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January 7, 1983

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos. 50-352
50-353

Subject: Limerick Generating Station Units 1 and 2
Request for Additional Information (RAI)
from NRC Fire Protection Section of the
Chemical Engineering Branch

Reference: Letter, A. Schwencer to E. G. Bauer, Jr.
dated July 28, 1982

Dear Mr. Schwencer:

Transmitted herewith are draft responses and Fire Protection Evaluation Report (FPER) page changes related to the subject RAIs. This material is provided in draft form at the request of Mr. Robert Martin, NRC Project Manager for Limerick, as an aid to the Chemical Engineering Branch in preparing their portion of the draft safety evaluation report. We plan to formally incorporate these responses and page changes into FPER Revision 2 scheduled for submittal in late January, 1983.

Very truly yours,

EUGENE J. BRADLEY

JLP/pb/H-5

cc: See attached service list

B002

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QUESTION 280.1

The fire protection program will be reviewed to the guidelines of BTP CMEB 9.5-1 (NUREG-0800), July 1981. Provide a comparison that shows conformance of the plant fire protection program to these guidelines. Deviations from the guidelines should be specifically identified. A technical basis should be provided for each deviation.

RESPONSE

Section 3.1 of the FPER has been changed to address the July 1981 revision of BTP CMEB 9.5-1, rather than Appendix A to the previous revision of BTP ASB 9.5-1.

QUESTION 280.2

Provide the qualifications of the fire protection engineer responsible for the formulation and implementation of the fire protection program.

Response

The Superintendent Generation Division - Nuclear is responsible for the formulation and implementation of the fire protection program. In this capacity he has the services of a member of the Mechanical Engineering department as a fire protection engineer. The individual meets the requirements for membership in the Society of Fire Protection Engineers (i.e. a graduate of an engineering curriculum of accepted standing and shall have completed not less than 6 years of engineering attainment indicative of growth in engineering competency and achievement, 3 years of which shall have been in responsible charge of fire protection work. In addition fire protection consultants are available to assist in design and review tasks as required.

QUESTION 280.3

Verify that administrative controls will be developed and implemented in accordance with BTP CMEB 9.5-1 Section C.2.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.2.

QUESTION 280.4

Verify that a plant fire brigade will be provided in accordance with BTP CMEB 9.5-1 Section C.3.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.3.

QUESTION 280.5

Verify that the plant fire brigade will have the minimum equipment listed in BTP CMEB 9.5-1 Section C.3.c.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.3.c.

QUESTION 280.6

Verify that a fire brigade training program will be provided in accordance with BTP CMEB 9.5-1 Section C.3.d.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.3.d.

QUESTION 280.7

Verify that fire brigade drills wll be performed at regular intervals in accordance with BTP CMEB 9.5-1 Section C.3.d(7).

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.3.d(7).

QUESTION 280.8 116

Verify that all fire barriers have been tested and approved by an independent laboratory. 119 119

RESPONSE 121

Section 3.1 of the FPER has been changed to address the July 1981 revision of BTP CMEB 9.5-1, including the provisions of the BTP that concern the rating and testing of fire barriers. The various components of fire barriers are discussed under the following item numbers within Section 3.1:

a. Structural features - Item 37
b. Penetration seals - Item 40
c. Ventilation dampers - Item 46
d. Doors - Item 48

QUESTION 280.9

Verify that all openings in rated fire barriers will be sealed to provide a fire resistance rating at least equal to that of the barrier in conformance with BTP CMEB 9.5-1 Section C.5.a.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.a.

QUESTION 280.10

Provide a design description of the types of penetration seals used, including materials of construction. Verify that tests have been conducted to qualify the resistance of the seals in acccrdance with BTP CMEB 9.5-1 Section C.5.a. Verify that the seals will be installed in accordance with the manufacturer's instructions.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.a. The requested information is included in FPER Section 3.1.

QUESTION 280.11

Verify that door openings in fire barriers will be protected with equivalently rated doors, frames, and hardware. Specify that a nationally recognized independent testing laboratory has tested and labelled this equipment in accordance with BTP CMEB 9.5-1 Section C.5.a.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.a.

QUESTION 280.12 182

Verify that the closing of fire doors will be supervised by one of the measures stated in BTP CMEB Section C.5.a. 185 185

RESPONSE 187

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.a. 189 190

QUESTION 280.13

Verify that fire protection has been provided for safe shutdown so that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage and that systems necessary to achieve and maintain cold shutdown from either the control room or the emergency control station(s) can be repaired within 72 hours.

Provide an analysis which shows that one redundant train of equipment, systems, and cables necessary for safe shutdown can be maintained free of fire damage by either:

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

b) Separation of cables and equipment and associated circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression systems should be installed in the fire area; or

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

Identify those areas of the plant that will not meet the guidelines of Section C.5.b of BTP CMEB 9.5-1 and, thus alternative shutdown will be provided. Additionally provide a statement that all other areas of the plant will be in compliance with Section C.5.b of BTP CMEB 9.5-1.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.b. The requested information is included in (or referenced in) FPER Section 3.1.

QUESTION 280.14 244

Verify that redundant safety-related cable systems outside the cable spreading room are protected in accordance with BTP CMEB 9.5-1 Section C.5.e(2). 246 247 247

RESPONSE 249

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.e(2). 251 252

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QUESTION 280.15

On page 9.5-10 of the FSAR, it is stated that emergency ac/dc lighting normally is powered from the Class IE buses and, in the event of loss of the Class IE source, the emergency lighting is transferred to the 125 V dc non-Class IE station battery source. The emergency lighting is provided in the following locations:

a. Control room

b. Auxiliary equipment room

c. Cable spreading room

d. Static inverter room

e. 4-kV switchgear compartment

f. 13-kV switchgear compartment

g. Drywell

h. HPCI, RCIC, and RHR pump compartments (at exit doors only)

i. Diesel-generator compartments

j. Spray pond pump structure (lights with individual battery packs, at exit doors only)

k. Stairways and access corridors.

It is our position that self-contained 8-hour minimum capacity, battery powered emergency lighting units be installed in conformance with BTP CMEB 9.5-1 Section C.5.g.

RESPONSE

Details of the emergency lighting system are discussed in FPER Section 3.2, Item 23. The design of the emergency lighting system provides an alternate means of compliance with the guidelines of BTP CMEB 9.5-1 and 10CFR50, Appendix R. Because the emergency lighting system utilizes the standby diesel-generators as a backup source of power, it will maintain adequate lighting in the designated areas on a long-term basis. The existing emergency lighting system is considered to be superior to a system utilizing individual 8-hour battery power supplies, for the following rasons: REASONS

1. The power source for the lighting is located remote from the location of the lighting fixtures, thereby exposing less of the lighting system to the effects of an exposure fire

occurring in the location where the emergency lighting is required. This results in a higher probability that the lighting will be available in that area when required.

2. Electrical cabling for the emergency lighting is routed exclusively in conduit, most of which is embedded in concrete. This design protects the cabling from the effects of exposure fires.

3. Individual battery packs, if used to power the lighting fixtures, could fail during exposure to heat in a manner which would be extremely hazardous to fire brigade personnel in the area. The existing design of the emergency lighting system utilizes centralized power sources which would not present this type of hazard.

4. The use of standby diesel-generators to power the emergency lighting system ensures that the required lighting levels can be maintained for much longer than the 8 hours that is available with battery packs.

QUESTION 280.16

Verify that fixed repeaters installed to permit use of portable radio communication units will be protected from exposure fire damage in accordance with BTP CMEB 9.5-1 Section C.5.g.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.5.g.

QUESTION 280.17

Verify that a fire detection system has been provided in accordance with BTP CMEB 9.5-1 Section C.6.a to protect all areas of the plant which contain or present an exposure fire hazard to safety related equipment and cables.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of CMEB 9.5-1, including Section C.6.a.

QUESTION 280.18 376

On page 2-2 of the Fire Protection Evaluation Report, it is 378
stated that five hose cart houses will be provided which can be 379
manually moved to any hydrant where they are needed. It is our 381
position that permanent hose houses, equipped with hose, nozzles 382
and other auxiliary equipment recommended in NFPA 24, be provided 383
as needed, but at least every 1,000 feet, in accordance with BTP 384
CMEB 9.5-1 Section C.5.b(7). 384

RESPONSE 386

Section 3.1 of the FPER has been changed to address the 388
guidelines of BTP CMEB 9.5-1, including Section C.6.b(7) 389

QUESTION 280.19 396

Verify that the minimum fire water requirements are dedicated by passive means in accordance BTP CMEB 9.5-1 Section C.5.b(11). 398 399

RESPONSE 401

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.6.b(11). 403 404

QUESTION 280.20

Verify that fixed water extinguishing systems conform to the requirements of NFPA 13 and NFPA 15 in accordance with BTP CMEB 9.5-1 C.5.c(3).

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.6.c(3).

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QUESTION 280.21 426

It is our position that the reactor recirculation pumps be equipped with an oil collection system in conformance with Section C.7.a of BTP CMEB 9.5-1. Provide the design description of this system. 428 429 431 431

RESPONSE 433

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.7.a. 435 436

QUESTION 280.22

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Verify that all cables in the control room meet the separation criteria and fire protection criteria detailed in BTP CMEB 9.5-1 Section C.7.b.

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RESPONSE

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Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.7.b.

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QUESTION 280.23 458

Verify that smoke detectors have been provided in all control room cabinets and consoles in accordance with BTP CMEB 9.5-1 Section C.7.b. 460 461 461

RESPONSE 463

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.7.b. 465 466

QUESTION 280.24

On page 9.5-12 of the FSAR, it is stated that primary fire suppression in the cable spreading room is provided by a total flooding CO_2 extinguishing system. It is our position that the primary fire suppression in the cable spreading room be an automatic water system in conformance with BTP CMEB 9.5-1 Section C.7.c.

RESPONSE

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.7.c.

QUESTION 280.25 490

Verify that the loss of ventilation in the safety-related battery rooms is alarmed in accordance with BTP CMEB 9.5-1 Section C.7.g. 492 493

RESPONSE 495

Section 3.1 of the FPER has been changed to address the guidelines of BTP CMEB 9.5-1, including Section C.7.g. 497 498

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CHAPTER 3

COMPARISON BETWEEN LGS FIRE PROTECTION PROGRAM AND NRC GUIDELINE DOCUMENTS

3.1 NRC BRANCH TECHNICAL POSITION CMEB 9.5-1

The purpose of this section is to compare the fire protection provisions of Limerick Generating Station (LGS) Units 1 and 2 with the guidelines in Branch Technical Position CMEB 9.5-1.

To identify areas of potential impact and to facilitate comparison, a matrix addressing each guideline of the BTP and relating to the plant systems, equipment, and components, is included as Section 3.1.1. The matrix has extracted all suggested guidelines from the BTP and given each an item number, 1 through 255. Each item has condensed a particular guideline and makes reference to the section in the BTP where that guideline can be found. The general degree of conformance to the guideline is indicated in the "comparison" column, using codes defined as follows:

C - indicates conformance to the guideline or conformance to its intent. Substantiating statements may be included as part of the matrix or in Section 3.1.2.

AC - indicates conformance to the guidelines by alternate means or methods. The manner of conformance is included in the matrix or discussed in Section 3.1.2.

WC - indicates that design changes, means, or methods are planned in order to conform, or conform to the intent of the guideline. The planned design changes, means, or methods and the manner of conformance may be discussed in the matrix or in Section 3.1.2.

NC - indicates that the plant is not in conformance and no design changes are planned. The basis for non-conformance to the guideline is included in the matrix or discussed in Section 3.1.2.

NA - indicates that the guideline is not applicable to Limerick Generating Station Units 1 and 2. Substantiating statements are included as part of the matrix in Section 3.1.1.

In the "remarks" column, additional information is provided to explain or expand on the degree of conformance. Alternatively, reference may be made to Section 3.1.2 (or other sections in this report) for a more detailed discussion. The item numbers in Section 3.1.2 correspond to those in Section 3.1.1.

SECTION 3.1.1

DETAILED COMPARISON TO BRANCH TECHNICAL POSITION CMEB 9.5-1

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Fire Protection Program			
1.	Direction of fire protection program; availability of personnel.	C.1.a (1)	WC	
2.	Defense-in-depth concept; objective of fire protection program.	C.1.a (2)	WC	
3.	Management responsibility for overall fire protection program; delegation of responsibility to staff.	C.1.a (3)	WC	
4.	The staff should be responsible for: (a) Fire protection program requirements. (b) Post-fire shutdown capability. (c) Design, maintenance, surveillance, and quality assurance of all fire protection features. (d) Fire prevention activities. (e) Fire brigade organization and training. (f) Prefire planning.	C.1.a (3)	WC	
5.	The organizational responsibilities and lines of communication pertaining to fire protection should be defined through the use of organizational charts and functional descriptions.	C.1.a (4)	WC	
6.	Personnel qualification requirements for fire protection engineer reporting to the position responsible for formulation and implementation of the fire protection program.	C.1.a(5) (a)	WC	
7.	The fire brigade members' qualifications should include a physical examination for performing strenuous activity, and the training described in Position C.3.d.	C.1.a(5) (b)	WC	
8.	The personnel responsible for the maintenance and testing of the fire protection systems should be qualified by training and experience for such work.	C.1.a(5) (c)	WC	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
9.	The personnel responsible for the training of the fire brigade should be qualified by training and experience for such work.	C.1.a(5)(d)	WC	
10.	The following NFPA publications should be used for guidance to develop the fire protection program; No. 4, No. 4A, No. 6, No. 7, No. 8, No. 27.	C.1.a (6)	WC	
11.	On sites where there is an operating reactor and construction or modification of other units is underway, the superintendent of the operating plant should have a lead responsibility for site fire protection.	C.1.a (7)	WC	
	Fire Hazards Analysis			
12.	The fire hazards analysis should demonstrate that the plant will maintain the ability to perform safe shutdown functions and minimize radioactive releases to the environment in the event of a fire.	C.1.b	C	See Chapters 4 and 5
13.	The fire hazards analysis should be performed by fire protection and reactor systems engineers to (1) consider potential in situ and transient fire hazards: (2) determine the consequences of a fire in any location in the plant; and (3) specify measures for fire prevention, detection, suppression, and containment.	C.1.b	C	
14.	Fires involving facilities shared between units should be considered.	C.1.b	C	Fires are postulated to occur in structures such as the control structure and the spray pond pump structure that are common to both reactor units.
15.	Fires due to man-made site-related events that have a reasonable probability of occurring and affecting more than one reactor unit should be considered.	C.1.b	C	See Section 3.1.2.
16.	Establishment of three levels of fire damage limits according to safety function (hot shutdown; cold shutdown; design basis accidents).	C.1.b	C	
17.	The fire hazards analysis should separately identify hazards and provide appropriate protection in locations where safety-related losses can occur.	C.1.b	C	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Fire Suppression System Design Basis			
18.	Total reliance should not be placed on a single fire suppression system. Backup fire suppression capability should be provided.	C.1.c (1)	C	All automatic fire suppression systems are backed up by two methods of manual extinguishment (hose stations and portable extinguishers).
19.	A single active failure or a crack in a moderate-energy line in the fire suppression system should not impair both the primary and backup fire suppression capability.	C.1.c (2)	C	See Section 3.1.2.
20.	The fire suppression system should be capable of delivering water to manual hose stations located within hose reach of areas containing equipment required for safe shutdown following an SSE.	C.1.c (3)	NC	See Item 155.
21.	The fire protection systems should retain their original design capability for natural phenomena of less severity and greater frequency than the most severe natural phenomena.	C.1.c (4)	C	See Section 3.1.2.
22.	The fire protection systems should retain their original design capability for potential man-made site-related events that have a reasonable probability of occurring at a specific plant site.	C.1.c (4)	NC	See Section 3.1.2.
23.	The effects of lightning strikes should be included in the overall plant fire protection program.	C.1.c (4)	C	Lightning protection is provided per NFPA No. 78.
24.	The consequences of inadvertent operation or of a crack in a moderate-energy line in the fire suppression system should meet the guidelines specified for moderate-energy systems outside containment in SRP Section 3.6.1.	C.1.c (5)	C	See Section 3.1.2.
	Alternative or Dedicated Shutdown			
25.	Alternative or dedicated shutdown capability should be provided where the protection of systems whose functions are required for safe shutdown is not provided by established fire suppression methods or by Position C.5.6.	C.1.d	AC	See Item 20 of Section 3.2.2.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Implementation of Fire Protection Programs			
26.	The fire protection program for buildings storing new reactor fuel and for adjacent fire areas that could affect the fuel storage area should be fully operational before fuel is received at the site.	C.1.e (1)	C	The fire protection program for the new fuel area will be completed and fully operational before fuel is received at the site.
27.	The fire protection program for an entire reactor unit should be fully operational prior to initial fuel loading in that reactor unit.	C.1.e (2)	C	
28.	Special considerations for the fire protection program on reactor sites where there is an operating reactor and construction or modification of other units is under way.	C.1.e (3)	C	See Section 3.1.2.
	Administrative Controls			
29.	Establishment of administrative controls to maintain the performance of the fire protection system and personnel.	C.2	WC	
	Fire Brigade			
30.	The guidance in Regulatory Guide 1.101 should be followed as applicable.	C.3.a	WC	
31.	Establishment of site brigade: minimum number of fire brigade members on each shift; qualification of fire brigade members; competence of brigade leader.	C.3.b	WC	
32.	The minimum equipment provided for the brigade should consist of turnout coats, boots, gloves, hard hats, emergency communications equipment, portable ventilation equipment, and portable extinguishers.	C.3.c	WC	
33.	Recommendations for breathing apparatus for fire brigade, damage control, and control room personnel.	C.3.c	WC	See Section 3.1.2.
34.	Recommendations for the fire brigade training program.	C.3.d	WC	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Quality Assurance Program			
35.	Establishment of quality assurance programs for the fire protection systems for safety-related areas; identification of specific criteria for QA programs.	C.4	AC/WC	See Section 3.1.2.
	Building Design			
36.	Fire barriers with a minimum rating of 3 hours should be provided to separate safety-related systems from any potential fires in nonsafety-related areas.	C.5.a(1)(a)	C	Structures housing safety-related systems are separated from non-safety-related structures by 3-hour rated fire walls.
37.	Fire barriers with a minimum rating of 3 hours should be provided to separate redundant divisions of safety-related systems from each other.	C.5.a(1)(b)	AC	See Section 3.1.2.
38.	Fire barriers with a minimum rating of 3 hours should be provided to separate individual units on a multiple-unit site.	C.5.a(1)(c)	C	Fire barriers rated for 3 hours are provided to separate Unit 1 structures from Unit 2 structures. Those structures that are common to both reactor units (such as the control structure and the control portion of the turbine enclosure) are separated from the adjacent structures of both reactor units by 3-hour fire barriers.
39.	Fire barriers should be provided within a single safety division to separate components or cabling that present a fire hazard to other safety-related components.	C.5.a (2)	AC	See Section 3.1.2.
40.	Openings through fire barriers for pipe, conduit, and cable trays which separate fire areas should be sealed or closed to provide a fire resistance rating equal to that required of the barrier.	C.5.a (2)	WC	See Section 3.1.2.
41.	Recommendations for internal sealing of conduits penetrating fire barriers.	C.5.a (3)	AC	See Section 3.1.2.
42.	Fire barrier penetrations that must maintain environmental isolation or pressure differentials should be qualified by test.	C.5.a (3)	C	Fire-rated penetration seals that are also required to perform other barrier functions (such as maintaining a pressure differential) are qualified by test for all the intended functions. The fire barrier function of a penetration seal is not required to be performed simultaneously with any other barrier functions.
43.	Penetration designs should utilize only noncombustible materials.	C.5.a (3)	WC	See Section 3.1.2.

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NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
44.	The penetration qualification tests should use the time-temperature exposure curve specified by ASTM E-119.	C.5.a (3)	C	The time-temperature exposure curve used in qualification tests for penetration seals is as specified by ASTM E-119-73.
45.	Acceptance criteria for penetration qualification tests.	C.5.a (3)	NC	The acceptance criteria for penetration qualification tests are in agreement with those specified in paragraphs (a), (b), and (c) of Position C.5.a(3), except that the maximum allowable temperature on the unexposed side is 325 °F above ambient temperature. This is in accordance with the ANI "Standard Method of fire tests of Cable and Pipe Penetration Fire Stops." Testing of fire-rated penetration seals is performed in accordance with ANI guidelines.
46.	Penetration openings for ventilation systems should be protected by fire dampers having a rating equivalent to that required of the barrier.	C.5.a (4)	C	Ventilation ducts that penetrate fire barriers are provided with 3-hour rated fire dampers at penetrations of 3-hour rated barriers and with 1.5-hour rated fire dampers at penetrations of 1-hour rated barriers. Both classifications of fire dampers are UL-listed and manufactured to comply with NFPA 90 and the Commonwealth of Pennsylvania Fire Protection Code.
47.	Flexible air duct couplings in ventilation and filter systems should be noncombustible.	C.5.a (4)	C	
48.	Door openings in fire barriers should be protected with equivalently rated doors, frames, and hardware that have been tested and approved by a nationally recognized laboratory.	C.5.a (5)	AC	See Section 3.1.2.
49.	Fire doors should be self-closing or provided with closing mechanisms.	C.5.a (5)	AC	See Item 40 of Section 3.2.2.
50.	Fire doors should be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.	C.5.a (5)	AC	See Item 41 of Section 3.2.1.
51.	Alternative means for ensuring that fire doors protect the door opening as required in case of fire.	C.5.a (5)	C	See Item 42 of Section 3.2.2.
52.	The fire brigade leader should have ready access to keys for any locked fire doors.	C.5.a (5)	NC	
53.	Areas protected by automatic total flooding gas suppression systems should have electrically supervised self-closing fire doors or should satisfy option (a) above.	C.5.a (5)	C	See Item 44 of Section 3.2.1.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
54.	Personnel access routes and escape routes should be provided for each fire area.	C.5.a (6)	C	All fire areas are provided with personnel access routes and escape routes.
55.	Stairwells serving as escape routes, access routes for firefighting, or access routes to areas containing equipment necessary for safe shutdown should be enclosed in masonry or concrete towers with a minimum fire rating of 2 hours and self-closing Class B fire doors.	C.5.a (6)	C	
56.	Fire exit routes should be clearly marked.	C.5.a (7)	NC	
57.	Each cable spreading room should contain only one redundant safety division.	C.5.a (8)	NC	The cable spreading room for each reactor unit contains all four divisions of safety-related cabling. Raceways containing the different divisions of cabling are separated from each other in accordance with Regulatory Guide 1.75. Cabling associated with the remote shutdown panel is not routed through the cable spreading room.
58.	Cable spreading rooms should be separated from each other and from other areas of the plant by barriers having a minimum fire resistance of 3 hours.	C.5.a (8)	C	
59.	Interior wall and structural components, thermal insulation materials, radiation shielding materials, and soundproofing should be noncombustible.	C.5.a (9)	AC	See Section 3.1.2.
60.	Interior finishes should be noncombustible.	C.5.a (9)	AC	Areas containing systems or equipment required for safe shutdown of the plant are unfinished, or are finished with materials which are either noncombustible or are listed by an independent testing laboratory for flame spread, smoke generation, and fuel contribution of 25 or less.
61.	Metal deck roof construction should be noncombustible and listed as "acceptable for fire" in the UL Building Materials Directory, or listed as Class I in the Factory Mutual Approval Guide.	C.5.a (10)	AC	See Section 3.1.2.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
62.	Suspended ceilings and their supports should be of noncombustible construction.	C.5.a (11)	C	The suspended ceiling in the control room consists of mineral fiber panels resting on a metal grid system which is supported by steel wires. These materials are either noncombustible or are listed by an independent testing laboratory for flame spread, smoke generation, and fuel contribution of 25 or less.
63.	Concealed spaces should be devoid of combustibles except as noted in Position C.6.b.	C.5.a (11)	AC	See Section 3.1.2.
64.	Transformers installed inside fire areas containing safety-related systems should be of the dry type or insulated and cooled with non-combustible liquid.	C.5.a (12)	C	All indoor transformers are either air cooled, dry type, or cooled by noncombustible gases.
65.	Outdoor oil-filled transformers should have oil spill confinement features or drainage away from the buildings.	C.5.a (13)	C	See Section 3.1.2.
66.	Outdoor oil-filled transformers should be located at least 50 feet distant from the building, or building walls within 50 feet of oil-filled transformers should be without openings and have a 3-hour fire resistance rating.	C.5.a (13)	AC	See Section 3.1.2.
67.	Floor drains sized to remove expected firefighting water flow without flooding safety-related equipment should be provided in areas where fixed water fire suppression systems are installed.	C.5.a (14)	C	
68.	Floor drains should be provided in areas where hand hose lines may be used if such fire-fighting water could cause unacceptable damage to safety-related equipment.	C.5.a (14)	AC	See Section 3.1.2.
69.	Where gas suppression systems are installed, the drains should be provided with adequate seals, or the gas suppression system should be sized to compensate for the loss of the suppression agent through the drains.	C.5.a (14)	C	The capacity of the carbon dioxide storage tank is sufficient to compensate for losses through the floor drains in the cable spreading rooms.
70.	Drains in areas containing combustible liquids should have provisions for preventing the backflow of combustible liquids to safety-related areas through the interconnected drain systems.	C.5.a (14)	C	See Section 3.1.2.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
71.	Water drainage from areas that may contain radioactivity should be collected, sampled, and analyzed before discharge to the environment.	C.5.a (14)	C	Potentially radioactive liquid wastes are collected and monitored prior to discharge.
	Safe Shutdown Capability			
72.	Fire damage should be limited so that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station is free of fire damage.	C.5.b (1)	WC	
73.	Fire damage should be limited so that systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station can be repaired within 72 hours.	C.5.b (1)	WC	
74.	Alternative means of ensuring that one train of systems necessary to achieve and maintain hot shutdown is free of fire damage.	C.5.b (2)	AC	See Item 18 of Section 3.2.2.
75.	Provision of alternative or dedicated shutdown capability in certain fire areas.	C.5.b (3)	AC	See Item 20 of Section 3.2.2.
76.	Alternative or Dedicated Shutdown Capability	C.5.c	--	See Items 25 through 26 of Section 3.2.
	Control of Combustibles			
77.	Safety-related systems should be separated from combustible materials where possible; where not possible, special protection should be provided to prevent a fire from defeating the safety system function.	C.5.d (1)	C	To the maximum extent possible, significant concentrations of combustible materials are located outside structures containing safety-related components. In those cases for which this is not possible, such as the standby diesel-generator fuel oil day tanks, special fire protection consisting of automatic fire suppression systems and/or construction capable of withstanding a fire is provided.
78.	Bulk gas storage (compressed or cryogenic) should not be permitted inside structures housing safety-related equipment. Flammable gases should be stored outdoors or in separate detached buildings.	C.5.d (2)	NC	See Section 3.1.2.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
79.	High pressure gas storage containers should be located with the long axis parallel to building walls.	C.5.d (2)	C	High pressure gas storage cylinders are stored vertically.
80.	Use of compressed gases inside buildings should be controlled.	C.5.d (2)	NC	See Section 3.1.2.
81.	The use of plastic materials should be minimized. Halogenated plastics such as PVC and neoprene should be used only when substitute noncombustible materials are not available.	C.5.d (3)	C	See Section 3.1.2.
82.	Storage of flammable liquids should comply with NFPA 30.	C.5.d (4)	C	Liquid fuels are stored either in aboveground tanks that have been provided with suitable fire barriers or in underground tanks.
83.	Hydrogen lines in safety-related areas should be either designed to seismic Class I requirements, or sleeved, or equipped with excess flow valves.	C.5.d (5)	C	Hydrogen lines in safety-related areas are designed to seismic Class I requirements.
	Electrical Cable Construction, Cable Trays, and Cable Penetrations			
84.	Only metal should be used for cable trays.	C.5.e (1)	C	Cable trays are of all-metal construction.
85.	Only metallic tubing should be used for conduit. Thin-wall metallic tubing should not be used.	C.5.e (1)	NC	See Section 3.1.2.
86.	Flexible metallic tubing should only be used in short lengths to connect components to equipment.	C.5.e (1)	C	Flexible metallic tubing used at raceway connections to components is limited to 5 feet in length.
87.	Other raceways should be made of noncombustible materials.	C.5.e (1)	C	Gutter-type raceways are of all-metal construction.
88.	Redundant safety-related cable systems outside the cable spreading room should be separated from each other and from potential fire exposure hazards in nonsafety-related areas by 3-hour fire barriers.	C.5.e (2)	AC	See Section 3.1.2.
89.	These cable trays should be provided with continuous line-type heat detectors.	C.5.e (2)	NC	Continuous line-type heat detectors are not provided in cable trays. Smoke detectors of the ionization or photo-electric type are located in areas through which safety-related cable trays are routed.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
90.	Cables should be designed to allow wetting down with fire suppression water without electrical faulting.	C.5.e (2)	C	Cable insulating systems include proprietary jacketing materials designed for wetting.
91.	Redundant safety-related cable trays outside the cable spreading room should be accessible for manual firefighting. Manual hose stations and portable hand extinguishers should be provided.	C.5.e (2)	C	
92.	Safety-related cable trays of a single division that are separated from redundant divisions by a 3-hour fire barrier should be protected from the effects of a potential exposure fire by providing automatic water suppression. and are accessible for manual firefighting	C.5.e (2)	NC	Safety-related cable trays that are separated from their redundant divisions by 3-hour fire barriers are not generally provided with automatic suppression system coverage. Fire-caused damage to a single train of safety-related components will not have an adverse effect on the ability to achieve safe shutdown.
93.	Safety-related cable trays that are not accessible for manual fire fighting should be protected by an automatic water system.	C.5.e (2)	NA	Safety-related cable trays are not routed through areas that are inaccessible for manual fire fighting.
94.	Safety-related cable trays that are not separated from redundant divisions by 3-hour fire barriers should be protected by automatic water suppression systems.	C.5.e (2)	NC	See Section 3.1.2. The trays are accessible for manual firefighting.
95.	The capability to achieve safe shutdown considering the effects of a fire involving fixed and transient combustibles should be evaluated with and without actuation of the automatic suppression system.	C.5.e (2)	C	See Chapter 5.
96.	Electric cable construction should pass the flame test in IEEE Std 383.	C.5.e (3)	AC	See Section 3.1.2.
97.	Cable raceways should be used only for cables.	C.5.e (4)	C	
98.	Miscellaneous storage and piping for combustible liquids or gases should not create a potential exposure hazard to safety-related systems.	C.5.e (5)	C	See Section 3.1.2.
	Ventilation			
99.	Smoke and corrosive gases should be discharged directly outside to an area that will not affect safety-related plant areas.	C.5.f (1)	AC	See Section 3.1.2.

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NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
100.	To facilitate manual firefighting, separate smoke and heat vents should be provided in certain areas.	C.5.f (1)	NC	See Section 3.1.2.
101.	Release of smoke and gases containing radioactive materials to the environment should be monitored.	C.5.f (2)	C	See Section 3.1.2.
102.	Any ventilation system designed to exhaust potentially radioactive smoke or gases should be evaluated to ensure that inadvertent operation or single failures will not violate the radiologically controlled areas of the plant.	C.5.f (2)	AC	See Section 3.1.2.
103.	The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system.	C.5.f (3)	AC	See Section 3.1.2.
104.	Engineered safety feature filters should be protected in accordance with the guidelines of Regulatory Guide 1.52.	C.5.f (4)	C	See Section 3.1.2.
105.	Air intakes for ventilation systems serving areas containing safety-related equipment should be located remote from the exhaust air outlets and smoke vents of other fire areas.	C.5.f (5)	C	Air intakes serving areas which contain safety-related equipment are remote from exhaust and smoke outlets of other fire areas.
106.	Stairwells should be designed to minimize smoke infiltration during a fire.	C.5.f (6)	C	Stair towers are provided with self-closing doors, which will minimize smoke infiltration during a fire.
107.	Where total flooding gas extinguishing systems are used, ventilation dampers should be controlled in accordance with NFPA 12 and NFPA 12A.	C.5.f (7)	C	See Section 3.1.2.
	Lighting and Communication			
108.	Fixed self-contained lighting units with individual 8-hour battery power supplies should be provided in areas that must be manned for safe shutdown and for access and egress routes to and from all fire areas.	C.5.g (1)	AC	See Item 23 of Section 3.2.2.
109.	Sealed-beam battery powered portable hand lights should be provided for emergency use.	C.5.g (2)	WC	Portable lights will be provided.
110.	Fixed emergency communications independent of the the normal plant communication system should be installed at preselected stations.	C.5.g (3)	AC	See Section 3.1.2.

In lieu of complete reliance on NFPA 72E, smoke and fire detector locations are established by a qualified fire protection engineer.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
111.	A portable radio communications system should be provided for use by the fire brigade and other operations personnel required to achieve safe plant shutdown.	C.5.g (4)	WC	See Section 3.1.2.
	Fire Detection			
112.	Detection systems should be provided for all areas that contain or present a fire exposure to safety-related equipment.	C.6.a (1)	AC	Fire detection systems have been provided for all areas that contain safety-related equipment, with the exception of the service water pipe tunnel (fire area 75). As discussed in Section 5.4.24, this area contains no combustible materials and the redundant components needed for safe shutdown are widely separated.
113.	Fire detection systems should comply with the requirements of Class A systems as defined in NFPA 72D and Class 1 circuits as defined in NFPA 70.	C.6.a (2)	C	Class A systems are defined in the 1975 edition of NFPA 72D.
114.	Fire detectors should be selected and installed in accordance with NFPA 72E.	C.6.a (3)	AC	
115.	Testing of pulsed line-type heat detectors should demonstrate that the frequencies used will not affect the actuation of protective relays in other plant systems.	C.6.a (3)	NA	Pulsed line-type detectors are not used in the plant.
116.	Fire detection systems should give audible and visual alarm and annunciation in the control room.	C.6.a (4)	C	
117.	Where zoned detection systems are used in a given fire area, local means should be provided to identify which zone has actuated.	C.6.a (4)	C	A coding system has been established for all fire alarms in the plant so that the location of a fire can be determined from the sound of the alarm. A list of these codes and their corresponding detection areas will be posted at each fire alarm pull station.
118.	Local audible alarms should sound in the fire area.	C.6.a (4)	C	Fire alarms are annunciated throughout the plant, as well as in the local area in which a fire detector has been actuated.

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NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
119.	Fire alarms should be distinctive and unique so they will not be confused with any other plant system alarms.	C.6.a (5)	C	
120.	Primary and secondary power supplies which satisfy the provisions of Section 2220 of NFPA 72D should be provided for the fire detection system and for electrically operated control valves for automatic suppression systems.	C.6.a (6)	AC	See Section 3.1.2.
	Fire Protection Water Supply Systems			
121.	An underground yard fire main loop should be installed to furnish anticipated water requirements.	C.6.b (1)	C	An underground yard fire main loop has been provided and is in compliance with NFPA 24.
122.	Type of pipe and water treatment should be design considerations with tuberculation as one of the parameters.	C.6.b (1)	C	The yard fire main loop utilizes cement-lined cast iron pipe to reduce tuberculation. Water used for fire protection service meets the requirements of NFPA 22 and does not require treatment.
123.	Means of inspecting and flushing the systems should be provided.	C.6.b (1)	C	Following its installation, the yard fire main loop was flushed and tested in accordance with NFPA 24 - 1973, Sections 98 and 99. Flushing of the loop is accomplished through the use of sectional control valves to direct the flow and yard hydrants to serve as discharge points.
124.	Approved visually indicating sectional control valves should be provided to isolate portions of the main for maintenance or repair.	C.6.b (2)	C	Post indicator valves provided for sectionalized control and isolation of portions of the yard fire main loop.
125.	Valves should be installed to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the water supply to automatic or manual fire suppression systems.	C.6.b (3)	C	A key-operated gate valve with a curb box is provided in each lateral from the yard fire main loop to a fire hydrant.
126.	The fire main system piping should be separate from service or sanitary water system piping.	C.6.b (4)	C	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
127.	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 loop around each unit.	C.6.b (5)	C	The yard fire main loop is common to both reactor units. The loop is cross-connected between units and provided with sectional control valves.
128.	A sufficient number of pumps should be provided to ensure that 100% capacity will be available assuming failure of the largest pump or loss of offsite power.	C.6.b (6)	C	Two fire pumps (one diesel-driven and one electric motor-driven) are provided, each capable of supplying 100% of the system flow requirements.
129.	Individual fire pump connections to the yard fire main loop should be separated with sectionalizing valves between connections.	C.6.b (6)	C	
130.	Each pump and its driver and controls should be separated from the remaining fire pumps by a 3-hour fire wall.	C.6.b (6)	C	
131.	The fuel for the diesel fire pump should be separated so that it does not provide a fire source exposing safety-related equipment.	C.6.b (6)	C	The diesel oil day tank is located in a curbed area within the diesel-driven fire pump compartment. This compartment is located in the circulating water pump structure, which is separated from all structures containing safety-related equipment.
132.	Alarms indicating pump running, driver availability, failure to start, and low fire-main pressure should be provided in the control room.	C.6.b (6)	AC	Pump running, driver availability, and failure to start are annunciated in the control room. Fire main pressure is indicated in the control room but not annunciated.
133.	The fire pump installation should conform to NFPA 20.	C.6.b (6)	C	
134.	Outside manual hose installation should be sufficient to provode an effective hose stream to any onsite location where fixed or transient combustibles could jeopardize safety-related equipment. Hydrants should be installed approximately every 250 feet on the yard main system.	C.6.b (7)	AC	Hydrants are spaced between 250 and 300 feet apart along the fire main loop.
135.	Recommendations for hose houses and hose carts.	C.6.b (7)	C	See Section 3.1.2.
136.	Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings, and standpipe risers.	C.6.b (8)	C	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
137.	Two separate, reliable freshwater supplies should be provided.	C.6.b (9)	C	The cooling tower basins of the Unit 1 and Unit 2 circulating water systems are used as the two sources of water for the fire pumps.
138.	Recommendations for tanks used to supply fire protection water.	C.6.b (9)	NA	Tanks are not utilized for fire protection water supply.
139.	Recommendations for tanks used to supply fire protection water	C.6.b (10)	NA	Tanks are not utilized for fire protection water supply.
140.	The fire water supply should be based on the largest expected flow rate for a period of 2 hours, but not less than 300,000 gallons.	C.6.b (11)	C	See Section 3.1.2.
141.	The fire water supply should be capable of delivering the design demand over the longest route of the water supply system.	C.6.b (11)	C	In the event that a portion of the yard fire main loop is valved out of service, the fire pumps are capable of delivering the design demand over the longest route of the water supply system.
142.	Recommendations for freshwater lakes or ponds used to supply fire protection water.	C.6.b (12)	NA	Lakes or ponds are not utilized for fire protection water supply.
143.	Recommendations concerning use of a common water supply for fire protection and the ultimate heat sink.	C.6.b (13)	NA	The fire protection system and the ultimate heat sink do not share a common water supply.
144.	Recommendations concerning use of other water systems as the source of fire protection water.	C.6.b (14)	AC	See Section 3.1.2.
	Water Sprinkler and Hose Standpipe Systems			
145.	Recommendations concerning connection of sprinkler systems and manual hose station standpipes to the yard fire main loop.	C.6.c (1)	C	See Item 19.
146.	Each sprinkler and standpipe system should be equipped with OS&Y gate valve or other approved shutoff valve and waterflow alarm.	C.6.c (1)	AC	See Section 3.1.2.
147.	Safety-related equipment should be protected from sprinkler discharge if such discharge could result in unacceptable damage to the equipment.	C.6.c (1)	AC	See Section 3.1.2.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
148.	Control and sectionalizing valves in the fire water systems should be electrically supervised (with indication in the control room) or administratively controlled.	C.6.c (2)	C	See Section 3.1.2.
149.	All valves in the fire protection system should be periodically checked to verify position.	C.6.c (2)	WC	
150.	Fixed water extinguishing systems should conform to requirements of NFPA 13 and NFPA 15.	C.6.c (3)	C	
151.	Recommendations for interior manual hose installations.	C.6.c (4)	NC	See Section 3.1.2.
152.	Individual standpipes should be at least 4 inches in diameter for multiple hose connections and and 2.5 inches in diameter for single hose connections.	C.6.c (4)	AC	Wet standpipes are not less than 3 inches in diameter for one or two hose connections and 4 inches in diameter for three or more hose connections.
153.	Standpipe and hose station installations should follow the requirements of NFPA 14.	C.6.c (4)	C	
154.	Hose stations should be located as dictated by the fire hazard analysis to facilitate access and use for fire fighting operations.	C.6.c (4)	C	
155.	Recommendations concerning seismic design of standpipes and hose connections.	C.6.c (4)	NC	See Section 3.1.2.
156.	Recommendations concerning hose nozzle selection.	C.6.c (5)	WC	
157.	Fire hose should be hydrostatically tested in accordance with NFPA 1962. Hose stored in outside hose houses should be tested annually. Interior standpipe hose should be tested every 3 years.	C.6.c (6)	WC	
158.	Consideration of foam suppression systems for flammable liquid fires.	C.6.c (7)	C	See Section 3.1.2.
	Halon Suppression Systems			
159.	Halon fire extinguishing systems should comply with NFPA 12A and NFPA 12B. Only UL-listed or FM-approved agents should be used.	C.6.d	C	Design and installation of the Halon 1301 system is in accordance with NFPA 12A.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
160.	Provisions for locally disarming automatic Halon systems should be key locked and under administrative control. Automatic Halon systems should not be disarmed unless controls as described in Position C.2.c are provided.	C.6.d	WC	
161.	Preventive maintenance and testing of the systems, including check-weighing of the Halon cylinders, should be done at least quarterly.	C.6.d	C	
162.	Considerations for design of Halon suppression systems.	C.6.d	C	See Section 3.1.2.
	Carbon Dioxide Suppression Systems			
163.	Carbon dioxide extinguishing systems should comply with the requirements of NFPA 12.	C.6.e	C	
164.	Automatic carbon dioxide systems should be equipped with a predischarge alarm system and a discharge delay to permit personnel egress.	C.6.e	C	
165.	Provisions for locally disarming automatic carbon dioxide systems should be key locked and under administrative control. The systems should not be disarmed unless controls as described in Position C.2.c are provided.	C.6.e	WC	
166.	Considerations for design of carbon dioxide suppression systems.	C.6.e	C	See Section 3.1.2.
	Portable Extinguishers			
167.	Fire extinguishers should be provided in areas that contain, or could present a fire exposure hazard to, safety-related equipment in accordance with NFPA 10.	C.6.f	C	
168.	Dry chemical extinguishers should be installed with due consideration given to possible adverse effects on safety-related equipment.	C.6.f	C	

NO.	CMEB 9.5-1 GUIDELINE	CMER 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Primary and Secondary Containment			
169.	Fire protection for the primary and secondary containment areas should be provided for hazards identified by the fire hazards analysis.	C.7.a (1)	C	Fire hazards have been identified, as discussed in Chapter 4, and fire suppression systems have been provided accordingly. The types and locations of suppression systems are identified in Table A-1 and Figures B-4 through B-12.
170.	Because of the general inaccessibility of primary containment during normal plant operation, protection should be provided by automatic fixed systems.	C.7.a (1)	NC	See Section 3.1.2.
171.	Operation of the fire protection systems should not compromise the integrity of the containment or other safety-related systems.	C.7.a(1)(a)	C	The fire protection system does not penetrate the primary containment boundary. Also see Item 24.
172.	Recommendations for protection of safety-related cables and equipment inside noninerted containments.	C.7.a(1)(b)	NA	The primary containment is inerted with nitrogen during reactor operation.
173.	Recommendations concerning fire detection inside the primary containment.	C.7.a(1)(c)	NC	See Section 3.1.2.
174.	For BWR drywells, standpipe and hose stations should be placed outside the drywell with adequate lengths of hose, no longer than 100 feet, to reach any location inside the drywell with an effective hose stream.	C.7.a(1)(d)	WC	The hose reels located nearest the drywell entrances are equipped with a 100-foot length of fire hose. To supplement this hose length, a hose cart equipped with enough hose to reach any location within the drywell will be located near each drywell entrance.
175.	Recommendations for reactor coolant pump oil collection systems in noninerted containments.	C.7.a(1)(e)	NA	The primary containment is inerted with nitrogen during normal reactor operation.
176.	For secondary containment areas, cable fire hazards that could affect safety should be protected as described in Position C.5.e(2).	C.7.a(1)	--	See Items 88 through 95.
177.	Self-contained breathing apparatus should be provided near the containment entrances for firefighting and damage control personnel. These units should be independent of any breathing apparatus provided for general plant activities.	C.7.a (2)	WC	See Item 33.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Control Room Complex			
178.	The control room complex should be separated from other areas of the plant by 3-hour rated fire barriers.	C.7.b	C	
179.	Recommendations concerning peripheral rooms in the control room complex.	C.7.b	NC	See Section 3.1.2.
180.	Recommendations concerning the use of Halon and carbon dioxide flooding systems in the peripheral rooms.	C.7.b	NA	The peripheral rooms adjacent to the control room are not provided with Halon or carbon dioxide flooding systems.
181.	Recommendations concerning manual fire fighting capability in the control room.	C.7.b	C	See Section 3.1.2.
182.	Recommendations concerning fire detection in the control room.	C.7.b	AC	See Section 3.1.2.
183.	Breathing apparatus for control room operators should be readily available.	C.7.b	WC	See Item 33.
184.	Recommendations concerning control room ventilation.	C.7.b	C	See Section 3.1.2.
185.	All cables that enter the control room should terminate in the control room.	C.7.b	C	
186.	Cables in underfloor and ceiling spaces should meet the separation criteria necessary for fire protection.	C.7.b	C	See Section 3.1.2.
187.	Air-handling functions should be ducted separately from cable runs in such spaces.	C.7.b	C	The space above the suspended ceiling in the control room is not used as an air plenum for ventilation of the control room. Ventilation air is ducted through the space above the suspended ceiling.
188.	Fully enclosed electrical raceways located in underfloor and ceiling spaces, if over 1 square foot in cross-sectional area, should have automatic fire suppression inside.	C.7.b	C	None of the fully enclosed raceways in the space above the suspended ceiling in the control room has a cross-sectional area exceeding 1 square foot. The raceways in the raised flooring of the auxiliary equipment room are provided with an automatic Halon suppression system, as described in Section 2.9.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
189.	Recommendations concerning automatic fire suppression in underfloor and ceiling spaces.	C.7.b	NC	See Section 3.1.2.
190.	There should be no carpeting in the control room.	C.7.b	C	
	Cable Spreading Room			
191.	Recommendations concerning automatic fire suppression in the cable spreading room.	C.7.c	AC	See Section 3.1.2.
192.	Open-head deluge and open directional spray systems should be zoned.	C.7.c	NA	Open-head water suppression systems are not used in the cable spreading room.
193.	Cable spreading rooms should have at least two remote and separate entrances for access by fire brigade personnel.	C.7.c (1)	C	Each cable spreading room is provided with at least three entrances at widely separated locations.
194.	Cable spreading rooms should have an aisle separation between tray stacks at least 3 feet wide and 8 feet high.	C.7.c (2)	NC	Cable trays in the cable spreading rooms are arranged to provide aisleways with a minimum headroom approximately 6.5 feet high and a minimum width between tray stacks of approximately 3 feet. At certain locations, structural supports for the cable trays reduce the aisle width to a minimum of 17 inches.
195.	Cable spreading rooms should have hose stations and portable extinguishers installed immediately outside the room.	C.7.c (3)	C	
196.	Cable spreading rooms should have area smoke detection.	C.7.c (4)	C	
197.	Cable spreading rooms should have continuous line-type heat detectors for cable trays inside the cable spreading room.	C.7.c (5)	NC	Continuous line-type heat detectors are not used in cable trays. Smoke detectors are provided in the cable spreading room (as specified in Table A-1) and will provide early warning for cable tray fires occurring in the cable spreading room.
198.	Drains to remove firefighting water should be provided.	C.7.c	C	
199.	When gas systems are installed, drains should have adequate seals or the gas extinguishing systems should be sized to compensate for losses through the drains.	C.7.c	C	The capacity of the carbon dioxide storage tank is sufficient to compensate for losses through the floor drains in the cable spreading rooms.
200.	A separate cable spreading room should be provided for each redundant division.	C.7.c	NC	See Item 57.

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NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
201.	Cable spreading rooms should not be shared between reactors.	C.7.c	C	Each reactor unit is provided with its own separate cable spreading room.
202.	Each cable spreading room should be separated from the others and from other areas of the plant by 3-hour fire barriers.	C.7.c	C	
203.	The ventilation system for the cable spreading room should be designed to isolate the area upon actuation of the gas extinguishing system.	C.7.c	C	In the event of actuation of the carbon dioxide system in the cable spreading room, ventilation ducts penetrating the boundaries of the room are automatically isolated by steam isolation dampers. The dampers are actuated by pressure switches connected to the carbon dioxide distribution piping.
204.	Separate manually actuated smoke venting that is operable from outside the room should be provided for the cable spreading room.	C.7.c	NC	The normal ventilation system is used to exhaust smoke from the cable spreading rooms. The exhaust from the cable spreading rooms is discharged to the generator equipment area of the turbine enclosure.
	Plant Computer Rooms			
205.	Recommendations concerning fire protection for computers performing safety-related functions.	C.7.d	NA	The plant computer is not safety-related.
206.	Nonsafety-related computers outside the control room should be separated from safety-related areas by 3-hour fire barriers and should be protected as needed to prevent damage to safety-related equipment.	C.7.d	AC	The plant computer is nonsafety-related and is located in the auxiliary equipment room. The auxiliary equipment room is separated from other areas of the plant by 3-hour fire barriers, but the computer is not separated (other than by distance) from safety-related panels in the auxiliary equipment room. Automatic fire suppression for the raised flooring in the auxiliary equipment room is discussed in Section 2.9.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Switchgear Rooms			
207.	Switchgear rooms containing safety-related equipment should be separated from the remainder of the plant by 3-hour fire barriers. Redundant switchgear safety divisions should be separated from each other by 3-hour fire barriers.	C.7.e	AC	The safety-related switchgear rooms at elev. 239 feet in the control structure are separated from each other and from the remaining areas of the plant by 3-hour rated fire walls. The concrete slab above these rooms is a 3-hour rated barrier, and the slab below the room is capable of a 3-hour fire rating with the exception of exposed structural steel members supporting the slabs.
208.	Automatic fire detectors should alarm and annunciate in the control room and alarm locally.	C.7.e	C	Each safety-related switchgear room is provided with smoke and heat detectors that annunciate in the control room and alarm locally.
209.	Fire hose stations and portable fire extinguishers should be readily available outside the switchgear rooms.	C.7.e	C	
210.	Drains should be provided to prevent water accumulation from damaging safety-related equipment.	C.7.e	NC	See Section 3.1.2.
211.	Remote manually actuated ventilation should be provided for venting smoke when manual fire suppression effort is needed.	C.7.e	NC	Ventilation features separate from the normal ventilation system are not provided for the switchgear rooms. Smoke removal can be accomplished using portable exhaust fans, if necessary.
	Remote Safety-Related Panels			
212.	Recommendations concerning separation and electrical isolation of remote safety-related panels.	C.7.f	AC	See Section 3.1.2.
213.	The general area housing remote safety-related panels should be provided with automatic fire detectors that alarm locally and 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 readily available in the general area.	C.7.f	C	

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NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Safety-Related Battery Rooms			
214.	Safety-related battery rooms should be separated from each other and other areas of the plant by 3-hour rated fire barriers.	C.7.g	AC	The safety-related battery rooms are located in the control structure. These rooms are separated from each other and from the remaining areas of the plant by 3-hour rated fire walls. The floor slabs above and below the battery rooms are capable of 3-hour fire ratings with the exception of exposed structural steel members supporting the concrete slabs.
215.	DC switchgear and inverters should not be located in safety-related battery rooms.	C.7.g	AC	
216.	Automatic fire detection should be provided to annunciate in the control room and alarm locally.	C.7.g	C	Each safety-related battery room is provided with smoke and heat detectors that annunciate in the control room and alarm locally.
217.	Ventilation systems in the battery rooms should be capable of maintaining the hydrogen concentration below 2%.	C.7.g	C	See Section 3.1.2.
218.	Loss of ventilation should be alarmed in the control room.	C.7.g	C	See Section 3.1.2.
219.	Portable extinguishers and manual hose stations should be readily available outside the battery rooms.	C.7.g	C	
	Turbine Building			
220.	The turbine building should be separated from adjacent structures containing safety-related equipment by 3-hour fire barriers.	C.7.h	C	The turbine enclosure is separated from the reactor enclosure and control structure by 3-hour rated fire walls.
221.	The fire barriers should be designed so as to maintain structural integrity in the event of collapse of the turbine structure.	C.7.h	C	See Section 3.1.2.
222.	Openings and penetrations in the fire barrier should be minimized and should not be located where the turbine oil system or generator hydrogen cooling system creates a fire exposure hazard to the barrier.	C.7.h	C	See Section 3.1.2.

Battery chargers and dc fuse boxes are located in the safety-related battery rooms along with the batteries that they serve. Other dc power system components (such as inverters and dc power distribution panels) are located outside the battery rooms.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Diesel Generator Areas			
223.	Diesel generators should be separated from each other and from other areas of the plant by 3-hour rated fire barriers.	C.7.i	C	
224.	Automatic fire suppression should be installed to combat diesel generator or lubricating oil fires. Such systems should be designed for operation when the diesel is running without affecting the diesel.	C.7.i	AC	See Section 3.1.2.
225.	Automatic fire detection should be provided to annunciate in the control room and alarm locally.	C.7.i	C	
226.	Portable extinguishers and manual hose stations should be readily available outside the area.	C.7.i	C	Portable extinguishers are available outside the diesel-generator cells. Fire hydrants located in the yard can reach any area of the diesel-generator cells.
227.	Drainage for firefighting water and means for local manual venting of smoke should be provided.	C.7.i	AC	See Section 3.1.2.
228.	Day tanks with total capacity up to 1100 gallons are permitted in the diesel generator area under specified conditions.	C.7.i	C	The day tank for each diesel-generator has a capacity of 800 gallons.
229.	The day tank should be located in a separated enclosure with a 3-hour fire rating.	C.7.i	C	The day tank for each diesel-generator is located in a vault that is separated from the remainder of the diesel-generator cell by 3-hour rated fire walls.
230.	The day tank enclosure should be capable of containing the entire contents of the tank.	C.7.i	C	
231.	The day tank enclosure should be protected by an automatic fire suppression system.	C.7.i	C	The pre-action sprinkler system provided in each diesel-generator cell includes coverage of the day tank vault.
	Diesel Fuel Oil Storage Areas			
232.	Recommendations concerning diesel fuel oil tanks.	C.7.j	C	Each diesel-generator is provided with a diesel fuel oil storage tank that has a capacity of 41,500 gallons. All eight tanks are located adjacent to each other and are buried underground.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
233.	Above-ground tanks should be protected by an automatic fire suppression system.	C.7.j	NA	See Item 232.
	Safety-Related Pumps			
234.	Pump houses and rooms housing redundant safety-related pump trains should be separated from each other and from other areas of the plant by 3-hour rated fire barriers.	C.7.k	C	The safety-related pump compartments located at elevation 177 feet in the reactor enclosure are separated from each other and from other areas of the plant by 3-hour rated fire walls. The spray pond pump structure is located remote from other plant structures, and the two divisions of pumps within the structure are separated by a 3-hour rated fire wall.
235.	These rooms should be protected by automatic fire suppression unless a fire hazards analysis can demonstrate that a fire will not endanger equipment required for safe shutdown.	C.7.k	C	The HPCI pump compartment and the RCIC pump compartment are protected by automatic pre-action sprinkler systems. Fires originating in other safety-related pump compartments would not endanger other safety-related equipment required for safe shutdown, as discussed in Chapter 5.
236.	These rooms should be provided with automatic fire detection to annunciate in the control room and alarm locally.	C.7.k	C	
237.	Portable extinguishers and manual hose stations should be readily accessible.	C.7.k	NC	Portable extinguishers are provided for use in all areas housing safety-related pumps. Manual hose stations are provided for use in all areas housing safety-related pumps, except for the spray pond pump structure. In consideration of the low combustible loading in the spray pond pump structure, portable extinguishers are deemed adequate to control and extinguish a fire at any pump.
238.	Floor drains should be provided to prevent water accumulation from damaging safety-related equipment.	C.7.k	C	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
239.	Provisions should be made for manual control of the ventilation system to facilitate smoke removal.	C.7.k	C	The ventilation systems in areas housing safety-related pumps are provided with controls that are sufficient to permit manual control of the ventilation as necessary to facilitate smoke removal.
	New Fuel Area			
240.	Recommendations for fire protection of the new fuel area.	C.7.l	NA/AC	
	Spent Fuel Pool Area			
241.	Protection for the spent fuel pool area should be provided by hose stations and portable extinguishers.	C.7.m	C	Hose stations and portable extinguishers are located near the spent fuel pool.
242.	Automatic fire detection should be provided to annunciate in the control room and to alarm locally.	C.7.m	NC	See Section 3.1.2.
	Radwaste and Decontamination Areas			
243.	Fire barriers, automatic fire suppression and and detection, and ventilation controls should be provided.	C.7.n	C	See Section 3.1.2.
	Safety-Related Water Tanks			
244.	Fire protection provisions for safety-related water tanks.	C.7.o	NA	The plant has no safety-related water tanks.
	Records Storage Areas			
245.	Records storage areas should be so located and protected that a fire in these areas does not expose safety-related systems or equipment.	C.7.p	WC	

The normal storage area for new fuel is the spent fuel pool. Prior to plant operation and during the initial phases of plant operation, new fuel may be stored in a temporary outdoor storage area. Fire protection for this temporary new fuel storage area will be provided in accordance with guidelines established by American Nuclear Insurers.

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
	Cooling Towers			
246.	Cooling towers should be of noncombustible construction or so located and protected that a fire will not adversely affect any safety-related systems or equipment.	C.7.q	C	The cooling towers are of noncombustible construction except for the fill material, which is polyvinyl chloride. No safety-related structures or systems are located near the cooling towers such that they could be affected by a fire in the cooling towers.
247.	Cooling towers should be of noncombustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply.	C.7.q	AC	See Section 3.1.2.
	Miscellaneous Areas			
248.	Location and protection of miscellaneous areas.	C.7.r	C	See Section 3.1.2.
	Storage of Acetylene-Oxygen Fuel GAses			
249.	Gas cylinder storage locations should not be in areas that contain or expose safety-related equipment or the fire protection systems that serve those safety-related areas.	C.8.a	WC	Compressed gas storage cylinders for welding are located outdoors, away from safety-related components.
250.	A permit system should be required to use this equipment in safety-related areas of the plant.	C.8.a	WC	
	Storage Areas for Ion Exchange Resins			
251.	Unused ion exchange resins should not be stored in areas that contain or expose safety-related equipment.	C.8.b	WC	Storage areas for dry ion exchange resins will be remote from safety-related equipment.
	Hazardous Chemicals			
252.	Hazardous chemicals should not be stored in areas that contain or expose safety-related equipment.	C.8.c	WC	Hazardous chemicals are stored in areas remote from safety-related equipment.
	Materials Containing Radioactivity			
253.	Materials that collect and contain radioactivity should be stored in closed metal tanks or containers that are located in areas free from ignition sources or combustibles.	C.8.d	WC	

NO.	CMEB 9.5-1 GUIDELINE	CMEB 9.5-1 ITEM NO.	COMPARISON	REMARKS
254.	These materials should be protected from exposure to fires in adjacent areas.	C.8.d	WC	
255.	Consideration should be given to requirements for removal of decay heat from entrained radioactive materials.	C.8.d	C	Provisions for accommodating decay heat are considered when selecting containers.

3.1.2 EXPLANATORY NOTES FOR COMPARISON TO BRANCH TECHNICAL POSITION CMEB 9.5-1

Item 15

BTP Guideline

Fires involving facilities shared between units and fires due to man-made site-related events that have a reasonable probability of occurring and affecting more than one reactor unit (such as an aircraft crash) should be considered.

LGS Design

The control structure, the spray pond pump structure, and the radwaste enclosure are common to the two reactor units. Fires are postulated to occur in these structures just as in other structures, and appropriate provisions are made for fire prevention, fire detection, and fire suppression.

For a discussion of fires due to man-made site-related events, refer to Item 22.

Item 19

BTP Guideline

A single active failure or a crack in a moderate-energy line (pipe) in the fire suppression system should not impair both the primary and backup fire suppression capability. For example, neither the failure of a fire pump, its power supply or controls, nor a crack in a moderate-energy line in the fire suppression system, should result in loss of function of both sprinkler and hose standpipe systems in an area protected by such primary and backup systems.

LGS Design

As described in Section 2.1.2, fire water is supplied by two redundant pumps, each of which is capable of providing the design fire protection system flow rate at the design pressure. Power for the motor-driven fire pump is provided from either of two independent offsite power sources. The controls for the diesel engine-driven fire pump are dc-operated and are powered from batteries which supply only the engine-driven fire pump. Therefore, no single failure of the power supplies or controls can affect both fire pumps.

If a crack should occur in the yard fire main loop, sectional isolation valves can be used to isolate the damaged portion of

the loop without affecting the majority of the loop. There is no single active failure that could affect the operability of both the sprinkler systems and manual hose stations for a given area. In certain cases, the occurrence of a crack in a header that supplies water to sprinklers and manual hose stations could affect the ability to achieve design flow rates for the sprinklers and hose stations in a given fire area. The provision of portable extinguishers for manual fire fighting precludes the possibility of a pipe crack from disabling all means of fire suppression for a given area.

Item 21

BTP Guideline

The fire protection systems should retain their original design capability for natural phenomena of less severity and greater frequency than the most severe natural phenomena (approximately once in 10 years) such as tornadoes, hurricanes, floods, ice storms, or small-intensity earthquakes that are characteristic of the geographic region.

LGS Design

The fire pumps, the yard fire main loop, distribution piping within structures, manual hose stations, and fixed suppression systems are conservatively designed so as to retain their operability following the occurrence of natural phenomena with severities corresponding to a recurrence interval of once in 10 years.

Item 22

BTP Guideline

The fire protection systems should retain their original design capability for potential man-made site-related events such as oil barge collisions or aircraft crashes that have a reasonable probability of occurring at a specific plant site.

LGS Design

Transportation activities taking place near the plant site, and the potential for accidents affecting the plant, are discussed in Section 2.2 of the FSAR. As indicated in Section 2.2.2.4 of the FSAR, there is no commercial traffic on the Schuylkill River in the vicinity of the site. As discussed in Section 2.2.3 of the FSAR, the potential effects of an explosion occurring on nearby highways are exceeded in serverity by the potential effects of a railway explosion. Structures housing safety-related systems and

components are designed to withstand impact from missiles generated by a railway explosion. Portions of fire protection systems that are located outside the safety-related structures could potentially be damaged by missiles generated by a railway explosion. However, such damage will not jeopardize safe shutdown capability since the systems and components needed for safe shutdown are protected from damage due to missile impact and are isolated from the effects of fires occurring outside the safety-related structures.

Hazards to the plant resulting from aircraft operating in the vicinity of the Limerick site are discussed in Section 3.5.1.6 of the FSAR. The control structure, reactor enclosure, and spray pond pump structure are designed to withstand the impact of the design aircraft (a Learjet) without loss of structural integrity. Portions of fire protection systems that are located outside these structures could potentially be damaged by aircraft impact. However, such damage will not jeopardize safe shutdown capability since the systems and components needed for safe shutdown are protected from damage due to aircraft impact and are isolated from the effects of fires occurring outside the control structure, reactor enclosure, and spray pond pump structure.

Item 24

BTP Guideline

The consequences of inadvertent operation of or a crack in a moderate energy line in the fire suppression system should meet the guidelines specified for moderate-energy systems outside containment in SRP Section 3.6.1.

LGS Design

Moderate-energy leakage cracks in fire suppression system piping are analyzed as discussed in Section 3.6 of the FSAR. Inadvertent operation of a fire suppression system could, in certain cases, affect the operability of safety-related systems or components. However, such inadvertent operation would not prevent safe shutdown from being achieved through the use of redundant safety-related systems.

Item 28

BTP Guideline

On reactor sites where there is an operating reactor and construction or modification of other units is under way, the fire protection program should provide for continuing evaluation of fire hazards. Additional fire barriers, fire protection

capability, and administrative controls should be provided as necessary to protect the operating unit from construction fire hazards.

LGS Design

Administrative procedures will be prepared to protect the operating Unit 1 from fire hazards associated with construction of Unit 2. Special precautions will be taken to prevent and control fire hazards. Use of open flames and welding or cutting equipment will be properly supervised.

Construction of both the underground yard fire main and the fire water distribution piping inside both units of the plant will be completed prior to Unit 1 operation so that manual hose station coverage will be available in Unit 2 as well as Unit 1. Portable fire extinguishers will also be available in the Unit 2 portions of the plant during its construction. The construction site will be kept clean and orderly and contractors' sheds will be kept outside the confines of new construction.

Item 33

BTP Guideline

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. At least 10 masks shall be available for fire brigade personnel. Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or rated operating life shall be a minimum of one-half hour for the self-contained units.

At least two extra air bottles 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 shall be used; compressors shall be operable assuming a loss of offsite power. Special care must be taken to locate the compressor in areas free of dust and contaminants.

LGS Design

Self-contained breathing apparatus will be available for use by control room personnel and fire brigade members. The breathing apparatus will have a minimum operating life of 4 hours for control room personnel and 1 hour for fire brigade members.

An onsite reserve air supply of six hours for at least five persons will be provided in stored air bottles. Compressors, if used, will be units approved for breathing air.

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Item 35

BTP Guideline

The quality assurance (QA) programs of applicants and contractors should ensure that the guidelines for design, procurement, installation, and testing and the administrative controls for the fire protection systems for safety-related areas are satisfied. The QA program should be under the management control of the QA organization. This control consists of (1) formulating a fire protection QA program that incorporates suitable requirements and is acceptable to the management responsible for fire protection or verifying that the program incorporates suitable requirements and is acceptable to the management responsible for fire protection, and (2) verifying the effectiveness of the QA program for fire protection through review, surveillance, and audits. Performance of other QA program functions for meeting the fire protection program requirements may be performed by personnel outside of the QA organization. The QA program for fire protection should be part of the overall plant QA program. It should satisfy the specific criteria listed below.

LGS Design

The QA program described below will be under the management control of ~~the~~ PECo ~~Engineering & Research Department QA~~ and their agents organization during the construction phase.

1. Design Control and Procurement Document Control

The design review performed to compare the Limerick design to the BTP guidelines provides assurance that necessary design features are included in appropriate design and procurement documents.

Deviations from the design and procurement documents will be controlled by mechanisms specified in the 10 CFR 50, Appendix B QA program for this project.

2. Instructions, Procedures, and Drawings

These requirements will be met during the construction phase through the use of a documented, final installation inspection and through implementation of a written pre-operational test.

3. Control of Purchased Material, Equipment, and Services

Based upon the status of procurements and the identification of significant design or manufacturing features, certain fire protection equipment may be subject to shop inspection during manufacture.

Receipt inspection at the construction site shall be performed.

4. Inspection

These requirements will be met through the use of a documented, final installation inspection and through implementation of a written preoperational test.

5. Test and Test Control

Documented preoperational test procedures including evaluation of results and followup action, if indicated, shall be employed to meet these requirements relative to the construction phase of the plant.

6. Inspection, Test, and Operating Status

Installation inspections, as described in Item 4 above, shall be documented in such a manner as to indicate the acceptability of the item/activity inspected. Deficiencies shall be identified and corrected in accordance with mechanisms specified in the 10 CFR 50, Appendix B QA program for this project.

Satisfactory completion of the preoperational test and release for operation shall be accomplished and documented in accordance with mechanisms specified in the 10 CFR 50, Appendix B QA program for this project.

7. Nonconforming Items

Nonconforming items shall be identified, controlled, and corrected in accordance with the mechanisms specified in the 10 CFR 50, Appendix B QA program for this project.

8. Corrective Action

Conditions adverse to fire protection (such as failures, malfunctions, deficiencies, deviations, defective components, and nonconformances) during the construction phase shall be reported and corrected in accordance with mechanisms specified in the 10 CFR 50, Appendix B QA program for this project.

9. Records

Records shall be prepared and maintained to furnish evidence that the criteria described in Items 1 through 10 are being met for activities affecting the fire protection program.

10. Audits

The activities described above are subject to audit. In addition, implementation of receipt inspections, final installation inspections, and pre-operational tests shall be subject to audit to conform with documented instructions, procedures, and drawings.

Item 37

BTP Guideline

Fire barriers with a minimum rating of 3 hours should be provided to separate redundant divisions of safety-related systems from each other.

LGS Design

Redundant divisions of safety-related systems will be separated from each other so as to achieve the three levels of fire damage limits established in Position C.1.b. The provision of fire barriers between redundant divisions of safety-related systems that do not have safe shutdown functions is not required. Fire barriers will be provided between redundant divisions of safe shutdown systems as necessary to ensure that one train of equipment necessary to achieve safe shutdown is maintained free of fire damage to the degree specified in Position C.1.b.

The reactor enclosures, turbine enclosures, diesel-generator enclosures, radwaste enclosure, and administration building are separated from each other by 3-hour rated fire walls. Walls internal to these structures (and also the spray pond pump structure) which serve as boundaries between different fire areas are provided with fire ratings or construction details consistent with the fire hazard existing in each area. The locations of fire-rated walls are shown on Figures B-4 through B-12, and the walls surrounding each fire area are further described in the fire area discussions contained in Sections 5.3 through 5.9.

The structural steel beams supporting the floor slabs at four elevations in the control structure (254, 269, 289 and 304 feet) have been fireproofed to provide a 3-hour rating for the complete floor assembly. The structural steel beams supporting floor slabs in other areas have not been fireproofed. The fire ratings of floor slabs above and below each fire area are listed in the fire area discussions contained in Sections 5.3 through 5.9. Those slabs which are shown as "3 hr*" are capable of being rated as 3-hour fire barriers, except for the lack of fireproofing on the structural steel beams supporting the slab.

Reinforced concrete walls without penetrations are considered to qualify for a 3-hour fire rating, provided that the wall has a thickness of at least 6 inches. Concrete block walls designated as fire walls are constructed in accordance with UL Design No.

Separation to ensure independence between Class IE and non-Class IE circuits and between redundant divisions of Class IE circuits is discussed in FSAR Section 8.1.6.1.14.

U904, as a minimum. Fire walls incorporating metal studs with lath and plaster are constructed in accordance with UL Design No. U409. Fireproofing material is applied to structural steel beams in accordance with UL Design No. N706 or N712.

Item 39

BTP Guideline

Appropriate fire barriers should be provided within a single safety division to separate components that present a fire hazard to other safety-related components or high concentrations of safety-related cables within that division.

LGS Design

The diesel-generator day tanks constitute the most significant fire hazard posed by components within safety-related systems. As stated in Item 229, the day tank for each diesel-generator is located in a vault that is separated from the remainder of the diesel-generator cell by 3-hour rated fire walls. The HPCI, RCIC, RHR, and LPCI systems contain lesser fire hazards in the form of lubricating oil associated with the pumps and drivers in these systems. These pumps are located at elevation 177 feet in the reactor enclosure, which is compartmentalized to separate the pumps from each other and from other safety-related systems.

Fire barriers are not provided solely for the purpose of separating safety-related cables from other safety-related cables in the same division. Separation by distance or by fire barriers between redundant divisions is provided as necessary to ensure safe shutdown capability in the event of a fire.

Item 40

BTP Guideline

Openings through fire barriers for pipe, conduit, and cable trays which separate fire areas should be sealed or closed to provide a fire resistance rating at least equal to that required of the barrier itself.

LGS Design

Pipe, conduit, and cable tray penetrations through fire-rated barriers will be sealed to provide a fire resistance rating that is consistent with that of the overall barrier. Such seals in fire barriers will be installed in accordance with the manufacturer's instructions and with the applicable requirements established by American Nuclear Insurers. Tests will be

For fire barriers that separate safety-related areas from nonsafety-related areas of the plant, conduit penetrations will be provided with internal seals in the same manner as discussed above for safety-related areas.

conducted to qualify each type of penetration seal for its intended fire rating.

Item 41

BTP Guideline

Openings inside conduit larger than 4 inches in diameter should be sealed at the fire barrier penetration. Openings inside conduit 4 inches or less in diameter should be sealed at the fire barrier unless the conduit extends at least 5 feet on each side of the fire barrier and is sealed either at both ends or at the fire barrier with noncombustible material to prevent the passage of smoke and hot gases.

LGS Design

In areas of the plant that contain safety-related equipment, conduits that penetrate fire barriers will be sealed internally to prevent the passage of smoke and hot gases. For each penetrating conduit, seals will be provided on both sides of the fire barrier at the access point (junction box, termination at a cable tray, or equipment connection) that is closest to the fire barrier. For those cases in which a conduit extends less than 5 feet on either side of the fire barrier, a 3-hour fire rated seal will be provided on one side of the barrier at the access point that is closest to the barrier.

In areas of the plant not containing safety-related equipment, internal seals will be provided for conduits penetrating fire barriers that are adjacent to fire areas with high combustible loadings. The locations of the conduit seals with respect to the fire barrier being penetrated will be the same as discussed above for safety-related areas.

This design is acceptable since all exposed conduit is steel and cable insulation and jacketing is flame retardant. No combustible pathway exists through the conduit.

Item 43

BTP Guideline

Penetration designs should utilize only noncombustible materials.

LGS Design

All materials used in fire-rated penetration seals are either noncombustible or are listed by an independent testing laboratory for flame spread, smoke generation, and fuel contribution of 25 or less. The following different types of seals will be used in fire-rated applications:

(1) Cement-type grout.

(2) Foamed silicone polymer. This is a self-vulcanizing material that results from the mixture of two liquid components.

(3) Solid silicone polymer. The polymer is impregnated with a powdered high-density filler.

(4) Flexible boot with ceramic fiber. The boot material is silicone rubber with woven glass fiber reinforcing. Ceramic fiber is installed inside the boot, in the space between the penetrating object and the edge of the penetration. Stainless steel compression straps and silicone adhesives are used in attaching the boot.

(5) Flexible boot with gel. The boot material is silicone rubber with woven glass fiber reinforcing. The boot is filled with a high-density silicone dielectric gel. Stainless steel compression straps and silicone adhesives are used in attaching the boot.

Item 48

BTP Guideline

Door openings in fire barriers should be protected with equivalently rated doors, frames, and hardware that have been tested and approved by a nationally recognized laboratory.

LGS Design

Door openings in rated fire barriers are provided with fire doors having ratings consistent with the barrier itself. Except as discussed below, access openings in 3-hour barriers are provided with Class A (3-hour) UL-labeled doors and access openings in 2-hour barriers are provided with Class B (1-1/2 hour) UL-labeled doors. Although not provided with UL labels, oversized steamtight doors which are also designated as fire rated are certified by the manufacturer to conform to standards established for UL-labeled fire-rated doors. American Nuclear Insurers has reviewed the design differences between the steamtight doors involved in this exception and UL-labeled doors of similar design, and has accepted their use in fire-rated barriers. These steamtight doors are identified in the fire area discussions contained in Sections 5.3 through 5.9 by a double asterisk (**) following the indicated fire rating.

DRAFT

Item 59

BTP Guideline

Interior wall and structural components, thermal insulation materials, radiation shielding materials, and soundproofing should be noncombustible.

LGS Design

Most interior walls are constructed of either reinforced concrete, or concrete masonry units. Limited use is made of walls constructed of metal studs with either gypsum wallboard or gypsum plaster on expanded metal lath. Structural components consist of structural steel or reinforced concrete. Soundproofing materials, if required, will be noncombustible. Radiation shielding consists of concrete, concrete masonry unit, or steel plates.

Thermal insulation materials are noncombustible, with the following exceptions:

(1) Insulation for domestic cold water piping (in the administration building only)is a closed-cell foamed elastomer with an ASTM E-84 flame spread rating of 25 or less.

(2) Insulation for the offgas refrigeration equipment (located only in the offgas enclosure) has an ASTM E-84 flame spread rating of 25 or less.

(3) Insulation for ductwork and plenums of the ventilation systems has an ASTM E-84 flame spread rating of 25 or less and a smoke generation rating of 50 or less.

Item 61

BTP Guideline

Metal deck roof construction should be noncombustible and listed as "acceptable for fire" in the UL Building Materials Directory, or listed as Class I in the Factory Mutual System Approval Guide.

LGS Design

Metal roof deckings consist of manufactured fluted panels with rigid insulation and builtup roofing membrane with gravel. This is a Class A UL fire-resistive rated builtup roofing system.

There are no combustible materials in the space above the suspended ceiling in the control room, other than electrical cables.

DRAFT

Item 63

BTP Guideline

Concealed spaces should be devoid of combustibles except as noted in Position C.6.b.

LGS Design

These cables (associated primarily with control room annunciators and control room lighting) are routed in cable tray, fully-enclosed gutters, and conduit above the suspended ceiling. Fire detectors will be located above the suspended ceiling to provide early warning of fires occurring within the area.

Electrical cables are routed through the raised floor sections in the auxiliary equipment room. Access to the cables for manual fire fighting efforts is obtained by the removal of floor plates covering the floor sections. The floor plates are constructed of aluminum honeycomb bonded between sheet steel, and are easily removable using two quick-disconnect fasteners on each plate. Automatic fire detection systems and automatic Halon suppression systems are provided in the floor sections. Additional discussion of the auxiliary equipment room raised flooring and the Halon suppression system is provided in Sections 2.9 and 5.3.25.

Item 65

BTP Guideline

Outdoor oil-filled transformers should have oil spill confinement features or drainage away from the buildings.

LGS Design

The main transformers, the safeguard transformers, and the auxiliary transformers are each surrounded by a curb approximately 2 feet high. A floor drain is provided within each curbed area to drain liquids to the normal waste drainage system.

The fire walls that are located on three sides of each plant services transformer would prevent spilled oil from flowing toward the circulating water pump structure. The pavement in the vicinity of each transformer is sloped to provide drainage to nearby catch basins.

Table A-3 lists the insulation and jacketing materials used for electrical cabling. As noted in the table, cable insulation and jacketing materials are specified to meet the IEEE Std 383 flame test requirements, except for lighting and communications cables, which are routed exclusively in conduit.

Item 66

BTP Guideline

Outdoor oil-filled transformers should be located at least 50 feet distant from the building, or by ensuring that such building walls within 50 feet of oil-filled transformers are without openings and have a fire resistance rating of at least 3 hours.

LGS Design

The main transformers are located more than 50 feet from any building. The plant services transformers are located adjacent to the circulating water pump structure, but are separated from it by free-standing 3-hour rated fire walls. The safeguard transformers and auxiliary transformers are located approximately 14 feet from the north side of the turbine enclosure. As described in Section 2.4, the latter transformers are provided with automatically-actuated deluge systems to suppress fires involving the transformers. This automatic suppression will prevent the turbine enclosure from being damaged as a result of a transformer fire. In addition, the turbine enclosure is nonsafety-related and does not contain any components that are needed in order to achieve safe shutdown of the plant.

Item 68

BTP Guideline

Floor 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 safety-related equipment in the area.

LGS Design

Most plant areas are provided with drainage facilities adequately sized to remove all the water discharged from a 1-1/2 inch hand hose line. Some areas which contain primarily electrical and electronic equipment are not provided with floor drains. For these latter areas, the doors which would be open to provide access for hand hose usage would also provide a flow path for fire protection water to drain to areas not containing safety-related components.

Item 69

BTP Guideline

Where gas suppression systems are installed, the drains should be provided with adequate seals, or the gas suppression system should be sized to compensate for the loss of the suppression agent through the drains.

LGS Design

Gas suppression systems are provided for the cable spreading rooms (carbon dioxide) and the raised flooring in the auxiliary equipment room (Halon 1301). The carbon dioxide suppression system is sized to compensate for the loss of carbon dioxide through floor drains. Loss of Halon 1301 through floor drains is not possible, since the auxilairy equipment room does not have floor drains.

Item 70

BTP Guideline

Drains in areas containing combustible liquids should have provisions for preventing the backflow of combustible liquids to safety-related areas through the interconnected drain systems.

LGS Design

The floor drains in the safety-related pump compartments at elevation 177 feet of the reactor enclosure are each provided with backflow-prevention devices. The only other safety-related areas of the plant that contain significant quantities of combustible liquids are the diesel-generator cells. The drains from the diesel-generator cells are not interconnected with drains from other safety-related areas of the plant. The drains from each diesel-generator cell are provided with traps upstream of their connection to an oil separator receiver.

The turbine enclosure contains several oil storage tanks, but the floor drains from the turbine enclosure are not interconnected with drains from safety-related areas of the plant.

Item 78

BTP Guideline

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.

LGS Design

Compressed gases are stored either outdoors or in nonsafety-related structures whenever possible. However, compressed gases with safety-related uses must be stored in safety-related structures. For this reason, compressed gas cylinders associated with the primary containment instrument gas system and containment combustible gas monitoring system are located in the reactor enclosure. Compressed gas cylinders used for welding are stored in the construction shop (during periods of usage only) and the machine shop. Hydrogen used in cooling of the main generators is provided from hydrogen cylinders stored at an outdoor location that is separated from all structures. The compressed propane gas used for ignition of the auxiliary boilers is also stored outdoors. The supply line penetrates only the auxiliary boiler enclosure.

Item 80

BTP Guideline

Use of compressed gases (especially flammable and fuel gases) inside buildings should be controlled.

LGS Design

The usage of compressed gases for cutting and welding is limited to those activities authorized as to be outlined in the administrative procedures.

The usage of compressed fuel gases for laboratory and shop use is limited to a low pressure supply system for Bunsen burners in the radioactive chemistry laboratory in the radwaste enclosure and the instrument repair shop on the 269-foot level of the control structure. Compressed fuel gas cylinders and gas pressure-reducing stations are installed outside of the building at a location that does not expose nuclear safety-related structures, systems, and equipment to potential damage from fire at the storage location.

Item 81

BTP Guideline

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.

LGS Design

The use of plastic materials within the plant has been minimized to the greatest extent practicable. However, alternatives to plastic or elastomeric materials for electrical cable insulating systems, with an optimum balance of electrical, physical, and environmental characteristics, are not available. Cable insulation and jacketing materials are chosen for their fire-retardant and self-extinguishing properties, such that fuel contribution to a cable fire is minimized and propagation of a fire along cables is self-limiting in the absence of an external fire hazard. The types of electrical cable insulation and jacketing used in the plant are listed in Table A-3.

Electrical components located throughout the plant, such as control panels, relay panels, motor control centers, and power distribution panels, contain relatively small amounts of plastic in the form of terminal blocks, relay cases, circuit breaker cases, and other small items. The use of plastic in these applications is necessary because of its electrically insulating properties.

Plastic materials are also used for electrical conduit, but only when embedded within poured concrete walls and floor slabs.

Item 85

BTP Guideline

Only metallic tubing should be used for conduit. Thin-wall metallic tubing should not be used.

LGS Design

Exposed conduit used for the routing of safety-related cables is rigid steel conduit. Conduit embedded in poured concrete walls and slabs may be either rigid steel or PVC. Conduits used for the routing of nonsafety-related cables may be either rigid steel or EMT.

exposed

DRAFT

Item 88

BTP Guideline

Redundant safety-related cable system outside the cable spreading room should be separated from each other and from potential fire exposure hazards in nonsafety-related areas by fire barriers with a minimum fire rating of 3 hours.

LGS Design

Fire exposure hazards in nonsafety-related areas are separated from safety-related areas by 3-hour rated fire barriers. Separation by distance or by fire barriers between redundant divisions of electrical cabling is provided as necessary to ensure safe shutdown capability in the event of a fire.

Item 94

BTP Guideline

In other areas where it may not be possible because of other overriding design features necessary for reasons of nuclear safety to separate redundant safety-related cable systems by 3-hour-rated fire barriers, cable trays should be protected by an automatic water system with open-head deluge or open directional spray nozzles arranged so that adequate water coverage is provided for each cable tray. Such cable trays should also be protected from the effects of a potential exposure fire by providing automatic water suppression in the area where such a fire could occur.

LGS Design

In areas that contain redundant divisions of safety-related cable trays that are not separated by 3-hour fire barriers, those specific trays that contain cables needed for safe shutdown are provided with separation by means of distance or by lesser-rated fire barriers (minimum 1-hour rating) and provided with automatic water suppression. is deemed sufficient to ensure safe shutdown capability in the event of fire, due to low combustible loading in the area, automatic water suppression to protect the cable trays is not provided.

Where separation alone

DRAFT

Item 96

BTP Guideline

Electric cable construction should, as a minimum, pass the flame test in the current IEEE Std 383.

LGS Design

With the exception of cables associated with the lighting and communication systems, electrical cable insulation and jacketing systems pass the IEEE Std 383 flame test. Cables associated with the lighting and communication systems are routed exclusively in conduit and are not routed together with cables associated with other plant systems.

Item 98

BTP Guideline

Miscellaneous storage and piping for flammable or combustible liquids or gases should not create a potential exposure hazard to safety-related systems.

LGS Design

Piping for combustible liquids or gases is not routed through areas containing safety-related systems unless this is unavoidable due to the fact that the combustible liquids or gases are used by a safety-related component. The situations where this exception arises involve the fuel oil supply piping to the diesel-generators and the reagent gas (hydrogen) tubing to the combustible gas analyzer packages.

DRAFT

The standby diesel-generators are located in individual cells within the diesel-generator enclosure. The fuel oil supply piping is routed so that the piping exposed in any given diesel-generator cell serves only the one diesel-generator in that cell. Therefore, a leak occurring at any location in the fuel oil supply piping can affect only one diesel-generator.

The combustible gas analyzer packages are located in the reactor enclosure. The reagent gas tubing to these analyzer packages is designated seismic Category I and is designed and constructed in accordance with the ASME B&PV Code, Section III, Class 2. As a result of the high quality standards applied to this tubing, it is extremely unlikely that any design basis event could cause a leak in the tubing.

Item 99

BTP Guideline

Smoke and corrosive gases should generally be discharged directly outside to an area that will not affect safety-related plant areas. The normal plant ventilation system may be used for this purpose if capable and available.

LGS Design

The products of combustion from a fire in any area of the plant will be removed by the normal plant ventilation systems and exhausted through the ventilation stacks above the reactor enclosure roof. A portion of the air exhausted from the control room, auxiliary equipment room, and control structure fan room is normally recirculated back to those rooms. Controls are available to permit switchover to the purge mode, in which 100% of the exhaust air from these rooms is discharged to the atmosphere.

Item 100

BTP Guideline

To facilitate manual firefighting, separate smoke and heat vents should be provided in specific areas such as cable spreading rooms, diesel fuel oil storage areas, switchgear rooms, and other areas where the potential exists for heavy smoke conditions.

LGS Design

As discussed in Item 99, the smoke resulting from a fire will be removed by the normal plant ventilation systems. Ventilation air from the cable spreading room is exhausted to the turbine enclosure. Fuel oil for the standby diesel-generators is stored in underground tanks rather than inside any structure. Smoke removal from the switchgear rooms can be accomplished using portable exhaust fans, if necessary.

Item 101

BTP Guideline

Release of smoke and gases containing radioactive materials to the environment should be monitored in accordance with emergency plans as described in the guidelines of Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants."

LGS Design

Radiation monitors are provided in the ventilation exhaust stacks to determine if the radioactive release to the environment is within the permissible limits of the plant Technical Specifications.

Exhaust from the control room is discharged directly to the atmosphere by alignment of dampers. Exhaust from potentially contaminated areas of the turbine enclosure and the control structure is discharged through deep bed charcoal filters prior to release to the atmosphere, with a means provided to bypass the filters for direct discharge. Independent systems provide filtered exhaust from the radwaste enclosure and the reactor enclosure with discharge through ventilation exhaust stacks above the reactor enclosure roof.

Item 102

BTP Guideline

Any ventilation system designed to exhaust potentially radioactive smoke or gases should be evaluated to ensure that inadvertent operation or single failures will not violate the radiologically controlled areas of the plant design. This requirement includes containment functions for protecting the public and maintaining habitability for operations personnel.

LGS Design

No portion of the ventilation system is specifically dedicated to smoke removal except for the purge mode of the control room ventilation system (see Item 99.) The basic design of the overall plant ventilation system considers the effects of inadvertent operation and single failure. The fire dampers provided within the ventilation system affect only those portions isolated by the dampers with no adverse effects on the balance of the systems.

Item 103

BTP Guideline

The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system where practical.

LGS Design

With the exception of fire area 27, the power and control cabling associated with ventilation systems for safety-related areas is routed outside the area served by the system. Fire area 27 is the control structure fan room, located at elevation 304 feet in the control structure. Ventilation for the control structure fan room is provided by the auxiliary equipment room supply air fans (OAV114 and OBV114) and return air fans (OAV120 and OBV120). Both of these sets of fans, plus their associated control panels, are located in fire area 27. Fire barriers, separation by distance, and an automatic suppression system will be provided in accordance with the guidelines of Section III.G.2 of Appendix R to 10 CFR Part 50, in order to ensure that a postulated fire within fire area 27 does not disable both fans in each pair of fans discussed above.

Item 104

BTP Guideline

Engineered safety feature filters should be protected in accordance with the guidelines of Regulatory Guide 1.52. Any filter that includes combustible materials and is a potential exposure fire hazard that may affect safety-related components should be protected as determined by the fire hazards analysis.

LGS Design

Manually-actuated sprinkler systems with water spray nozzles are provided as an integral component of the charcoal filters in the standby gas treatment system, the control room emergency ventilation system, the reactor enclosure equipment compartment exhaust system, and the reactor enclosure recirculation system. Heat detectors monitor charcoal filter temperature and alarm in the control room on high temperature.

The four filtration systems listed above also contain prefilters and HEPA filters that are constructed of fire retardant materials. Because of the low fire potential of these filter elements, and the fact that they are contained within all-metal plenums, they do not constitute a significant exposure fire hazard to other safety-related systems.

Telephones are also installed at preselected locations throughout the plant, providing two-way intraplant communication and access to the PA page channel. A portable radio communication system utilizing a distributed antenna system provides a backup to both the PA and PABX systems.

Item 107

BTP Guideline

Where total flooding gas extinguishing systems are used, area intake and exhaust ventilation dampers should be controlled in accordance with NFPA 12, "Carbon Dioxide Systems," and NFPA 12A, "Halon 1301 Systems," to maintain the necessary gas concentration.

LGS Design

Dampers in the supply and exhaust ductwork for the cable spreading room are controlled so as to minimize the loss of gas during actuation of the carbon dioxide total flooding system for the cable spreading room. Carbon dioxide discharge actuates pressure switches that initiate closure of the steam isolation dampers in the ducts penetrating the cable spreading room walls.

The Halon suppression systems for the auxiliary equipment room discharge only within the raised flooring. Therefore, automatic termination of ventilation for the general area of the auxiliary equipment room is unnecessary.

Item 110

BTP Guideline

Fixed emergency communications independent of the normal plant communication system should be installed at preselected stations.

LGS Design

The fixed communication systems to be used during emergencies are the same as those provided for normal plant communications. Both public address and private automatic branch exchange (PABX telephone) systems are provided. The PA system has two-way communication facilities for speech input at handset stations. Each station is capable of originating and receiving communication through the use of a page channel and five non-interfering party-line channels. Handset stations are installed at preselected locations.

Item 111

BTP Guideline

A portable radio communications system should be provided for use by the fire brigade and other operations personnel required to achieve safe plant shutdown. This system should not interfere

with the communications capabilities of the plant security force. Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure fire damage. Preoperational and periodic testing should demonstrate that the frequencies used for portable radio communication will not affect the actuation of protective relays.

LGS Design

A portable radio communications system will be provided for use by the fire brigade and other operations personnel. The system will utilize a distributed antenna network with base station repeaters. The distributed antenna modules will be located throughout the plant. Although the antenna modules are not designed to withstand an exposure fire, the system is designed such that the failure of one module will not result in failure of the entire antenna system. The antenna modules will be located so as to minimize their proximity to combustible materials. In the event of failure of a local antenna module, plant personnel will also have access to the plant PA and PABX communication systems.

Item 120

BTP Guideline

Primary and secondary power supplies should be provided for the fire detection system and for electrically operated control valves for automatic suppression systems. Such primary and secondary power supplies should satisfy provisions of Section 2220 of NFPA 72D. This can be accomplished by using normal offsite power as the primary supply with a 4-hour battery supply as secondary supply; and by providing capability for manual connections to the Class 1E emergency power bus within 4 hours of loss of offsite power. Such connection should follow the applicable guidelines in Regulatory Guides 1.6, 1.32, and 1.75.

LGS Design

Power for the early warning fire and smoke detection systems is provided from a Class IE ac motor control center. In the event of loss of offsite power, the motor control center is powered from the standby diesel-generators.

non-Class IE

The detection and actuation systems for the Halon system, the total flooding carbon dioxide system, and the deluge and pre-action sprinkler systems are connected to a dc power supply. The charger associated with the batteries is powered from a Class IE ac motor control center that is powered from the standby diesel-generators in the event of loss of offsite power. In the event of loss of charging power to the

batteries, the dc power system can supply its rated load for approximately 3 hours.

The above-described power supplies are in compliance with applicable portions of Regulatory Guides 1.6, 1.32, and 1.75. They are also in compliance with Section 2220 of NFPA 72D-1975, except for the rating period of the dc power supplies (3 hours rather than 4 hours).

Item 135

BTP Guideline

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 ft. Alternatively, mobile means of providing hose and associated equipment, such as hose carts or trucks, may be used. When provided, such mobile equipment should be equivalent to the equipment supplied by three hose houses.

LGS Design

As indicated in NFPA 24-1981, Section 5-2.2, portable hose carts stored in permanent hose cart houses are acceptable alternatives to permanent hose houses. Hose cart houses are provided at 5 selected hydrants in the yard area at intervals of approximately 650 feet. Each hose cart will be equipped with the following fire fighting equipment:

(1) 600 feet of 2-1/2" rubber lined hose

(2) 400 feet of 1-1/2" rubber lined hose

(3) One 30" playpipe

(4) Two 1-1/2" adjustable spray nozzles

(5) Two 1-1/2" ball shutoff

(6) One 2-1/2" adjustable fog nozzle

(7) One 2-1/2" ball shutoff

(8) One siamese connection (gated wye)

(9) Two 2-1/2" to 1-1/2" spanner wrenches

(10) One hydrant wrench

(11) One fire axe

(12) One 1-½" Rockwood Fog Nozzle with 6-foot applicator

The above listing of equipment is in compliance with NFPA 24-1981 except for the quantities of spray nozzles and spanner wrenches. A single spray nozzle is sufficient for use with the 2-1/2" hose. The 2-1/2" hose is intended to be used as a leader line for the gated wye. It is not expected that the plant fire brigade will need to use the 2-1/2" hose for direct fire fighting.

Hose coupling gaskets and an additional spanner wrench will be provided on the hose carts. Two spanner wrenches per hose cart house is sufficient to ensure their availability.

Item 140

BTP Guideline

The fire water supply should be calculated on the basis of the largest expected flow rate for a period of 2 hours, but not less than 300,000 gallons. This flow rate should be based (conservatively) on 500 gpm for manual hose streams plus the largest design demand of any sprinkler or deluge system as determined in accordance with NFPA 13 or NFPA 15.

LGS Design

Fire protection water is supplied from the basins of the two cooling towers in the Unit 1 and Unit 2 circulating water systems. The total capacity of each cooling tower basin is 7,000,000 gallons. Each fire water pump takes suction from both cooling tower basins through connections to the 96-inch circulating water lines.

The cooling tower basin storage capacity exceeds the 311,000 gallon capacity required for two-hour operation of the turbine condenser compartment sprinkler system at 2090 gpm plus 500 gpm for hose streams.

Item 144

BTP Guideline

Other water systems that may be used as one of the two fire water supplies should be permanently connected to the fire main system and should be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems should satisfy the requirements for the main fire pumps. The use of other water systems for fire protection should not be incompatible with their functions required for safe plant shutdown. Failure of the other system should not degrade the fire main system.

LGS Design

The suction piping of the fire pumps is permanently connected to the 96-inch circulating water lines that supply water from the cooling towers to the main condensers. Since there are no pumps or valves located in the circulating water lines between the cooling tower basins and the connection points of the fire pump suction lines, no re-alignments are necessary to make the circulating water system available to provide water to the fire pumps. Therefore, there are no active failures of the circulating water system that could degrade the fire main system, and no special requirements are needed for the circulating water pumps or their associated power supplies and controls.

Item 146

BTP Guideline

Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve or other approved shutoff valve and waterflow alarm.

LGS Design

Each sprinkler and deluge system is provided with an OS&Y gate valve adjacent to the system's automatic control or alarm valve. Each sprinkler system is provided with local water flow alarms and control room annunciation. In the deluge and pre-action systems, the actuation of the heat responsive device initiates an alarm locally and in the control room.

Water flow in the standpipe systems due to manual hose station usage is indicated by pump running annunciation with the absence of automatic system actuation annunciation. Individual standpipe flow alarms are not provided.

Each connection of a fire water header to the yard fire main is provided with a post indicator valve to permit isolation of the header. In many cases, branch connections to the headers are provided with approved shutoff valves so that groups of sprinkler systems and/or manual hose stations can be isolated without interrupting the supply to other sprinkler systems and manual hose stations connected to the same header.

Item 147

BTP Guideline

Safety-related equipment that does not itself require sprinkler water fire protection but is subject to unacceptable damage if wet by sprinkler water discharge should be protected by water shields or baffles.

LGS Design

Safety-related equipment not requiring sprinkler protection is provided with water shields and/or protected from unacceptable water damage by zoned discharge or directional spray nozzles.

Item 148

BTP Guideline

Control and sectionalizing valves in the fire water systems should be electrically supervised or administratively controlled. The electrical supervision signal should indicate in the control room.

LGS Design

Other than the non-indicating gate valves with curb boxes controlling laterals to the fire hydrants, all valves in the yard fire loop and headers into the buildings are post indicator valves. The valves are locked in the open position using padlock-type locking devices. These valves are not equipped with supervisory switches.

All of the fire protection OS&Y valves directly controlling each wet pipe sprinkler system, pre-action sprinkler system, and deluge system are provided with electrically actuated supervisory switches with annunciation in the control room.

Item 151

BTP Guideline

Interior manual hose installation should be able to reach any location that contains, or could present a fire exposure hazard to, safety-related equipment with at least one effective hose stream. To accomplish this, standpipes with hose connections equipped with a maximum of 100 feet of 1-1/2-inch woven-jacket, lined fire hose and suitable nozzles should be provided in all buildings on all floors.

LGS Design

Readily accessible hose reels or cabinet-mounted racks are located throughout the plant in areas that either contain systems and components important to safety or present an exposure fire hazard to such areas. The hose stations are provided with a maximum of 100 feet of 1-1/2 inch woven-jacket lined fire hose equipped with adjustable fog and straight stream nozzles.

Fire suppression capability for the spray pond pump structure is provided by portable fire extinguishers rather than hose stations. As shown in Table A-1, the combustible loading in the various compartments of the spray pond pump structure is low enough that portable fire extinguishers are sufficient to extinguish any postulated fire. Those compartments that contain combustible materials are provided with fire detectors that annunciate in the control room. In addition, the spray pond pump structure is divided into two separate fire areas by a 3-hour rated fire wall along the centerline of the structure. Components needed for shutdown methods A and C are located on the west side of this wall and components needed for shutdown methods B and D are located on the east side of the wall, so that a postulated fire in either fire area will leave at least one method available to safely shut the plant down.

Item 155

BTP Guideline

Provisions should be made to supply water at least to standpipes and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of a safe shutdown earthquake. The piping system serving such hose stations should be analyzed for SSE loading and should be provided with supports to ensure system pressure integrity. The piping and valves for the portion of hose standpipe system affected by this functional requirement should, as a minimum, satisfy ANSI B31.1, "Power Piping." The water supply for this condition may be obtained by manual operator actuation of valves in a connection to the hose standpipe header from a normal seismic Category I water system such as the essential service water system. The cross connection should be (a) capable of providing flow to at least two hose stations (approximately 75 gpm per hose station), and (b) designed to the same standards as the seismic Category I water system; it should not degrade the performance of the seismic Category I water system.

LGS Design

As discussed in Section 2.5 of the FSAR, the region surrounding the Limerick plant site has a low to moderate potential for seismic activity. The fire water system, including standpipes and manual hose stations, is designed as seismic Category II (except for portions of the system located in the control structure, reactor enclosure, and diesel-generator enclosure, which are designed as seismic Category IIA) and is not designed to remain functional in the event of a safe shutdown earthquake. All systems and components that are needed to ensure safe shutdown of the plant are designed as seismic Category I and are located in seismic Category I structures. These safe shutdown systems will therefore remain functional in the event of an SSE. In the event that one train of systems needed for safe shutdown is impaired due to fire following an SSE, the combination of separation and fire barriers that is provided between redundant trains of safe shutdown systems will ensure that at least one means of achieving safe shutdown remains available. The fire water system is designed in accordance with the National Fire Protection Code rather than ANSI B31.1.

Item 158

BTP Guideline

Certain fires, such as those involving flammable liquids, respond well to foam suppression. Consideration should be given to use of mechanical low-expansion foam systems, high-expansion foam generators, or aqueous film-forming foam (AFFF) systems, including the AFFF deluge system. These systems should comply with the requirements of NFPA 11, NFPA 11A, NFPA 11B, and NFPA 16, as applicable.

LGS Design

Foam suppression systems have been provided for the protection of the fuel oil transfer structure and the two outdoor storage tanks containing No. 2 and No. 6 fuel oil for the auxiliary boilers. These systems are designed in accordance with NFPA 11. NFPA 11A, NFPA 11B, and NFPA 16 are not applicable to the type of foam systems being used. The design of the foam suppression systems is discussed in Section 2.7.

Item 162

BTP Guideline

Particular consideration should also be given to:

(1) Minimum required Halon concentration, distribution, soak time, and ventilation control;

(2) Toxicity of Halon;

(3) Toxicity and corrosive characteristics of the thermal decomposition products of Halon; and

(4) Location and selection of the activating detectors.

LGS Design

The following comments apply to the Halon 1301 system that is provided for the raised flooring in the auxiliary equipment room.

(1) The design concentration for the Halon 1301 system is 20% with a 20 minute soak time. A system of distribution piping and nozzles is provided within the raised flooring so that the Halon is distributed evenly. Since the Halon is not discharged into the general air space of the auxiliary equipment room, isolation of the ventilation system is not necessary to prevent the loss of Halon.

(2) The Halon 1301 system is provided only under the raised floor of the auxiliary equipment room, rather than in the entire room. Emergency procedures will require personnel to use self-contained breathing apparatus when entering the auxiliary equipment room following the discharge of Halon.

(3) The Halon 1301 system is designed to achieve a concentration of 6% within the first 10 seconds after discharge begins. This concentration is sufficient to extinguish the flames, which will largely end the production of toxic gases as a result of the thermal decomposition of Halon. Thus, rapid extinguishment of the flames will prevent the production of a significant quantity of toxic gases.

(4) Heat detectors are used to provide the actuation signal for the Halon 1301 system. Eight heat detectors are located in each of the PGCC floor sections, and additional heat detectors are located in the raised flooring that surrounds the PGCC floor sections.

Item 166

BTP Guideline

Particular consideration should also be given to:

(1) Minimum required CO_2 concentration, distribution, soak time, and ventilation control;

(2) Anoxia and toxicity of CO_2;

(3) Possibility of secondary thermal shock (cooling) damage;

(4) Conflicting requirements for venting during CO_2 injection to prevent overpressurization versus sealing to prevent loss of agent; and

(5) Location and selection of the activating detectors.

LGS Design

The following comments apply to the total flooding carbon dioxide system that is provided for the cable spreading rooms.

(1) The design concentration for the carbon dioxide system is 50% achieved within 7 minutes. The carbon dioxide storage tank has sufficient capacity to maintain a 50% concentration in both the Unit 1 and Unit 2 cable spreading rooms simultaneously for a period of 1 hour. Loss of carbon dioxide through the ventilation system is prevented by the automatic closure of steam isolation dampers in the ventilation ducts that penetrate the cable spreading room walls.

(2) The protected space is normally unoccupied. The emergency procedures will require personnel to use breathing apparatus when entering the space following carbon dioxide discharge.

(3) Carbon dioxide discharge will be directed so as not to impinge directly on any cables.

(4) Provisions to prevent loss of carbon dioxide through the ventilation system are discussed in Item (1) above. Leakage around the doors leading into the cable spreading rooms will prevent overpressurization of the rooms due to the carbon dioxide discharge.

(5) Heat detectors are used to provide the actuation signal for the carbon dioxide system. The heat detectors are located at ceiling level in the cable spreading rooms.

Item 170

BTP Guideline

Because of the general inaccessibility of primary containment during normal plant operation, protection should be provided by automatic fixed systems.

LGS Design

The primary containment is inerted with nitrogen during reactor operation, so that the oxygen concentration is maintained below 4% by volume. This inert atmosphere will prevent fires from occurring in the primary containment. For this reason, fixed suppression systems are not needed within the primary containment and are not provided.

Fire suppression coverage for the primary containment is provided by manual hose stations and portable fire extinguishers located outside the two entrances to the suppression chamber at elevation 217 feet and the two entrances to the drywell at elevation 253 feet.

Item 173

BTP Guideline

In primary containment, fire detection systems should be provided for each fire hazard. The type of detection used and the location of the detectors should be the most suitable for the particular type of fire hazard identified by tthe fire hazard analysis.

A general area fire detection capability should be provided in the primary containment as backup for the above described hazard detection. To accomplish this, suitable smoke or heat detectors compatible with the radiation environment should be installed.

LGS Design

Fire detectors are not provided inside the primary containment. During reactor operation, the primary containment is inerted with nitrogen, and the oxygen concentration is maintained below 4% by volume. This inert atmosphere will prevent fires from occurring in the primary containment. Administrative procedures provide for fire watches when necessary during maintenance operations when the drywell has been de-inerted.

Item 179

BTP Guideline

Peripheral rooms in the control room complex should have automatic water suppression and should be separated from the control room by noncombusitble construction with a fire resistance rating of 1 hour. Ventilation system openings between the control room and peripheral rooms should have automatic smoke dampers that close on operation of the fire detection or suppression system.

LGS Design

The walls and ceilings separating the control room proper from its support facilities (such as office, shop, toilet, utility room, and instrument laboratory) are rated as 1-hour fire barriers. Ventilation ducts serving these peripheral rooms are provided with 1-hour rated fire dampers that are actuated closed by fusible links. The entrances to the individual rooms are provided with C-label (3/4 hour) doors.

Automatic suppression systems are not provided in the peripheral rooms. Manual fire fighting capability is provided for as discussed in Item 181.

Item 181

BTP Guideline

Manual firefighting capability should be provided for both:

(1) Fire originating within a cabinet, console, or connecting cables; and

(2) Exposure fires involving combustibles in the general room area.

Portable Class A and Class C fire extinguishers should be located in the control room. A hose station should be installed immediately outside the control room.

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 firefighting needs, satisfy electrical safety, and minimize physical damage to electrical equipment from hose stream impingement.

LGS Design

Portable carbon dioxide fire extinguishers are located in the control room. In addition, manual hose stations of both the carbon dioxide and water types are located outside both entrances to the control room. The water hoses are equipped with All Fog nozzles approved by Underwriters Laboratories Inc.

Item 182

BTP Guideline

Smoke detectors should be provided in the control room, cabinets, and consoles. Alarm and local indication should be provided in the control room.

LGS Design

Fire detectors are not located inside the individual cabinets and consoles in the control room. The control room panels are not gasketed and therefore are not airtight. Any smoke generated within the cabinets will leak out and be detected by the fire detectors in the control room. Twenty-three detectors are distributed throughout the control room to provide rapid detection of smoke originating in any panel. Actuation of any of these detectors is annunciated on the fire protection panels in the control room. The indicator light on the detector itself will then identify the specific detector originating the alarm.

Item 184

BTP Guideline

The outside air intake(s) for the control room ventilation system should be provided with smoke detection capability to alarm in the control room to enable manual isolation of the control room ventilation system and thus prevent smoke from entering the control room.

LGS Design

The control room ventilation intake is provided with smoke detection capability to automatically detect and alarm the presence of smoke. Upon receipt of the alarm, the control room ventilation system can be manually placed in the recirculation mode in order to isolate the control room from the outside.

For purge operation of the control room ventilation system, the outside supply air and exhaust air dampers are fully opened and the return air damper to the control room is closed. The control

room purge system can be operated from both inside and outside the control room.

Item 186

BTP Guideline

Cables in underfloor and ceiling spaces should meet the separation criteria necessary for fire protection.

LGS Design

The features of the raised flooring in the auxiliary equipment room that provided separation between redundant divisions of electrical cabling are described in Section 5.3.25. In summary, each raceway within the raised flooring is totally enclosed and is used for only one division of cabling, unless additional barriers are provided.

Cables routed through the space above the suspended ceiling in the control room consist of low-voltage control and instrumentation cables, plus lighting cables that serve the control room. The control and instrumentation cables are specified to meet the IEEE Std 383 flame test requirements, and have flame retardant jacketing that will not support flame propagation. Lighting cables are routed exclusively in conduits that are dedicated to lighting cable service only. These design features, together with the lack of other combustible materials above the suspended ceiling, precludes the possibility of a fire that could affect redundant divisions of safe shutdown cabling within this space.

Item 189

BTP Guideline

Area automatic fire suppression should be provided for underfloor and ceiling spaces if used for cable runs unless all cable is run in 4-inch or smaller steel conduit or the cables are in fully enclosed raceways internally protected by automatic fire suppression.

LGS Design

The raised flooring in the auxiliary equipment room is provided with an automatic Halon suppression system as described in Section 2.7.

Automatic suppression systems are not provided for the electrical cabling routed through the space above the suspended ceiling in the control room. Portable fire extinguishers located in the control room and hose stations located outside the control room provide the capability to manually extinguish any fire involving the cables above the suspended ceiling. Individual panels in the

suspended ceiling are easily removable to provide access to this area.

Item 191

BTP Guideline

The primary fire suppression in the cable spreading room should be an automatic water system such as closed-head sprinklers, open-head deluge system, or open directional water spray system. Deluge and open spray systems should have provisions for manual operation at a remote station; however, there should be provisions to preclude inadvertent operation. Location of sprinkler heads or spray nozzles should consider tray arrangements and possible transient combustibles to ensure adequate water coverage for areas that could present exposure hazards to the cable system. Cables should be designed to allow wetting down with water supplied by the fire suppression system without electrical faulting.

LGS Design

The primary fire suppression system in the cable spreading room is a total flooding carbon dioxide system. The design of this system is discussed in Section 2.8.

Backup suppression capability for the cable spreading room is provided by a wet pipe sprinkler system with fusible-type sprinkler heads.

Electrical cabling is designed to allow wetting down without electrical faulting.

Item 210

BTP Guideline

Drains should be provided to prevent water accumulation from damaging safety-related equipment.

LGS Design

Floor drains are not provided in the safety-related switchgear rooms. In the event that hand hose lines are used for fire suppression in the switchgear rooms, the doors that would be open to provide access would provide a flow path for fire protection water to drain to areas not containing safety-related components.

Item 212

BTP Guideline

Redundant safety-related panels remote from the control room complex should be separated from each other by barriers having a minimum fire rating of 3 hours. Panels providing remote shutdown capability should be separated from the control room complex by barriers having a minimum fire rating of 3 hours. Panels providing remote shutdown capability should be electrically isolated from the control room complex so that a fire in either area will not affect shutdown capability from the other area.

LGS Design

Most safety-related panels are located in either the control room or the auxiliary equipment room. These two rooms are separated from each other by a 3-hour rated floor slab. Some of the safety-related panels outside the control room and auxiliary equipment room are located within the same fire area as their redundant counterparts, with no intervening fire barriers. The panels that are located in this manner and are needed to achieve safe shutdown of the plant are separated by at least 20 feet horizontally, as required by Section III.G of 10 CFR Part 50, Appendix R.

The remote shutdown panels are located in the auxiliary equipment room, which is separated from the control room by a 3-hour rated floor slab. Transfer switches are provided on the remote shutdown panels to allow the operators to isolate the remote shutdown panels from control room circuits.

Item 217

BTP Guideline

Ventilation systems in the battery rooms should be capable of maintaining the hydrogen concentration well below 2 volume percent.

LGS Design

Ventilation air for the safety-related battery rooms is supplied by the safety-related 0AV118 and 0BV118 fan cabinets, and is exhausted by the nonsafety-related OAV124 and OBV124 fan cabinets. Both sets of fans are 100% redundant and are controlled such that the standby fan will start running automatically if the lead fan fails. In the event of loss of flow through the battery room exhaust ducts, due either to fan stoppage or isolation damper closure, the battery room exhaust will automatically be recirculated to the suction of the OAV118

and OBV118 fan cabinets. The ventilation flow rate through the battery rooms provides 12 air changes per hour, which maintains hydrogen concentration far below 2% by volume.

Item 218

BTP Guideline

Loss of ventilation should be alarmed in the control room.

LGS Design

The OAV118 and OBV118 fan cabinets, which supply ventilation air to the safety-related battery rooms, are provided with flow switches at the discharge of each fan. Low flow through an operating fan will be detected by the flow switches and annunciated at the control structure HVAC panels (OAC101 and OBC101). Alarms on these panels are relayed to the control room as a common trouble alarm.

Item 221

BTP Guideline

The fire barriers should be designed so as to maintain structural integrity even in the event of a complete collapse of the turbine structure.

LGS Design

The turbine enclosure is structurally separate from the reactor enclosure and control structure. The structural integrity of the fire barrier walls of the reactor enclosure and control structure will not be impaired by a collapse of the turbine enclosure.

Item 222

BTP Guideline

Openings and penetrations in the fire barrier should be minimized and should not be located where the turbine oil system or generator hydrogen cooling system creates a direct fire exposure hazard to the barrier.

LGS Design

Penetrations in the walls that separate the turbine enclosure from the reactor enclosure and the control structure are provided with 3-hour rated penetration seals, and doorways in these walls are provided with 3-hour rated fire doors.

The main turbine lube oil storage tanks and lube oil reservoir are located in compartments that are separated from the remainder of the turbine enclosure by 3-hour fire walls. Therefore, a fire occurring in any of these compartments would not affect the boundary wall separating the turbine enclosure from the reactor enclosure and control structure. The generator hydrogen seal oil unit is separated from the reactor enclosure boundary wall by a 3-hour rated fire wall, and is located more than 70 feet away from the nearest control structure wall.

Item 224

BTP Guideline

Automatic fire suppression should be installed to combat any diesel generator or lubricating oil fires; such systems should be designed for operation when the diesel is running without affecting the diesel.

LGS Design

Each diesel-generator cell is provided with a pre-action suppression system that is activated by heat detectors. Flow switches located in the supply piping to each pre-action system will trip the diesel-generator in that cell if the suppression system is actuated. Baffles are provided to protect the generators and control devices from damage due to suppression system water discharge.

Item 227

BTP Guideline

Drainage for firefighting water and means for local manual venting of smoke should be provided.

LGS Design

Each diesel-generator cell is provided with trapped and vented floor drains with adequate drainage capacity to cope with the maximum sprinkler water flow in each room.

Each diesel-generator cell is provided with two exhaust fans, each capable of 40 air changes per hour for cooling and/or smoke removal. The ventilation system is controlled manually from a local control panel and is also started automatically by either high air temperature or a diesel engine start signal.

Item 242

BTP Guideline

Automatic fire protection should be provided to alarm and annunciate in the control room and to alarm locally.

LGS Design

Fire detectors are not provided within the refueling area (elev. 352 feet in the reactor enclosure). The floor-to-ceiling height of this area is greater than 57 feet, which greatly limits the usefulness of photoelectric or ionization-type detectors mounted at ceiling level. The use of beam-type detectors as an alternative is not practical, because movement of the reactor enclosure crane and its loads would interfere with proper operation of the detectors. The lack of fire detectors in this area is acceptable for the following reasons:

(1) Equipment and cabling needed for safe shutdown in the event of a fire is not located in this area, as noted in Section 5.4.27.

(2) There is no significant quantity of combustible materials located within this area.

Item 243

BTP Guideline

Fire barriers, automatic fire suppression and detection, and ventilation controls should be provided.

LGS Design

The radwaste enclosure, including the offgas enclosure, is separated from other portions of the plant by 3-hour rated fire walls. Automatic fire detection is provided in limited areas of the radwaste enclosure, as shown in Table A-1. In consideration of the low combustible loading in the remaining areas of the radwaste enclosure, detection by personnel in the vicinity is deemed sufficient.

An automatic wet pipe sprinkler system is provided for the waste drum storage area at elevation 217 feet in the radwaste enclosure. Hose stations and portable fire extinguishers are provided for fire suppression coverage of the remainder of the radwaste enclosure.

Ventilation systems for the radwaste enclosure are manually controllable from control panels located in easily accessible areas of the radwaste enclosure.

Item 247

BTP Guideline

Cooling towers should be of noncombustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply.

LGS Design

The cooling tower basins serve as a source of water for the fire protection system but not for any safety-related systems. The cooling towers are constructed entirely of non-combustible material except for the splash bars and drift eliminators, which are polyvinyl chloride, and the splash bar support grids, which are fire retardant polyester and fiberglass. The fill material is contained in a ring-shaped area around the periphery of each

tower. The ring is separated into six cells by fire walls located at 60° intervals. A fire occurring in any one cell would have no effect on safety-related structures or systems, since such a fire would not affect the structural integrity of the cooling tower and the towers are located away from safety-related structures. This arrangement has been accepted by ANI for design of cooling towers with PVC and polyester fill material and without fire protection sprinklers.

Item 248

BTP Guideline

Miscellaneous areas such as shops, warehouses, auxiliary boiler rooms, fuel oil tanks, and flammable and combustible liquid storage tanks should be so located and protected that a fire or effects of a fire, including smoke, will not adversely affect any safety-related systems or equipment.

LGS Design

The machine shop, construction shop, warehouse, administration building, and auxiliary boiler enclosure are located adjacent to the Unit 2 reactor enclosure and turbine enclosure, but are separated from these structures by 3-hour rated fire walls so that fires occurring in any of the miscellaneous areas will not adversely affect any safety-related systems. The machine shop, construction shop, warehouse, administration building, and auxiliary boiler enclosure each are provided with wet pipe sprinkler systems at strategic locations. Hose stations and portable fire extinguishers are also provided to support manual fire fighting efforts. The two outdoor storage tanks containing No. 2 and No. 6 fuel oil for the auxiliary boilers are separated from the nearest portion of the power block (the Unit 2 diesel-generator enclosure) by more than 120 feet. Both of these tanks are provided with foam extinguishing systems, as described in Section 2.7.