].
8, 3.2.4.2	Cable penetrations between fire zones 1.1.1.1 and 8.2.4 have fire resistive seals.



**Fire Zone: 8.2.4****Unit 1 Cable Tunnel****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	NRC Exemption Aug. 18, 1989. Including Exemption Requests 3.3 and 5.2 which apply to the fire zone.
4	SER, July 21, 1988.
5	Letter dated 4-10-78 from CE to NRC.
6	LER 90-020, Rev.00 (10-19-90).
7	The intervening cable raceway has been sealed with a 1'-0" thick cerafiber / flammastic and ceraboard fire seal.
8	Appendix R Exemption Requests
9	ComEd response to the requirements of Appendix A
10	Equivalency of steel hatch (#308) justified in DCP 9800275.
11	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
12	Evaluation for fire area separation between SB-I and TB-III, ER9801619.
13	Equipment access hatch #300 and personnel access hatch #302 are class "A" fire rated doors with a 3-hour fire label (Ref. 9900059).

**ZONE:** 8.2.4**AREA:** CT-1**LOCATION:** TB1, Elev. 588' 0"**ZONE DESCRIPTION:** Unit 1 Cable Tunnel**FIRE SEVERITY:**

The fire severity for this zone is 2.9 hours. The combustible loading is due to cable insulation almost exclusively.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.4 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
1.1.1.1	RB-I	3-Hour
11.2.1	RB-I	3-Hour
4.0	SB-I	3-Hour
6.3	SB-I	3-Hour
8.2.5	CT-2	3-Hour
8.2.6.A	TB-III	3-Hour
9.1	TB-III	3-Hour

**EVALUATION – ZONE 8.2.4:**

Fire zone 8.2.4's walls are constructed of concrete and concrete block with all electrical penetrations sealed by materials having a 3-hour fire rating except for a gap that opens into fire zone 4.0 which is filled with noncombustible material. The outer walls are constructed of minimum 1'-6" thick concrete while an 11-5/8" thick concrete block wall separates the unit 1 cable tunnel from the unit 2 cable tunnel (fire zone 8.2.5). The floor is a minimum 1'-0" thick concrete and carries a 3-hour fire rating where it serves as a boundary between fire zone 8.2.4 and fire zone 11.2.1. The access hatches are curbed to prevent fluid borne fire spread across fire boundary. Equipment access hatch #300 and personnel access hatch #302 are class "A" fire rated doors with a 3-hour fire label (Ref. DCP 9900059).

Penetrations have been sealed to provide a 3-hour barrier. The portion of the ceiling that forms a boundary with fire zone 6.3 is 3-hour fire rated.

The Unit 1 cable tunnel is provided with a fire detection system and an automatic suppression system. The fire detection system utilizes ionization detectors and the automatic suppression system is a wet pipe sprinkler system utilizing closed head directional spray nozzles for the cable trays and a special sprinkler arrangement protecting access hatches to the floor above the tunnel. No manual fire suppression support equipment is provided within the tunnel, however, hose stations, equipped with 100 ft. of hose, and portable CO<sub>2</sub> fire extinguishers are located in the zones above the tunnel. Additional hose is provided to assure adequate hose to cover the cable tunnel.

The Unit 1 cable tunnel's fire loading limit is comprised almost entirely of electrical cable insulation. This fire zone has total coverage automatic wet pipe sprinkler protection. This system addresses the cable hazard with directional spray closed head nozzles and special sprinkler coverage around hatchway openings to the zones above. Therefore, ample assurance exists that any fire originating from within the cable tunnel will be confined and controlled or extinguished by the installed sprinkler system. Due to the special coverage of openings to zones above the tunnel, the potential of a fire spreading into the tunnel is minimized. In addition, the openings are curbed to prevent any fluid borne fire from affecting the tunnel and the entrances to the openings are sealed to provide a 3-hour fire barrier, or have 3-hour fire rated doors or equivalent design. Alternate shutdown paths exist in the event of a fire in this fire zone involving safe shutdown associated cables

**Fire Zone: 8.2.5****Unit 2 Cable Tunnel****Fire Area:** CT-2**F Drawing:** F-11-1**General Elevation:** 588'-0"**Zone Area:** 8,690 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection coverage.
<b>Suppression:</b>	General area wet pipe sprinkler system and closed head water spray nozzles provided in the cable trays. System is arranged to prevent fire spread through hatches to the floor above.
<b>Manual Suppression:</b>	A hose station equipped with 100 feet of hose. An additional 100 ft. of fire hose is provided at the primary access. Portable fire extinguisher(s) located in adjacent fire zones.
<b>Other FP features:</b>	Access hatches are curbed to prevent fluid borne fire spreading across fire boundary. Equipment access hatches/doors and personnel access hatches/doors are class "A" fire rated doors with a 3-hour fire label with exception of the hatches to Fire Zone 6.3. (Ref. DCP 9900174).
<b>Suppression Effects:</b>	Water release in this zone (including drainage from upper levels of the plant) from sprinkler system operation, hose line use, or piping breaks would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water will not affect undamaged insulated cable. Only cables are present in this zone. Water runoff would be controlled through utilization of floor drains located in the cable tunnel.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** High**Equivalent Fire Severity:** 2.9 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
RB-2S	3 Hour
SB-I	Equivalent 3 Hour [4][14]
RB-2N	3 Hour
RB-1N	3 Hour
TB-III	3 Hour [4]
TB-II	3 Hour [4][15]
TB-I	3 Hour

**Fire Zone: 8.2.5****Unit 2 Cable Tunnel****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
11.1.3*	RB-1N	3 hour	3 hour	No doors	1'-0" thick concrete floor (1'-6" thick at wall)
9.1	TB-III	3 hour [4][5]	3 hour	No doors	3'-0" thick concrete
8.2.1.D	TB-I	3 hour	3 hour	No doors	1'-6" thick concrete
8.2.1.C	TB-III	3 hour	3 hour	No doors	1'-6" thick concrete
11.1.4*	RB-2S	3 hour	3 hour	No doors	1'-0" thick concrete floor (1'-6" thick at wall)
8.2.6.E	TB-I	3 hour	3 hour	2 personnel access hatches/doors [16]	3'-0" thick concrete
8.2.6.D	TB-I	3 hour	3 hour	No doors	3'-0" thick concrete wall (1'-0" thick at ceiling)
8.2.6.B	TB-III	3 hour [4][5]	noncombustible	No doors	3'-0" thick concrete ceiling
6.3	SB-I	3 hour[4][5]	3 hour [F-190].	Non-rated access hatch door [14]	1'-0" thick concrete ceiling
8.2.6.A	TB-III	3 hour [4][5]	3 hour	1 personnel access hatch/door 1 equipment access hatch/door [16]	3'-0" thick concrete ceiling (4'-0" thick at trackway 1)
4.0	SB-I	3 hour [9]	Gap filled w/ noncombustible material [9][14]	No doors	Sealed intervening cable raceway
8.2.6.C	TB-II	3 hour	3 hour	1 equipment access hatch/door [16]	3'-0" thick concrete
11.3.3*	RB-2N	3 hour	3 hour (F-143)	No doors	1'-0" thick concrete floor
11.3.1*	RB-2S	3 hour	3 hour	No doors	1'-0" thick concrete floor
8.2.4	CT-1	3 hour [4][5]	3 hour (F-148, 149, 150, 151)	No doors	0'-11 5/8" thick concrete block wall

\* Secondary Containment Boundary

**Fire Zone: 8.2.5****Unit 2 Cable Tunnel****Fire Protection Commitments:**

Reference Section	Commitment
5, 5.2	3-hour separation between fire zone 6.3 and cable tunnel except for fire resistive access covers. Also reference [6](6.2.1).
1, 3.1.5d	Modify sprinkler system to prevent propagation between trays. Also reference [1](4.10 & 5.16.6).
1, 3.1.4	Provide additional hose on hose stations adjacent to cable tunnel. Hose packs with two 50 feet lengths of hose provided. Also reference [1](4.3.1.4 & 5.16.6) and [12](E.3.d).
2, (13)13.C pg.4	Provide portable ventilation equipment. Also reference [1](4.11).
3	Ensure U2 cable tunnel automatic sprinkler protection is arranged to prevent fire spread thru hatches to floor above at F/12 and F/17. Also see M4-2-84-37 (7-7-87).
5, 10.2	Cable tunnel access have heavy, metal checker plates for access hatches. Also reference [6](5.1). Replaced with 3-hr. rated hatches per DCP 9900174 [16].
5, 10.2	Cable tunnel electrical penetrations sealed with 3-hour seals.
1, 3.1.1(8)	Provide fire detection in Unit 2 cable tunnel. Also reference [1](5.16.6).
5, 10.2	Cable tunnels separated by 3-hour construction. Electrical seals are 3-hour rated. Also reference [1](3.1.8 and 5.3.6), and [6](5.3.4).
12, D.3.c	Manual fire fighting equipment available from adjacent zones. Available from ground floor of TB.
5, 10.2	Complete detection and suppression in the cable trays.
5, 10.2	Unit 1 and Unit 2 cable tunnels separated by 3-hour walls.
1, 5.16.4	Automatic sprinkler system provided for cable tunnel.
5, 9.2	3-hour separation between RB and TB.
10, 3.1.5.d	Unit 1 cable tunnel sprinkler system is adequate to prevent propagation between trays.
10, 3.1.5.d	Single line break would take sprinkler system out of service. Should provide adequate separation of feeds. Separate sprinkler system for each division of cables [11](3.1.5.d).
12, D.3.c	Water suppression provided over major cable concentrations.
5, 10.2	Cable tunnels have complete detection and water suppression. Also reference [1](4.10) and [6](5.1).

**Fire Zone: 8.2.5****Unit 2 Cable Tunnel****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter dated 4-10-78 from CE to NRC.
3	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-84
4	NRC Exemption Aug. 18, 1989.
5	SER, July 21, 1988.
6	Appendix R Exemption Request 5.2 applies to this fire zone. Also see section 5.1.
7	LER 90-020, Rev.00 (10-19-90).
8	Exemption Request 4.3
9	The intervening cable raceway has been sealed with a 1'-0" thick cerafiber / flammastic and ceraboard fire seal, per ER 965927.
10	SER, November 5, 1980.
11	SER, February 12, 1981.
12	ComEd response to the requirements of Appendix A
13	GL 86-10 Evaluation S040-QH-0612 Rev. 1.
14	Evaluation for fire area separation between SB-I and TB-I, ER9801618, the equivalency of steel hatch (#301) is justified by DCP 9800275.
15	Evaluation for fire area separation between TB-I and TB-II, QDC-4100-M-1222.
16	Equipment access hatches #301 & 304 and personnel access hatches #303, 305 & 306 are class "A" fire rated doors with a 3-hour fire label (Ref. 9900174)
17	GL 86-10 Evaluation EC 401034 Rev. 0, Fire Seals F-382-(1-14) and F-382(18-21)

**ZONE:** 8.2.5**AREA:** CT-2**LOCATION:** TB, Elev 588'-0"**ZONE DESCRIPTION: Unit 2 Cable Tunnel****FIRE SEVERITY:**

The fire severity for this zone is 2.9 hours. The combustible loading is heavy due to cable insulation almost exclusively.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 8.2.5 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
11.1.3	RB-1	3 hour
9.1	TB-III	3 hour
8.2.1. D	TB-I	3 hour
8.2.1. C	TB-III	3 hour
11.1.4	RB-2	3 hour
8.2.6. E	TB-I	3 hour
8.2.6. D	TB-I	3 hour
8.2.6. B	TB-III	3 hour
6.3	SB-I	3 hour
8.2.6. A	TB-III	3 hour
4.0	SB-I	3 hour
8.2.6. C	TB-II	3 hour
11.3.3	RB-2	3 hour
11.3.1	RB-2	3 hour
8.2.4	CT-1	3 hour



**EVALUATION - ZONE 8.2.5:**

Fire zone 8.2.5's walls are constructed of concrete and concrete block with all electrical penetrations sealed by materials having a 3-hour fire rating except for the penetrations to fire zones 8.2.6.A and 8.2.6.C which utilize noncombustible seals and a gap that opens into fire zone 4.0 which is filled with noncombustible material. The outer walls are constructed of minimum 1'-6" thick concrete while an 11-5/8" thick concrete block wall separates the unit 2 cable tunnel from the unit 1 cable tunnel (fire zone 8.2.4). The floor is a minimum 1'-0" thick concrete and carries a 3-hour fire rating where it serves as a boundary between fire zone 8.2.5 and fire zones 11.3.1, 11.3.3, 11.1.3 and 11.1.4. The ceiling is 1'-0" thick concrete with various access hatches and penetrations. All access hatches are curbed. Equipment access hatches/doors #301 & 304 and personnel access hatches #303, 305 & 306 are class "A" fire rated doors with a 3-hour fire label (Ref. DCP 9900174). The electrical and mechanical penetrations have been sealed to provide a 3-hour fire barrier. The portion of the ceiling that forms a boundary with fire zone 6.3 is 3-hour fire rated.

The unit 2 cable tunnel is provided with a fire detection system and an automatic suppression system. The fire detection system utilizes ionization detectors and the automatic suppression system is a wet pipe sprinkler system utilizing closed head directional spray nozzles for the cable trays and a special sprinkler arrangement protecting access hatches to the floor above the tunnel. No manual fire suppression support equipment is provided within the tunnel, however, hose stations, equipped with 100 ft. of hose, and portable CO<sub>2</sub> fire extinguishers are located in the zones above the tunnel.

The unit 2 cable tunnel's fire loading limit is comprised almost entirely of electrical cable insulation. This fire zone has total coverage automatic wet pipe sprinkler protection. This system addresses the cable hazard with directional spray closed head nozzles and special sprinkler coverage around hatchway openings to the zones above. Therefore, ample assurance exists that any fire originating from within the cable tunnel will be confined and controlled or extinguished by the installed sprinkler system. Due to the special coverage of openings to zones above the tunnel, the potential of a fire spreading into the tunnel is minimized. In addition, the openings are curbed to prevent any fluid borne fire from spreading to the tunnel, and the entrances to the openings are sealed to provide a 3-hour fire barrier, or have 3-hour fire rated doors or equivalent design. Alternate shutdown paths exist in the event of a fire in this fire zone involving safe shutdown associated cables

**Fire Zone: 8.2.8.B****Unit 1 Switchgear Area****Fire Area:** 13-1**F Drawing:** F-5-1, F-17-1**General Elevation:** 639/647-6**Zone Area:** 2,145 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat (thermal) detection protects MG set 1A (abandoned in place) and actuates automatic water spray system. Local area smoke detection protects 4-kV switchgear 13-1 and 480-V switchgears 18 and 19 at the ceiling.
<b>Suppression:</b>	Local area wet pipe and automatic water spray sprinkler systems protect reactor recirculation MG set 1A-202-51 (abandoned in place).
<b>Manual Suppression:</b>	Located in adjacent Fire Zone 8.2.8.E is one hose station, equipped with 100 feet of hose, and portable fire extinguisher(s).
<b>Other FP features:</b>	Curbs, spray shields, and floor drains are installed.
<b>Suppression Effects:</b>	Any adverse effects on safe shutdown through discharge of water or Carbon Dioxide in this area would be no more severe than those determined to be acceptable for a design-basis fire. Water runoff would be handled by the floor drains at el. 639'-0". Curbs, spray shields, and floor drains are installed. The spray shields installed at the ceiling will prevent sprinkler water from discharging onto 4-kV switchgear panel 13-1 (no water seals on switchgear or pedestals) and 480-V switchgear panels 18 and 19 (pedestals provided but top of switchgear not sealed). This area is open to hose stream entry from Fire Zone 8.2.8.E but hose discharge will be deflected by the spray shields at the ceiling and a shield wall between this zone and 8.2.8.C.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
24-1	Equivalent 3 Hour [7]
14-1	Equivalent 3 Hour [7]
TB-IV	Equivalent 3 Hour [7]
RB-1N	3 Hour
TB-II	Equivalent 3 Hour[25]

**Fire Zone: 8.2.8.B****Unit 1 Switchgear Area****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.7.C	TB-II	Non-rated[25]	noncombustible, (3 hour under	No doors	4'-0" thick concrete
1.1.1.5.A	TB-IV	Non-rated	noncombustible	No doors	0'-6" thick concrete floor (1'-6" thick at
1.1.1.5*	RB-1N	3 hour	3 hour	No doors	1'-0" thick concrete
1.1.1.4*	RB-1N	3 hour except at SBT line [6][7]	3 hour (F-68, F-69)	No doors	1'-6" thick concrete
1.1.1.3*	RB-1N	3 hour	3 hour (F-60)	No doors	2'-0" thick concrete floor (4'-0" thick at
8.2.8.E	TB-IV	Open [10]	open [10]	No doors	No wall
8.2.8.C	24-1	3 hour	3 hour (F-173)	Two 3 hour doors	11 5/8" thick concrete block
8.2.8.A	14-1	3 hour [10]	3 hour (F-170)	No doors, one 3 hour rated damper	0'-11 5/8" thick concrete block

\* Secondary Containment Boundary

**Fire Zone: 8.2.8.B****Unit 1 Switchgear Area****Fire Protection Commitments:**

Reference Section	Commitment
2	3-hour barrier between 4-kV SWGR 13-1 and 14-1 (23-1 and 24-1) along row 15 (11) extending to col G beyond MG sets (MG sets abandoned in place. Oil removed). Also reference [15](5.1), [7](12.2) and [10](5.8.1).
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1. Also reference [15](5.1) and [10](5.8.1).
7, 9.2	Provide 3-hour separation between RB and TB. There are some exceptions. Also reference [5].
7, 12.2	Smoke detection provided at ceiling. Also reference [10](5.8.4.1) and [1](3.1.1).
1, 5.19.6	Drains will be provided for the area enclosed by curbs.
12	Replace foam system protecting MG sets (MG sets abandoned in place. Oil removed) with water spray system and use of thermostat detection. Also reference [7](12.2) and [10](5.8.4.1).
15, 5.1	There are no unsealed penetrations located near the SWGRs. Also reference [10](5.8.1).
2	Water curtain has been replace by a 3 hour wall [23].
7, 12.2	Provide 3-hour barrier (with 2-hour section) between RB and 480V SWGR areas. Also reference [10](5.8.1).
1, 3.1.1(13)	Install fire detection system by 480V switchgear. Smoke detection at ceiling per [7](12.2). Also reference [10](5.8.4.1), [10](5.8.4.2), [1](3.1.1), and [1](5.19.6).
9, (13)22.C pg.5	Install canopies over switchgear 13-1, 14-1, 23-1, and 24-1. Not provided. Also reference [1](3.1.10) and [1](5.19.6).
1, 3.1.6(b)	Foam water system replaced with thermally actuated water spray system per [7](12.2). Also reference [10](5.8.4.1), [1](5.19), and [1](4.3.1.6).
1, 3.1.1	Provide fire detection in area of 4kV and 480V switchgear. Smoke detection at ceiling per [7](12.2). Also reference [10](5.8.4.1), [10](5.8.4.2), and [1](5.19.6).
1, 3.1.11	Provide curb around MG sets (MG Sets abandoned in place. Oil Removed). Also reference [7](12.2), [10](5.8.4.1), and [1](5.19.6).

2	3-hour wall between U1 and U2 480-V switchgear area. Also reference [7](12.2) and [10](5.8.1).
1, 5.19.4	Portable extinguishers and hose stations provided.
15, 5.1	4-kV SWGRs for each unit separated by partial 3-hour barrier.
15, 5.1	Provide automatic fixed water suppression and foam water systems for MG sets (MG sets abandoned in place. Oil removed). Foam water system replaced with water spray system per [7](12.2).
17, 3.1.6.b	Water supply for U1 foam system also supplies U2 sprinkler system, and water for U2 foam system also supplies U1 sprinkler system. Foam water system replaced with water spray system per [7](12.2).
7, 12.2	Area beneath water curtain is curbed and drained. Also reference [10](5.8.4.2) and [15](5.1). Water curtain has been replaced by a 3 hour wall [23].
16, 3.1.6.b	Modify foam system design to provide 72 gallons of foam. Relocate system controls and have independent feed. Foam water system replaced with water spray system per [7](12.2).
7, 12.2	Partial (20 ft. high) fire barrier separates division SWGR. Also reference [10](5.8.1).
1, 3.1.6	Independent feed for foam deluge system provided. Foam water system replaced with water spray system per [7](12.2).
7, 12.2	No intervening combustibles between U1 and U2 SWGR. Also reference [10](5.8.4.2),[23].
7, 12.2	Manual fire fighting equipment is available for this zone. Also reference [10](5.8.4.1).
7, 12.2	Provide separate automatic wet pipe sprinkler system at ceiling for MG sets (MG sets abandoned in place. Oil removed). Provide spray sheilds to prevent damage to SWGR. Provide water flow indication in control room. Also reference [10](5.8.4.10) and [1](5.19.4).
10, 5.8.4.1	No continuity of combustibles between 8.2.8.E and equivalent fire areas (8.2.8.A-D).

**Fire Zone: 8.2.8.B****Unit 1 Switchgear Area****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-84
3	Letter, CECO to NRC 3-29-79.
4	Left blank intentionally
5	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	Left Intentionally Blank.
9	Letter from CECO to NRC dated 4-10-78.
10	Exemption Request 5.8 (12-18-84). Exemption for lack of complete 3-hour barriers between equivalent fire areas 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D on the TB operating floor. Exemption granted (12.0) 12-11-87.
11	LER 85-018, Rev.00 12-11-85.
12	Letter, J. Wojnarowski (CECO) to R. Denton (NRC).
13	Left Intentionally Blank
14	Left Intentionally Blank.
15	Appendix R Exemption Requests, Section 5.1
16	SER, November 5, 1980.
17	SER, February 12, 1981.
18	ComEd response to the requirements of Appendix A
19	ComEd Request letter dated November 5, 1991.
20	Left Intentionally Blank.
21	The previous FHA references exemption request 5.6. The exemption request 5.6 has been withdrawn.
22	SER, March 2, 1994.
23	DCP 9700200, Installation of block wall to replace
24	Lack of complete detection and suppression for Fire Area 13-1, 24-1, GL 86-10 Evaluation NTSC 98-020.004 Rev. 3.
25	Evaluation for fire area separation between TB-II and TB-IV, ER9801622.

**ZONE:** 8.2.8.B      **AREA:** 13-1 (Equivalent Fire Area)      **LOCATION:** TB, Elev. 639

**ZONE DESCRIPTION:**

Fire Zone 8.2.8.B is on elevation 639 of the Turbine Building, adjacent to the turbine operating floor.

The zone extends from the 639 foot elevation to the bottom of the floor at elevation 658 and is bounded by zone 8.2.8.A on the south side, by column line G to the west, by zone 8.2.8.C to the north at column line 13, and column line H to the east.

This zone contains the 1A Reactor Recirc. System MG Set (abandoned with oil removed), two oil-filled transformers, a 4kV switchgear, and two 480 volt switchgear.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.8.E, west	TB-IV
8.2.8.A, south	14-1 <sup>1</sup>
8.2.8.C, north	24-1 <sup>2</sup>
1.1.1.5.A, above	TB-IV
8.2.7.C	TB-II
1.1.1.5, above	RB-1N
1.1.1.3, 1.1.1.4, east	RB-1N

**DETECTION:**

Heat detection is provided over the MG set, and smoke detection over the switchgear areas.

**AUTOMATIC SUPPRESSION:**

Wet-pipe sprinkler protection and a water spray system are provided for the MG set area.

**COMBUSTIBLE LOADING:**

Calculated Value: Medium

**FIRE SEVERITY:**

Less than 2.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is primarily composed of transformer oil, and electrical cables contribute a minor amount to the loading. The rest of the fixed combustibles consist of various materials distributed throughout the zone. The only fixed combustibles capable of sustaining a severe fire is the transformer oil. The zone is classified as having medium fire severity, but its combustible loading is generally lower since the MG sets were abandoned with their oil removed.

<sup>1</sup> Equivalent Fire Area as defined in Section 4.1

<sup>2</sup> Ibid

Transients account for a relatively small amount of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The main hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of producing a severe fire. The only fixed combustibles capable of such propagation are transformer oil and electrical cables.

The installed detection system should provide for detection of fires in the vicinity of the switchgear and the abandoned MG set and notification of operating personnel via Control Room annunciation. This notification should prompt fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade performance may be hampered by:

- Fires involving polychlorinated biphenyls (PCB's).

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 8.2.8.B:**

Several combustibles are capable of producing an extensive fire in this zone. The cables form a continuous combustible path from one end of the zone to the other, providing a means for spreading fire, should they become ignited. The Unit 1 MG sets have been drained of oil and is no longer an oil combustible fire hazard. The sprinkler protection will limit the impact of the fire immediately around the MG set, however, it will have little effect on fire damage in the remainder of the zone. The oil filled transformers are surrounded by curbs which may be effective in containing small spills or leakage, but ineffective in the event of a rupture or other significant failure of the transformer tank. A fire in this zone would be expected to cause damage throughout.



**Fire Spread Potential To Fire Area TB-IV:**

Fire spread to zone 8.2.8.E, west of 8.2.8.B, is likely should a serious fire occur in zone 8.2.8.B due to the lack of any separating barrier. However, due to the discontinuity of combustibles, the sprinkler protection over the abandoned MG set area, and the large volume of zone 8.2.8.E, this should not result in serious damage in zone 8.2.8.E.

Fire zone 1.1.1.5.A is located above a portion of zone 8.2.8.B. A reinforced concrete floor separates the two zones. There are a number of openings in the floor such that fire spread to 1.1.1.5.A is likely.

**Fire Spread Potential To Equivalent Fire Area 14-1:**

The potential for spread of fire to zone 8.2.8.A is limited by a three-hour rated barrier which separates the two zones. Given the vent area of zone 8.2.8.B (vents to 8.2.8.E and 1.1.1.5.A) and the sprinkler protection over the abandoned MG set area, a fire in 8.2.8.B is not expected to challenge this barrier. Hot combustion products and possibly flames could intrude into zone 8.2.8A above the level of the barrier, however, this is not expected to impair the safe shutdown components in the zone.

**Fire Spread Potential To Equivalent Fire Area 24-1:**

The potential for fire spread to zone 8.2.8.C is limited by a three-hour rated barrier which separates the two zones. Given the vent area of zone 8.2.8.B (vents to 8.2.8.E and 1.1.1.5.A) and the sprinkler protection over the abandoned MG set area, a fire in 8.2.8.B is not expected to challenge this barrier.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II (zone 8.2.7.C) is separated from zone 8.2.8.B by the reinforced concrete floor of zone 8.2.8.B. The spread of fire via this avenue is not considered credible since the fire loading in zone 8.2.8.B is not sufficient to challenge the integrity of the barrier.

**Fire Spread Potential To Fire Area RB-1N:**

Fire zone 8.2.8.B is separated from zones 1.1.1.3, 1.1.1.4 and 1.1.1.5 in area RB-1N by three-hour rated barriers. Given the vent area of zone 8.2.8.B (vents to 8.2.8.E and 1.1.1.5.A) and the sprinkler protection over the abandoned MG set area, a fire in 8.2.8.B is not expected to challenge these barriers.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 8.2.8.B is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

9.0 Lack of 3-Hour Fire Barriers Between the Equivalent Fire Areas 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D, Operating Floor, Turbine Building

**Issue:** Fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D are located on the same elevation of the Turbine Building and share boundaries which deviate from the requirements of Section III. G. 2 of Appendix R to 10 CFR 50, to the extent that it requires installation of 3-hour barriers between redundant divisions of safe shutdown (SS/D) components. The principle concern is that a fire in one of these zones could spread to the adjacent zone(s) and damage redundant SS/D equipment.

**Evaluation:** The zones adjacent to 8.2.8.B are 8.2.8.A and 8.2.8.C as discussed in **Barriers**, above. These zones contain switchgear used for safe shutdown purposes under Appendix R. The potential for fire spread to zones 8.2.8.A and 8.2.8.C is explored in **Fire Spread Potential**, above. This exploration concludes that spread to zone 8.2.8.A cannot be excluded, but would not cause a severe challenge to safe shutdown components in the zone. With respect to zone 8.2.8.C, the effectiveness of the separation features has been greatly improved by the installation of a three-hour rated barrier in place of a previously existing "water-curtain".

**CONCLUSION:**

The evaluation presented above as it relates to the potential for fire spread to zone 8.2.8.A from zone 8.2.8.B demonstrates that the changes in combustible loading values for zone 8.2.8.B do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

- The physical separation between zones 8.2.8.A and 8.2.8.B, in combination with the automatic suppression provided is suitable to prevent fire spread between the zones. Thus, the separation provided is sufficient for the hazard and a fire in zone 8.2.8.B will not result in the loss of redundant SS/D train equipment in zone 8.2.8.A and the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

The evaluation presented above for the potential for fire spread from zone 8.2.8.B to zone 8.2.8.C demonstrates that the separation features provided assures that fire will not spread between the two zones. Thus, the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994, can be substantiated.

- The separation provided between zones 8.2.8.B and 8.2.8.C can assure that fire spread between the zones will be precluded. Thus, the loss of redundant SS/D train equipment in zone 8.2.8.C from a fire in 8.2.8.B can be precluded and the objective of Appendix R with respect to the ability to establish and maintain safe shutdown can be achieved.

**Fire Zone: 8.2.8.A****Unit 1 Switchgear Area****Fire Area:** 14-1**F Drawing:** F-17-1**General Elevation:** 639'-0"**Zone Area:** 2,940 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat (thermal) detection protects abandoned MG set 1B and actuates water spray system. Local area smoke detection protects 4-kV switchgear 14-1.
<b>Suppression:</b>	Local area wet pipe and water spray sprinkler systems protect abandoned reactor recirculation MG set 1B-202-51.
<b>Manual Suppression:</b>	One hose station, equipped with 100 feet of hose. Another water hose station is located in Fire Zone 8.2.8.E, equipped with 100 feet of hose, a foam cart, and portable fire extinguisher(s).
<b>Other FP features:</b>	The abandoned MG Set is curbed.
<b>Suppression Effects:</b>	Any adverse effects on safe shut down through discharge of water in this area would be no more severe than those determined to be acceptable for a design-basis fire. Water runoff would be handled by the floor drains at el. 639'-0". The shield wall between this zone and Fire Zone 8.2.8.B as well as spray shields installed at the ceiling will prevent sprinkler water (from the MG sets sprinkler system) from discharging onto 4-kV switchgear panel 14-1. This panel is not sealed nor installed on a pedestal but curbs are provided for adjacent areas provided with fixed water suppression systems.

**Combustible Loading Limit:**

**Analyzed Combustible Loading Category:** Medium  
**Equivalent Fire Severity:** 2.5 Hours

**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
13-1	Equivalent 3 Hour[7]
TB-IV	Equivalent 3 Hour[7]
RB-1N	3 Hour
TB-III	Equivalent 3 Hour[22]
TB-II	Equivalent 3 Hour[21]

**Fire Zone: 8.2.8.A****Unit 1 Switchgear Area****Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.1.5.A	TB-IV	Non-rated	noncombustible	No doors	0'-6" thick concrete
8.2.7.A	TB-III	Non-rated[22]	noncombustible[22]	No doors	4'-0" thick concrete
8.2.7.C	TB-II	Non-rated[21]	noncombustible[21]	No doors	4'-0" thick concrete
8.2.7.B	TB-III	Non-rated[22]	3 hour seals under SWGR[22]	No doors	4'-0" thick concrete
1.1.1.4*	RB-1N	3 hour[6][7]	3 hour	No doors	1'-6" thick concrete
1.1.1.3*	RB-1N	3 hour[6][7]	3 hour (F-58, F-59)	No doors	4'-0" thick concrete
8.2.8.E	TB-IV	Non-rated [10]	none	No doors	No wall
8.2.8.B	13-1	3 hour [10]	3 hour (F-170)	No doors, one 3 hour rated damper	0'-11 5/8" thick concrete block

\* Secondary Containment Boundary

**Fire Zone: 8.2.8.A****Unit 1 Switchgear Area****Fire Protection Commitments:**

Reference Section	Commitment
1, 3.1.6	Independent feed for foam deluge system provided. Foam water system replaced with water spray system per [7](12.2).
1, 3.1.11	Provide curb around MG sets (MG sets are abandoned in place with oil removed). Also reference [1](5.19.6), [10](5.8.4.1), and [7](12.2).
1, 3.1.1	Provide fire detection in area of 4kV and 480V switchgear. Smoke detection provided per [7](12.2). Also reference [10](5.8.4.3), and [1](5.19.6).
1, 3.1.6	An automatic foam suppression system actuated by flame or infrared detectors for each MG set (MG sets are abandoned in place with oil removed). Foam water system replaced with water spray system per [7](12.2). Also reference [1](5.19), [1](4.3.1.6), and [10](5.8.4.1).
2	3-hour barrier between 4-kV SWGR 13-1 and 14-1 (23-1 and 24-1) along row 15 (11) extending to col G beyond MG sets. Also reference [15](5.1), [10](5.8.1), [7](12.2).
12	Replace foam system protecting MG sets (MG sets are abandoned in place with oil removed) with water spray system and use of thermostat detection. Also reference [7](12.2) and [10](5.8.4.1).
1, 5.19.6	Drains will be provided for the area enclosed by curbs.
7, 9.2	The U1 RB Mezzanine level is separated from the TB by a 3-hour barrier. Also reference [5]. There are some exceptions.
15, 5.1	There are no unsealed floor penetrations located near the SWGRs. Also reference [10](5.8.1).
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1. Also reference [10](5.8.1) and [15](5.1).
7, 12.2	Manual fire fighting equipment is available for this zone. Also reference [10](5.8.4.1).
7, 12.2	Partial (20 ft. high) fire barrier separates division SWGR. Also reference [10](5.8.1).
1, 5.19.4	Portable extinguishers and hose stations provided.
16, 3.1.6.b	Modify foam system design to provide 72 gallons of foam. Relocate system controls and have independent feed. Foam water system replaced with water spray system per [7](12.2).

17, 3.1.6.b	Two 150 gallon foam storage tanks are provided for systems. Foam water system replaced with water spray system per [7](12.2).
17, 3.1.6.b	Water supply for U1 foam system also supplies U2 sprinkler system, and water for U2 foam system also supplies U1 sprinkler system. Foam water system replaced with water spray system per [7](12.2).
18, D.1.j	Partial fire barriers and a water curtain provided on operating floor. See exemption requests for details.
10, 5.8.4.1	Fire suppression or detection provided. Smoke detection at ceiling per [7](12.2). Also [10](5.8.4.1).
7, 12.2	Provide 3-hour barrier (with 2-hour section) between RB and 480V SWGR areas. Also reference [10](5.8.1).
10, 5.8.4.1	No continuity of combustibles between 8.2.8.E and equivalent fire areas (8.2.8.A-D).
7, 12.2	Separate automatic wet pipe sprinkler system at ceiling to protect MG set (abandoned). Provide spray shields to prevent SWGR water damage. Provide water flow indication in control room per [1](5.19.4). Also reference [10](5.8.4.1).
15, 5.1	4-kV SWGRs for each unit separated by partial 3-hour barrier.

**Fire Zone: 8.2.8.A****Unit 1 Switchgear Area****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79.
4	Left blank intentionally
5	GL 86-10 Evaluation S040-QH-0611 Rev. 1.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	ComEd Request letter dated November 5, 1991.
9	Letter from CECO to NRC dated 4-10-78.
10	Exemption Request 5.8 (12-18-84). Exemption for lack of complete 3-hour barriers between equivalent fire areas 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D on the TB operating floor. Exemption granted (12.0) 12-11-87.
11	LER 85-018, Rev.00 12-11-85.
12	Letter, J. Wojnarowski (CECO) to R. Denton (NRC) 4
13	Left Blank Intentionally.
14	Left Blank intentionally.
15	Appendix R Exemption Requests, Section 5.1.
16	SER, November 5, 1980.
17	SER, February 12, 1981.
18	ComEd response to the requirements of Appendix A
19	SER, March 2, 1994.
20	Lack of complete detection and suppression for Fire Area 13-1, 14-1, 23-1, 24-1, NDIT QDC-98-130.
21	Evaluation for fire area separation between TB-II and TB-IV, ER9801622.
22	Evaluation for fire area separation between TB-III and TB-IV, ER9801624.

**ZONE:** 8.2.8.A      **AREA:** 14-1 (Equivalent Fire Area)      **LOCATION:** TB, Elev. 639

**ZONE DESCRIPTION:**

Fire Zone 8.2.8.A is on elevation 639 of the Turbine Building.

The zone extends from the 639 foot elevation to the bottom of the floor at elevation 658 and is bounded by the building exterior wall on the south side, by column line G to the west, by zone 8.2.8.B to the north at column line 15, and column line H to the east.

This zone contains the abandoned 1B Reactor Recirc. System MG Set and a 4kV switchgear.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.8.E, west	TB-IV
8.2.8.B, north	13-1 <sup>3</sup>
1.1.1.5.A, above, and north	TB-IV
8.2.7.C	TB-II
8.2.7.A, 8.2.7.B, below	TB-III
1.1.1.3, 1.1.1.4, east	RB-1

**DETECTION:**

Heat detection is provided over the MG set and smoke detection over the switchgear.

**AUTOMATIC SUPPRESSION:**

Wet-pipe sprinkler protection and a water spray system are provided for the MG set area.

**COMBUSTIBLE LOADING:**

Calculated Value: Medium

**FIRE SEVERITY:**

Less than 2.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

Electrical cables contribute a minor amount to the loading. The rest of the fixed combustibles consists of various materials distributed throughout the zone with good spatial separation. The only fixed combustible capable of sustaining a severe fire in the zone is the lubricating oil. The zone is classified as having medium fire severity, but its combustible loading is generally lower since the MG sets were abandoned with their oil removed.

<sup>3</sup> Equivalent Fire Area as defined in Section 1.4



Transients account for a moderate portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The main hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of producing such propagation are the electrical cables and the lubricating oil.

The installed detection system should provide for detection of fires in the vicinity of the switchgear and the abandoned recirc. MG set and notification of operating personnel via Control Room annunciation. This notification should prompt fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Availability of adequate standpipe hose lines for manual fire fighting.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 8.2.8.A:**

In general, the potential for fire spread within the zone is limited by the discontinuity of combustibles. An exception to this is the electrical cables in the tray system. The cables form a continuous combustible path over a portion of the zone, providing a means for spreading fire. The abandoned MG set has been drained of oil, eliminating the oil as a fire hazard. The sprinkler protection will limit the impact of the fire immediately around the MG set, however, it will have little effect on fire damage in the remainder of the zone. A fire in this zone would be expected to cause damage throughout.

**Fire Spread Potential Within Fire Area TB-IV:**

Fire spread to zone 8.2.8.E, west of 8.2.8.A, is likely should a serious fire occur in zone 8.2.8.A due to the lack of any separating barrier. However, due to the discontinuity of combustibles, the sprinkler protection over the MG set area (MG sets abandoned, oil removed) and the large volume of zone 8.2.8.E, this should not result in serious damage in zone 8.2.8.E.

Fire zone 1.1.1.5.A is located above a portion of zone 8.2.8.A. The potential for fire spread to 1.1.1.5.A is limited by the reinforced concrete floor separating the two.

**Fire Spread Potential To Equivalent Fire Area 13-1:**

The potential for spread of fire to zone 8.2.8.B is limited by a three-hour rated barrier which separates the two zones. Given the vent areas of zone 8.2.8.A (vents to 8.2.8.E), and the sprinkler protection over the MG set area, (MG sets abandoned, oil removed) a fire in 8.2.8.A is not expected to challenge this barrier. Hot combustion products and possible flames could intrude into zone 8.2.8.B above the level of the barrier, however, this is not expected to impair safe shutdown components in the zone.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II (zone 8.2.7.C) is separated from zone 8.2.8.A by the reinforced concrete floor of zone 8.2.8.A. The spread of fire via this avenue is not considered credible since the fire loading in zone 8.2.8.A is not sufficient to challenge the integrity of the barrier.

**Fire Spread Potential To Fire Area TB-III:**

Fire area TB-III (zones 8.2.7.A and 8.2.7.B) is separated from zone 8.2.8.A by a heavy reinforced concrete floor/ceiling assembly. The fire loading in zone 8.2.8.A is not sufficient to challenge the integrity of this barrier. The barrier does have unsealed piping penetrations in it, however. Given the nature and distribution of combustibles in zone 8.2.8.A, fire extension downward to 8.2.7.A is not likely, but cannot be fully discounted.

**Fire Spread Potential To Fire Area RB-1:**

Fire zone 8.2.8.A is separated from zones 1.1.1.3 and 1.1.1.4 in area RB-1 by a three-hour rated barrier. Given the vent path to zone 8.2.8.E, the sprinkler protection over the MG set, (MG sets abandoned, oil removed) and the combustible loading, a fire in zone 8.2.8.A is not expected to challenge the integrity of the barrier.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issues identified in the SER relative to zone 8.2.8.A are addressed below. Each issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

9.0      Lack of 3-Hour Fire Barriers Between the Equivalent Fire Areas 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D, Operating Floor, Turbine Building

**Issue:** Fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D are located on the same elevation of the Turbine Building and share boundaries which deviate from the requirements of Section III. G. 2 of Appendix R to 10 CFR 50, to the extent that it requires installation of 3-hour barriers between redundant divisions of safe shutdown (SS/D) components. The principle concern is that a fire in one of these zones could spread to the adjacent zone and damage redundant SS/D equipment.

**Evaluation:** The zone adjacent to 8.2.8.A is 8.2.8.B as discussed in **Barriers**, above. These zones contain switchgear and a control panel that is used for safe shutdown purposes under Appendix R. The potential for fire spread to zone 8.2.8.B is explored in **Fire Spread Potential**, above. This exploration concludes that spread to the adjacent zone is not expected, but, without automatic suppression, cannot be discounted.

**CONCLUSION:**

The evaluation presented above for fire zone 8.2.8.A demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The physical separation between zones 8.2.8.A and 8.2.8.B, in combination with the automatic suppression provided, is suitable to prevent fire spread between the zones. Thus, the separation provided is sufficient for the hazard and a fire in zone 8.2.8.A will not result in the loss of redundant SS/D train equipment in zone 8.2.8.B and the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 8.2.8.D****Unit 2 Switchgear Area****Fire Area:** 23-1**F Drawing:** F-18-1**General Elevation:** 639'-0"**Zone Area:** 2,940 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat (thermal) detection protects MG set 2A (abandoned in place, oil removed) and actuates automatic water spray system. Local area smoke detection protects 4-kV switchgear 23-1.
<b>Suppression:</b>	Local area wet pipe and automatic water spray sprinkler systems protect reactor recirculation MG set 2A-202-51 (abandoned in place, oil removed).
<b>Manual Suppression:</b>	One hose station, equipped with 100 feet of hose, and in adjacent Fire Zone 8.2.8.E, is a water hose station, equipped with 100 feet of hose and portable fire extinguishers.
<b>Other FP features:</b>	MG Set Unit is curbed (abandoned in place, oil removed).
<b>Suppression Effects:</b>	Any adverse effects on safe shut down through discharge of water in this area would be no more severe than those determined to be acceptable for a design-basis fire. Water runoff would be handled by the floor drains at el. 639'-0". The shield wall between this zone and Fire Zone 8.2.8.C as well as spray shields installed at the ceiling will prevent sprinkler water (from the sprinkler system) from discharging onto 4-kV switchgear panel 23-1. This panel is not sealed nor installed on a pedestal.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
24-1	Equivalent 3 Hour [10]
TB-IV	Equivalent 3 Hour [10]
TB-II	Equivalent 3 Hour [13][23]
RB-2N	3 Hour
TB-I	Equivalent 3 Hour [13]

**Fire Zone: 8.2.8.D****Unit 2 Switchgear Area****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
1.1.2.4*	RB-2N	3 hour	3 hour (F-75, 76)	No doors	1'-6" thick concrete
1.1.2.3*	RB-2N	3 hour	3 hour	No doors	4'-0" thick concrete
8.2.7.C	TB-II	Non-rated[13][23]	noncombustible[23]	No doors	4'-0" thick concrete
8.2.7.E	TB-I	Non-rated	noncombustible	No doors	4'-0" thick concrete
8.2.7.D	TB-I	Non-rated	noncombustible (3 hour under SWGR)[20]	No doors	4'-0" thick concrete
1.1.1.5.A	TB-IV	Non-rated	noncombustible	No doors	0'-6" thick concrete ceiling
8.2.8.E	TB-IV	Non-rated [10]	none	No doors	No wall
8.2.8.C	24-1	3 hour	3 hour (F-171)	No doors, one 3 hour rated damper	0'-11 5/8" thick concrete block

\* Secondary Containment Boundary

**Fire Zone: 8.2.8.D****Unit 2 Switchgear Area****Fire Protection Commitments:**

Reference Section	Commitment
7, 6.2	Manual fire fighting equipment is available for this zone. Also reference [10](5.8.4.3) and [7](12.2).
1, 3.1.11	Provide curb around MG sets (MG set abandoned in place, curb retained). Also reference [7](12.2), [10](5.8.4.3), and [1](5.19.6).
1, 3.1.1	Provide fire detection in area of 4kV and 480V switchgear. Smoke detection provided per [7](12.2). Also reference [7](6.2), [10](5.8.4.3), and [1](5.19.6).
1, 3.1.6(b)	An automatic foam suppression system actuated by flame or infrared detectors for each MG set (MG set abandoned in place, sprinkler system retained). Foam water system replaced with water spray system per [7](12.2). Also reference [1](5.19), [1](4.3.1.6).
2	3-hour barrier between 4-kV SWGR 13-1 and 14-1 (23-1 and 24-1) along row 15 (11) extending to col G beyond MG sets (abandoned). Also reference [15](5.1), [10](5.8.1), [7](12.2), and [10](5.8.4.3).
12	Replace foam system protecting MG sets with water spray system and use of thermostat detection (MG set abandoned in place, sprinkler system retained). Also reference [7](12.2), [10](5.8.4.3).
1, 5.19.6	Drains will be provided for the area enclosed by curbs.
7, 9.2	The U1 RB Mezzanine level is separated from the TB by a 3-hour barrier. Also reference [5].
15, 5.1	There are no unsealed penetrations located near the SWGRs. Also reference [10](5.8.1).
12.2	MG set 2A-202-51 is protected by a wet pipe sprinkler system (MG set abandoned in place, sprinkler system retained). Baffles provided to prevent SWGR damage. Provide water flow indication in control room. Also reference [10](5.8.4.3) and [1](5.19.4).
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1. Also reference [10](5.8.1), and [15](5.1).
7, 12.2	No intervening combustibles between SWGR divisions. Also reference [10](5.8.4.3).
15, 5.1	4-kV SWGRs for U1 and U2 separated by partial 3-hour barrier.

18, D.1.j	Partial fire barriers and a water curtain provided on operating floor. See exemption requests for details.
17, 3.1.6.b	Water supply for U1 foam system also supplies U2 sprinkler system, and water for U2 foam system also supplies U1 sprinkler system. Foam water system replaced with water spray system per [7](12.2).
17, 3.1.6.b	Two 150 gallon foam storage tanks are provided for systems. Foam water system replaced with water spray system per [7](12.2).
16, 3.1.6.b	Modify foam system design to provide 72 gallons of foam. Relocate system controls and have independent feed. Foam water system replaced with water spray system per [7](12.2).
1, 3.1.6	Independent feed for foam deluge system provided. Foam water system replaced with water spray system per [7](12.2).
15, 5.10.5	Provide 1-hour penetration seals through floor to bottom of SWGR. A 3-hour floor rating is required per [15](5.10.5). 3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1. Also reference [10](5.8.1), and [15](5.1).
10, 5.8.4.3	No continuity of combustibles between 8.2.8.E and equivalent fire areas (8.2.8.A-D). No continuity of combustibles through the floor slab.
10, 5.8.1	Provide 3-hour barrier (with 2-hour section) between RB and 480V SWGR areas.
7, 12.2	Complete automatic fire detection provided. Smoke detection at ceiling. Also reference [10](5.8.4.3).
15, 5.10.4.1	All electrical penetrations except through floor slab and SWGR are sealed with noncombustible material.
7, 12.2	Partial (20 ft. high) fire barrier separates division SWGR. Also reference [10](5.8.1).
1, 5.19.4	Portable extinguishers and hose stations provided.

**Fire Zone: 8.2.8.D****Unit 2 Switchgear Area****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
3	Letter, CECO to NRC 3-29-79
4	Intentionally left blank.
5	GL 86-10 Evaluation S040-QH-0612 Rev. 1.
6	NRC Exemption Aug. 18, 1989.
7	SER, July 21, 1988.
8	Intentionally Left Blank.
9	Letter from CECO to NRC dated 4-10-78.
10	Exemption Request 5.8 (12-18-84). Exemption for lack of complete 3-hour barriers between equivalent fire areas 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D on the TB operating floor. Exemption granted 12-11-87 (12.0).
11	LER 85-018, Rev.00 12-11-85.
12	Letter, J. Wojnarowski (CECO) to R. Denton (NRC) 4
13	GL 86-10 Evaluation S040-QH-0613 Rev. 1.
14	Exemption Request 7.1
15	Appendix R Exemption Requests, Section 5.10.
16	SER, November 5, 1980.
17	SER, February 12, 1981.
18	ComEd response to the requirements of Appendix A
19	ComEd Request letter dated November 5, 1991.
20	The barrier separating fire zone 8.2.8.D from fire zone 8.2.7.D contains 4kV bus duct penetration (SWGR 23-1 feed from the swing diesel generator).
21	SER, March 2, 1994.
22	Lack of complete detection and suppression for Fire Area 13-1, 14-1, 23-1, 24-1, NDIT QDC-98-130.
23	Evaluation for fire area separation between TB-II and TB-IV, ER9801622.



**ZONE:** 8.2.8.D      **AREA:** 23-1 (Equivalent Fire Area)      **LOCATION:** TB, Elev. 639

**ZONE DESCRIPTION:**

Fire Zone 8.2.8.D is on elevation 639 of the Turbine Building.

The zone extends from the 639 foot elevation to the bottom of the floor at elevation 658 and is bounded by the building exterior wall on the north side, by column line G to the west, by zone 8.2.8.C to the south at column line 11, and column line H to the east.

This zone contains the 2A Reactor Recirc. System MG Set (abandoned, oil removed) and a 4kV switchgear.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.8.E, west	TB-IV
8.2.8.C, south	24-1 <sup>4</sup>
1.1.1.5.A, above, and north	TB-IV
8.2.7.C	TB-II
8.2.7.D, 8.2.7.E, below	TB-I
1.1.2.3, 1.1.2.4, east	RB-2N

**DETECTION:**

Heat detection is provided over the MG set (abandoned, oil removed), and smoke detection over the switchgear.

**AUTOMATIC SUPPRESSION:**

Wet-pipe sprinkler protection and a water spray system are provided for the MG set area (abandoned, oil removed).

**COMBUSTIBLE LOADING:**

Calculated Value: Medium

**FIRE SEVERITY:**

Less than 2.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed primarily of electrical cables. The rest of the fixed combustibles consists of various materials distributed about the zone. The zone is classified as having medium fire severity, but its combustible loading is generally lower since the MG sets were abandoned with their oil removed.

<sup>4</sup> Equivalent Fire Area, as defined in Section 1.4

Transients account for a moderate portion of the total combustibles which may be in the zone. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The main hazard associated with transients in this zone is the potential for a localized fire which may expose combustibles capable of producing a severe fire.

The installed detection system should provide for detection of fires in the vicinity of the switchgear and the recirc. MG set (abandoned, oil removed) and notification of operating personnel via Control Room annunciation. This notification should prompt fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade performance may be hampered by:

- Fires involving combustible liquids

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 8.2.8.D:**

In general, the potential for fire spread within the zone is limited by the discontinuity of combustibles. An exception to this is the electrical cables in the tray system. The cables form a continuous combustible path over a portion of the zone, providing a means for spreading fire. The fire suppression protection will limit the impact of the fire immediately around the MG set (abandoned, oil removed), however, it will have little effect on fire damage in the remainder of the zone.

**Fire Spread Potential To Fire Area TB-IV:**

Fire spread to zone 8.2.8.E, west of 8.2.8.D, is likely should a serious fire occur in zone 8.2.8.D due to the lack of any separating barrier. However, due to the discontinuity of combustibles, the sprinkler protection over the MG set area (MG sets abandoned, oil removed), and the large volume of zone 8.2.8.E this should not result in serious damage in zone 8.2.8.E.

Fire zone 1.1.1.5.A is located above a portion of zone 8.2.8.D. The potential for fire spread to 1.1.1.5.A is limited by the reinforced concrete floor separating the two.

**Fire Spread Potential To Equivalent Fire Area 24-1:**

The potential for spread of fire to zone 8.2.8.C (Fire Area 24-1) is limited by a three-hour rated barrier which separates the two zones. Given the vent area of zone 8.2.8.D (vents to 8.2.8.E), and the sprinkler protection over the MG set area (abandoned), a fire in 8.2.8.D is not expected to challenge this barrier. Hot combustion products and possibly flames could intrude into zone 8.2.8.C above the level of the barrier, however, this is not expected to impair safe shutdown components in the zone.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II (zone 8.2.7.C) is separated from zone 8.2.8.D by the reinforced concrete floor of zone 8.2.8.D. The spread of fire via this avenue is not considered credible since the fire loading in zone 8.2.8.D is not sufficient to challenge the integrity of the barrier.

**Fire Spread Potential To Fire Area TB-I:**

Fire area TB-I (zones 8.2.7.D and 8.2.7.E) is separated from zone 8.2.8.D by a heavy reinforced concrete floor/ceiling assembly. The fire loading in zone 8.2.8.D is not sufficient to challenge the integrity of this barrier. The barrier does have unsealed piping penetrations in it, however. Given the nature and distribution of combustibles in zone 8.2.8.D, fire extension downward to 8.2.7. D is not likely, but cannot be fully discounted.

**Fire Spread Potential To Fire Area RB-2N:**

Fire zone 8.2.8.D is separated from zones 1.1.2.3 and 1.1.2.4 in area RB-2N by a three-hour rated barrier. Given the vent path to zone 8.2.8.E, the sprinkler protection over the MG set (abandoned, oil removed), and the combustible loading, a fire in zone 8.2.8.D is not expected to challenge the integrity of the barrier.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 8.2.8.D is addressed below. The issue carries thenumber of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

9.0 Lack of 3-Hour Fire Barriers Between the Equivalent Fire Areas 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D, Operating Floor, Turbine Building

**Issue:** Fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D are located on the same elevation of the Turbine Building and share boundaries which deviate from the requirements of Section III. G. 2 of Appendix R to 10 CFR 50, to the extent that it requires installation of 3-hour barriers between redundant divisions of safe shutdown (SS/D) components. The principle concern is that a fire in one of these zones could spread to the adjacent zone and damage redundant SS/D equipment.

**Evaluation:** The zone adjacent to 8.2.8.D is 8.2.8.C as discussed in **Barriers**, above. These zones contain switchgear and a control panel that is used for safe shutdown purposes under Appendix R. The potential for fire spread to zone 8.2.8.C is explored in **Fire Spread Potential**, above. This exploration concludes that spread to the adjacent zone is not expected, but without automatic suppression, cannot be discounted.

**CONCLUSION:**

The evaluation presented above for fire zone 8.2.8.D demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The physical separation between zones 8.2.8.D and 8.2.8.C, in combination with the automatic suppression provided, is suitable to prevent fire spread between the zones. Thus, the separation provided is sufficient for the hazard and a fire in zone 8.2.8.D will not result in the loss of redundant SS/D train equipment in zone 8.2.8.C and the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 8.2.8.C****Unit 2 Switchgear Area****Fire Area:** 24-1**F Drawing:** F-5-1,18-1**General Elevation:** 639/647-6**Zone Area:** 2,146 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	Local area heat (thermal) detection protects MG set 2B (abandoned, oil removed) and actuates automatic water spray system. Local area smoke detection protects 4-kV switchgear 24-1 and 480-V switchgear 28 and 29.
<b>Suppression:</b>	Local area wet pipe and automatic water spray sprinkler systems protect reactor recirculation MG set 2B-202-51 (abandoned, oil removed).
<b>Manual Suppression:</b>	Fire extinguisher(s) available in zone 8.2.8.C. A hose station, equipped with 100 feet of hose, is available in adjacent fire zone 8.2.8.E
<b>Other FP features:</b>	Curbs, spray shields, and floor drains are installed.
<b>Suppression Effects:</b>	Any adverse effects on safe shut down through discharge of water or Carbon Dioxide in this area would be no more severe than those determined to be acceptable for a design-basis fire. Water runoff would be handled by the floor drains at el. 639'-0". Curbs, spray shields, and floor drains are installed. The spray shields installed at the ceiling will prevent sprinkler water from discharging onto 4-kV switchgear panel 24-1 (no pedestals nor water seals on switchgear) and 480-V switchgear panels 28 and 29 (pedestals provided but top of switchgear not sealed). This area is open to hose stream entry from Fire Zone 8.2.8.E but hose discharge will be deflected by the spray shields at the ceiling and a shield wall between this zone and 8.2.8.B.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u><b>Fire Area</b></u>	<u><b>Barrier Description</b></u>
TB-IV	Equivalent 3 Hour [7]
23-1	Equivalent 3 Hour [7]
13-1	Equivalent 3 Hour [7]
RB-2N	3 Hour
TB-II	Equivalent 3 Hour[24]

**Fire Zone: 8.2.8.C****Unit 2 Switchgear Area****Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
8.2.8.D	23-1	3 hour	3 hour	No doors, one 3 hour rated damper	0'-11 5/8" thick concrete block wall
8.2.7.C	TB-II	Non-rated[24]	noncombustible (3 hour under	No doors	4'-0" thick concrete
1.1.1.5.A	TB-IV	Non-rated	noncombustible	No doors	0'-6" thick concrete floor (1'-6" thick at
1.1.2.5*	RB-2N	3 hour	3 hour	No doors	1'-0" thick concrete
1.1.2.4*	RB-2N	3 hour except at SBT line [6][7]	3 hour (F-78)	One Class A door	1'-6" thick concrete
1.1.2.3*	RB-2N	3 hour	3 hour	No doors	2'-0" thick concrete floor (4'-0" thick at
8.2.8.E	TB-IV	Open [10]	open [10]	No doors	No wall
8.2.8.B	13-1	3 hour	3 hour (F-73)	Two 3 hour doors	11-5/8" thick concrete block

\* Secondary Containment Boundary

**Fire Zone: 8.2.8.C****Unit 2 Switchgear Area****Fire Protection Commitments:**

Reference Section	Commitment
2	3-hour barrier between 4-kV SWGR 13-1 and 14-1 (23-1 and 24-1) along row 15 (11) extending to col G beyond MG sets (MG sets abandoned. Curbs and sprinkler system retained). Also reference [15](5.1), [7](12.2) and [10](5.8.4.3).
2	3-hour seals at bottom of SWGR's 13-1, 14-1, 23-1, and 24-1. Also reference [15](5.1) and [10](5.8.1).
15, 5.1	There are no unsealed penetrations located near the SWGRs. Provide Class A Fire Door leading to the Unit 1 and 2 Reactor Building. Also reference [10](5.8.1).
7, 12.2	Area beneath water curtain is curbed and drained. Also reference [10](5.8.4.2) and [15](5.1). Water curtain has been replaced by a 3 hour wall [22].
7, 9.2	Provide 3-hour separation between RB and TB. There are some exceptions. Also reference [5].
7, 12.2	Smoke detection provided at ceiling. Also reference [10](5.8.4.3) and [1](3.1.1).
1, 5.19.6	Drains will be provided for the area enclosed by curbs.
12	Replace foam system protecting MG sets (MG sets abandoned. Curbs and sprinkler system retained) with water spray system and use of thermostat detection. Also reference [7](12.2) and [10](5.8.4.3).
10, 5.8.4.2	No continuity of combustibles between 8.2.8.E and equivalent fire areas (8.2.8.A-D).
2	Water curtain between units on main operating floor separates U1 and U2 SWGR. Water curtain actuated by separate smoke detection. Also reference [15](5.1), [7](12.2), [10](5.8.1) and [10](5.8.4.2). Water curtain has been replaced by a 3 hour wall [22].
7, 12.2	Provide separate automatic wet pipe sprinkler system at ceiling for MG sets (MG sets abandoned. Curbs and sprinkler system retained). Provide spray shields to prevent damage to SWGR. Provide water flow indication in control room. Also reference [10](5.8.4.3) and [1](5.19.4).
1, 3.1.6	An automatic foam suppression system actuated by flame or infrared detectors for each MG set (MG sets abandoned. Curbs and sprinkler system retained). Foam water system replaced with thermally actuated water spray system per [7](12.2). Also reference [15](5.1), [5](4.3.4), [1](5.19), [1](4.3.1.6).
1, 3.1.1	Provide fire detection in area of 4kV and 480V switchgear. Smoke detection provided per [7](12.2). Also reference [10](5.8.4.2), [1](1.3.1.1), and [1](5.19.6).
1, 3.1.11	Provide curb around MG sets (MG sets abandoned. Curbs and sprinkler system retained). Also reference [7](12.2), [10](5.8.4.2), and [1](5.19.6).

**Fire Zone: 8.2.8.C**

**Unit 2 Switchgear Area**

- 2 3-hour wall between U1 and U2 480-V switchgear area. Also reference [7](12.2) and [10](5.8.1).
- 17, 3.1.6.b Two 150 gallon foam storage tanks are provided for systems. Foam water system replaced with water spray system per [7](12.2).
- 7, 12.2 3-hour barrier separates fire areas along col. G to H at 11. Full height partial fire barrier for div. 4-kV. Also reference [10](5.8.4.3).
- 7, 12.2 Partial (20' high) fire barrier separates division SWGR. Also reference [10](5.8.1).
- 4 Fire suppression or detection provided.
- 15, 5.1 Provide automatic fixed water suppression and foam water systems for MG sets (MG set abandoned, sprinkler system retained). Foam water system replaced with water spray system per [7](12.2). Also reference [5](4.3.4).
- 7, 12.2 Provide 3-hour barrier (with 2-hour section) between RB and 480V SWGR areas. Provide Class A fire door. Also reference [10](5.8.1) and [5](4.3.4).
- 17, 3.1.6.b Water supply for U1 foam system also supplies U2 sprinkler system, and water for U2 foam system also supplies U1 sprinkler system. Foam water system replaced with water spray system per [7](12.2).
- 7, 12.2 Automatic open head water curtain along col. line 13 separates U1 and U2 SWGR. Also reference [10](5.8.1) and [10](5.8.4.2). Water curtain has been replaced by a 3 hour wall [22].
- 16, 3.1.6.b Modify foam system design to provide 72 gallons of foam. Relocate system controls and have independent feed. Foam water system replaced with water spray system per [7](12.2).
- 1, 5.19.4 Portable extinguishers and hose stations provided.
- 1, 3.1.6 Independent feed for foam deluge system provided. Foam water system replaced with water spray system per [7](12.2).
- 7, 12.2 No intervening combustibles between SWGR divisions. Also reference [10](5.8.4.3).
- 7, 12.2 No intervening combustibles between U1 and U2 SWGR. Also reference [10](5.8.4.2).
- 7, 12.2 1 photoelectric and 2 ionization smoke detectors are provided to actuate water curtain. Water curtain has been replaced by a 3 hour wall [22].
- 7, 12.2 Manual fire fighting equipment is available for this zone. Also reference [10](5.8.4.3).
- 19, D.1.j Partial fire barriers and a water curtain provided on operating floor. See exemption requests for details.



**Fire Zone: 8.2.8.C****Unit 2 Switchgear Area****Notes and References:****Number Description**

- 1 SER, July 27, 1979.
- 2 Letter, B. Rybak (CECO) to R. Denton (NRC) 12-18-8
- 3 Letter, CECO to NRC 3-29-79.
- 4 GL 86-10 Evaluation S040-QH-0610 Rev. 1.
- 5 GL 86-10 Evaluation S040-QH-0612 Rev. 1.
- 6 NRC Exemption Aug. 18, 1989.
- 7 SER, July 21, 1988.
- 8 Left Intentionally Blank.
- 9 Letter from CECO to NRC dated 4-10-78.
- 10 Exemption Request 5.8 (12-18-84). Exemption for lack of complete 3-hour barriers between equivalent fire areas 8.2.8.A, 8.2.8.B, 8.2.8.C, and 8.2.8.D on the TB operating floor. Exemption granted (12.0) 12-11-87.
- 11 LER 85-018, Rev.00 12-11-85.
- 12 Letter, J. Wojnarowski (CECO) to R. Denton (NRC) 4
- 13 Left Intentionally Blank.
- 14 ComEd Request letter dated November 5, 1991.
- 15 Appendix R Exemption Requests, Section 5.1.
- 16 SER, November 5, 1980.
- 17 SER, February 12, 1981.
- 18 GL 86-10 Evaluation QC-98-009.
- 19 ComEd response to the requirements of Appendix A
- 20 The previous FHA references exemption request 5.6. The exemption request 5.6 has been withdrawn.
- 21 SER, March 2, 1994.
- 22 DCP 9700200, Installation of block wall to replace Water Curtain.
- 23 Lack of complete detection and suppression for Fire Area 13-1, 24-1, GL 86-10 Evaluation NTSC 98-020.004 Rev. 3.
- 24 Evaluation for fire area separation between TB-II and TB-IV, ER9801622.

**ZONE:** 8.2.8.C      **AREA:** 24-1 (Equivalent Fire Area)      **LOCATION:** TB, Elev. 639

**ZONE DESCRIPTION:**

Fire Zone 8.2.8.C is on elevation 639 of the Turbine Building, adjacent to the turbine operating floor.

The zone extends from the 639 foot elevation to the bottom of the floor at elevation 658 and is bounded by zone 8.2.8.B on the south side, by column line G to the west, by zone 8.2.8.D to the north at column line 11, and column line H to the east.

This zone contains the 2B Reactor Recirc. MG Set (abandoned), two oil-filled transformers a 4-kV switchgear, and two 480 volt switchgear.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
8.2.8.E, west	TB-IV
8.2.8.B, south	13-1 <sup>5</sup>
8.2.8.D, north	23-1 <sup>6</sup>
1.1.1.5.A, above	TB-IV
8.2.7.C	TB-II
1.1.2.3, 1.1.2.4, 1.1.2.5, east	RB-2N

**DETECTION:**

Heat detection is provided over the MG set (abandoned), and smoke detection over the switchgear.

**AUTOMATIC SUPPRESSION:**

Wet-pipe sprinkler protection and a water spray system are provided for the MG set area (abandoned)..

**COMBUSTIBLE LOADING:**

Calculated Value: Medium

**FIRE SEVERITY:**

Less than 2.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed of residual lubricating oil associated with the MG set (abandoned). Transformer oil is also a significant contributor, and electrical cables contribute a minor amount to the loading. The rest of the fixed combustibles consist of various materials distributed about the zone. The only fixed combustible capable of sustaining a severe fire is the transformer oil. The zone is classified as having medium fire severity, but its combustible loading is generally lower since the MG sets were abandoned with their oil removed.

<sup>5</sup> Equivalent Fire Area, as defined in Section 1.4

<sup>6</sup> Ibid

Transients account for a relatively small amount of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The main hazard associated with transients in this zone, is the potential for a localized fire which may expose combustibles capable of producing a severe fire. The only fixed combustibles capable of producing such propagation are the transformer oil and electrical cables.

The installed detection system should provide for detection of fires in the vicinity of the switchgear and the recirc. MG set (abandoned) and notification of operating personnel via Control Room annunciation. This notification should prompt fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- High ceilings with vertical vent paths which will allow smoke and heat venting from the zone; minimizing the likelihood that heat and smoke will adversely affect access and visibility;
- Multiple and separate means of access for fire fighting; and
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade performance may be hampered by:

- Fires involving polychlorinated biphenyls (PCB's).

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 8.2.8.C:**

Several combustibles are capable of producing an extensive fire in this zone. The cables form a continuous combustible path from one end of the zone to the other, providing a means for spreading fire, should they become ignited. The sprinkler protection will limit the impact of the fire immediately around the MG set (abandoned), however it will have little effect on fire damage in the remainder of the zoned. The oil filled transformers are surrounded by curbs which may be effective in containing small spills or leakage, but ineffective in the event of a rupture or other significant failure of the transformer tank. A fire in this zone would be expected to cause damage throughout.

**Fire Spread Potential To Fire Area TB-IV:**

Fire spread to zone 8.2.8.E, west of 8.2.8.C, is likely should a serious fire occur in zone 8.2.8.C due to the lack of any separating barrier. However, due the discontinuity of combustibles, the sprinkler protection over the abandoned MG set area, and the large volume of zone 8.2.8.E, this should not result in serious damage in zone 8.2.8.E.

Fire zone 1.1.1.5.A is located above a portion of zone 8.2.8.C. A reinforced concrete floor separates the two zones. There are a number of openings in the floor such that fire spread to 1.1.1.5.A is likely.

**Fire Spread Potential To Equivalent Fire Area 23-1:**

The potential for spread of fire to zone 8.2.8.D is limited by a three-hour rated barrier which separates the two zones. Given the vent area of zone 8.2.8.C (vents to 8.2.8.E and 1.1.1.5.A) and the sprinkler protection over the abandoned MG set area, a fire in 8.2.8.C is not expected to challenge this barrier. Hot combustion products and possibly flames could intrude into zone 8.2.8.D above the level of the barrier, however, this is not expected to impair safe shutdown components in the zone.

**Fire Spread Potential To Equivalent Fire Area 13-1:**

The potential for fire spread to zone 8.2.8.B is limited by a three-hour rated barrier which separates the two zones. Given the vent area of zone 8.2.8.C (vents to 8.2.8.E and 1.1.1.5.A) and the sprinkler protection over the abandoned MG set area, a fire in 8.2.8.C is not expected to challenge this barrier.

**Fire Spread Potential To Fire Area TB-II:**

Fire area TB-II (zone 8.2.7.C) is separated from zone 8.2.8.C by the reinforced concrete floor of zone 8.2.8.C. The spread of fire via this avenue is not considered credible since the fire loading in zone 8.2.8.C is not sufficient to challenge the integrity of the barrier.

**Fire Spread Potential To Fire Area RB-2N:**

Fire zone 8.2.8.C is separated from zones 1.1.2.3, 1.1.2.4, and 1.1.2.5 in area RB-2N by three-hour rated barriers. Given the vent area of zone 8.2.8.C (vents to 8.2.8.E and 1.1.1.5.A) and the sprinkler protection over the abandoned MG set area, a fire in 8.2.8.C is not expected to challenge these barriers.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 8.2.8.C is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

9.0 Lack of 3-Hour Fire Barriers Between the Equivalent Fire Areas 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D, Operating Floor, Turbine Building

**Issue:** Fire zones 8.2.8.A, 8.2.8.B, 8.2.8.C and 8.2.8.D are located on the same elevation of the Turbine Building and share boundaries which deviate from the requirements of Section III. G. 2 of Appendix R to 10 CFR 50, to the extent that it requires installation of 3-hour barriers between redundant divisions of safe shutdown (SS/D) components. The principle concern is that a fire in one of these zones could spread to the adjacent zone(s) and damage redundant SS/D equipment.

**Evaluation:** The zones adjacent to 8.2.8.C are 8.2.8.B and 8.2.8.D as discussed in **Barriers**, above. These zones contain switchgear used for safe shutdown purposes under Appendix R. The potential for fire spread to zones 8.2.8.B and 8.2.8.D is explored in **Fire Spread Potential**, above. This exploration concludes that spread to zone 8.2.8.D cannot be excluded, but would not cause a severe challenge to safe shutdown components in the zone. With respect to zone 8.2.8.B, the effectiveness of the separation features has been greatly improved by the installation of a three-hour rated barrier in place of a previously existing "water-curtain".

**CONCLUSION:**

The evaluation presented above as it relates to the potential for fire spread to zone 8.2.8.D from zone 8.2.8.C demonstrates that the changes in combustible loading values for zone 8.2.8.C do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The physical separation between zones 8.2.8.C and 8.2.8.D, in combination with the automatic suppression provided, is suitable to prevent fire spread between the zones. Thus, the separation provided is sufficient for the hazard and a fire in zone 8.2.8.C will not result in the loss of redundant SS/D train equipment in zone 8.2.8.D and the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

The evaluation presented above for the potential for fire spread from zone 8.2.8.C to zone 8.2.8.B demonstrates that the separation features provided assures that fire will not spread between the two zones. Thus, the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994, can be substantiated.

The separation provided between zones 8.2.8.C and 8.2.8.B can assure that fire spread between the zones will be precluded. Thus, the loss of redundant SS/D train equipment in zone 8.2.8.B from a fire in 8.2.8.C can be precluded and the objective of Appendix R with respect to the ability to establish and maintain safe shutdown can be achieved.

**Fire Zone: 11.1.1.B****Unit 1 RHR Service Water Pump Room****Fire Area:** TB-V**F Drawing:** F-9-1**General Elevation:** 547'-0"**Zone Area:** 599 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area heat (thermal) detection.**Suppression:** General area wet pipe sprinkler system.**Manual Suppression:** Portable fire extinguishers and a hose station equipped with 100 feet of hose are located in adjacent Fire Zone 8.2.1.A.**Other FP features:** None**Suppression Effects:** Any adverse effects on safe shutdown equipment by water discharge would be less severe than those determined to be acceptable for a design-basis fire. Water removal would be accomplished with sump pumps as there are no drains located within the RHRSW cubicles.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-III	3 Hour Except Watertight Door. [6]

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.1.A	TB-III	3 hour [4][5] except door (F-139)	3 hour except door (F-139)	One unlabeled watertight door.	1'-6" thick concrete
11.1.1.C	TB-III	3 hour [4][5]	3 hour (F-140)	No doors	4'-0" thick concrete
11.1.1.A	TB-III	3 hour [4][5]	3 hour (F-138)	No doors	4'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.1.1.B****Unit 1 RHR Service Water Pump Room****Fire Protection Commitments:**

Reference Section	Commitment
4, 13.2	Complete fire detection (rate compensated thermal) and automatic water suppression system. Also reference [7] (5.9.2).
4, 9.2	3-hour walls, floor, ceiling, except for closed, substantial metal, and watertight door in the east wall. Also reference [4] (13.2) and [7] (5.9.1).
4, 13.2	Fire hose stations and fire extinguishers are available.
2	Detection in DG 1 and DG 1/2 cooling water pump area.
2	Smoke detection in rooms housing RHR service water pumps 1A, 1B, 1C, 1D, 2A, 2B, 2C, and 2D. Thermal detection is provided throughout. See M4-1(2)-83-30 Task 2.18, 2.23. Also reference [4] (13.2) and [7] (5.9.2).
1, 5.13.6	For the TB Basement floor which includes the SW Pump Rooms, waste oil will be removed from the area and NFPA approved flammable liquid storage cabinets will be provided. Lube oil storage will be limited to 30 gallons. Provided in Fire Zone 8.2.1.A.
1, 3.1.5	The turbine building sprinkler system will be extended to provide protection for the RHR service water rooms and Diesel Generator cooling pumps. Also reference [1] (5.13.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	Letter, dated 12-18-84, B. Rybak (CECO) to R. Dent
3	Exemption for lack of complete 3-hour barriers between fire area 11.1.1.B and the Southern Zone Group. Exemption Request 5.9 located in Volume 4 of the FPR.
4	SER, July 21, 1988.
5	NRC Exemption Aug. 18, 1989.
6	Fire Zone 11.1.1.B has 3-hour separation except door. NRC Safety Evaluation dated Dec. 11, 1987. Section 13.0 addresses the lack of complete 3-hour separation for Fire Zone 11.1.1.B. Fire Zone 11.1.1.B has a floor, ceiling, and all walls with a 3-hour fire rating except for the east wall that contains a metal, watertight door. Also see [4] (9.0).
7	Appendix R Exemption Requests
8	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
9	SER, March 2, 1994.

**ZONE:** 11.1.1.B      **AREA:** TB-V      **LOCATION:** TB 1, Elev. 558

**ZONE DESCRIPTION:**

Fire Zone 11.1.1.B is one of the RHR service water pump rooms on elevation 558 of the Unit 1 Turbine Building.

Zone 11.1.1.B, on the basement floor of the turbine building, extends from the 558 foot elevation to elevation 572 and is bounded by the exterior building wall to the west, and by Fire Area TB-III zones 8.2.1.A to the east and above, 11.1.1.A to the south, and 11.1.1.C to the north.

The zone contains two RHR service water pumps and the cooling water pump for the Unit 1/2 diesel generator.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
11.1.1.A, south	TB-III
11.1.1.C, north	TB-III
8.2.1.A, east and above	TB-III

**DETECTION:**

Heat detection is provided throughout.

**AUTOMATIC SUPPRESSION:**

A wet pipe sprinkler system is provided throughout.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hour

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed primarily of electrical cables. The other prominent combustibles are duct liner for the ventilation system and lubricating oil. The remainder of the fixed combustibles consists of various materials distributed through the area. Thus, the only fixed combustibles capable of producing a significant fire in the zone are the electrical cables, the duct liner, and the lubricating oil. Full involvement of the cables is possible, depending on the location of the ignition source. The oil is distributed among the bearing housings of three separate pieces of equipment. These bearing housings are of substantial construction, with the largest quantity of oil in a single housing being one gallon. Thus, a large spill fire capable of causing full area involvement is unlikely.



Transients account for a large portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The hazard associated with transients in this zone is the potential for a localized fire which may expose fixed combustibles capable of producing a severe fire. As mentioned above, the only fixed combustibles capable of such propagation are the electrical cables and the ventilation duct lining.

The detection system or the actuation of the sprinkler system would notify operating personnel of a fire in this zone via Control Room annunciation. This notification should prompt fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Low probability of fire spread to adjacent areas due to rated fire barriers;
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade performance could be hampered by the:

- Restricted access due to door configuration; and
- Small compartment size, allowing quick smoke and heat build up which would adversely affect access and visibility.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 11.1.1.B (Fire Area TB-V):**

The potential for a serious fire in the zone is limited by the installed suppression system. However, due to the zone's limited size and rated construction, any significant fire which occurs has the potential to involve other exposed combustibles in the zone and, should automatic suppression fail, result in full involvement of the zone.

##### **Fire Spread Potential To Fire Area TB-III:**

The potential for fire spread to zones 11.1.1.A, 11.1.1.C, and 8.2.1.A is limited by the three-hour rated barriers separating them from 11.1.1.B. Personnel access to 8.2.1.A from 11.1.1.B is via a water tight door. This door is of heavy steel construction (it is a door used for providing watertight integrity between compartments on a submarine), but is not fire-rated. The design of this door is such that, even when exposed to severe fire conditions, it would remain in place. The performance of such doors under severe fire conditions was demonstrated during a battery fire aboard the U.S.S. Cochino (SS-349). The only failure mechanism of concern would be the loss of the door gasket (rubber) when exposed to fire conditions. Loss of the gasket would allow combustion gases to enter the uninvolved zone. Should the sprinkler system in zone 11.1.1.B perform as designed, the integrity of the gasket would not be challenged. If the sprinkler system failed, prolonged exposure of the gasket to elevated temperatures could be expected and gasket failure could occur. The impact of such failure should be limited, however, since 8.2.1.A has high ceilings and vertical vent paths, allowing rapid dispersion of any high temperature combustion gases escaping 11.1.1.B. Thus, fire spread into the surrounding TB-III zones would not be expected.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 11.1.1.B is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**10.0** Lack of 3-Hour Barriers Between Fire Zones 8.2.1.A and 11.1.1.B and the Rest of the Southern Zone Group

**Issue:** Fire zones 8.2.1.A (TB-III) and 11.1.1.B (TB-V) are separated from each other by 3-hour fire rated construction except for the connecting personnel access door. The principle concern is that compliance with the requirements of Section III.G.2 with regard to redundant safe shutdown components is not achieved.

**Evaluation:** As discussed under **Fire Spread Potential**, above, the possibility of fire spread to TB-III is unlikely and, therefore, the separation provided is acceptable for the hazard. Thus, the increase in combustible loading values for zone 11.1.1.B does not constitute a threat of damage to redundant SS/D trains via fire spread into fire area TB-III. This finding is consistent with that of the existing SER.

**CONCLUSION:**

The evaluation presented above for fire zone 11.1.1.B demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

The barrier shared by 8.2.1.A (TB-III) and 11.1.1.B (TB-V) deviates from Appendix R with respect to separation of redundant safe shutdown related cables. However, the separation provided is sufficient for the hazard and a fire in zone 11.1.1.B will not result in the loss of redundant SS/D trains. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 2.0****Control Room****Fire Area:** SB-1**F Drawing:** F-8-1**General Elevation:** 623'-0"**Zone Area:** 4,161 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection system. HVAC system air return and makeup supply paths contains duct smoke detectors.
<b>Suppression:</b>	None.
<b>Manual Suppression:</b>	Portable fire extinguisher(s) and portable halon fire extinguisher(s) are located inside the Control Room. Fire hose stations and a low flow capacity booster fire hose reel station are located in the corridor outside of room's south entrance. Portable fire extinguisher(s) located outside of each of the control room's two exits.
<b>Other FP features:</b>	The control room floor contains a UL listed floor covering.
<b>Suppression Effects:</b>	There are no water suppression systems or piping within the Control Room, any water entry would be from the use of manual hose stations located outside of this zone. Any damage which would result from water discharge within the room would be of no greater severity than that resulting from a design basis fire. Therefore, water discharge from hose streams is considered tolerable. The room has no floor drains so water runoff would be via floor drains located outside of the Control Room.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u><b>Fire Area</b></u>	<u><b>Barrier Description</b></u>
SB-II	3 Hour
TB-III	3 Hour

**Boundary Fire Zones:**

<u><b>Boundary Zone</b></u>	<u><b>Area</b></u>	<u><b>Barrier Rating</b></u>	<u><b>Seal Rating</b></u>	<u><b>Doors and Dampers</b></u>	<u><b>Barrier Type</b></u>
Exterior Roof	Outside	3 hour	3 hour	No doors	2'-0" thick concrete
19.3	SB-II	3 hour	3 hour (F-133 & 134)	Two Class "A" fire doors, Two- 3 hour fire dampers	1'-6" thick concrete
8.2.7.A	TB-III	3 hour	3 hour (F-131 & 135)	No doors	2'-0" thick concrete
7.1	TB-III	3 hour	3 hour (F-131 & 135)	No doors	2'-0" thick concrete
6.1.B	TB-III	3 hour	3 hour (F-131 & 135)	No doors	2'-0" thick concrete
3.0	SB-I	Non-rated	noncombustible (F-194)	No doors	0'-6" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 2.0****Control Room****Fire Protection Commitments:**

Reference Section	Commitment
4, 5.2	Manual fire fighting equipment (hose reels & port. extinguishers) is available for this zone. Also reference [2](5.1.4), [5](6.3.2), & [11](F.2). Hose stations are available outside entrances. Additional port. extinguishers provided in adjacent areas.
4,5.0	Fire zone 2.0 is separated from fire zones 8.2.7.A, 6.1.B, and 7.1 by 3-hour rated fire barriers. Also see UFHA section 4.12.1. Also see penetration drawings F-131 and 135. Also reference [4](5.2), [5](6.3.1), [7](6.1), [11](F.2).
4, 5.0	Fire zone 2.0 is separated from fire zone 3.0 by a nonrated barrier. Also see UFHA section 4.12.1. All penetrations are sealed w/ unrated, noncomb. matl. Also see NRC Exemption Aug. 18, 1989, Sec. III (4). Also [4](5.2), [5](6.3.1), [7](6.1), [11](F.2).
4, 5.0	Fire zone 2.0 is separated from fire zone 19.3 and the outside by a 3-hour rated fire barrier. Also see penetration drawing F-134. Also reference [4](5.2), [5](6.3.1), [7](6.1), [11](F.2).
4, 5.0	Fire zone 2.0 is separated from the outside by a 3-hour rated fire barrier. Also see UFHA section 4.12.1 and NRC Exemption Aug. 18, 1989, Sec. III (4). Also reference [4](5.2), [5](6.3.1), [7](6.1), [11](F.2).
1, pg. 2.3-27	False ceiling replaced with complete aluminum grid ceiling. Noncombustible suspended ceiling provided [11](D.1.f).
2, 5.1.4	Provide Class A fire doors for access doors to Control Room.
2, 5.1.4	Install 3 hour fire dampers in HVAC ducts in Control Room.
2, 3.1.1(1)	Install fire detection (early warning) system in consoles, cabinets and general area. Also reference [2](5.1.6), [3](3.1.1.(1), [5](6.3.1)). System provided and alarms locally [4](5.2), [5](6.3.4) and [7](6.1). Provided above drop ceiling [11](D.1.f).
2, 5.1.6	Replace carpet in Control Room with UL listed covering. Also reference [2](3.1.11).2, 5.1.4 Fire detection (smoke detectors) in makeup air supply to Control Room. Detectors are also provided in the return air path from the control room. Also reference [2](3.1.1 & 5.1.6).
2, 5.1.6	Provide two portable halon 1211 extinguishers in the Control Room. Also reference [2](3.1.7).
2, 5.1.6	Provide low flow booster reel in Control Room. One inch reels with low flow nozzles with shutoff valves. Also reference [2](3.1.4 & 4.3.1.4) and [11](F.2).
4, 5.0	Fire zone 2.0 is separated from fire zone 19.3 by a 3-hour rated fire barrier. Also see UFHA section 4.12.1. Also see penetration drawing F-133. Also reference [4](5.2), [5](6.3.1), [7](6.1), [11](F.2).
5, 2.2	Safe shutdown makeup pump and RCIC system required for fires in certain areas.

11, F.2	Control room vent system designed as a recirculation system with smoke detectors provided in the return air ducts. The vent system may be manually operated to provide purging capability if necessary.
11, F.2	Ionization detection provided above open-grid ceiling. As indicated by the reference, this is from the Appendix A response.
11, D.4.h	Adequate SCBAs and spare bottles available for use for control room personnel. Breathing apparatus available for control room operators [11](F.2).
11, D.3.j	Cabling kept to a minimum, no cables in trenches, etc. Cables terminate in room. No cables routed under raised central console area. Also reference [11](F.2).
11, E.1.b	Detection alarms and annunciation provided in control room. Local alarms also provided for detection systems.
11, F.2	Fire alarms throughout the plant alarm in the control room. Visual and audible alarms in control room for detection and suppression systems (also for supervisory systems) [2](4.2).
5, 6.3.5	Local monitoring capability from outside SB-I.
5, 6.3.4	Transient combustibles and ignition sources are administratively controlled.
5, 6.3.4	Fire brigade could respond instantly to a fire condition in the zone.
4, 5.2	Control room is continuously manned. Also reference [5](6.3.4).
11, F.2	Dampers are interlocked with the detection system which operates as a once-through system.

**Fire Zone: 2.0****Control Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Updated Fire Hazards Analysis, Amendment 10 (8/93)
2	SER, July 27, 1979.
3	SER, November 5, 1980.
4	SER July 21, 1988.
5	Exemption Request, Sec. 6.3 applies to this fire zone and addresses the lack of suppression in the Control Room.
6	SER, December 30, 1982.
7	Appendix R Exemption Requests, Section 6.1.
8	November 5, 1991 ComEd request letter (establishing combustible loading limits for specific fire zones).
9	Left Intentionally Blank.
10	Left Intentionally Blank.
11	ComEd response to the requirements of Appendix A
12	SER, March 2, 1994.

**ZONE:** 2.0**AREA:** SB-I**LOCATION:** SB , Elev. 623**ZONE DESCRIPTION:**

Fire Zone 2.0 consists of the Control Room on elevation 623 of the Service Building.

The zone extends from the 623 foot elevation to the bottom of the roof at elevation 639 and is bounded by column line 25 to the north, column line H to the south, by an exterior wall on the west and north sides of the building. A portion of the west side is bounded by a rated barrier separating it from zone 19.3 of the Service Building, and a portion of the north wall abuts a stairwell.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
3.0, below	SB-I
19.3, west and south	SB-II
8.2.7.A north	TB-III
7.1, 6.1.B, north	TB-III

**DETECTION:**

Smoke detection is provided throughout the zone. HVAC return and supply paths have duct detectors.

**AUTOMATIC SUPPRESSION:**

None.

**COMBUSTIBLE LOADING:**

Calculated Value: Low

**FIRE SEVERITY:**

Less than 1.25 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed primarily of electrical cables. The remainder of the fixed combustibles consists of a variety of materials distributed about the zone. Thus, the fixed combustibles capable of producing the most severe fire in the zone are the electrical cables.

Transients account for a significant portion of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The main hazard associated with transients in this zone is the potential for a localized fire which may expose combustibles capable of producing a severe, propagating fire. As mentioned above, the largest category of fixed combustibles capable of supporting such a fire are the electrical cables.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Type and distribution of combustibles;
- Slow rate of propagation of cable tray fires;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers; and
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade action may be hampered by the:

- Concern with applying water to control and instrument panels; and
- Interference with continuation of operations from this station.

## **FIRE SPREAD POTENTIAL:**

### **Fire Spread Potential Within Fire Zone 2.0:**

The potential for fire spread within the zone is limited by the discontinuity of combustibles. The exposed combustibles are limited, with the electrical cables being in the various panels or in underfloor conduits or raceways between the panels. Due to this containment, the development of a large fire involving electrical cables is not likely. Ordinary combustibles are limited to those materials required for plant operation (e.g., manuals, procedures, computer terminals, furniture). The development of a fire resulting in full area involvement is not expected due to the containment and distribution of combustibles, the continuous manning of the area, and the provision of fire detection.

### **Fire Spread Potential Within Fire Area SB-I:**

Fire spread to the zone below, 3.0, is unlikely due to the substantial reinforced floor separating the two zones. Although the numerous penetrations where the electrical cables pass through the floor are not sealed with a rated seal design, they are provided with non-combustible seals. This arrangement should preclude fire propagation to zone 3.0.

### **Fire Spread Potential Within Fire Area SB-II:**

The potential for fire spread to the adjacent zone, 19.3, is limited by the 3-hour rated construction. The control room fire loading is not sufficient to challenge such a barrier.

### **Fire Spread Potential To Fire Area TB-III:**

Fire area TB-III, zone 8.2.7.A, 6.1.B and 7.1 are separated from zone 2.0 by three-hour rated barriers. The fire loading in zone 2.0 is not sufficient to challenge the integrity of these barriers.



**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 2.0 is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern are satisfied is provided under **Evaluation**.

**13.0 Lack of Complete Suppression System in the Control Room, Fire Zone 2.0**

**Issue:** Section III.G.3 of Appendix R requires the installation of an area-wide fixed fire suppression system in areas for which alternative shutdown capability is provided. The concern is that a fire in the Control Room would damage the normal safe shutdown systems.

**Evaluation:** As discussed under **Factors Influencing Fire Impact**, above, the primary fixed combustibles in zone 2.0 are electrical cables. These cables are largely unexposed and are separated in individual cabinets or raceways. Thus, these cables, unlike cables in open trays, do not represent a combustible capable of propagating fire throughout the zone. The constant manning of the Control Room is a factor contributing to early fire detection. For any fires escaping detection by Control Room personnel, the presence of a smoke detection system should assure early signaling of a fire emergency. This early discovery of any fires which may occur provides confidence that the fire brigade will be able to respond in a timely manner. For fires detected early, it is expected that personnel on duty in the control room would be able to extinguish the fires using first aid fire fighting techniques before the brigade arrives. Considering the foregoing, the installation of a fixed suppression system would not result in a corresponding improvement in safety. This finding is consistent with that of the existing SER.

**CONCLUSION:**

The evaluations presented above for fire zone 2.0 demonstrate that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

Zone 2.0, a zone for which alternative SS/D is provided, does not comply with Appendix R since fixed suppression is not provided throughout. However, the suppression and detection provided are sufficient to assure a fire in 2.0 would not cause a loss of SS/D capability. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: 3.0****Cable Spreading Room****Fire Area:** SB-I**F Drawing:** F-8-1**General Elevation:** 609'-0"**Zone Area:** 4,150 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area smoke detection system. HVAC system contains duct smoke detectors.
<b>Suppression:</b>	General area wet pipe system and closed head water spray system in cable trays.
<b>Manual Suppression:</b>	Fire extinguisher(s) and two hose stations, one outside of each entrance, each with 100 feet of hose.
<b>Other FP features:</b>	Room is curbed and contains drains. Structural steel at ceiling is coated with fire proof material.
<b>Suppression Effects:</b>	Water release from suppression system operation, hose line use, or piping breaks in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled by floor drains in this room. The room is curbed and the doors are elevated.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
SB-II	3 Hour
TB-III	3 Hour

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.7.A	TB-III	3 hour	3 hour (F-131)	No doors, One 3-hr. Damper	2'-0" thick concrete
8.2.6.A	TB-III	3 hour	3 hour (F-131)	No doors	2'-0" thick concrete
6.1.B	TB-III	3 hour	3 hour (F-131)	No doors	2'-0" thick concrete
19.2	SB-II	3 hour	3 hour	Two Class A doors, Four 3-hr. dampers.	1'-6" thick concrete
4.0	SB-I	3 hour	3 hour equivalent (F-191) [1]	No doors	0'-6" thick concrete
6.3	SB-I	3 hour	3 hour equivalent (F-191)[1]	No doors	0'-6" thick concrete
2.0	SB-I	Non-rated	noncombustible (F-194)	No doors	0'-6" thick concrete ceiling

\* Secondary Containment Boundary

**Fire Zone: 3.0****Cable Spreading Room****Fire Protection Commitments:**

Reference Section	Commitment
5, F.3.a.5	All cable trays accessible for manual suppression.
5, F.3.a.4	Two separate entrances provided for the cable spreading room.
5, F.3.a.1	Safe shutdown for both units can be achieved independent of this fire area. Also reference [5](F.3.b).
8, 2.2	Safe shutdown makeup pump and RCIC system required for shutdown for a fire in this zone.
6, 5.2	Complete fire detection and water suppression for the cable spreading room. Also reference [4](6.1).
6, 5.2	3-hour separation between Fire Zone 3.0 and surrounding zones including doors, dampers, seals, etc. Except ceiling (floor of control room) which has unrated noncombustible penetration seals. Also Reference [4](6.1), [2](3.1.8, 5.3.6), [5](D.1.c, F.3.b).
2, 3.1.5j	Install auto. sprinkler system. 11-5-79 two wet pipe sprinkler systems. Provides both area & cable tray protection. Design acceptable on 11-5-80. A zoned deluge system was originally recommended. Also [2](5.2.6), [5](F.3.a.1, D.3.c), & [7](3.1.5.j).
2, 5.2.6	Install water drainage system.
2, 5.2.6	Install cross zoned ionization detection systems in Cable Spread Room.
2, 3.1.8	Provide Class A fire doors in Cable Spread Room. Also reference [2](5.2.6).
2, 5.2.6	Upgrade structural steel fire resistance to 3 hour rating in Cable Spread Room. Mod. complete 4-1/2-78-20.
2, 5.2.6	Install fire rated dampers in all HVAC penetrations.
2, 5.2.4	Hose stations and portable extinguishers located outside of each entrance (provided for backup suppression). Also reference [5](F.3.a.2).
2, 5.2.4	Smoke detectors in the return air duct (from cable spreading room).

**Notes and References:**

<b>Number</b>	<b>Description</b>
1	Equivalency of fire seal justified in PLC Report "Evaluation of Penetration Seal Systems at the Dresden and Quad Cities Nuclear Power Plants" Section 2.12, Dated April 21, 1987. Reference FPPDP Volume 5, Section E.
2	SER, July 27, 1979.
3	SER, November 5, 1989.
4	Appendix R Exemption Requests
5	ComEd response to the requirements of Appendix A
6	SER, July 21, 1988.
7	SER, November 5, 1980.
8	SER, December 30, 1982.

**ZONE:** 3.0      **AREA:** SB-I      **LOCATION:** SB, Elev. 609'-0"

**ZONE DESCRIPTION:** Cable Spreading Room

**FIRE SEVERITY:** The fire severity for this zone is 2.5 hours.

**SER ISSUES:**

A review of the Safety Evaluation Reports did not uncover established combustible loading limits for this zone.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones which are adjacent to Fire Zone 3.0 but in different fire areas, and summarizes the fire resistance rating of the fire barriers for each. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then the spread of fire to the adjoining fire area is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
19.2	SB-II	3 hour
6.1.B	TB-III	3 hour
8.2.6.A	TB-III	3 hour
8.2.7.A	TB-III	3 hour

**EVALUATION - GENERAL:**

The combustible loading for this zone results in a fire severity of approximately 2.5 hours. However, this zone is provided with general area smoke detection, a wet pipe sprinkler system, and a closed head water spray system in the cable trays. These systems provide for prompt notification and fire growth control/extinguishment. In addition, the fire brigade should have ample time for successful intervention prior to any significant fire challenge to the barriers.

**Fire Zone: 4.0****Old Computer Room****Fire Area: SB-I****F Drawing: F-8-1****General Elevation: 595'-0"****Zone Area: 858 Ft²****Fire Protection Features:****Detection:** General area smoke detection system.**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s).**Other FP features:** Structural steel at ceiling is coated with fire proof material.**Suppression Effects:** Water release from hose line use in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff from manual hose stream use would be through the door to the auxiliary electrical equipment room.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
CT-1	Equivalent 3 Hour [3][7]
CT-2	Equivalent 3 Hour [3][6]
SB-II	3 Hour

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
19.1	SB-II	3 hour	3 hour (F-125)	No Doors One 3-hour damper	1'-6" thick concrete
8.2.5	CT-2	3 hour [4]	Gap filled with noncombustible materials [4][6]	No doors	Sealed intervening cable raceway
8.2.4	CT-1	3 hour [4]	Gap filled with noncombustible materials [4][7]	No doors	Sealed intervening cable raceway
6.3	SB-I	3 hour	3 hour	Two Class A doors. Six, 3-hr. dampers.	0'-11 5/8" thick concrete block walls (1'-0" at ceiling)
3.0	SB-I	3 hour	3 hour equivalent[1] (F-191)	No doors	0'-6" thick concrete ceiling

\* Secondary Containment Boundary

**Fire Zone: 4.0****Old Computer Room****Fire Protection Commitments:**

Reference Section	Commitment
2, 3.1.8	Provide 3 hour rated barriers, Class A doors, dampers (in HVAC ducts) & penetrations to computer room, cable tunnel, CSR & service building. Also reference [2](5.3.6). 3-hour separation from other areas of the service building [3](5.2), [5](6.1).
2, 5.3.6	Install engineered fire detection system in Aux. Electric Room and Computer Room. Complete early warning fire detection system provided [3](5.2) and [5](6.1).
2, 5.3.4	Hose stations located outside of each entrance of the auxiliary electric equipment room.
2, 5.3.4	Portable fire extinguishers are provided.
2, 5.3.4	Smoke detectors in the return air duct from the computer room to the Auxiliary Electrical Equipment Room.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Equivalency of fire seal justified in PLC Report "Evaluation of Penetration Seal Systems at the Dresden and Quad Cities Nuclear Power Plants" Section 2.12, Dated April 21, 1987. Reference FPPDP Volume 5, Section E.
2	SER, July 27, 1979.
3	SER, July 21, 1988.
4	The intervening cable raceway has been sealed with a 1'-0" thick cerafiber / flammastic and ceraboard fire seal, per ER 9605927.
5	Appendix R Exemption Requests
6	Evaluation for fire area separation between SB-I and TB-I, ER9801618.
7	Evaluation for fire area separation between SB-I and TB-III, ER9801619.

**ZONE:** 4.0**AREA:** SB-I**LOCATION:** SB, Elev. 595**ZONE DESCRIPTION:**

Fire zone 4.0 consists of the computer room on elevation 595 of the Service Building.

The zone extends from the 595 foot elevation to the bottom of the floor/ceiling assembly at elevation 609 and is bounded on the north, east and west sides by fire zone 6.3, the Auxiliary Electrical Equipment Room. On the south side, it is bounded by zone 19.1 in Fire Area SB-II. Below the 595 foot elevation, zone 4.0 interfaces with the cable tunnels, zones 8.2.4 and 8.2.5, to the north.

**BARRIERS:**

This zone shares barriers with:

**ZONES**

3.0, above  
6.3, north, east and west  
19.1, south  
8.2.5, north  
8.2.4, north

**AREAS**

SB-I  
SB-I  
SB-II  
CT-2  
CT-1

**DETECTION:**

Smoke detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

None.

**COMBUSTIBLE LOADING:**

Calculated Value: Medium

**FIRE SEVERITY:**

Less than 2.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is overwhelmingly composed of electrical cables. Thus, the only fixed combustibles capable of sustaining a propagating fire from the ignition point to other portions of the zone are the electrical cables.

Transients account for a very small fraction of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Relative slow rate of propagation of cable tray fires;
- Multiple access paths;
- Low probability of early fire spread to adjacent areas due to presence of substantial concrete barriers; and
- Availability of adequate standpipe hose lines for manual fire fighting.

Fire brigade effectiveness could be hampered by the small volume of the room and its relatively high combustible loading; a situation which, once a certain degree of involvement is reached, can serve to significantly accelerate fire growth.

### **FIRE SPREAD POTENTIAL:**

#### **Fire Spread Potential Within Fire Zone 4.0:**

The potential for fire spread within the zone is good given its combustible loading, continuity of combustibles, and the close confines. However, the primary combustibles (i.e., electrical cables) exhibit slow rates of flame spread, allowing for ready extinguishment if the fire is discovered early. To facilitate early detection, this zone is provided with smoke detectors which signal the control room in the event of fire. This should produce timely fire brigade response. If brigade response is slow or ineffective, since, given the small volume of the space radiative feedback from surfaces in the room would tend to promote increasingly rapid fire growth. Thus, full involvement of the space can occur, but would be precluded if brigade response is timely and effective.

#### **Fire Spread Potential Within Fire Area SB-I:**

The chance of fire spread to zones 3.0 and 6.3 is not significant. The combustible loading in the fire zone 4.0 is considerably less than the fire barriers three hour rating. The majority of the combustible loading in the fire zone is due to electrical cable insulation which has slow burning characteristics. The fire zone is covered completely by smoke detection which allows prompt response by the fire brigade. When factors such as fire development time, early response detection, and availability of the fire brigade, are considered along with the capability of the barriers, the prospect for fire spread to other zones in SB-I is limited. The presence of full area automatic suppression in zone 3.0 would limit the impact on that zone, should the separating barrier be breached.

#### **Fire Spread Potential Within Fire Area SB-II:**

The barrier separating zone 4.0 from fire area SB-II is of three-hour rated construction. The combustible loading in the fire zone 4.0 is considerably less than the fire barriers three hour rating. The majority of the combustible loading in the fire zone is due to electrical cable insulation which has slow burning characteristics. The fire zone is covered completely by smoke detection which allows prompt response by the fire brigade. When factors such as fire development time, early response detection, and availability of the fire brigade, are considered, the prospect of such spread is diminished, but cannot be excluded as a possibility.



**Fire Spread Potential To Fire Area CT-2:**

Fire area CT-2, zone 8.2.5, is separated from 4.0 by a rated penetration seal. The location of this interface, below the floor level of 4.0, is such that it would receive less exposure in a given fire than the barriers surrounding the zone on the sides and above. When coupled with early detection, timely brigade response, and the relatively slow growth rate of cable fires, the prospect of this barrier being challenged is significantly reduced. Should brigade response not be effective, however, fire spread to area TB-I cannot be discounted.

**Fire Spread Potential To Fire Area CT-1:**

Fire area CT-1, zone 8.2.4, is separated from 4.0 by a rated penetration seal. The location of this interface, below the floor level of 4.0, is such that it would receive less exposure in a given fire than the barriers surrounding the zone on the sides and above. When coupled with early detection, timely brigade response, and the relatively slow growth rate of cable fires, the prospect of this barrier being challenged is significantly reduced. Should brigade response not be effective, however, fire spread to area TB-III cannot be discounted.

**SER ISSUES (SEE SER TRANSMITTED JULY 21, 1988):**

The issue identified in the SER relative to zone 4.0 is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern is satisfied is provided under **Evaluation**.

**5.0 Fire Zone 4.0, Units 1 and 2 Auxiliary Computer Room**

**Issue:** An exemption was requested from Section III.G.3 of Appendix R to the extent that it requires installation of a fixed fire suppression system in fire zones for which an alternative safe shutdown capability is provided. The primary concern was that a fixed fire suppression system is not installed in the zones of Fire Area SB-I (e.g., control room, auxiliary electrical equipment room) and a fire could result in the loss of normal safe shutdown capability.

**Evaluation:** The SER concluded that any fire that might occur "would be promptly detected by the automatic fire detection system, one of the station personnel, or the fire brigade". Further, should extensive fire damage occur, the independent alternative safe shutdown system can be utilized to safely shutdown the plant. Considering that the entire fire area, including the control room, cable spreading room, auxiliary electrical equipment room and the auxiliary computer room, is surrounded by a 3-hour fire rated barrier, it was determined that "the installation of a fixed suppression system ... would not significantly increase the level of fire protection."

The SER considered that the combustible loading for zone 4.0 was significantly below those that would challenge a 3-hour rated barrier. This limited loading, then, assured that a fire in the area would not affect the alternative safe shutdown system (located outside fire area SB-I). The revised combustible loading figures indicate a higher loading than that used by the reviewers in 1988 (<21,000 BTU/ft<sup>2</sup>). The loading for zone 4.0 is of medium load. The combustible loading therefore is still within the fire barrier capability to contain a fire in the fire zone 4.0.

Section III. G.1 of Appendix R establishes performance objectives relative to the safe shutdown of power plants. In Section III. G.2, the NRC specified three alternatives for achieving these objectives. Among these prescriptive alternatives, was the provision of a 3-hour barrier for separating redundant safe shutdown components. The existing configuration satisfies this requirement.

Section III.G.3 of Appendix R requires the installation of fire detection and fixed fire suppression systems in areas for which alternative safe shutdown is provided. Zone 4.0 is provided with detection as specified, but does not have fixed fire suppression. An exemption from this requirement was granted based on several factors; among which were:

- a) Provision of fire detection;
- b) Availability of manual fire fighting equipment; and
- c) Fire severity of less than 1 hour.

The SER did not indicate any credit being taken for rated separation between zones 4.0 and 6.3 and between zones 4.0 and 3.0. Indeed, the SER states that zone 4.0 was not separated from the zone above, 3.0, by a rated floor/ceiling assembly.

#### **CONCLUSION:**

The evaluation presented above demonstrates that the changes in combustible loading values for zone 4.0 do not compromise compliance with Section III.G.2 of Appendix R (zone 4.0 is separated from adjacent areas by 3-hour barriers). However, the basis for the NRC's findings relative to the need for fixed fire suppression as required by Section III.G.3 and as articulated in the July 21, 1988, Safety Evaluation Report, is no longer valid. To wit, the fire severity associated with the zone is no longer less than 1 hour.

Despite the increase in combustible loading, the fire barrier is still able to withstand the potential fire. Regardless, considering the nature of cable fire development and the fire resistive capability of the barrier separating zone 4.0 from the areas containing alternative safe shutdown components and the early detection and response capability provided, the ability of the plant to safely shutdown should not be compromised by a fire in zone 4.0.

**Fire Zone: 6.3****Auxiliary Electric Equipment Room****Fire Area: SB-I****F Drawing: F-8-1****General Elevation: 595'-0"****Zone Area: 3,275 Ft²****Fire Protection Features:**

<b>Detection:</b>	General area smoke detection system. Smoke detectors are provided in the return air duct from the computer room.
<b>Suppression:</b>	None.
<b>Manual Suppression:</b>	Portable fire extinguisher(s).
<b>Other FP features:</b>	Structural steel at ceiling is coated with fire proof material.
<b>Suppression Effects:</b>	There are no water suppression systems or piping within the Auxiliary Electric Room so any water entry would be from the use of manual hose stations located outside of this zone. Electrical panels are installed with and without pedestals and the tops of electrical panels are both sealed and unsealed so the possibility does exist for water entry into the panels. The damage resulting from water discharge within the room would be of no greater severity than that resulting from a design basis fire. Therefore water discharge from hose streams is considered tolerable. The room has no floor drains so water runoff would be either through the door to the service building or via the hatches to the Unit 1 and Unit 2 Cable Tunnels which would have to be manually opened to aid in water removal. The water would be removed by floor drains in the cable tunnels.

**Combustible Loading Limit:****Analyzed Combustible Loading Category: Medium****Equivalent Fire Severity: 2.5 Hours****Boundary Fire Areas:**

<b><u>Fire Area</u></b>	<b><u>Barrier Description</u></b>
TB-III	3 Hour
CT-2	Equivalent 3 Hour [2][10]
SB-II	3 Hour
CT-1	Equivalent 3 Hour [2][11]

**Fire Zone: 6.3****Auxiliary Electric Equipment Room****Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
19.1	SB-II	3 hour	3 hour (F-125, F-126, F-128)	Two Class "A" fire doors, 1-3 hr. damper.	1'-6" thick concrete
8.2.6.A	TB-III	3 hour	3 hour (F-127)	No doors, one 3 hour rated damper	2'-0" thick concrete
8.2.5	CT-1	3 hour	3 hour (F-190)[1]	One non-rated steel hatchway cover[2][10]	1'-0" thick concrete
8.2.4	CT-2	3 hour	3 hour (F-190)[1]	One non-rated steel hatchway cover[2][11]	1'-0" thick concrete
4.0	SB-I	3 hour	3 hour (F-122, F-123, F-124, F-125)	Two Class "A" fire doors, Six- 3 hr fire dampers	0'-11 5/8" concrete block wall(1'-0" floor at 4.0)
3.0	SB-I	3 hour	3 hour equivalent (F-191)[1]	No doors	0'-6" thick concrete ceiling

\* Secondary Containment Boundary

**Fire Zone: 6.3****Auxiliary Electric Equipment Room****Fire Protection Commitments:**

Reference Section	Commitment
6, 2.2	Safe shutdown makeup pump and RCIC system required for shutdown for a fire in this zone.
3, 5.3.4	Smoke detectors are provided in return air paths from computer room.
5, 6.2.4	Transient combustibles and ignition sources are administratively controlled.
5, 6.2.4	Fire brigade can respond quickly to a fire condition in the zone.
4, 5.2	Manual fire fighting equipment (including port. extinguishers, hose reels, water and carbon dioxide supp. capability available for a fire in this zone. Also reference [3](5.3.4) and [5](6.2.2).
4, 5.2	3-hour separation between this zone and U1 Turbine Building. Also reference [5](6.1).
4, 5.2	3-hour separation from other areas of the service building. Also reference [5](6.1 & 6.2.1).
3, 3.1.8	Provide fire barrier between cable tunnels & Aux. Elec. Room. 3-hour except fire resistive access covers. See Reference [2] for equivalency evaluation. Also reference [4](5.2) and [5](6.2.1).
3, 5.3.6	Provide low flow booster reel in the vicinity of the room with shutoff valves. Also reference [3](3.1.4 & 4.3.1.4).
3, 5.3.6	Install engineered (early warning) fire detection system in Aux. Electric Room and Computer Room. Also reference [3](3.1.1), [4](5.2), [5](6.1, 6.2.2, 6.2.4). Alarms locally and in control room.
3, 5.3.6	The fire barriers between fire zone 6.3 and the adjacent areas will be upgraded to provide 3-hour rated barriers for doors (Class A), dampers (in HVAC), and electrical penetrations to the computer room, cable tunnels, CSR, and service bldg. & [3](3.1.8).

**Fire Zone: 6.3****Auxiliary Electric Equipment Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	Equivalency of fire seal (hatch covers) justified in DCP 9800275.
2	Equivalency of hatchway doors justified in PLC Report "An Evaluation of Fire Doors in Safety Related Areas at Quad Cities Nuclear Power Station", Dated April 9, 1987. Reference FPPDP Volume 7, Section 17.
3	SER, July 27, 1979.
4	SER, July 21, 1988.
5	Appendix R Exemption Requests for lack of complete suppression in the auxiliary electric room. 12-11-87 exemption granted (5.0).
6	SER, December 30, 1982.
7	Nov. 5, 1991 ComEd Letter requested revised combustible loading limits.
8	SER, March 2, 1994.
9	Justification to perform manual actions in this zone prior to fire extinguishment can be found in NDIT QDC-98-139.
10	Evaluation for fire area separation between SB-I and TB-I, ER9801618.
11	Evaluation for fire area separation between SB-I and TB-III, ER9801619.

**ZONE:** 6.3**AREA:** SB-I**LOCATION:** SB, Elev. 595**ZONE DESCRIPTION:**

Fire Zone 6.3 consists of the auxiliary electrical equipment room on elevation 595 of the Service Building.

The zone extends from the 595 foot elevation to the bottom of the floor/ceiling assembly at elevation 609 and is bounded on the north side by fire zone 8.2.6.A in TB-III. On the east and west sides it is bounded by zone 19.1 in Fire Area SB-II; on the south side, it is bounded by zones 4.0, the computer room, and 19.1 in Fire Area SB-II. Below the 595 foot elevation, zone 6.3 interfaces with the cable tunnels, zones 8.2.4 and 8.2.5., to the north.

**BARRIERS:**

This zone shares barriers with:

<u>ZONES</u>	<u>AREAS</u>
3.0, above	SB-I
4.0, west	SB-I
19.1, east, west, and south	SB-II
8.2.5, below	CT-2
8.2.4, below	CT-1
8.2.6.A, north	TB-III

**DETECTION:**

Smoke detection is provided throughout the zone.

**AUTOMATIC SUPPRESSION:**

No automatic suppression is provided.

**COMBUSTIBLE LOADING:**

Calculated Value: Medium

**FIRE SEVERITY:**

Less than 2.5 hours

**FACTORS INFLUENCING FIRE IMPACT:**

The fixed combustible loading in this zone is composed predominantly of electrical cables. The remainder of the fixed combustibles consists of various materials distributed about the zone.

Thus, the only combustibles capable of producing a severe fire in the zone are the electrical cables.

Transients account for a small fraction of the total combustibles which may be in the area. This accounting is derived from an analysis of the activities and tasks which normally occur, or may be reasonably expected to occur, during the plant's operating cycle. The main hazard associated with transients in this zone, is the potential for a localized fire which could expose the electrical cables; ultimately producing a severe fire.

The installed detection system should provide for rapid detection of fires and prompt notification of operating personnel via Control Room annunciation. This notification should provide for timely fire brigade call out.

The ability of the fire brigade to extinguish fires in the zone is enhanced by the:

- Slow rate of propagation of cable tray fires;
- Multiple access paths;
- Low probability of fire spread to adjacent areas due to substantial concrete barriers;
- Availability of adequate standpipe hose lines for manual fire fighting; and
- Presence of a smoke removal system.

Fire brigade effectiveness could be hampered by the small volume of the room and its relatively high combustible loading; a situation which, once a certain degree of involvement is reached, can serve to significantly accelerate fire growth.

#### **FIRE SPREAD POTENTIAL:**

##### **Fire Spread Potential Within Fire Zone 6.3:**

The potential for fire spread within the zone is good given its combustible loading, consisting predominantly of multiple layers of cable trays and risers, and its close confines. However, the primary combustible exhibits a slow rate of flame spread, allowing for ready extinguishment if the fire is discovered early. To facilitate early detection, this zone is provided with smoke detectors which signal the control room in the event of fire. This should produce timely fire brigade response. The provision of a smoke removal system serves to limit heat and smoke buildup in the room. Thus, full involvement of the space can occur, but is not expected if fire brigade response is prompt and effective.

##### **Fire Spread Potential Within Fire Area SB-I:**

Fire zone 6.3 is separated from zones 3.0 and 4.0 by three-hour rated construction. The combustible loading in these fire zones is within the capability of the fire barrier. When additional factors such as fire development time, early response detection, and availability of the fire brigade are considered, however, the prospect of such spread is diminished, and, is not expected to occur.



**Fire Spread Potential Within Fire Area SB-II:**

Fire zone 6.3 is separated from fire area SB-II by three-hour rated construction. The combustible loading in these fire zones is within the capability of the fire barrier. When factors such as fire development time, early response detection, and availability of the fire brigade are considered, however, the prospect of such spread is diminished, and, is not expected to occur.

**Fire Spread Potential To Fire Area CT-2:**

Fire area CT-2, zone 8.2.5, is separated from 6.3 by 3-hour rated construction. This barrier constitutes a portion of the floor of zone 6.3. As such, it would receive less exposure in a given fire than the barriers surrounding the zone on the sides and above. When coupled with early detection, timely brigade response, and the relatively slow growth rate of cable fires, the prospect of this barrier being challenged is significantly reduced.

**Fire Spread Potential To Fire Area CT-1:**

Fire area CT-1, zone 8.2.4, is separated from 6.3 by 3-hour rated construction. This barrier constitutes a portion of the floor of zone 6.3. As such, it would receive less exposure in a given fire than the barriers surrounding the zone on the sides and above. When coupled with early detection, timely brigade response, and the relatively slow growth rate of cable fires, the prospect of this barrier being challenged is significantly reduced.

**SER ISSUES (SEE SER TRANSMITTED MARCH 2, 1994):**

The issue identified in the SER relative to zone 6.3 is addressed below. The issue carries the number of the SER section in which it appears; followed by the topic of the section. The specific issue identified in that section of the SER is paraphrased under **Issue**. An evaluation of how the objectives of the issue of concern are satisfied is provided under **Evaluation**.

**12.0**    Lack of Complete Fixed Fire Suppression and Detection System in the Auxiliary Electric Equipment Room of Service Building Fire Zone 6.3

**Issue:** Section III.G. of Appendix R to 10 CFR 50 requires, *inter alia*, the installation of area-wide fixed suppression in areas for which alternative shutdown is provided. The concern is that a fire in this zone could damage the normal safe shutdown components.

**Evaluation:** Zone 6.3 has no fixed fire suppression (See **Automatic Suppression**, above); but is provided with smoke detectors throughout. The combustibles in the zone are limited, with the exception of electrical cables. The presence of the early detection capability, coupled with the fire brigade and considering the growth characteristics of cable fires suggests that any fires which occur could be controlled and extinguished before the integrity of the surrounding barriers was challenged if brigade response is prompt and effective.

The provision of alternative safe shutdown capability provides assurance that shutdown can be achieved even if zone 6.3 were lost so long as the fire does not damage or preclude the execution and maintenance of safe shutdown from the adjacent fire areas, TB-I and TB-II.

**CONCLUSION:**

The evaluation presented above for fire zone 6.3 demonstrates that the changes in combustible loading values for the zone do not compromise the findings of the NRC as articulated in the Safety Evaluation Report transmitted March 2, 1994. To wit:

Zone 6.3, a zone for which alternative SS/D is provided, does not comply with Appendix R since fixed suppression is not provided throughout. However, the suppression and detection capability provided are sufficient to assure a fire in 6.3 would not cause a loss of SS/D capability. Thus, the objective of Appendix R with respect to the ability to establish and maintain safe shutdown is achieved.

**Fire Zone: SBO-1****SBO Work Area****Fire Area:** SBO**F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 36 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection coverage.**Suppression:** None.**Manual Suppression:** Portable fire extinguishers and a manual hose station are located nearby.**Other FP features:** None.**Suppression Effects:** Water, dry chemical and carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
SBO-7	SBO	1 hour	1 hour	No doors or dampers.	8" Concrete Block
SBO-3	SBO	1 hour	1 hour	One 1.5 hour rated Door, One fire damper	8" Concrete Block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:**

<u>Number</u>	<u>Description</u>
0	NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-1      **AREA:** SBO      **LOCATION:** SBO, Elev 595'-0"

**ZONE DESCRIPTION:** SBO Work Area

**FIRE SEVERITY:**

The fire severity for this zone is 1 hour.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-1, which is an approximately 5'-10" by 6'-3" room, is bounded by 1 hour rated cement masonry unit (CMU) walls on all sides and a 1-½ hour fire rated door. The ceiling is constructed of 6" thick concrete and is fire rated for 1-hour. Fire zones SBO-3 and SBO-7 bound this zone.

**EVALUATION - ZONE SBO-1:**

The combustible loading within SBO-1 is normal office type material of ordinary combustibles. The zone is provided with a fire detection system and there is equipment to support manual fire suppression located in the adjacent fire zone. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the Unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the type of combustible loading in the fire zone, the detection system, and the availability of manual suppression equipment, assurance exists that a fire originating in this zone would be expediently identified and suppressed by the plant fire brigade. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire loading limit established for this zone is acceptable.

**Fire Zone: SBO-2****Unit 1 SBO Day Tank Room****Fire Area: SBO****F Drawing: None****General Elevation: 595'-0"****Zone Area: 132 Ft²****Fire Protection Features:****Detection:** None**Suppression:** Local wet pipe sprinkler protection.**Manual Suppression:** Portable fire extinguishers, and a manual hose station are located in adjacent Fire Zone 3.**Other FP features:** The day tank is enclosed within a curbed area.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category: High**  
**Equivalent Fire Severity: 16.8 Hours****Boundary Fire Areas:****Fire Area**                      **Barrier Description**

None

**Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
SBO-8	SBO	3 Hour	3 Hour	No Doors	8" Concrete filled concrete block
SBO-3	SBO	3 Hour	3 Hour	One Door, Two Fire Dampers	8" Concrete filled Concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:****Number**      **Description**

0      NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-2      **AREA:** SBO      **LOCATION:** SBO, Elev 595'-0"

**ZONE DESCRIPTION:** Unit 1 Day Tank Room

**FIRE SEVERITY:**

The fire severity for this zone is 17 hours.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-2, which is an approximately 10'-0" by 13'-2" room, is bounded by 3-hour rated cement masonry unit (CMU) walls on all sides with a 6" thick reinforced concrete roof. A 3-hour fire rated door as well as 3-hour fire rated dampers in the ceiling and wall is provided. Fire zones SBO-3 and SBO-8 bound this zone.

**EVALUATION - ZONE SBO-2:**

The combustible loading within SBO-2 is almost exclusively from the 1200 gallons of fuel oil in the day tank. The zone is provided with a wet pipe sprinkler system and there is equipment to support manual fire suppression located in the adjacent fire zone. The day tank room contains a spill confinement dike to retain tank contents in the event of tank rupture. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the wet pipe sprinkler suppression system, any fire originating within this zone would be expediently subjected to suppression system actuation, which would extinguish or control the fire. The spill confinement dike would serve to help prevent spread of the fire by liquid born mechanisms. The suppression system actuation would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.



**Fire Zone: SBO-3****Unit 1 SBO Diesel Generator Room****Fire Area: SBO****F Drawing: None****General Elevation: 595'-0"****Zone Area: 2,000 Ft²****Fire Protection Features:****Detection:** None**Suppression:** Local wet pipe sprinkler protection.**Manual Suppression:** Portable fire extinguishers, and a manual hose station are located within this area.**Other FP features:** Fire proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category: Medium****Equivalent Fire Severity: 2.5 Hours****Boundary Fire Areas:****Fire Area**                      **Barrier Description**

None

**Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
SBO-7	SBO	1 Hour	1 Hour	One 1.5 Hour Door	8" concrete block
SBO-5B	SBO	1 Hour	1 Hour	None	6" thick concrete block
SBO-5A	SBO	1 Hour	1 Hour	One Damper 3 hr., non-rated Hatch	6" thick concrete block
SBO-4	SBO	1 Hour	1 Hour	None	8" concrete block
SBO-2	SBO	3 Hour	3 Hour	3 Hour Door, Two Fire Dampers	8" concrete filled concrete block
SBO-1	SBO	1 Hour	1 Hour	One 1.5 Hour Door, One Fire Damper	8" concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:****Number**      **Description**

0      NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-3      **AREA:** SBO      **LOCATION:** SBO, Elev 595'-0"

**ZONE DESCRIPTION: Unit 1 Diesel Generator Room**

**FIRE SEVERITY:**

The fire severity for this zone is 2.5 hours.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-3, which is an approximately 62'-0" by 36'-0" room, occupies the southern half of the SBO building ground floor. It is separated from other areas within the building by either 1 or 3-hour rated boundaries. The exterior walls consist of non-rated metal siding with 4" bat insulation except for a portion of the wall required to be 1-hour rated to maintain a 1-hour fire separation between building elevations. A 1-hour fire rated door is provided at the stair vestibule and exterior door are unrated. A 3-hour fire rated damper is provided between this floor and the second floor. In addition, all exposed structural steel is covered with 1-hour fire proofing material. Fire zones SBO-1, SBO-2, SBO-4 and SBO-7 bound this zone on elevation 595'-0" and fire zones SBO-5A and SBO-5B are separated from this zone by a ceiling/floor assembly constructed of 6"-thick concrete rated for 1-hour of fire resistance.

**EVALUATION - ZONE SBO-3:**

The combustible loading within SBO-3 is associated with the diesel engines and the electrical generator. The zone is provided with a wet pipe sprinkler system and there is equipment to support manual fire suppression located in this fire zone as well as in the adjacent fire zone SBO-4. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the wet pipe sprinkler suppression system, any fire originating within this zone would be expediently subjected to suppression system actuation, which would extinguish or control the fire. The suppression system actuation would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-4****Unit 2 SBO Diesel Generator Room****Fire Area: SBO****F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 2,000 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** Local wet pipe sprinkler protection.**Manual Suppression:** Portable fire extinguishers, and a manual hose station are located within this area.**Other FP features:** Fire proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	

**Boundary Fire Zones:****Boundary**

<u>Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
SBO-8	SBO	3 Hour	3 Hour	One 3 hr. Door, 2 fire dampers	8" concrete filled Concrete block
SBO-7	SBO	1 Hour	1Hour	One 1.5 hr. Door	8" concrete block
SBO-6B	SBO	1 Hour	1 Hour	None	6" thick concrete
SBO-6A	SBO	1 Hour	1 Hour	One Damper 3 hr., Non rated hatch	6" thick concrete
SBO-3	SBO	1 Hour	1 Hour	None	8" concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:**

<u>Number</u>	<u>Description</u>
0	NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-4      **AREA:** SBO      **LOCATION:** SBO, Elev 595'-0"

**ZONE DESCRIPTION: Unit 2 Diesel Generator Room**

**FIRE SEVERITY:**

The fire severity for this zone is 2 hours.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-4, which is an approximately 62'-0" by 36'-0" room, occupies the northern half of the SBO building ground floor. It is separated from other areas within the building by either 1 or 3-hour rated boundaries. The exterior walls consist of non-rated metal siding with 4" bat insulation except for a portion of the wall required to be 1-hour rated to maintain a 1-hour fire separation between building elevations. A 1-hour fire rated door is provided at the stair vestibule and exterior door are unrated. A 3-hour fire rated damper is provided between this floor and the second floor. In addition, all exposed structural steel is covered with 1-hour fire proofing material. Fire zones SBO-3, SBO-7 and SBO-8 bound this zone on elevation 595'-0" and fire zones SBO-6A and SBO-6B are separated from this zone by a ceiling/floor assembly constructed of 6"-thick concrete rated for 1-hour of fire resistance.

**EVALUATION - ZONE SBO-4:**

The combustible loading within SBO-4 is associated with the diesel engines and the electrical generator. The zone is provided with a wet pipe sprinkler system and there is equipment to support manual fire suppression located in this fire zone as well as in the adjacent fire zone SBO-3. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the wet pipe sprinkler suppression system, any fire originating within this zone would be expediently subjected to suppression system actuation, which would extinguish or control the fire. The suppression system actuation would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-5A****Unit 1 SBO Switchgear Room****Fire Area:** SBO**F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 1,250 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection coverage.**Suppression:** None**Manual Suppression:** Portable fire extinguishers, and a manual hose station are located in the area as well as adjacent Fire Zones 6A.**Other FP features:** Fire proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
SBO-7	SBO	1 Hour	1 Hour	One 1.5 hr. Door	8" concrete block
SBO-6A	SBO	1 Hour	1 Hour	One 1.5 hr. Double Door	8" concrete block
SBO-5B	SBO	1 Hour	1 Hour	One 1.5 hr. Door, One fire damper	8" concrete block
SBO-3	SBO	1 Hour	1 Hour	One Damper 3 hr., Non-rated hatch	6" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:**

<u>Number</u>	<u>Description</u>
0	NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-5A      **AREA:** SBO      **LOCATION:** SBO, Elev 615'-0"

**ZONE DESCRIPTION:** Unit 1 Switchgear Room

**FIRE SEVERITY:**

The fire severity for this zone is 2 hours.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-5A, which is an approximately 1250-ft<sup>2</sup> room, occupies the major portion of the southern half of the SBO building second floor. It is separated from other areas within the building by 1-hour fire rated boundaries. The exterior walls consist of non-rated metal siding with 4" bat insulation except for a portion of the wall required to be 1-hour rated to maintain a 1-hour fire separation between building elevations. The roof deck that forms the ceiling for this fire zone is an Underwriters Laboratory (UL) Class 1-A design. Fire doors rated for 1-hour are provided at the stair vestibule, at the entrance to the unit 1 battery room, and between the unit 2 switchgear room. An exterior door is unrated. A 3-hour fire rated damper is provided between this floor and the second floor and a 1 ½ hour fire rated damper is provided between this area and the unit 1 battery room. In addition, all exposed structural steel is covered with 1-hour fire proofing material. Fire zones SBO-5B, SBO-6A and SBO-7 bound this zone on elevation 615'-0" and fire zone SBO-3 is separated from this zone by a floor/ceiling assembly constructed of 6"-thick concrete rated for 1-hour of fire resistance.

**EVALUATION - ZONE SBO-5A:**

The combustible loading within SBO-5A is associated electrical switchgear and miscellaneous equipment. The zone is provided with an ionization smoke detection system and there is equipment to support manual fire suppression located in this fire zone as well as in the adjacent fire zone SBO-6A. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material.



The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the automatic ionization smoke detection system, any fire originating within this zone would be expediently identified, which would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-5B****Unit 1 SBO Battery Room****Fire Area:** SBO**F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 200 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection coverage.**Suppression:** None**Manual Suppression:** Portable fire extinguishers, and manual hose stations are located in adjacent Fire Zones 5A.**Other FP features:** Fierier proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would nor result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff could be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:****Fire Area** **Barrier Description**

None

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
SBO-5A	SBO	1 Hour	1 Hour	1.5 hr. Door & Damper	8" concrete block
SBO-3	SBO	1 Hour	1 Hour	None	6" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:****Number**    **Description**

0      NDIR No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-5B      **AREA:** SBO      **LOCATION:** SBO, Elev 615'-0"

**ZONE DESCRIPTION: Unit 1 Battery Room**

**FIRE SEVERITY:**

The fire severity for this zone is 1 hour.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-5B, which is an approximately 360-ft<sup>2</sup> room, is located in the southeast corner of the unit 1 switchgear room. It is separated from other areas within the building by 1-hour fire rated boundaries. The exterior walls consist of non-rated metal siding with 4" bat insulation except for a portion of the wall required to be 1-hour rated to maintain a 1-hour fire separation between building elevations. The roof deck that forms the ceiling for this fire zone is an Underwriters Laboratory (UL) Class 1-A design. A fire door rated for 1-hour of fire resistance and a 1-½ hour fire rated damper is provided between this area and the unit 1 switchgear room. In addition, all exposed structural steel is covered with 1-hour fire proofing material. Fire zones SBO-5A bounds this zone on elevation 615'-0" and fire zone SBO-3 is separated from this zone by a floor/ceiling assembly constructed of 6"-thick concrete rated for 1-hour of fire resistance.

**EVALUATION - ZONE SBO-5B:**

The combustible loading within SBO-5B is comprised of ABS plastic associated with two banks of batteries housed in this room and minor associated equipment. The zone is provided with an ionization smoke detection system and there is equipment to support manual fire suppression located in the adjacent fire zone. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the automatic ionization smoke detection system, any fire originating within this zone would be expediently identified, which would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-6A****Unit 2 SBO Switchgear Room****Fire Area:** SBO**F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 1,250 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection coverage.**Suppression:** None**Manual Suppression:** Portable fire extinguishers, and a manual hose station are located in the area as well as adjacent Fire Zones 5A.**Other FP features:** Fire proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	

**Boundary Fire Zones:****Boundary**

<u>Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
SBO-7	SBO	1 Hour	1 Hour	One 1.5 hr. Door	8" concrete block
SBO-6B	SBO	1 Hour	1 Hour	One 1.5 hr. Door, One Damper	8" concrete block
SBO-5A	SBO	1 Hour	1 Hour	One 1.5 hr. Double Door	8" concrete block
SBO-4	SBO	1 Hour	1 Hour	One Damper 3 hr., Non-rated hatch	6" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:**

<u>Number</u>	<u>Description</u>
0	NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-6A      **AREA:** SBO      **LOCATION:** SBO, Elev 615'-0"

**ZONE DESCRIPTION:** Unit 2 Switchgear Room

**FIRE SEVERITY:**

The fire severity for this zone is 2 hours.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-6A, which is an approximately 1250-ft<sup>2</sup> room, occupies the major portion of the northern half of the SBO building second floor. It is separated from other areas within the building by 1-hour fire rated boundaries. The exterior walls consist of non-rated metal siding with 4" bat insulation except for a portion of the wall required to be 1-hour rated to maintain a 1-hour fire separation between building elevations. The roof deck that forms the ceiling for this fire zone is an Underwriters Laboratory (UL) Class 1-A design. Fire doors rated for 1-hour are provided at the stair vestibule, at the entrance to the unit 2 battery room, and between the unit 1 switchgear room. An exterior door is unrated. A 3-hour fire rated damper is provided between this floor and the second floor and a 1 ½ hour fire rated damper is provided between this area and the unit 1 battery room. In addition, all exposed structural steel is covered with 1-hour fire proofing material. Fire zones SBO-5A, SBO-6B and SBO-7 bound this zone on elevation 615'-0" and fire zone SBO-4 is separated from this zone by a floor/ceiling assembly constructed of 6"-thick concrete rated for 1-hour of fire resistance.

**EVALUATION - ZONE SBO-6A:**

The combustible loading within SBO-6A is associated electrical switchgear and miscellaneous equipment. The zone is provided with an ionization smoke detection system and there is equipment to support manual fire suppression located in this fire zone as well as in the adjacent fire zone SBO-5A. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the automatic ionization smoke detection system, any fire originating within this zone would be expediently identified, which would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-6B****Unit 2 SBO Battery Room****Fire Area:** SBO**F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 200 Ft<sup>2</sup>**Fire Protection Features:****Detection:** General area smoke detection coverage.**Suppression:** None**Manual Suppression:** Portable fire extinguishers and manual hose station are located in adjacent Fire Zones 6A.**Other FP features:** Fire proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
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None

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
SBO-6A	SBO	1 Hour	1 Hour	One 1.5 hr. Door, One Damper	8" concrete block
SBO-4	SBO	1 Hour	1 Hour	None	6" thick concrete

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
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None

**Notes and References:**

<u>Number</u>	<u>Description</u>
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0	NDIT No. S040-QH-0413 Station Blackout Building In
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**ZONE:** SBO-6B      **AREA:** SBO      **LOCATION:** SBO, Elev 615'-0"

**ZONE DESCRIPTION: Unit 2 Battery Room**

**FIRE SEVERITY:**

The fire severity for this zone is 1.25 hour.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-6B, which is an approximately 360-ft<sup>2</sup> room, is located in the northeast corner of the unit 2 switchgear room. It is separated from other areas within the building by 1-hour fire rated boundaries. The exterior walls consist of non-rated metal siding with 4" bat insulation except for a portion of the wall required to be 1-hour rated to maintain a 1-hour fire separation between building elevations. The roof deck that forms the ceiling for this fire zone is an Underwriters Laboratory (UL) Class 1-A design. A fire door rated for 1-hour of fire resistance and a 1-½ hour fire rated damper is provided between this area and the unit 2 switchgear room. In addition, all exposed structural steel is covered with 1-hour fire proofing material. Fire zones SBO-6A bounds this zone on elevation 615'-0" and fire zone SBO-4 is separated from this zone by a floor/ceiling assembly constructed of 6"-thick concrete rated for 1-hour of fire resistance.

**EVALUATION - ZONE SBO-6B:**

The combustible loading within SBO-6B is comprised of ABS plastic associated with two banks of batteries housed in this room and minor associated equipment. The zone is provided with an ionization smoke detection system and there is equipment to support manual fire suppression located in the adjacent fire zone. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path.

The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the automatic ionization smoke detection system, any fire originating within this zone would be expediently identified, which would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-7****SBO Building Stairwell****Fire Area:** SBO**F Drawing:** None**General Elevation:** 595'-0"**Zone Area:** 200 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** Particle wet pipe coverage**Manual Suppression:** Portable fire extinguishers are located in adjacent Fire Zones 3, 4, 5A and 6A.**Other FP features:** Fire proofing provided for structural steel.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floor drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:****Fire Area** **Barrier Description**

None

**Boundary Fire Zones:**

<b><u>Boundary Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
SBO-6B	SBO	1 Hour	1 Hour	One 1.5 hr. Door	8" concrete block
SBO-5A	SBO	1 Hour	1 Hour	One 1.5 hr. Door	8" concrete block
SBO-4	SBO	1 Hour	1 Hour	One 1.5 hr. Door	8" concrete block
SBO-3	SBO	1 Hour	1 Hour	One 1.5 hr. Door	8" concrete block
SBO-1	SBO	1 Hour	1 Hour	None	8" concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:****Number**    **Description**

0      NDIT No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-7**AREA:** SBO**LOCATION:** SBO, Elev 595'-0"/615'-0"**ZONE DESCRIPTION:** Common Stairwell (Vestibule)**FIRE SEVERITY:**

The fire severity for this zone is 1 hour.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-7, which is an approximately 200-ft<sup>2</sup> stairwell/vestibule area, provides access to both elevations of the SBO building. It is separated from other areas within the building by 1-hour fire rated boundaries. The roof deck that forms the ceiling for this fire zone is an Underwriters Laboratory (UL) Class 1-A design. All doors into the stairwell from adjacent SBO fire zones are 1-hour rated. In addition, all exposed structural steel is covered with 1-hour fire proofing material. All of the fire suppression control valves as well as the fire detection panel for the SBO building are located in this area. A hose station and hose reel is located in this area. Fire zones SBO-1, SBO-3, and SBO-4 bound this zone on SBO elevation 595'-0" and fire zones SBO-5A and SBO-5B bound this area on elevation 615'-0".

**EVALUATION - ZONE SBO-7:**

The combustible loading within SBO-7 is negligible, as there is no significant combustible material located within this area. This fire zone is entirely surrounded by 1-hour rated fire barriers and fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north. If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries as the fire rating resistance of the barriers separating this area from adjacent fire zones is equal to or greater than the combustible loading limit. In reality, no significant combustibles are located in this area. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.

**Fire Zone: SBO-8****Unit 2 SBO Day Tank Room****Fire Area: SBO****F Drawing: None****General Elevation: 595'-0"****Zone Area: 132 Ft²****Fire Protection Features:****Detection:** None**Suppression:** Local wet pipe sprinkler protection.**Manual Suppression:** Portable fire extinguishers. Manual hose stations are located in the east corner of the area as well as adjacent Fire Zone 4.**Other FP features:** The day tank is enclosed within a curbed area.**Suppression Effects:** Water, dry chemical or carbon dioxide from manual suppression onto equipment in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design basis fire. Water runoff would be controlled through floors drains in the general area.**Combustible Loading Limit:****Analyzed Combustible Loading Category: High**  
**Equivalent Fire Severity: 16.8 Hours****Boundary Fire Areas:****Fire Area**                      **Barrier Description**

None

**Boundary Fire Zones:****Boundary**

<b><u>Zone</u></b>	<b><u>Area</u></b>	<b><u>Barrier Rating</u></b>	<b><u>Seal Rating</u></b>	<b><u>Doors and Dampers</u></b>	<b><u>Barrier Type</u></b>
SBO-4	SBO	3 Hour	3 Hour	One 3 hr. Door, Two Dampers	8" concrete filled concrete block
SBO-2	SBO	3 Hour	3 Hour	None	8" concrete filled Concrete block

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section      Commitment

None

**Notes and References:****Number**      **Description**

0      NDIR No. S040-QH-0413 Station Blackout Building In

**ZONE:** SBO-8      **AREA:** SBO      **LOCATION:** SBO, Elev 595'-0"

**ZONE DESCRIPTION:** Unit 2 Day Tank Room

**FIRE SEVERITY:**

The fire severity for this zone is 17 hours.

**SER ISSUES:**

Established combustible loading limits for this fire zone are not addressed by any previous Safety Evaluation Report.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown equipment or cables, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

Fire zone SBO-8, which is an approximately 10'-0" by 13'-2" room, is bounded by 3-hour rated cement masonry unit (CMU) walls on all sides with a 6" thick reinforced concrete roof. A 3-hour fire rated door as well as 3-hour fire rated dampers in the ceiling and wall is provided. Fire zones SBO-2 and SBO-4 bound this zone.

**EVALUATION - ZONE SBO-8:**

The combustible loading within SBO-8 is almost exclusively from the 1200 gallons of fuel oil in the day tank. The zone is provided with a wet pipe sprinkler system and there is equipment to support manual fire suppression located in the adjacent fire zone. The day tank room contains a spill confinement dike to retain tank contents in the event of tank rupture. This fire zone is entirely surrounded by fire zones of the SBO and no other plant fire zones. The SBO building is located 15 feet east of the unit 1 reactor building. The east wall of the unit 1 reactor building is constructed of 1 ½ foot thick reinforced concrete with no penetrations or connections to the SBO building. The cables/cable trays that exit the SBO building on the west side from the second floor of the SBO run south and west along the exterior wall of the reactor building. At the interface of the turbine and reactor buildings, the trays rise up to the turbine building roof and continue north.

If a fire were to originate in the SBO building, it would not spread into the reactor or turbine buildings due to the lack of a fire path. The exterior wall of the SBO building is constructed of noncombustible material. The physical separation, lack of barrier penetrations, noncombustible construction and other fire protection features in the SBO assure that a fire originating in the SBO would not physically compromise safe shutdown equipment and cables in the reactor or turbine buildings due to an exposure fire.

**CONCLUSION:**

The combustible loading limit that is established for this zone is unlikely to significantly challenge its structural boundaries. Due to the wet pipe sprinkler suppression system, any fire originating within this zone would be expediently subjected to suppression system actuation, which would extinguish or control the fire. The spill confinement dike would serve to help prevent spread of the fire by liquid born mechanisms. The suppression system actuation would summon the plant fire brigade, which would assure containment and extinguishment of the fire. As such, a reasonable assurance exists that, for any fire that occurs in this zone, the potential to spread to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone or fire area, and adversely impact the ability to achieve or maintain safe shutdown does not exist. On this basis, the combustible fire-loading limit that is established for this zone is deemed acceptable.



**Fire Zone: 11.4.A****Crib House Basement****Fire Area:** CH**F Drawing:** F-19-1**General Elevation:** 559'-8"**Zone Area:** 4,092 Ft<sup>2</sup>**Fire Protection Features:****Detection:** None**Suppression:** None**Manual Suppression:** Portable fire extinguisher(s) and three hose stations, equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** No safe shutdown equipment would be affected by water discharge as there is no safe shutdown equipment in this area. Water runoff would travel to the sump where it would be pumped to either the storm drain system or the discharge bay immediately outside the Crib House.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u><b>Fire Area</b></u>	<u><b>Barrier Description</b></u>
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None	N/A
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**Boundary Fire Zones:**

<u><b>Boundary Zone</b></u>	<u><b>Area</b></u>	<u><b>Barrier Rating</b></u>	<u><b>Seal Rating</b></u>	<u><b>Doors and Dampers</b></u>	<u><b>Barrier Type</b></u>
11.4.B	CH	Non-rated	noncombustible, open mechanical	No doors	2'-0" thick concrete ceiling

\* Secondary Containment Boundary

**Fire Protection Commitments:**

Reference Section	Commitment
2, 3.1.5.(k)	Administrative procedures are in place to eliminate excessive oil storage. The total storage quantity is limited to 25 gallons, safety cans and safety cabinets are provided.
1, 5.21.4	Portable extinguishers and hose stations provided for area.
1, 3.1.11	Approved cabinets required for oil dispensing stations. Container size limited to 55-gallon. Also reference [1](5.21.6).

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	SER, November 5, 1980.

**ZONE:** 11.4.A      **AREA:** CH      **LOCATION:** CH, Elev. 559'-8"

**ZONE DESCRIPTION:** Crib House Basement

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hours.

**SER ISSUES:**

A review of the Safety Evaluation Reports did not uncover established combustible loading limits for this zone.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The only fire zone adjacent to Fire Zone 11.4.A is in the same fire area, and is separated by the non-fire-rated floor.

**CONCLUSION:**

Since the only adjoining fire zone is in the same fire area, spread of fire would not adversely impact safe shutdown capabilities.

**Fire Zone: 11.4.B****Crib House Ground Floor****Fire Area:** CH**F Drawing:** F-19-1**General Elevation:** 595'-0"**Zone Area:** 8,676 Ft<sup>2</sup>**Fire Protection Features:****Detection:** Local area heat (thermal) detection at the two fire pumps.**Suppression:** Local area open head water spray (deluge) system to protect the two fire pumps.**Manual Suppression:** Portable fire extinguishers, three hose stations equipped with 100 feet of hose.**Other FP features:** None**Suppression Effects:** No safe shutdown equipment would be affected by water discharge as there is no safe shutdown equipment in this area. Water runoff would travel to the sump on the lowest level of the Crib House where it would be pumped to either the storm drain system or the discharge bay immediately outside the Crib House.**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Low**Equivalent Fire Severity:** 1.25 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
None	N/A

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
11.4.A	CH	Non-rated	noncombustible, open mechanical	No doors	2'-0" thick concrete

\* Secondary Containment Boundary

**Fire Zone: 11.4.B****Crib House Ground Floor****Fire Protection Commitments:**

Reference Section	Commitment
4, E.2.d	Fire pumps take suction from Mississippi River. Storage tanks are not used. Also reference [4](E.2.c)
4, E.2.c	Provide separate valved connections to loop from each pump. Fire pumps generally installed per NFPA 20. Also reference [4](E.2.d).
1, 5.21.4	Provide portable extinguishers and hose stations for area.
1, 4.3.1.3	Provide each pump with a separate 10" discharge line.
1, 4.3.1.2	Provide a system to detect excessive make up water. Water provided from service water system to fire water system.
1, 4.3.1.2	Provide two fire pumps and controllers. Provide an 8-hour diesel fuel supply for each pump. Each pump rated at 2500 gpm at 139 psig.
1, 3.1.5	Provide sprinklers in oil storage locations of crib house. Also reference [1](5.21.6). Sprinklers still required by NRC; administrative controls not enough [2](3.1.5k).
3, 3.1.5k	Maintain 25' and 80' distance between fire pumps and flammable liquids cabinet. Maintain cabinet contents at <25 gal. oil, <10 gal. grease.
1, 3.1.5	Provide sprinkler coverage in oil storage area. CE no sprinklers 9-25-79 and 1-26-81 (1A). Acceptable 2-12-81. Justification for no sprinklers: Flam. Liq. Cab., admin. controls to 25 gal. (oil), 10 gal. (grease), spk. for fire pumps, & proximity.
1, 3.1.11	Provide curb and drain around flammable liquid storage area. A flammable liquids cabinet and administrative controls on the quantity and location of flammable liquids storage were provided in lieu of curbs (acceptable 2/12/81). Ref [1](5.21.6).
1, 3.1.5	Install sprinkler system to protect Diesel Fire Pumps. Not required 9-25-79. Also reference [1](5.21.6).
1, 3.1.11	Provide listed flammable liquids cabinet. Limit container size to 55 gallon. Also reference [1](5.21.6). Per [2](3.1.5k) storage limited to a total of 25 gallons, container size limited to 5 gallon.

**Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979.
2	SER, November 5, 1980.
3	SER, February 12, 1981.
4	APCSB 9.5-1 Appendix A commitments

**ZONE:** 11.4.B      **AREA:** CH      **LOCATION:** CH, Elev. 595'

**ZONE DESCRIPTION:** Crib House Ground Floor

**FIRE SEVERITY:**

The fire severity for this fire zone is 1.25 hour.

**SER ISSUES:**

A review of the Safety Evaluation Reports did not uncover established combustible loading limits for this zone.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that starts in one fire area or zone, impacting safe shutdown equipment in that zone, then spreads to an adjacent zone. If the ability to achieve and maintain safe shutdown for a fire in the first zone relies on equipment that could be affected by a fire in the second zone (or vice versa), then the spread of fire could cause the loss of safe shutdown capability.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The only fire zone adjacent to Fire Zone 11.4.B is in the same fire area, and is separated by the non-fire-rated floor.

**CONCLUSION:**

Since the only adjoining fire zone is in the same fire area, spread of fire would not adversely impact safe shutdown capabilities.

**Fire Zone: 9.2****Unit 2 Diesel Generator Room****Fire Area:** EDG-2**F Drawing:** F-13-1**General Elevation:** 595-0**Zone Area:** 1,089 Ft<sup>2</sup>**Fire Protection Features:**

<b>Detection:</b>	General area heat (thermal) detectors are provided to actuate the Carbon Dioxide suppression system.
<b>Suppression:</b>	A wet pipe sprinkler system is provided in the day tank room. The Unit 2 diesel generator room and day tank room are protected by an automatic total flooding CO <sub>2</sub> system supplied from the CO <sub>2</sub> storage tank / unit actuated by thermal detectors.
<b>Manual Suppression:</b>	A hose reel and portable extinguishers are located outside the entrance to the zone in adjacent Fire Zone 8.2.6.E.
<b>Other FP features:</b>	The day tank room is curbed. Fire proofing provided for structural steel.
<b>Suppression Effects:</b>	Water or Carbon Dioxide release in this zone would not result in adverse effects of greater severity than those determined to be acceptable for a design-basis fire. Water runoff would be controlled through utilization of floor drains in the general areas. The day tank room is curbed.

**Combustible Loading Limit:****Analyzed Combustible Loading Category:** Medium**Equivalent Fire Severity:** 2.5 Hours**Boundary Fire Areas:**

<u>Fire Area</u>	<u>Barrier Description</u>
TB-I	3 Hour (Note 8)

**Boundary Fire Zones:**

<u>Boundary Zone</u>	<u>Area</u>	<u>Barrier Rating</u>	<u>Seal Rating</u>	<u>Doors and Dampers</u>	<u>Barrier Type</u>
8.2.7.E	TB-I	3 hour	3 hour except exhaust duct penetration	No doors	0'-6" thick concrete on fire proofed steel
8.2.6.E	TB-I	3 hour	3 hour (F-161, 162 & 163)	Two, 3-hour, Class "A" door Two, Dampers.	1'-0" thick concrete
6.2.B	TB-I	3 hour	3 hour	No doors	0'-6" thick concrete on fire proofed steel

**Fire Zone: 9.2****Unit 2 Diesel Generator Room****Fire Protection Commitments:**

Reference Section	Commitment
1, 4.3.2	Local and control room alarms required for DG CO2 systems.
1, 3.1.8	Upgrade penetrations to 3 hour rating. Completed. Also reference [1](5.20.6).
1, 3.1.8	Protect structural steel in room to achieve 3 hour rating. Completed MOD 4-1/2-78-20. Also reference [1](5.20.6).
1, 3.1.8	Electrically supervise door to U2 DG Room. Door is electrically supervised. Also reference [1](5.20.6).
2, pg.6	Provide fire rated barrier for louvered doors. Doors with louvers have been removed.
2, pg.6	Install 3 hour fire dampers in HVAC Ducts. Also see PLC NFPA 90A Review 7-31-85.
2, pg.6	Provide portable ventilation equipment. Three portable ventilators provided on fire cart.
1, 5.20.4	Carbon Dioxide Suppression System is provided for DG1. Manual and automatic actuation of system provided. Manual smoke venting by portable smoke ejectors. Also reference [1](4.3.2), and [6](F.9).
1, 3.1.8	Provide Class A fire Doors U2 DG Room.
5, 10.1.1	Emergency lighting placed to allow fuse replacement during blackout conditions.
6, F.9	Provide 3 hour separation for DG room except around DG exhaust and air supply pipes.
1, 5.20.2	A 3 hour enclosure is provided for the diesel day tank.
1, 5.20.4	Thermostats actuate local and control room alarms, and the total flooding CO2 system.
1, 5.20.4,6,F.9.b	DG day tank room protected by automatic sprinkler system.
1, 5.20.4	Portable extinguishers and hose stations provided for area.
6, D.4.i	Dampers interlocked to close on activation of CO2 system.
6, E.5.a	CO2 systems designed per NFPA 12. Installation acceptance tests were not performed.
6, E.5.b	CO2 systems have predischage alarms. CO2 system nozzles do not discharge directly on equipment. CO2 is discharged into DG and day tank rooms. Also reference [6](E.5.c) and [6](F.9.b).
1, 3.1.8	Fire zone 9.2 separated from rest of plant by 3-hour rated barriers.



**Fire Zone: 9.2****Unit 2 Diesel Generator Room****Notes and References:**

<b><u>Number</u></b>	<b><u>Description</u></b>
1	SER, July 27, 1979
2	Letter 4-10-78 from CECO to NRC.
3	Letter 12-18-84 from B. Rybak (CECO) to R. Denton
4	NTS item 254(265)/88021-07 addresses the need to perform CO2 concentration test. Item closed 2-5-92.
5	Appendix R Exemption Requests
6	ComEd response to the requirements of Appendix A
7	Lack of complete detection and suppression for Fire Area TB-I, NDIT QDC-98-131.
8	Generic Letter 86-10 Evaluation validating 3 hour separation from adjacent fire zones, DG 00-00374, Q-ECDS-00-0171.

**ZONE:** 9.2**AREA:** EDG-2**LOCATION:** TB I, Elev. 595'-0"**ZONE DESCRIPTION:** Unit 2 Diesel Generator Room**FIRE SEVERITY:**

Less than 2.5 hours.

**SER ISSUES:**

A review of the Safety Evaluation Reports did not uncover established combustible loading limits for this zone.

**ACCIDENT ANALYZED IN THE FSAR:**

The accident of concern is a fire that occurs in this zone damaging safe shutdown cable, then spreads to affect redundant or alternative safe shutdown equipment or cable in an adjacent zone, and adversely impacts the ability to achieve or maintain safe shutdown.

**FIRE BARRIERS AND ADJACENT FIRE ZONES:**

The following table lists all fire zones adjacent to Zone 9.2 which are in separate fire areas or which contain redundant or alternate safe shutdown equipment. The table also summarizes fire resistance rating of the fire barriers for each zone. If the barrier rating exceeds the predicted fire severity, based on the increased combustible loading limit, then spread of fire to the adjoining fire zone is not considered credible. If the barrier rating is less than or equal to the predicted fire severity, further evaluation is required to determine the potential for fire spread and the effect on safe shutdown capabilities.

Zone	Area	Fire Resistance Rating
6.2.B	TB-I	3 hour
8.2.6.E	TB-I	3 hour
8.2.7.E	TB-I	3 hour <sup>1</sup>

<sup>1</sup> FHA indicates barrier and seal rating of 3 hour except for exhaust duct penetration.

**EVALUATION ZONE 9.2:**

This fire zone is separated from the rest of the plant by 3-hour fire barriers. The walls separating this zone from fire zone 8.2.6.E is constructed of 1'-0" thick concrete and contains two Class A fire for access to the zone. The east wall is an unrated exterior wall constructed of 1'-6" thick concrete. The ceiling separates this zone from fire zone 6.2.B and is constructed of 6" thick concrete supported on fire proofed structural steel. The barriers bounding adjacent fire zones are rated for 3 hours of fire resistance. The major combustible material within this fire zone is fuel oil, lube oil, and other miscellaneous combustible material associated with diesel generator support equipment. This zone is provided with a CO<sub>2</sub> fire suppression system actuated by thermal detectors. The day tank room is provided a wet-pipe sprinkler system and overflow/tank rupture spill containment. Manual fire suppression equipment is provided near the entrance to this fire zone.

**CONCLUSION:**

The barriers separating this zone from adjacent fire zones are rated for 3-hours of fire resistance. In addition, this zone is provided with automatic fire suppression systems, which would actuate in the event of a fire in this zone and control or suppress any fire event. In addition, the systems actuation would summon the plant fire brigade would provide additional assurance that any fire originating in this zone would not grow and spread to an adjacent fire zone and damage redundant safe shutdown equipment and cables.

5.0

GUIDELINES OF APPENDIX A TO

APCSB 9.5-1

**5.0 GUIDELINES OF APPENDIX A TO APCSB 9.5-1****5.1 OVERALL REQUIREMENTS OF NUCLEAR PLANT FIRE PROTECTION PROGRAM**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
A.1 <u>Personnel</u>	<p>Responsibility for the overall fire protection program should be assigned to a designated person in the upper level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated. Such delegation of authority should be to staff personnel prepared by training and experience in fire protection and nuclear plant safety to provide a balanced approach in directing the fire protection programs for nuclear power plants. The qualification requirements for the fire protection engineer or consultant who will assist in the design and selection of equipment, inspect and test the completed physical aspects of the system, develop the fire protection program, and assist in the fire-fighting training for the operating plant should be stated. Subsequently, the FSAR should discuss the training and updating provisions such as fire drills provided for maintaining the competence of the station fire-fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment.</p>	<p>Comply with intent: The administrative program was compared with the detailed recommendations in a 1977 NRC Supplementary Guidance document entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." See Supplementary Guidance Review (F.P.P.D.P.).</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>The fire protection staff should be responsible for:</p> <ul style="list-style-type: none"> <li>(a) coordination of building layout and systems design with fire area requirements, including consideration of potential hazards associated with postulated design basis fires,</li> <li>(b) design and maintenance of fire detection, suppression, and extinguishing systems,</li> <li>(c) fire prevention activities,</li> <li>(d) training and manual fire-fighting activities of plant personnel and the fire brigade.</li> </ul> <p>(Note: NFPA 6 – <u>Recommendations for Organization of Industrial Fire Loss Prevention</u>, contains useful guidance for organization and operation of the entire fire loss prevention program.)</p>	See NFPA Code Review (F.P.P.D.P.).
A.2	<u>Design Bases</u>	
	<p>The overall fire protection program should be based upon evaluation of potential fire hazards throughout the plant and the effect of postulated design basis fires relative to maintaining ability to perform safety shutdown functions and minimize radioactive releases to the environment.</p>	<p>Comply: See Sections 3.0 and 4.0 of this report and Safe Shutdown Report.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
A.3	<u>Backup</u>	
	Total reliance should not be placed on a single automatic fire suppression system. Appropriate backup fire suppression capability should be provided.	Comply: See Section 4.0 of this report for description of available automatic suppression systems. Backup fire suppression equipment is provided in the form of manual hose stations and/or portable fire extinguishers.
A.4	<u>Single Failure Criterion</u>	
	A single failure in the fire suppression system should not impair both the primary and backup fire suppression capability. For example, redundant fire water pumps with independent power supplies and controls should be provided. Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena.	Comply with intent: A single failure would not impair both the primary and backup fire suppression capability. Fire water supply is provided by redundant diesel driven fire pumps. (See Section 4.0 of this report for a discussion of suppression system arrangements.)
	The effects of lightning strikes should be included in the overall plant fire protection program.	Lightning protection was compared with the requirements of NFPA-78. See NFPA Code Review (F.P.P.D.P.).
A.5	<u>Fire Suppression Systems</u>	
	Failure or inadvertent operation of the fire suppression system should not incapacitate safety-related systems or components. Fire suppression systems that are pressurized during normal plant operation should meet the guidelines specified in APCSB Branch Technical Position 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment."	Partially comply: A suppression effects analysis has been conducted to ensure that inadvertent operation or a pipe break would not adversely affect safe shutdown. This review was conducted in accordance with NRC I&E Temporary Instruction 2515/62 Rev. 1, Section 0.4.1.f. (See Section 4.0 of this report for suppression effects.)

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
A.6	<u>Fuel Storage Areas</u>	
	Schedule for implementation of modifications, if any, will be established on a case-by-case basis.	Not applicable.
A.7	<u>Fuel Loading</u>	
	Schedule for implementation of modifications, if any, will be established on a case-by-case basis.	Not applicable.
A.8	On multiple-reactor sites where there are operating reactors and construction of remaining units is being completed, the fire protection program should provide continuing evaluation and include additional fire barriers, fire protection capability, and administrative controls necessary to protect the operating units from construction fire hazards. The superintendent of the operating plant should have the lead responsibility for site fire protection.	Not applicable. Quad Cities is an operating station with no units under construction.
A.9	Simultaneous fires in more than one reactor need not be postulated, where separation requirements are met. A fire involving more than one reactor unit need not be postulated except for facilities shared between units.	Separation between shared equipment has been addressed in the Safe Shutdown Report and Exemption Requests.



**5.2 Administrative Procedures, Controls, and Fire Brigade**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
B.1	<p>Administrative procedures consistent with the need for maintaining the performance of the fire protection system and personnel in nuclear power plants should be provided.</p> <p>Guidance is contained in the following publications.</p> <p>NFPA 4 - Organization for Fire Services</p> <p>NFPA 4A - Organization for Fire Department</p> <p>NFPA 6 - Industrial Fire Loss Prevention</p> <p>NFPA 7 - Management of Fire Emergencies</p> <p>NFPA 8 - Management Responsibility for Effects of Fire on Operations</p> <p>NFPA 27 - Private Fire Brigades</p>	<p>Comply with intent:</p> <p>Administrative procedure guidance in NFPA Codes 4, 4A, 6, 7, and 8 were reviewed for applicability. NFPA Code 4A was found not to be applicable. The results of the rest of the reviews are found in the NFPA Code Review (F.P.P.D.P.)</p>
B.2	<p>Effective administrative measures should be implemented to prohibit bulk storage of combustible materials inside or adjacent to safety-related buildings or systems during operation or maintenance periods. Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants" provides guidance on housekeeping, including the disposal of combustible materials.</p>	<p>Comply:</p> <p>The administrative program was compared with the detailed recommendations in a 1977 NRC Supplementary Guidance document entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance."</p> <p>See Supplementary Guidance Review (F.P.P.D.P.)</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
B.3	Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management and appropriate special actions and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular:	
(a)	Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. If this is not possible, a person qualified in fire protection should directly monitor the work and function as a fire watch.	Comply: Work involving ignition sources is covered by an administrative procedure. This procedure was reviewed against the criteria of NFPA Code 51B and the 1977 NRC Supplementary Guidance entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." The results of these reviews are found in the NFPA Code Review and the Supplementary Guidance Review (F.P.P.D.P.).
(b)	Leak testing, and similar procedures such as air flow determination, should use one of the commercially available aerosol techniques. Open flames or combustion generated smoke should not be permitted.	Comply: The local leak rate test procedures contain a precaution statement prohibiting the use of open flames for any testing of penetration leakage. These test procedures were reviewed against the guidelines of the 1977 NRC Supplementary Guidance entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance.": The results of these reviews are found in the Supplementary Guidance Review (F.P.P.D.P.).

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(c)	Use of combustible material, e.g., HEPA and charcoal filters, dry ion exchange resins or other combustible supplies in safety-related areas should be controlled. Use of wood inside buildings containing safety-related systems or equipment should be permitted only when suitable noncombustible substitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted. Such materials should be allowed into safety-related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazards analysis to determine the adequacy of the installed fire protection systems.	Comply with intent: Control of combustibles is accomplished through use of an administrative procedure. This procedure allows only pressure impregnated flame retardant wood to be used in the plant. The procedure was reviewed against the guidelines of the 1977 NRC Supplementary Guidance entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." The results of this review are found in the Supplementary Guidance Review (F.P.P.D.P.).
B.4	Nuclear power plants are frequently located in remote areas, at some distance from public fire departments. Also, first response fire departments are often volunteer. Public fire department response should be considered in the overall fire protection program. However, the plant should be designed to be self-sufficient with respect to fire fighting activities and rely on the public response only for supplemental or backup capability.	Comply: The station fire brigade is designed to be self-sufficient. However, other fire agencies are used in periodic drills for experience and adaptability to function with the station brigade.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
B.5	<p>The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these functions. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," should be followed as applicable.</p> <p>(a) Successful fire fighting requires testing and maintenance of the fire protection equipment, emergency lighting and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan that lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems should be developed. The test plan should contain the types, frequency and detailed procedures for testing. Procedures should also contain instructions on maintaining fire protection during those periods when the fire protection system is impaired or during periods of plant maintenance, e.g., fire watches or temporary hose connections to water systems.</p>	<p>Comply with intent:</p> <p>Fire protection system surveillances are performed using detailed procedures describing the surveillance and acceptance criteria. Periodic testing of fire protection systems and equipment is scheduled and performed with documented procedures to assure that the equipment will properly function and continue to meet the design criteria. This test program was reviewed against the guidelines of the 1977 NRC Supplementary Guidance entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." The results of this review are found in the Supplementary Guidance Review (F.P.P.D.P.).</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(b)	Basic training is a necessary element in effective fire fighting operation. In order for a fire brigade to operate effectively, it must operate as a team. All members must know what their individual duties are. They must be familiar with the layout of the plant and equipment location and operation in order to permit effective fire-fighting operations during times when a particular area is filled with smoke or is insufficiently lighted. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of the plant. The drills should include the simulated use of equipment in each area and should be preplanned and post-critiqued to establish the training objective of the drills and determine how well these objectives have been met. These drills should periodically (at least annually) included local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade and with the on-scene fire team leader, the reactor operator in the control room, and the offsite command post.	Comply with intent: Fire drills are conducted so that there is one drill held per shift per quarter. The fire scenarios include various fire hazards throughout the plant covering different safety-related areas. The fire drill procedures were reviewed against the guidelines of the 1977 NRC Supplementary Guidance entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." The results of this review are found in the Supplementary Guidance Review (F.P.P.D.P.).

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(c)	To have proper coverage during all phases of operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire department so that responsibilities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site.	Comply with intent: The training procedures for training both site personnel and off-site fire department personnel were reviewed against the guidelines of the 1977 NRC Supplementary Guidance entitled, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." The results of this review are found in the Supplementary Guidance Review (F.P.P.D.P.).
(d)	NFPA 27, "Private Fire Brigade" should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Among the standards referenced in this document, the following should be utilized: NFPA 194, "Standard for Screw Threads and Gaskets for Fire Hose Couplings," NFPA 196, "Standard for Fire Hose," NFPA 197, "Training Standard on Initial Fire Attacks," NFPA 601, "Recommended Manual of Instructions and Duties	Comply with intent: The criteria of NFPA Codes 27, 194, 196, 197 and 601 were reviewed during the NFPA code Review. The results of this review are documented in the NFPA Code Review (F.P.P.D.P.).

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
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for the Plant Watchman on Guard.” NFPA booklets and pamphlets listed on Page 27-11 of Volume 8, 1971-72 are also applicable for good training references. In addition, courses in fire prevention and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.

**5.3 Quality Assurance Program**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
C.	Quality Assurance (QA) programs of applicants and contractors should be developed and implemented to assure that the requirements for design, procurement, installation, and testing and administrative controls for the fire protection program for safety-related areas as defined in this Branch Position are satisfied. The program should be under the management control of the QA organization. The QA program criteria that apply to the fire protection program should include the following:	Comply: Reliability related items are addressed in the appropriate sections of the 10 CFR 50 Appendix B program. See the Supplementary Guidance Review (F.P.P.D.P.).
C.1	<u>Design Control and Procurement Document Control</u>  Measures should be established to assure that all design-related guidelines of the Branch Technical Position are included in design and procurement documents and that deviations therefrom are controlled.	
C.2	<u>Instructions, Procedures and Drawings</u>  Inspections, tests, administrative controls, fire drills and training that govern the fire protection program should be prescribed by documented instructions, procedures, or drawings and should be accomplished in accordance with these documents.	



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<b><u>Section</u></b>	<b><u>NRC Position</u></b>
C.3	<u>Control of Purchased Material, Equipment and Services</u>

Measures should be established to assure that purchased material, equipment, and services conform to the procurement documents.

C.4	<u>Inspection</u>
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A program for independent inspection of activities affecting fire protection should be established and executed by, or for, the organization performing the activity to verify conformance with documented installation drawings and test procedures for accomplishing the activities.

C.5	<u>Test and Test Control</u>
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A test program should be established and implemented to assure that testing is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. The tests should be performed in accordance with written test procedures; test results should be properly evaluated and acted on.

C.6	<u>Inspection Test and Operating Status</u>
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Measures should be established to provide for the identification of items that have satisfactorily passed required tests and inspections.

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Measures should be established to control items that do not conform to specified requirements to prevent inadvertent use of installation.

C.8 Corrective Action

Measures should be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material and nonconformances are promptly identified, reported, and corrected.

C.9 Records

Records should be prepared and maintained to furnish evidence that the criteria enumerated above are being met for activities affecting the fire protection program.

C.10 Audits

Audits should be conducted and documented to verify compliance with the fire protection program including design and procurement documents; instructions; procedures and drawings; and inspection and test activities.

**5.4 General Guidelines for Plant Protection**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
D.1 <u>Building Design</u>		
(a)	Plant layouts should be arranged to:	Comply with intent: The fire area concept as it relates to reactor safety was not implemented in the initial design of Quad Cities Units 1 & 2. Safety-related and non-safety-related equipment was reviewed. This equipment was combined into specific shutdown paths. Assurance that one path to achieve safe shutdown will remain free of fire damage is described in the Safe Shutdown Report. Major fire hazards are protected with fixed suppression systems.
	(1) Isolate safety related systems from unacceptable fire hazards, and	
	(2) Alternatives:	
(a)	Redundant safety related systems that are subject to damage from a single fire hazard should be protected by a combination of fire retardant coatings and fire detection and suppression systems, or (b) a separate system to perform the safety function should be provided.	
(b)	In order to accomplish (1) (a) above, safety related systems and fire hazards should be identified throughout the plant. Therefore, a detailed fire hazard analysis should be made. The fire hazards analysis should be reviewed and updated as necessary.	The fire hazards analysis is contained in Section 4 of this report. It will be updated as discussed in Subsection 1.3.2.
	Additional fire hazards analysis should be done after any plant modification.	See Section 5.3(C.1) of this report.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(c)	<p>For multiple reactor sites, cable spreading rooms should not be shared between reactors. Each cable spreading room should be separated from other areas of the plant by barriers (walls and floors) having a minimum fire resistance of three hours. Cabling for redundant safety divisions should be separated by walls having three hour fire barriers.</p> <p>Alternative guidance for constructed plants is shown in Section E.3, "Cable Spreading Room."</p>	<p>Do not comply:</p> <p>The Auxiliary Electric Equipment Room (AEER), Control Room, Cable Spread Room and Computer Room are shared between both units. All these rooms form one fire area. Both divisions of cable are in the cable spread room; however, safe shutdown for both units can be achieved independent of the entire fire area. The cable spread room is separated from other rooms in the fire area by 3-hour fire barriers that have unrated noncombustible penetration seals. See Section 4.0 and Subsection 5.6.3 (F.3) of this report for more detail.</p>
(d)	<p>Interior wall and structural components, thermal insulation materials and radiation shielding materials and soundproofing should be noncombustible. Interior finishes should be noncombustible or listed by a nationally recognized testing laboratory, such as Factory Mutual or Underwriters' Laboratory, Inc. for flame spread, smoke and fuel contribution of 25 or less in its use configuration (ASTM E-84 Test, "Surface Burning Characteristics of Building Materials").</p>	<p>Do not comply:</p> <p>Minor amounts of combustibles were originally used as nailers, seals, caulking and joint fillers, etc. These existing materials do not significantly contribute to the fire loadings in the plant and do not expose safety-related systems to undue risks. The original Quad Cities HVAC work specification (R-2403 dated January 26, 1970) specified materials to be used for internal and external duct insulation. The materials specified meet NFPA 90A-1976 flame spread and combustibility requirements. For duct coverings and linings, NFPA 90A-1976 requires a flame spread rating not over 25 and a smoke developed rating no higher than 50. Installations since the late 1970's have specified noncombustible or limited combustible surface finishes. Floor coverings in areas containing systems or equipment required for safe shutdown of the plant are generally Class I material as defined in NFPA 101, or generally a flame spread of 25 or less as defined by ASTM E-84. For fire hazard analysis purposes, floor coatings are considered non-combustible if the material has a structural base of non-combustible material, with a nominal depth not over 1/8-inch thick, and has a flame spread rating not higher than 50 as defined by ASTM E-84. Exceptions to these guidelines are evaluated for acceptability by Fire Protection Engineering on a case-by-case basis.</p>

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
(e)	Metal deck roof construction should be noncombustible (see the building materials directory of the Underwriters' Laboratory, Inc.) or listed as Class I by Factory Mutual System Approval Guide.	Do not comply: The roofs at Quad Cities are of Class 2 construction.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	Where combustible material is used in metal deck roofing design, acceptable alternatives are (i) replace combustibles with noncombustible materials (ii) provide an automatic sprinkler system, or (iii) provide ability to cover roof exterior and interior with adequate water volume and pressure.	
(f)	<p>Suspended ceilings and their supports should be of noncombustible construction. Concealed spaces should be devoid of combustibles.</p> <p>Adequate fire detection and suppression systems should be provided where full implementation is not practicable.</p>	<p>Comply:</p> <p>Suspended ceilings are only in the main control room (Fire Zone 2.0), Radwaste Control Room (Fire Zone 14.1), and Service Building Offices (Fire Zone 19.1 and 19.2) and are made of noncombustible material. Fire detection is provided throughout the control room above the open-grid ceiling. Cables enter control panels from below.</p>
(g)	<p>High voltage – high amperage transformers installed inside buildings containing safety-related systems should be of the dry type or insulated and cooled with noncombustible liquid.</p> <p>Safety related systems that are exposed to flammable oil filled transformers should be protected from the effects of a fire by:</p>	<p>Partially comply:</p> <p>Transformers installed at Quad Cities are silicone insulating coolant filled with the exception of two dry transformers on the main turbine operating floor. These transformers are only used during a unit outage.</p>
	(i) replacing with dry transformers or transformers that are insulated and cooled with noncombustible liquid; or	

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	(ii) enclosing the transformer with a three-hour fire barrier and installing automatic water spray protection.	
(h)	Buildings containing safety-related systems having openings in exterior walls closer than 50 feet to flammable oil filled transformers should be protected from the effects of a fire by:	Comply with intent: Protection from the transformer fire hazard is provided by:
	(i) closing of the opening to have fire resistance equal to three hours,	1. Water spray system above the transformers.
	(ii) constructing a three-hour fire barrier between the transformers and the wall openings: or	2. Reinforced concrete wall up to elevation 641 feet 2 inches on the east side of the turbine building and elevation 639 feet 0 inches (plus a 6-inch curb) on the west side of the turbine building.
	(iii) closing the opening and providing the capability to maintain to water curtain in case of a fire.	3. Water spray protection of bus duct penetrations is provided where the bus ducts enter the west wall of the turbine building. Where the bus ducts enter the east wall no suppression is provided since the transformers are 19 feet from the wall.
(i)	Floor drains, sized to remove expected fire fighting water flow should be provided in those areas where fixed water fire suppression systems are installed. Drains should also be provided in other areas where hand hose lines may be used if such fire fighting water could cause unacceptable damage to equipment in the area. Equipment should be installed on pedestals, or curbs should be provided as required to contain water and direct it	Comply with intent: Suppression effects analysis was conducted to ensure that fire fighting water would not adversely affect safe shutdown (See Section 4.0 of this report.) NFPA Code 92M was reviewed and deviations justified (F.P.P.D.P.).

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>to floor drains. (See NFPA 92M, "Waterproofing and Draining of Floors.") Drains in areas containing combustible liquids should have provisions for preventing the spread of the fire throughout the drain system. Water drainage from areas which may contain radioactivity should be sampled and analyzed before discharge to the environment.</p> <p>In operating plants or plants under construction, if accumulation of water from the operation of new fire suppression systems does not create unacceptable consequences, drains need not be installed.</p>	
(j)	<p>Floors, walls and ceilings enclosing separate fire areas should have minimum fire rating of three hours. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide a fire resistance rating at least equal to that of the fire barrier itself. Door openings should be protected with equivalent rated doors, frames and hardware that have been tested and approved by a nationally recognized laboratory. Such doors should be normally closed and locked or alarmed with alarm and annunciation in the control room. Penetrations for ventilation system should be protected by a standard "fire</p>	<p>Comply with intent: Fire areas use 3-hour rated barriers and are defined in the Safe Shutdown Analysis. Deviations in these barriers are justified in the Exemption Requests (F.P.P.D.P.).</p> <p>See NFPA code review (NFPA 80 and NFPA 90A for doors and HVAC respectively) (F.P.P.D.P.).</p> <p>Most fire doors are locked and/or alarmed if kept in the closed position. Some sliding doors are provided in reactor building barriers. These doors are normally open but are equipped with fusible links that close the doors in the event of a fire.</p>



<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>door damper” where required. (Refer to NFPA 80, “Fire Doors and Windows.”)</p> <p>The fire hazard in each area should be evaluated to determine barrier requirements. If barrier fire resistance cannot be made adequate, fire detection and suppression should be provided, such as:</p> <ul style="list-style-type: none"> <li>(i) water curtain in case of fire,</li> <li>(ii) flame retardant coatings,</li> <li>(iii) additional fire barriers.</li> </ul>	<p>Partial fire barriers are used on the operating floor as discussed in the Exemption Requests (F.P.P.D.P.).</p>
D.2 <u>Control of Combustibles</u>		
(a)	<p>Safety related systems should be isolated or separated from combustible materials. When this is not possible because of the nature of the safety system or the combustible material, special protection should be provided to prevent a fire from defeating the safety system function. Such protection may involve a combination of automatic fire suppression, and construction capable of withstanding and containing a fire that consumes all combustibles present. Examples of such combustible materials that may not be separable from the remainder of its system are:</p>	<p>Comply:</p> <p>Major fire hazards are protected by appropriate fixed fire suppression systems as identified in Section 4.0 of this report.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	(1) Emergency diesel generator fuel oil day tanks	
	(2) Turbine-generator oil and hydraulic control fluid systems	
	(3) Reactor coolant pump lube oil system	
(b)	<p>Bulk gas storage (either compressed or cryogenic), should not be permitted inside structures housing safety-related equipment. Storage of flammable gas such as hydrogen, should be located outdoors or in separate detached buildings so that a fire or explosion will not adversely affect any safety related systems or equipment.</p> <p>(Refer to NFPA 50A, "Gaseous Hydrogen Systems.")</p> <p>Care should be taken to locate high pressure gas storage containers with the long axis parallel to building walls. This will minimize the possibility of wall penetration in the event of a container failure. Use of compressed gases (especially flammable and fuel gases) inside buildings should be controlled. (Refer to NFPA 6, "Industrial Fire Loss Prevention.")</p>	<p>Comply with intent:</p> <p>(1) Outside bulk hydrogen storage is located in the yard south of the crib house and is arranged in a standard manner. Hydrogen piping is properly color coded and marked. NFPA 50A and NFPA 6 are addressed in the NFPA code review (F.P.P.D.P.). The trailer mounted H<sub>2</sub> storage tank is situated with long axis parallel to the turbine buildings, which is in proximity. The permanent H<sub>2</sub> storage facility is located with the long axis toward the turbine building.</p> <p>(2) Hydrogen Water Chemistry System modification: Trailer-mounted hydrogen gaseous storage vessels and a 20,000 gallon liquid hydrogen storage tank are located outside the security fence, approximately 1,500 feet south of the nearest safety-related structure. The site also is at least 75 feet from any future or present buildings. The trailer storage is situated with its long axis toward the turbine building. The hydrogen line is routed underground to a point just west of the Unit 1 turbine building. A branch line proceeds underground to the Unit 1 and 2 generator hydrogen control cabinet. An excess flow check valve is provided at the hydrogen storage site and outside of the Unit 1 turbine building, to secure hydrogen flow in the event of a line break. An isolation valve interfaced with area hydrogen monitors is installed at the entrance point of the</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
		hydrogen line to the Unit 1 or 2 turbine building. This isolation valve will secure the hydrogen flow in the supply line if the monitors sense an approach to an explosive mixture in the turbine building basement.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>(c) The use of plastic materials should be minimized. In particular, halogenated plastics such as polyvinyl chloride (PVC) and neoprene should be used only when substitute noncombustible materials are not available. All plastic materials, including flame and fire retardant materials, will burn with an intensity and BTU production in a range similar to that of ordinary hydrocarbons. When burning, they produce heavy smoke that obscures visibility and can plug air filters, especially charcoal and HEPA. The halogenated plastics also release free chlorine and hydrogen chloride when burning which are toxic to humans and corrosive to equipment.</p> <p>(d) Storage of flammable liquids should as minimum, comply with the requirements of NFPA 30, "Flammable and Combustible Liquids Code."</p>	<p>Comply: The use of plastic materials is minimized. The use of PVC and neoprene has been severely restricted. New cable meets the requirements of IEEE-383, IEEE-1202, NFPA 262 or equivalent.</p> <p>Comply with intent: NFPA 30 is used as a guideline. See NFPA code review (F.P.P.D.P.).</p>
D.3	<u>Electric Cable Construction, Cable Trays and Cable Penetrations</u>	
	<p>(a) Only noncombustible materials should be used for cable tray construction.</p> <p>(b) See Section F.3 for fire protection guidelines for cable spreading rooms.</p>	<p>Comply: All cable trays are constructed of noncombustible materials (galvanized sheet metal). See Subsection 5.6.3 (F.3) for response.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(c)	<p>Automatic water sprinkler systems should be provided for cable trays outside the cable spreading room. Cables should be designed to allow wetting down with deluge water without electrical faulting. Manual hose stations and portable hand extinguishers should be provided as backup. Safety-related equipment in the vicinity of such cable trays, that does not itself require water fire protection, but is subject to unacceptable damage from sprinkler water discharge, should be protected from sprinkler system operation of malfunction.</p> <p>When safety related cables do not satisfy the provisions of Regulatory Guide 1.75, all exposed cables should be covered with an approved fire retardant coating and a fixed automatic water fire suppression system should be provided.</p>	<p>Partially comply:</p> <p>Water suppression is provided over major cable concentrations (i.e., Units 1 &amp; 2 cable tunnel, cable spread room, ground floor common access corridor, and the eastern portion of the Turbine Building Central Area). Water suppression is not provided in areas containing major electrical equipment. Fire detection is provided in these areas. See Exemption Requests (F.P.P.D.P.).</p> <p>Cables are of the waterproof type and not subject to electrical faulting due to water exposure. Manual hose stations and portable extinguishers are provided for all cable areas except the cable tunnels, however, manual equipment is available to the tunnels from the ground floor of the turbine building. A suppression effects analysis was conducted to ensure that unacceptable damage would not result (see Section 4.0 of this report).</p> <p>Alternative safe shutdown capability is available independent of all fire areas – lack of complete suppression and detection in these areas is justified in the Exemption Requests (F.P.P.D.P.).</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(d)	Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to give protection at least equivalent to that fire barrier. The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, "Fire Test of Building Construction and Materials," including the hose stream test. Where installed penetration seals are deficient with respect to fire resistance, these seals may be protected by covering both sides with an approved fire retardant material. The adequacy of using such material should be demonstrated by suitable testing.	Comply: Cable and cable tray penetrations are sealed to give protection equivalent to that of the rated fire barrier. The evaluation of existing penetration seals is provided in the report entitled "Review of Existing and Proposed Penetration Seal Fire Testing and Installation Program" (F.P.P.D.P.).
(e)	Fire breaks should be provided as deemed necessary by the fire hazards analysis. Flame or flame retardant coatings may be used as a fire break for grouped electrical cables to limit spread of fire in cable ventings. (Possible cable derating owing to use of such coating materials must be considered during design.)	Comply with intent: The Appendix R analysis demonstrates safe shutdown capability using alternate shutdown equipment. It has been shown in this analysis that for a fire involving redundant cable trains in a fire area, an alternate shutdown path will be available outside of the fire area. (See Appendix R Analysis which identifies the method to ensure separation of alternate shutdown paths.) Therefore, the fire stops identified in SER 4.9 and the 4-10-78 letter do not have the significance for safe shutdown they did at the time of the SER. However, some of these fire stops are relied upon to prevent cable tray fire propagation as indicated in the Fire Hazards Analysis. Other fire stops continue to provide divisional separation between redundant trains of safety-related circuits per Appendix A.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(f)	<p>Electric cable constructions should as a minimum pass the current IEEE No. 383 flame test. (This does not imply that cables passing this test will not require additional fire protection.)</p> <p>For cable installation in operating plants and plants under construction that do not meet the IEEE No. 383 flame test requirements, all cables must be covered with an approved flame retardant coating and properly derated.</p>	<p>Do not comply:</p> <p>IEEE-383 did not exist at the time of plant construction. Modifications after issuance of IEEE-383 have utilized cables designed to meet the requirements of IEEE-383. For Safety Related cables and all cables installed in cable tray or in free air applications will specify cable insulation which has been rated to IEEE-383, IEEE-1202, NFPA 262 or equivalent. Automatic fire suppression and/or detection is provided where deemed necessary as discussed in Section 4.0 of this report.</p>
(g)	<p>To the extent practical, cable construction that does not give off corrosive gases while burning should be used. For operating plants, this position is only applicable to new cable installations.</p>	<p>Future installations of Safety Related cables and all cables installed in cable tray or in free air applications will specify cable insulation which has been rated to IEEE-383, IEEE-1202, NFPA 262 or equivalent. Modifications after issuance of IEEE-383 have utilized cables designed to meet the requirements of IEEE 383. Upon combustion this cable may give off gases which are corrosive in nature.</p>
(h)	<p>Cable trays, raceways, conduit, trenches, or culverts should be used only for cables. Miscellaneous storage should not be permitted, nor should piping for flammable or combustible liquids or gases be installed in these areas.</p> <p>Installed equipment in cable tunnels or culverts, need not be removed if they present no hazard to the cable runs as determined by the fire hazards analysis.</p>	<p>Comply:</p> <p>Cable trays, raceways, conduit, trenches and culverts are used only for cables.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>(i) The design of cable tunnels, culverts and spreading rooms should provide for automatic or manual smoke venting as required to facilitate manual fire fighting capability.</p> <p>(j) Cables in the control room should be kept to the minimum necessary for operation of the control room. All cables entering the control room should terminate there. Cables should not be installed in floor trenches or culverts in the control room.</p> <p>Existing cabling installed in concealed floor and ceiling spaces should be protected with an automatic total flooding halon system.</p>	<p>Comply: Portable ventilating equipment (smoke ejectors) is available for fire brigade use.</p> <p>Partially Comply: Cabling in the control room is generally kept to a minimum for control room operation. All cables entering the control room terminate there. There are no cable trenches or culverts in the control room floor. A central console is located on a raised floor. Power cables under the console are routed in conduit. The remaining wiring feeds the communications and computer equipment in the control room. The total amount of cable and wiring under console is minimal. The control room is continuously manned and portable fire extinguishers are kept in the control room for manual fire fighting. The addition of a Halon flooding system for this concealed floor area is not warranted.</p>
D.4 <u>Ventilation</u>	<p>(a) The products of combustion that need to be removed from a specific fire area should be evaluated to determine how they will be controlled. Smoke and corrosive gases should generally be automatically discharged directly outside to a safe location. Smoke and gases containing radioactive materials should be monitored in the fire area</p>	<p>Partially comply: All existing ventilation exhaust air which is potentially contaminated is monitored prior to release to the atmosphere to ensure that releases are within the plant technical specification limits. Generally, the normal ventilation system would be shut down in a fire area and manually restarted post fire. Portable ventilating equipment would be used to remove smoke from the area.</p>



<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	to determine if release to the environment is within the permissible limits of the plant Technical Specifications.	
	The products of combustion which need to be removed from a specific fire area should be evaluated to determine how they will be controlled.	
(b)	Any ventilation system designed to exhaust smoke or corrosive gases should be evaluated to ensure that inadvertent operation or single failures will not violate the controlled areas of the plant design. This requirement includes containment functions for protection of the public and maintaining habitability for operations personnel.	Comply: Existing ventilation systems are not designed to exhaust smoke or corrosive gas concurrently with a fire. It is the intent to manually restart existing ventilation systems to provide purge on a post fire basis. These systems are monitored as noted in Position D.4(a) above.
(c)	The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system.	Do not comply: Power supply and controls for mechanical ventilation equipment are not necessarily routed outside of fire hazard areas served by the system. Most ventilation equipment is located within the fire hazard area, thereby requiring electrical cable to be routed accordingly.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(d)	Fire suppression systems should be installed to protect charcoal filters in accordance with Regulatory Guide 1.52, "Design Testing and Maintenance Criteria for Atmospheric Cleanup Air Filtration."	<p>Do not comply:</p> <p>Fixed automatic sprinkler system for charcoal filters are not provided. This design predated requirements for fire protection. The charcoal is contained in an enclosed metal cabinet and the spread of fire is remote. Manual water spray systems are provided for charcoal filter in the control room, technical support center, and HRSS building.</p> <p>It should be noted that Regulatory Guide 1.52 does not specifically require charcoal filters to have fixed automatic suppression systems.</p>
(e)	The fresh air supply intakes to areas containing safety related equipment or systems should be located remote from the exhaust air outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with the products of combustion.	<p>Comply:</p> <p>Fresh air intakes for the ventilation systems are currently constructed with physical separation between exhaust outlets. This is accomplished by routing plant ventilation exhaust air to the station stack which is remotely located from the station. Exhaust air not routed to the stack is separated from the air intakes.</p>
(f)	Stairwells should be designed to minimize smoke infiltration during a fire. Staircases should serve as escape routes and access routes for fire fighting. Fire exit route should be clearly marked. Stairwells, elevators and chutes should be enclosed in masonry towers with minimum fire rating of three hours and automatic fire doors at least equal to the enclosure construction, at each opening into the building. Elevators should not be used during fire emergencies.	<p>Do not comply:</p> <p>Stairwells are not enclosed. Elevators are enclosed in masonry shafts with 2-hour fire ratings. Escape and access routes are established.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	Where stairwells or elevators cannot be enclosed in three-hour fire rated barrier with equivalent fire doors, escape and access routes should be established by pre-fire plan and practiced in drills by operating and fire brigade personnel.	
(g)	Smoke and heat vents may be useful in specific areas such as cable spreading rooms and diesel fuel oil storage areas and switchgear rooms. When natural-convection ventilation is used, a minimum ratio of 1 sq. foot of venting area per 200 sq. feet of floor area should be provided. If forced-convection ventilation is used, 300 CFM should be provided for every 200 sq. feet of floor area. See NFPA No. 204 for additional guidance on smoke control.	Do not comply: Specifically designed smoke and heat vents are not and will not be installed in structures or identified fire hazard areas. Existing ventilation systems will be utilized for post fire purging as applicable.
(h)	Self-contained breathing apparatus, using full face positive pressure masks, approved by NIOSH (National Institute for Occupational Safety and Health – approval formerly given by the U.S. Bureau of Mines) should be provided for fire brigade, damage control and control room personnel. Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or operating life should be a minimum of one half hour for the self-contained units.	Comply: Adequate self-contained breathing apparatus and spare bottles are available for use. A manifold breathing air system is available for control room personnel.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	At least two extra air bottles should be located onsite for each self-contained breathing unit. In addition, an onsite 6-hour supply of reserve air should be provided and arranged to permit quick and complete replenishment of exhausted supply air bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air should be used. Special care must be taken to locate the compressor in areas free of dust and contaminants.	
(i)	Where total flooding gas extinguishing systems are used, area intake and exhaust ventilation dampers should close upon initiation of gas flow to maintain necessary gas concentration. (See NFPA 12, "Carbon Dioxide Systems," and 12A, "Halon 1301 Systems.")	Comply: Where total flooding gas extinguishing systems method is utilized, dampers are installed to isolate the ventilation supply and exhaust ductwork. These dampers are interlocked to close on the initiation of the gas system and are reopened to permit post fire purging. An example would be the diesel generator room at the station. See NFPA Code Review (F.P.P.D.P.).

#### D.5 Lighting and Communication

Lighting and two way voice communication are vital to safe shutdown and emergency response in the event of fire. Suitable fixed and portable emergency lighting and communication devices should be provided to satisfy the following requirements:

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(a)	Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.	Comply: Fixed emergency lighting is installed at selected locations throughout the plant per Appendix R, Section III.J requirements. See Section 6.5 of the Safe Shutdown Report.
(b)	Suitable sealed beam battery powered portable hand lights should be provided for emergency use.	Comply: Sealed beam battery powered portable hand lights are available at the station for emergency use.
(c)	Fixed emergency communication should use voice powered head sets at pre-selected stations.	Comply: Two-way telephones and a paging system exist throughout the plant. A limited number of voice powered head set stations are provided for maintenance use.
(d)	Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure fire damage.	Comply with intent: Most fires remote from the repeaters will have no impact on the repeater equipment. However, communications will not be interrupted in the event of a fire as described in Section 6.6 of the Safe Shutdown Report.

**5.5 Fire Detection and Suppression**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
E.1	<b><u>Fire Detection</u></b>	
(a)	Fire detection systems should as a minimum comply with NFPA 72D, "Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems."	Comply: Fire detection systems have been reviewed against the criteria of NFPA 72D. The results of this review are found in the NFPA Code Review (F.P.P.D.P.).
	Deviations from the requirements of NFPA 72D should be identified and justified.	
(b)	Fire detection system should give audible and visual alarm and annunciation in the control room. Local audible alarms should also sound at the location of the fire.	Partially Comply: Audible and visual alarms and annunciation are provided in the control room. Local alarms are present on most of the suppression systems but are not installed on the fire detection systems or fire suppression systems that have been installed since 1986. The Operations procedure for responding to a fire directs the use of the PA system to alert personnel to the location of a potential fire. This is an acceptable replacement of local alarms.
(c)	Fire alarms should be distinctive and unique. They should not be capable of being confused with any other plant system alarms.	
(d)	Fire detection and actuation systems should be connected to the plant emergency power supply.	Comply: The station fire alarm is distinct from other station alarms.
E.2	<b><u>Fire Protection Water Supply Systems</u></b>	
(a)	An underground yard fire main loop should be installed to furnish anticipated fire water requirements. NFPA 24 – Standard for Outside Protection – gives necessary guidance for installation.	Comply: The present fire detection and actuation system is connected to the plant uninterruptible power source.  Partially comply: A looped 10-inch water main surrounds the plant. Unlined pipe was used in the buried loop.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>It references other design codes and standards developed by such organizations as the American National Standards Institute (ANSI) and the American Water Works Association (AWWA). Lined steel or cast iron pipe should be used to reduce internal tuberculation. Such tuberculation deposits in an unlined pipe over a period of years can significantly reduce water flow through the combination of increased friction and reduced pipe diameter. Means for treating and flushing the systems should be provided. Approved visually indicating sectional control valves, such as Post Indicator Valve, should be provided to isolate portions of the main for maintenance or repair without shutting off the entire system.</p>	<p>Additional cross connections are provided to improve system hydraulics and reliability. Sectionalizing valves are provided to minimize adverse impact on systems.</p>
	<p>The fire main system piping should be separated from service or sanitary water system piping.</p>	<p>NFPA 24 code reviews justified the deviation of the unlined piping in the yard main. Condition of piping interior is monitored by conducting C-factor tests every 3 years. Suppression systems were conservatively designed to allow for deterioration in the underground piping. Hydrants are utilized in the periodic flushing of the system.</p>
	<p>Visible location marking signs for underground valves are acceptable. Alternative valve position indicators should also be provided.</p>	<p>NFPA-24 was reviewed and deviations are justified. (F.P.P.D.P.) See hydraulic calculation (F.P.P.D.P.).</p>
	<p>For operating plants, fire main system piping that can be isolated from service or sanitary water system piping is acceptable.</p>	<p>No underground valves are provided within the security fence except for hydrant laterals.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(b)	<p>A common yard fire main loop may serve multi-unit nuclear power plant sites, if cross connected between units. Sectional control valves should permit maintaining independence of the individual loop around each unit. For such installations, common water supplies may also be utilized. The water supply should be sized for the largest single expected flow. For multiple reactor sites with widely separated plants (approaching 1 mile or more), separate yard fire main loops should be used.</p> <p>Sectionalized systems are acceptable.</p>	<p>Comply with intent: Common yard main fire loops and water supplies are utilized for multiple units. Individual loops are not provided around each unit, since units are not separated from one another. Refer to Section 5.5(E.2.e) for fire water supply capacity.</p>
(c)	<p>If pumps are required to meet system pressure or flow requirements, a sufficient number of pumps should be provided so that 100% capacity will be available with one pump inactive (e.g., three 50% pumps or two 100% pumps). The connection to the yard fire main loop from each fire pump should be widely separated, preferably located on opposite sides of the plant. Each pump should have its own driver with independent power supplies and control. At least one pump (if not powered from the emergency diesels) should be driven by non-electrical means, preferably diesel engine. Pumps and drivers should be located in rooms separated from the remaining</p>	<p>Partially Comply: Two 100% diesel driven fire pumps are provided. These pumps are located in the crib house. The fire pumps are rated at 2500 gpm at 139 psig. The fire pump takes suction from the Mississippi River. The fire pumps are not separated by fire walls. Separate valved connections are provided to the loop from each pump. The fire system does not have a pressure maintenance pump because it is normally supplied by the service water pumps through a restricted orifice.</p> <p>Fire pumps are generally installed in accordance with NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps." Alarms indicating pump running, mechanical trouble, loss of d-c power and diesel day tank level are provided. NFPA 20 Code Review justified any deviation in the installation of these pumps (see F.P.P.D.P.).</p>



<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>pumps and equipment by a minimum three-hour fire wall. Alarms indicating pump running, driver availability, or failure to start should be provided in the control room.</p> <p>Details of the fire pump installation should as a minimum conform to NFPA 20 “Standard for the Installation of Centrifugal Fire Pumps.”</p>	
(d)	<p>Two separate reliable water supplies should be provided. If tanks are used, two 100% (minimum of 300,000 gallons each) system capacity tanks should be installed. They should be so interconnected that pumps can take suction from either or both. However, a leak in one tank or its piping should not cause both tanks to drain. The main plant fire water supply capacity should be capable of refilling either tank in a minimum of eight hours.</p> <p>Common tanks are permitted for fire and sanitary or service water storage. When this is done, however, minimum fire water storage requirements should be dedicated by means of a vertical standpipe for other water services.</p>	<p>Comply with intent: The fire pumps take suction from the Mississippi River. Storage tanks are not used.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(e)	<p>The fire water supply (total capacity and flow rate) should be calculated on the basis of the largest expected flow rate for a period of two hours, but not less than 300,000 gallons. This flow rate should be based (conservatively) on 1,000 gpm for manual hose streams plus the greater of:</p> <ol style="list-style-type: none"> <li>(1) all sprinkler heads opened and flowing in the largest designed fire area; or</li> <li>(2) the largest open head deluge system(s) operating.</li> </ol>	<p>Comply with intent:</p> <p>Hydraulic calculations have been conducted to verify that each system demand can be satisfied with 1) either fire pump operating or 2) the hydraulically shortest leg of the fire protection supply out of service. An allowance of 500 gpm was utilized for additional hose stream use simultaneous with fixed system operation.</p> <p>In most cases, the hose stream allowance assumed a 100 gpm flow from a nearby hose station and 400 gpm from a hydrant in the yard main. Water supply exceeds water requirements. See QDC-4100-M-0537 for specific requirements for each system.</p> <p>Comply:</p> <p>Failure of the fire protection system will not degrade the function of the ultimate heat sink.</p>
(f)	<p>Lakes or fresh water ponds of sufficient size may qualify as sole source of water for fire protection, but require at least two intakes to the pump supply. When a common water supply is permitted for fire protection and the ultimate heat sink, the following conditions should also be satisfied:</p> <ol style="list-style-type: none"> <li>(1) The additional fire protection water requirements are designed into the total storage capacity; and</li> <li>(2) Failure of the fire protection system should not degrade the function of the ultimate heat sink.</li> </ol>	

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>(g) Outside manual hose installation should be sufficient to reach any location with an effective hose stream. To accomplish this, hydrants should be installed approximately every 250 feet on the yard main system. The lateral to each hydrant from the yard main should be controlled by a visually indicating or key operated (curb) valve. A hose house, equipped with hose and combination nozzle, and other auxiliary equipment recommended in NFPA 24, "Outside Protection," should be provided as needed but at least every 1,000 feet.</p> <p>Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings and standpipe risers.</p>	<p>Comply with intent:</p> <p>Fire hydrant spacing is in accordance with NFPA 24 and is less than 400 feet, except in the area of the crib house where spacing is about 500 feet. Post indicator type valves are generally provided for fire hydrant laterals.</p> <p>Hose houses are not used in favor of a "fire truck". This truck is equipped with at least twice the equipment required by NFPA 24. All fire hose threads are compatible with the local fire department hose threads.</p>
E.3	<u>Water Sprinklers and Hose Standpipe Systems</u>	
	<p>(a) Each automatic sprinkler system and manual hose station standpipe should have an independent connection to the plant underground water main. Headers fed from each end are permitted inside buildings to supply multiple sprinkler and standpipe systems. When provided, such headers are considered an extension of the yard main system. The header arrangement should be such that no single failure can impair both the primary and backup fire protection systems.</p>	<p>Comply with intent:</p> <p>Automatic sprinkler system and manual hose stations are supplied from interior loops and mains. All loops and interior mains have a minimum of two connections to the underground loop. No single failure will impair both primary and backup systems.</p> <p>Automatic sprinkler systems and standpipe systems are equipped with OS&amp;Y gate valves or other approved valves. Waterflow alarms are provided for automatic sprinkler systems, but not for standpipe systems.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shutoff valve, and water flow alarm. Safety-related equipment that does not itself require sprinkler water fire protection, but is subject to unacceptable damage if wetted by sprinkler water discharge should be protected by water shields or baffles.	Special water shields or baffles are provided for some safety-related equipment. A suppression effects analysis was performed to ensure that water discharge would not adversely affect safe shutdown of the plant. The results of this analysis are documented in Section 4.0 of this report.
(b)	All valves in the fire water systems should be electrically supervised. The electrical supervision signal should indicate in the control room and other appropriate command locations in the plant (See NFPA 26, "Supervision of Valves.").  When electrical supervision of fire protection valves is not practicable, and adequate management supervision program should be provided. Such a program should include locking valves open with strict key control; tamper-proof seals; and periodic, visual check of all valves.	Comply: Electrical supervision is generally provided for valves controlling individual fixed extinguishing systems. Interior and exterior sectional control valves are not electrically supervised. Valves are sealed or locked in the proper position and inspected quarterly. NFPA-26 was reviewed and deviations justified (F.P.P.D.P.).
(c)	Automatic sprinkler systems should as a minimum conform to requirements of appropriate standards such as NFPA 13, "Standard for the Installation of Sprinkler Systems," and NFPA 15, "Standard for Water Spray Fixed Systems."	Comply with intent: Fixed water extinguishing systems are installed in accordance with the appropriate NFPA standards. NFPA 13 and 15 have been reviewed and deviations justified (F.P.P.D.P.).

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(d)	<p>Interior manual hose installation should be able to reach any location with at least one effective hose stream. To accomplish this, standpipes with hose connections equipped with a maximum of 75 feet of 1-1/2-inch woven jacket-lined fire hose and suitable nozzles should be provided in all buildings, including containment, on all floors and should be spaced at not more than 100-foot intervals. Individual standpipes should be of at least 4-inch diameter for multiple hose connections and 2-1/2-inch diameter for single hose connections. These systems should follow the requirements of NFPA No. 14 for sizing, spacing and pipe support requirements (NELPIA).</p> <p>Hose stations should be located outside entrances to normally unoccupied areas and inside normally occupied areas. Standpipes serving hose stations in areas housing safety-related equipment should have shutoff valves and pressure reducing devices (if applicable) outside the area.</p>	<p>Comply with intent: Manual hose stations are not provided for cable tunnel and containment drywells, however adequate hose is provided for access to these areas.</p> <p>Quad Cities utilizes rubber lined hose and hose lengths do not exceed 100 feet. A few hose standpipes serving multiple hose connections are less than 4-inch diameter, and several standpipes serving single hose connections are less than 2-1/2-inch diameter. Calculations have been done to verify the adequacy of supply from these smaller pipes. Other portions of the standpipe and hose systems comply with NFPA 14, "Standpipe and Hose Systems."</p> <p>Hose stations are generally located outside of unoccupied areas. Shutoff valves are provided for all standpipes or sections of interior piping. Additional shutoff valves are not provided for areas housing safety-related equipment. Standpipe systems are installed and tested in accordance with NFPA 14, "Standpipe and Hose Systems." Cross connections to essential service water systems are not provided within the plant.</p> <p>NFPA 14 was reviewed and deviations justified (F.P.P.D.P.).</p> <p>Signs are installed warning of hose station high pressure.</p>
(e)	<p>The proper type of hose nozzles to be supplied to each area should be based on the fire hazard analysis. The usual combination spray/straight-stream nozzle may cause unacceptable mechanical damage (for</p>	<p>Comply: Electrically safe nozzles are provided at locations where electrical equipment or cabling is located. .</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	example, the delicate electronic equipment in the control room) and be unsuitable. Electronically safe nozzles should be provided at locations where electrical equipment or cabling is located.	
(f)	Certain fires such as those involving flammable liquids respond well to foam suppression. Consideration should be given to use of any of the available foams for such specialized protection application. These include the more common chemical and mechanical low expansion foams, high expansion foam and the relatively new aqueous film forming foam (AFFF).	Fixed foam protection is not provided for flammable or combustible liquid hazards. Portable foam extinguishers are provided to supplement manual equipment.
E.4	<u>Halon Suppression Systems</u>	
	The use of Halon fire extinguishing agents should as a minimum comply with the requirements of NFPA 12A and 12B, "Halogenated Fire Extinguishing Agent Systems-Halon 1301 and Halon 1211." Only UL or FM approved agents should be used.	Comply with intent: Quad Cities utilize Halon 1301 for protection of the records storage vault and new computer room. This installation meets the requirements of NFPA 12A.
	In addition to the guidelines of NFPA 12A and 12B, preventative maintenance and testing of the systems, including check weighing of the Halon cylinders should be done at least quarterly.	NFPA 12A was reviewed and deviations justified (F.P.P.D.P.). Surveillance is conducted in accordance with documented procedures.

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	Particular consideration should also be given to:	
	(a) minimum required Halon concentration and soak time	
	(b) toxicity of Halon	
	(c) toxicity and corrosive characteristics of thermal decomposition products of Halon.	
E.5	<u>Carbon Dioxide Suppression Systems</u>	
	The use of carbon dioxide extinguishing systems should as a minimum comply with the requirements of NFPA 12, "Carbon Dioxide Extinguishing Systems."	Partially comply: Compliance with NFPA 12 is documented in the NFPA Code Review (F.P.P.D.P.).
	Particular consideration should also be given to:	
	(a) Minimum required CO <sub>2</sub> concentration and soak time;	(a) NFPA 12 was used in design although installation acceptance tests were not specifically performed.
	(b) toxicity of CO <sub>2</sub> ;	(b) All carbon dioxide systems have predischarg alarms.
	(c) possibility of secondary thermal shock (cooling) damage;	(c) Nozzles do not discharge directly on equipment.
	(d) offsetting requirements for venting during CO <sub>2</sub> injection to prevent overpressurization versus sealing to prevent loss of agent;	(d) See part (a).
	(e) design requirements from overpressurization; and	(e) See part (a).

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	(f) possibility and probability of CO <sub>2</sub> systems being out of service because of personnel safety consideration. CO <sub>2</sub> systems are disarmed when ever people are present in an area so protected. Areas entered frequently (even though duration time for any visit is short) have often been found with CO <sub>2</sub> systems shut off.	(f) Carbon dioxide systems are not provided with individual shutoff valves and are not taken out of service for equipment maintenance or at other times when personnel are present.
E.6	<u>Portable Extinguishers</u>	
	Fire extinguishers should be provided in accordance with guidelines of NFPA 10 and 10A, "Portable Fire Extinguishers, Installation, Maintenance, and Use." Dry chemical extinguishers should be installed with due consideration given to cleanup problems after use and possible adverse effects on equipment installed in the area.	Do not comply: Standpipes are generally used in lieu of Class A extinguishers. CO <sub>2</sub> and dry chemical portable extinguishers are available for use on Class B and C hazards.  NFPA 10 and 10A were reviewed and deviations justified (F.P.P.D.P.).



**5.6 Guidelines for Specific Plant Areas****5.6.1 Primary and Secondary Containment**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.1 (a)	<u>Normal Operation</u>	
	<p>Fire protection requirements for the primary and secondary containment areas should be provided on the basis of specific identified hazards. For example:</p> <p style="padding-left: 40px;">Lubricating oil or hydraulic fluid systems for the coolant pumps</p> <p style="padding-left: 40px;">Cable tray arrangements and cable penetrations</p> <p style="padding-left: 40px;">Charcoal filters</p> <p>Fire suppression systems should be provided based on the fire hazards analysis.</p> <p>Fixed fire suppression capability should be provided for hazards that could jeopardize safe plant shutdown. Automatic sprinklers are preferred. An acceptable alternate is automatic gas (Halon or CO<sub>2</sub>) for hazards identified as requiring fixed suppression protection.</p> <p>An enclosure may be required to confine the agent if a gas system is used. Such enclosures should not adversely affect safe shutdown, or other operating equipment in containment.</p>	<p>Comply with intent:</p> <p>Fire protection for the primary and secondary containment fire hazards were considered in plant design.</p> <p>Local water suppression systems are provided over specific fire hazards (i.e., HPCI room). Water suppression systems are also provided to separate fire areas as described in the Exemption Requests (F.P.P.D.P.). There are no fire protection features inside primary containment. The primary containment is inerted with nitrogen during operation. No gaseous suppression is used in secondary containment.</p> <p>The Safe Shutdown Report describes the effects of a fire on safe plant shutdown. The Exemption Requests (F.P.P.D.P.) provided justification for not installing complete suppression.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	<p>Operation of the fire protection systems should not compromise integrity of the containment or the other safety related systems. Fire protection activities in the containment areas should function in conjunction with total containment requirements such as control of contaminated liquid and gaseous release and ventilation.</p>	
	<p>Automatic fire suppression capability need not be provided in the primary containment atmospheres that are inerted during normal operation. However, special fire protection requirements during refueling and maintenance operations should be satisfied as provided below.</p>	<p>Administrative procedures and controls are enforced during refueling and maintenance operations to control any additional hazards that would be introduced to the primary containment area.</p>
	<p>Fire detection systems should alarm and annunciate in the control room. The type of detection used and the location of the detectors should be most suitable to the particular type of fire that could be expected from the identified hazard. A primary containment general area fire detection capability should be provided as backup for the above described hazard detection. To accomplish this, suitable smoke detection (e.g., visual obscuration, light scattering and particle counting) should be installed in the air recirculation system ahead of any filters.</p>	<p>Automatic fire detection is provided throughout most areas of the reactor building (secondary containment). (See Section 4.0 of this report.) The Exemption Requests (F.P.P.D.P.) provide justification for not installing complete fire detection systems. Suppression or detection systems are not being installed in the primary containment since it is inerted during operation.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
(b)	<u>Refueling and Maintenance</u>	
	<p>Refueling and maintenance operations in containment may introduce additional hazards such as contamination control materials, decontamination supplies, wood planking, temporary wiring, welding and flame cutting (with portable compressed fuel gas supply). Possible fires would not necessarily be in the vicinity of fixed detection and suppression systems.</p> <p>Management procedures and controls necessary to assure adequate fire protection are discussed in Section 3a.</p> <p>In addition, manual fire fighting capability should be permanently installed in containment. Standpipes with hose stations, and portable fire extinguishers, should be installed at strategic locations throughout containment for any required manual fire fighting operations.</p> <p>Equivalent protection from portable systems should be provided if it is impractical to install standpipes with hose stations.</p> <p>Adequate self-contained breathing apparatus should be provided near the containment entrances for fire fighting and damage control personnel. These units should be</p>	<p>Comply:</p> <p>Combustibles and ignition sources are controlled through administrative procedures.</p> <p>Hose stations and portable CO<sub>2</sub> extinguishers are located at various areas in the secondary containment. Sufficient hose length is provided to reach into the primary containment.</p> <p>Adequate self-contained breathing apparatus is provided near primary containment entrances.</p>

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
	independent of any breathing apparatus or air supply systems provided for general plant activities.	

**5.6.2 Control Room**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.2	<p>The control room is essential to safe reactor operation. It must be protected against disabling fire damage and should be separated from other areas of the plant by floors, walls, and roofs having minimum fire resistance rating of three hours.</p> <p>Hose stations adjacent to the control room with portable extinguishers in the control room are acceptable.</p> <p>Nozzles that are compatible with the hazards and equipment in the control room should be provided for the manual hose station. The nozzles chosen should satisfy actual fire fighting needs, satisfy electrical safety, and minimize physical damage to electrical equipment from hose stream impingement.</p> <p>Fire detection in the control room cabinets and consoles should be provided by smoke and heat detectors in each fire area. Alarm and annunciation should be provided in the control room. Fire alarms in other parts of the plant should also be alarmed and annunciated in the control room.</p>	<p>Comply with intent: Complete 3-hour fire barriers are provided with the exception of the floor between the control room and the cable spread room. This floor is a 3-hour barrier except for unrated noncombustible penetration seals. The AEER, cable spread, computer room and control room form one fire area. Safe shutdown for both units can be achieved independent of this fire area. See Safe Shutdown Report.</p> <p>Comply: Hose stations and portable extinguishers are provided as shown on Drawing F-8-1.</p> <p>Comply: Appropriate nozzles are provided.</p> <p>Comply with intent: Ionization detection is provided throughout the control room, both above and below the false ceiling. Fire alarms throughout the plant alarm and annunciate in the control room.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	Breathing apparatus for control room operators should be readily available. Control room floors, ceiling, supporting structures, and walls, including penetrations and doors, should be designed to a minimum fire rating of three hours. All penetration seals should be air tight.	Comply with intent: Breathing apparatus is available for control room operators. Discussion of the fire barriers is provided in the first paragraph above and Section 5.4(D.1.j.).
	The control room ventilation intake should be provided with smoke detection capability to alarm locally in order to allow control room personnel to manually operate ventilation dampers to prevent smoke from entering the control room. Manually operating venting should be available so that operators have the option of venting for visibility.	Comply: The control room ventilation system is designed as a recirculation system with the smoke detectors installed in the return air ducts. Upon detection of smoke, dampers automatically reposition enabling the system to operate as a once-through type. The ventilating system may be manually operated from the control room to provide a purging capability if necessary.
	Cables should not be located in concealed floor and ceiling spaces. All cables that enter the control room should terminate in the control room. That is, no cabling should be simply routed through the control room from one area to another.	Comply: Cabling in the control room is generally kept to a minimum for control room operation. All cables entering the control room terminate there. There are no trenches or culverts in the control room floor.  A central console is located on a raised floor. Power cables under the console are routed in conduit. The remaining wiring feeds the communications and computer equipment in the control room. The total amount of cable and wiring under console is minimal. The control room is continuously manned and portable fire extinguishers are kept in the control room for manual fire fighting. The addition of a Halon flooding system for this concealed floor are is not warranted.

**5.6.3 Cable Room**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.3(a) (1)	Automatic water system such as closed head sprinklers, open head deluge, or open directional spray nozzles. Deluge and open spray systems should have provisions for manual operation at a remote station; however, there should also be provisions to preclude inadvertent operation. Location of sprinkler heads or spray nozzles should consider cable tray sizing and arrangements to assure adequate water coverage. Cables should be designed to allow wetting down with deluge water without electrical faulting. Open head deluge and open directional spray systems should be zoned so that a single failure will not deprive the entire area of automatic fire suppression capability. The use of foam is acceptable, provided it is of a type capable of being delivered by a sprinkler or deluge system, such as an Aqueous Film Forming Foam (AFFF).	<p>Comply:</p> <p>Wet pipe suppression is provided in the cable spread room.</p> <p>Both divisions of cable for both units are located in this area, however, safe shutdown for both units can be achieved independent of this fire area. See Safe Shutdown Analysis and Exemption Requests.</p>
(2)	Manual hoses and portable extinguishers should be provided as backup.	<p>Comply:</p> <p>Manual hoses and portable extinguishers are provided as backup. See Section 4.0.</p>
(3)	Each cable spreading room of each unit should have divisional cable separation, and be separated from the other and the rest of the plant by a minimum three-hour rated fire wall (Refer to NFPA 251	<p>Do not comply:</p> <p>Both divisions of cable for both units are located in this area, however, alternative shutdown capability has been provided per provisions of Appendix R. See Safe Shutdown Report.</p>

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	or ASTM E-119 for the fire test resistance rating).	
	(4) At least two remote and separate entrances are provided to the room for access by fire brigade personnel; and	Comply: Two separate entrances are provided to the cable spread room.
	(5) Aisle separation provided between tray stacks should be at least three feet wide and eight feet high.	Comply with intent: All cable trays are accessible for manual suppression.
(b)	For cable spreading rooms that do not provide divisional cable separation of (a) (3), in addition to meeting (a) (1), (2), (4), and (5) above, the following should also be provided:	Comply with intent: The cable spreading room is separated from all other plant areas by complete three-hour barriers except for the control room above and AEER below which are considered part of the same fire area. The cable spread room is separated from the control room by a 3-hour fire barrier that has unrated noncombustible penetration seals. Fire retardant coatings are not provided on the cabling. Safe shutdown can be achieved independent of this fire area. See Safe Shutdown Report.
	(1) Divisional cable separation should meet the guidelines of Regulatory Guide 1.75, "Physical Independence of Electric Systems."	
	(2) All cabling should be covered with a suitable fire retardant coating.	
	(3) As an alternate to (a) (1) above, automatically initiated gas systems (Halon or CO <sub>2</sub> ) may be used for primary fire suppression, provided a fixed water system is used as a backup.	
	(4) Plants that cannot meet the guidelines of Regulatory Guide 1.75, in addition to meeting (a) (1), (2), (4), and (5) above, an auxiliary	



<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
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shutdown system with all cabling independent of the cable spreading room should be provided.

**5.6.4 Plant Computer Room**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.4	Safety-related computers should be separated from other areas of the plant by barriers having a minimum three-hour resistant rating. Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Manual hose stations and portable water and halon fire extinguishers should be provided.	The plant computers are not safety-related at Quad Cities.

**5.6.5 Switchgear Rooms**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.5	Switchgear rooms should be separated from the remainder of the plant by minimum three-hour rated fire barriers to the extent practicable.	Comply with intent: No switchgear rooms were provided in the design of Quad Cities. Essential switchgear and MCCs are located in the turbine and reactor buildings. Alternative shutdown capability has been identified in all areas containing switchgear and MCCs. See Safe Shutdown Report.
	Automatic fire detection should alarm and annunciate in the control room and alarm locally.	Automatic fire detection is provided in the vicinity of all switchgear and MCCs which alarms in the control room.
	Fire hose stations and portable extinguishers should be readily available.	Hose stations and portable fire extinguishers are provided for switchgear and MCCs.
	Acceptable protection for cables that pass through the switchgear room is automatic water or gas agent suppression. Such automatic suppression must consider preventing unacceptable damage to electrical equipment and possible necessary containment of agent following discharge.	Not applicable (see above).

**5.6.6 Remote Safety-Related Panels**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.6	The general area housing remote safety-related panels should be protected with automatic fire detectors that alarm and annunciate in the control room. Combustible materials should be controlled and limited to those required for operation. Portable extinguishers and manual hose stations should be provided.	Comply with intent: In general, local panels which are used for safe shutdown are in areas that are provided with fire detectors and/or suppression.

**5.6.7 Station Battery Room**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.7	Battery rooms should be protected against fire explosions.	Comply: NFPA 69 was reviewed and deviations justified (F.P.P.D.P.). Air flow alarms are provided in ventilation system to notify the control room upon loss of ventilation.
	Battery rooms should be separated from each other and other areas of the plant by barriers having a minimum fire rating of three hours inclusive of all penetrations and openings.	Comply with intent: The battery rooms are separated from the rest of the turbine building by 3 hour fire barriers, with the exception of DC switchgear rooms below the battery rooms. The battery rooms and their respective switchgear rooms have been evaluated as one fire area and have been evaluated as one fire area and have been demonstrated to comply with the requirements of App. R (See Safe Shutdown Report).
	Ventilation system in the battery rooms should be capable of maintaining the hydrogen concentration well below 2 volume percent hydrogen concentration.	See the first paragraph above.
	Standpipe and hose and portable extinguishers should be provided.	Comply: See F-drawings F-14-1 and F-15-1.
	Alternatives:	Not applicable.
	(a) Provide a total fire rated barrier enclosure of the battery room complex that exceeds the fire load contained in the room.	
	(b) Reduce the fire load to be within the fire barrier capability of 1-1/2-hours.	
	(c) Provide a remote manual actuated sprinkler system in each room and provide the 1-1/2-hour fire barrier separation.	

**5.6.8 Turbine Lubrication and Control Oil Storage and Use Areas**

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
F.8	<p>A blank fire wall having a minimum resistance rating of three hours should separate all areas containing safety-related systems and equipment from the turbine oil system.</p> <p>When a blank wall is not present, open head deluge protection should be provided for the turbine oil hazards and automatic open head water curtain protection should be provided for wall openings.</p>	<p>Comply with intent:</p> <p>The clean and dirty oil room has a 3-hour fire rating except for two hose access hatches and is protected by wet pipe sprinklers. The hatches have unrated hinged covers, however, they are of substantial construction, and therefore, a fire will not spread through these hatches.</p> <p>All other areas containing oil are provided with an automatic water protection system as described below.</p> <p>The turbines for Units 1 and 2 are equipped with separate electrohydraulic control (EHC) systems using approved fire retardant fluid. Closed head sprinkler protection is provided above the EHC units.</p> <p>Bearing lift pump oil systems are located on the main turbine floor outside of the radiation shield wall. An automatic closed head water suppression system protects the bearing lift pumps.</p> <p>The turbine oil reservoir tanks with a capacity of 13,000 gallons are located on the mezzanine floor of the turbine building. These tanks are protected with an automatic water spray supplemented by a ceiling-level wet pipe sprinkler system. Thermal detectors are provided for the turbine oil reservoir tanks.</p> <p>The hydrogen seal oil reservoirs are protected with automatic water spray systems and the turbine bearings are protected with heat detectors and an automatic deluge system.</p>

**5.6.9 Diesel Generator Area**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.9	<p>Diesel generators should be separated from each other and other areas of the plant by fire barriers having a minimum resistance rating of three hours.</p> <p>Automatic fire suppression such as AFFF foam, or sprinklers, should be installed to combat any diesel generator or lubricating oil fires (automatic gas systems may be used in lieu of foam or sprinklers). Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Drainage for fire fighting water and means for local manual venting of smoke should be provided.</p> <p>Day tanks with total capacity up to 1100 gallons are permitted in the diesel generator area under the following conditions:</p> <p>(a) The day tank is located in a separate enclosure, with a minimum fire resistance rating of three hours, including doors or penetrations. These enclosures should be capable of containing the entire contents of the day tanks. The enclosure should be ventilated to avoid accumulation of oil fumes.</p>	<p>Comply with intent: DG cells 1 and 2 are separated and each is enclosed with complete 3-hour rated barriers except for the annular spaces around the DG exhaust and air supply pipes. The DG ½ cell is separated from the reactor buildings by complete 3-hour barriers.</p> <p>Comply: An automatic total flooding CO<sub>2</sub> system is provided in each DG room. Manual smoke venting is provided by portable smoke ejectors.</p> <p>Do not comply: Although the day tank enclosure is masonry, it is not 3-hour rated. Furthermore, the room is not ventilated although the tanks are vented to outside the building. The day tank rooms are considered part of the DG cell.</p>

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
(b)	The enclosure should be protected by automatic fire suppression systems such as AFFF or sprinklers.	Comply: The DG day tank rooms are provided with automatic sprinkler protection. Upon actuation of the CO <sub>2</sub> system in the DG area, CO <sub>2</sub> is discharged into the day tank rooms.



**5.6.10 Diesel Fuel Oil Storage Area**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.10	Diesel fuel oil tanks with a capacity greater than 1100 gallons should not be located inside the buildings containing safety-related equipment. They should be located at least 50 feet from any building containing safety-related equipment, or if located within 50 feet, they should be housed in a separate building with construction having a minimum fire resistance rating of three hours. Buried tanks are considered as meeting the three hour fire resistance requirements. See NFPA 30, "Flammable and Combustible Liquids Code," for additional guidance.	Comply: Diesel fuel oil storage tanks are buried underground, thus meeting the 3-hour fire separation criteria.

**5.6.11 Safety-Related Pumps**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.11	<p>Pump houses and rooms housing safety-related pumps should be protected by automatic sprinkler protection unless a fire hazards analysis can demonstrate that a fire will not endanger other safety-related equipment required for safe plant shutdown. Early warning fire detection should be installed with alarm and annunciation locally and in the control room. Local hose stations and portable extinguishers should also be provided.</p> <p>Equipment pedestals or curbs and drains should be provided to remove and direct water away from safety-related equipment.</p> <p>Provisions should be made for manual control of the ventilation system to facilitate smoke removal if required for manual fire fighting operation.</p>	<p>Comply with intent: Safety-related pumps are located in the turbine building and reactor building.</p> <p>Automatic sprinkler protection and/or detection is provided as deemed appropriate by the fire hazards analysis (see Section 4.0).</p> <p>Local hose stations and portable fire extinguishers are provided throughout safety-related pump areas.</p> <p>Equipment pedestals, curbs and drains are provided to remove and direct water away from safety-related equipment.</p> <p>Ventilation to safety-related pump areas may be manually controlled by adjusting the balancing dampers to either reduce or increase the air flow rate into these areas. Exhaust from these areas is vented through the reactor building stack.</p>

**5.6.12 New Fuel Area**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.12	<p>Hand portable extinguishers should be located within this area. Also, local hose stations should be located outside but within hose reach of this area.</p> <p>Automatic fire detection should alarm and annunciate in the control room and alarm locally.</p> <p>Combustibles should be limited to a minimum in the new fuel area.</p> <p>The storage area should be provided with a drainage system to preclude accumulation of water.</p> <p>The storage configuration of new fuel should always be so maintained as to preclude critically for any water density that might occur during fire water application.</p>	<p>Partially comply:</p> <p>Portable fire extinguishers and local hose stations are located immediately outside of the new fuel storage area.</p> <p>Automatic fire detection is not provided for this area since the combustible loadings present are minor and would not affect any systems or equipment important to safe reactor shutdown or radioactivity control.</p> <p>Combustibles are limited by administrative controls in the new fuel area.</p> <p>The storage area is provided with a drain to preclude accumulation of water.</p> <p>The geometric configuration of the new fuel storage racks precludes criticality for total flooding of the storage area. Also fog nozzles are not used at any of the hose stations near the fuel storage area.</p>

**5.6.13 Spent Fuel Pool Area**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.13	Protection for the spent fuel pool area should be provided by local hose stations and portable extinguishers.  Automatic fire detection should be provided to alarm and annunciate in the control room and to alarm locally.	Partially comply: Portable fire extinguishers and local hose stations are located throughout the spent fuel pool area.  No automatic fire detection is provided for this area since the combustible loadings present are minor and would not affect any systems or equipment important to safe reactor shutdown or radioactivity control.

**5.6.14 Radwaste Building**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.14	<p>The radwaste building should be separated from other areas of the plant by fire barriers having at least three-hour ratings.</p> <p>Automatic sprinklers should be used in all areas where combustible materials are located.</p> <p>Automatic fire detection should be provided to annunciate an alarm in the control room and alarm locally.</p>	<p>Do not comply:</p> <p>The wall shared with the turbine building is constructed of unrated masonry. The safe shutdown analysis has demonstrated that a fire in the radwaste building will not prevent safe shutdown.</p> <p>No automatic sprinklers are provided based on a fire hazards analysis of the radwaste building.</p> <p>No detection has been provided in the Radwaste Building, due to the low combustible loading and minimal effect on the plant.</p>
During a fire, the ventilation systems in these areas should be capable of being isolated.		The ventilation system is independent of other plant ventilation systems and is capable of being shut down in the event of a fire and restarted for post-fire purge.
Water should drain to liquid radwaste building sumps.		Water drains to the liquid radwaste building sumps.
Acceptable alternative fire protection is automatic fire detection to alarm and annunciate in the control room, in addition to manual hose stations and portable extinguishers consisting of hand held and large wheeled units.		

**5.6.15 Decontamination Areas**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.15	<p>The decontamination areas should be protected by automatic sprinklers if flammable liquids are stored.</p> <p>Automatic fire detection should be provided to annunciate and alarm in the control room and alarm locally.</p> <p>The ventilation system should be capable of being isolated.</p> <p>Local hose stations and hand portable extinguishers should be provided as backup to the sprinkler system.</p>	<p>Not applicable:</p> <p>Decontamination areas are treated as part of the areas in which they are located. No flammable liquids are stored in these areas.</p>

**5.6.16 Safety-Related Water Tanks**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.16	<p>Storage tanks that supply water for safe shutdown should be protected from the effects of fire.</p> <p>Local hose stations and portable extinguishers should be provided. Portable extinguishers should be located in nearby hose houses.</p> <p>Combustible materials should not be stored next to outdoor tanks. A minimum of 50 feet of separation should be provided between outdoor tanks and combustible materials where feasible.</p>	<p>Comply with intent: Safety-related water tanks are located outside and are protected from the effects of a fire by fire hydrants located in the area.</p> <p>See position above.</p> <p>Major hazards such as transformers are located within 50 feet but are protected automatic suppression.</p>

**5.6.17 Cooling Towers**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b>Implementation or Justification for <u>Noncompliance</u></b>
F.17	Not applicable.	Quad Cities does not have cooling towers.



**5.6.18 Miscellaneous Areas**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
F.18	Miscellaneous areas such as records storage areas, shops, warehouses, and auxiliary boiler rooms should be so located that a fire or effects of a fire, including smoke, will not adversely affect any safety-related systems or equipment. Fuel oil tanks for auxiliary boilers should be buried or provided with dikes to contain the entire tank contents.	Comply: Miscellaneous areas are located or protected so as to minimize effects of a fire on any safety-related systems and equipment. Portable fire extinguishers and hose stations are provided in the various areas.

**5.7 Special Protection Guidelines**

<b><u>Section</u></b>	<b><u>NRC Position</u></b>	<b><u>Implementation or Justification for Noncompliance</u></b>
G.1	<u>Welding and Cutting, Acetylene – Oxygen Fuel Gas Systems</u>	
	This equipment is used in various areas throughout the plant. Storage locations should be chosen to permit fire protection by automatic sprinkler systems. Local hose stations and portable equipment should be provided as backup. The requirements of NFPA 51 and 51B are applicable to these hazards. A permit system should be required to utilize this equipment. (Also refer to 2f herein.)	Comply with intent: A permit system is used when welding and cutting work is being done. The bulk storage of this material is outdoors in designated storage areas under administrative procedures. Hose stations and portable fire extinguishers are provided throughout the plant. NFPA 51 and 51B were reviewed and deviations justified (F.P.P.D.P.).
G.2	<u>Storage Areas for Dry Ion Exchange Resins</u>	
	Dry ion exchange resins should not be stored near essential safety-related systems. Dry unused resins should be protected by automatic wet pipe sprinkler installations. Detection by smoke and heat detectors should alarm and annunciate in the control room and alarm locally. Local hose stations and portable extinguishers should provide backup for these areas. Storage areas of dry resin should have curbs and drains. (Refer to NFPA 92M, “Waterproofing and Draining of Floors.”)	Comply with intent: Resins are temporarily stored in various locations within the turbine building away from vital equipment. Wet pipe sprinkler protection is provided for major concentrations of resins located in the turbine building. See the NFPA 92M code review with respect to plant drainage (F.P.P.D.P.). Detection is provided in most areas containing dry resin storage. A fire involving dry resins will not prevent achieving a safe shutdown.
G.3	<u>Hazardous Chemicals</u>	
	Hazardous chemicals should be stored and protected in accordance with the recommendations of NFPA 49, “Hazardous Chemicals Data.”	Comply with intent: Hazardous chemicals are kept in proper containers in accordance with fire protection recommendations. Ventilation and flood

<u>Section</u>	<u>NRC Position</u>	<u>Implementation or Justification for Noncompliance</u>
	Chemicals storage areas should be well ventilated and protected against flooding conditions since some chemicals may react with water to produce ignition.	protection are provided. NFPA 49 and 30 were reviewed and deviations justified in the NFPA code review (F.P.P.D.P.).
G.4	<u>Materials Containing Radioactivity</u>	
	Materials that collect and contain radioactivity such as spent ion exchange resins, charcoal filters, and HEPA filters should be stored in closed metal tanks or containers that are located in areas free from ignition sources or combustibles. These materials should be protected from exposure to fires in adjacent areas as well. Consideration should be given to requirements for removal of isotopic decay heat from entrained radioactive materials.	Comply with intent: Materials such as resins and filters which collect and contain radioactivity are stored in controlled areas and kept in closed containers.