LIMERICK GENERATING STATION UNITS 1 & 2

FIRE PROTECTION EVALUATION REPORT

REVISION 1 PAGE CHANGES

The attached Revision 1 pages are considered part of a controlled copy of the Limerick Generating Station FPER. This material should be incorporated into the FPER by following the collating instructions below:

Remove	Insert	Dated
i	i	2/82
3-1 & 2	3-1 & 2	2/82
3-3 & 4	3-3 & 4	2/82
through	through	
3-27 & 28	3-27 & 28	2/82
3-29 & 30	3-29 & 30	2/82
3-47 & 48	3-47 & 48	2/82
3-69	3-69 & 70	2/82
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	3-87 & 88	2/82

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CHAPTER 3

COMPARISON BETWEEN LGS FIRE PROTECTION PROGRAM AND NRC GUIDELINE DOCUMENTS

3.1 APPENDIX A OF NRC BRANCH TECHNICAL POSITION ASB 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 Appendix A to Branch Technical Position ASB 9.5-1.

To identify areas of potential impact and to facilitate comparison, a matrix addressing each guideline of Appendix A and relating to the plant systems, equipment, and components, is included as Section 3.1.1. The matrix has extracted all suggested guidelines from Appendix A and given each an item number 1 through 210. Each item has condensed a particular guideline and makes reference to the page and paragraph in Appendix A 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 are included as part of the matrix or the manner of conformance is discussed 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 are discussed 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
APPENDIX A OF BRANCH TECHNICAL POSITION ASB 9.5-1

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
	Overall Requirements of Nuclear Plant Fire Protection Program				
1.	Management responsibility for fire protection program and delegation of authority.	1	A.1	WC	See note 1
2.	Qualification requirements for fire protection engineers.	1	A.1	WC	Qualified fire protection engineers of the Bechtel Power Corporation provided assistance in the development of the design and equipment specification for the fire protection system.
3.	Training of the fire fighting and operating crew.	1	A.1	WC	See note 1
4.	Responsibilities of the fire protection staff.	1	A.1	WC	See note 1
5.	The fire protection program should be based on evaluation of potential fire hazards and the effect of postulated fires on safety-related systems and radioactivity releases.	2	A.2	C	See Chapters 4 and 5
6.	Backup fire suppression capability should be provided.	2	A.3	C	All automatic fire suppression systems are backed up by two methods of manual extinguishment (hose stations and portable extinguishers).
7.	Primary and backup fire suppression capability should satisfy the single failure criterion.	2	A.4	C	See Section 3.1.2
8.	Effects of lightning strikes should be included in the fire protection program.	3	A.4	C	Lightning protection is provided per NFPA No. 78.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
9.	Failure or inadvertent operation of fire suppression systems should not incapacitate safety-related systems.	3	A.5	NC	See Section 3.1.2
10.	Fire suppression systems that are pressurized during normal plant operation should meet the guidelines specified in BTP APCSB 3-1.	3	A.5	C	Moderate-energy leakage cracks in fire suppression system piping are analyzed in accordance with BTP APCSB 3-1.
11.	The fire protection program for new fuel areas should be fully operational before fuel is received at the site.	3	A.6	C	The fire protection program for the new fuel area will be completed and fully operational before fuel is received at the site.
12.	The fire protection program should be fully operational prior to initial fuel loading.	4	A.7	C	The fire protection program for each reactor unit will be completed and fully operational prior to initial fuel loading.
13.	Multiple reactor unit site fire protection program.	4	A.8	NC	See Section 3.1.2
14.	Simultaneous fires in more than one reactor unit need not be postulated.	4	A.9	C	See Section 3.1.2
	Administrative Procedures, Controls, and Fire Brigade				
15.	Provision of administrative procedures.	4	B.1	NC	See note 1
16.	Administrative measures for combustible material storage.	5	B.2	NC	See note 1
17.	Management control of normal and abnormal conditions and modification work to assure adequate fire protection.	5	B.3	NC	See note 1
18.	Ignition sources: procedure review and approval, training and equipping, fire watch.	5	B.3.a	NC	See note 1
19.	Leak testing should use aerosol techniques rather than open flames or combustion generated smoke.	6	B.3.b	NC	See note 1

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APPENDIX A OF BRANCH TECHNICAL POSITION ASB 9.5-1

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3.	Training of the fire fighting and operating crew.	1	A.1	WC	See note 1
4.	Responsibilities of the fire protection staff.	1	A.1	WC	See note 1
5.	The fire protection program should be based on evaluation of potential fire hazards and the effect of postulated fires on safety-related systems and radioactivity releases.	2	A.2	C	See Chapters 4 and 5
6.	Backup fire suppression capability should be provided.	2	A.3	C	All automatic fire suppression systems are backed up by two methods of manual extinguishment (hose stations and portable extinguishers).
7.	Primary and backup fire suppression capability should satisfy the single failure criterion.	2	A.4	C	See Section 3.1.2
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10.	Fire suppression systems that are pressurized during normal plant operation should meet the guidelines specified in BTP APCSB 3-1.	3	A.5	C	Moderate-energy leakage cracks in fire suppression system piping are analyzed in accordance with BTP APCSB 3-1.
11.	The fire protection program for new fuel areas should be fully operational before fuel is received at the site.	3	A.6	C	The fire protection program for the new fuel area will be completed and fully operational before fuel is received at the site.
12.	The fire protection program should be fully operational prior to initial fuel loading.	4	A.7	C	The fire protection program for each reactor unit will be completed and fully operational prior to initial fuel loading.
13.	Multiple reactor unit site fire protection program.	4	A.8	NC	See Section 3.1.2
14.	Simultaneous fires in more than one reactor unit need not be postulated.	4	A.9	C	See Section 3.1.2
	Administrative Procedures, Controls, and Fire Brigade				
15.	Provision of administrative procedures.	4	B.1	NC	See note 1
16.	Administrative measures for combustible material storage.	5	B.2	NC	See note 1
17.	Management control of normal and abnormal conditions and modification work to assure adequate fire protection.	5	B.3	NC	See note 1
18.	Ignition sources: procedure review and approval, training and equipping, fire watch.	5	B.3.a	NC	See note 1
19.	Leak testing should use aerosol techniques rather than open flames or combustion generated smoke.	6	B.3.b	NC	See note 1

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		Page	Item		
20.	Combustible material usage: control and minimization in safety-related areas.	6	B.3.c	WC	See note 1
21.	The plant should be self-sufficient with respect to fire fighting activities, and rely on public fire department only for backup.	6	B.4	WC	See note 1
22.	Fire brigades: organization, training, and equipping.	7	B.5	WC	See note 1
23.	Testing and maintenance of fire protection program.	7	B.5.a	WC	See note 1
24.	Training of fire brigade; drills quarterly and with local fire department at least annually.	8	B.5.b	WC	See note 1
25.	Training of all shift members; coordination with and training of local fire department personnel.	8	B.5.c	WC	See note 1
26.	Standards for guidance: NFPA 27, 194, 196, 197, 601, and others.	9	B.5.d	WC	See note 1
	Quality Assurance Program				
27.	QA programs of applicants and contractors to assure proper control for the fire protection program for safety related areas; program under management control of the QA organization.	10	C	AC/WC	See Section 3.1.2
	General Guidelines for Plant Protection				
28.	Plant layout should be arranged to isolate safety-related systems from unacceptable fire hazards.	12	D.1.a.1	C	Safety-related systems are located in fire areas separate from those containing major fire hazards.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
29.	Plant layout should be arranged to separate redundant safety-related systems from each other.	12	D.1.a.2	NC	See Section 3.1.2
30.	Identification of safety-related systems and fire hazards.	13	D.1.b	C	See Section 3.1.2
31.	Cable spreading rooms should not be shared between multiple reactor units.	13	D.1.c	C	Cable spreading rooms are not shared between reator units.
32.	The cable spreading room should be separated from other areas of the plant by 3-hour fire barriers.	13	D.1.c	C	Cable spreading room is separated from other plant areas by 3-hour barriers.
33.	Redundant cabling in cable spreading room should be separated by 3-hour barriers.	13	D.1.c	NC	Cabling associated with redundant safety-related systems is routed in separate raceways which are separated in accordance with Regulatory Guide 1.75.
34.	Interior wall and structural components, thermal insulation, soundproofing, and radiation shielding materials should be noncombustible.	13	D.1.d	C	See Section 3.1.2
35.	Interior finishes should be noncombustible or listed by a testing laboratory for flame spread, smoke, and fuel contribution of 25 or less.	13	D.1.d	C	See Section 3.1.2
36.	Metal deck roof construction should be noncombustible or listed as Class I by Factory Mutual System Approval Guide.	13	D.1.e	AC	See Section 3.1.2
37.	Suspended ceilings and supports should be noncombustible.	14	D.1.f	C	The suspended ceiling in the control room is of noncombustible construction, consisting of mineral fiber panels resting on a metal grid system which is supported by steel wires.
38.	Concealed spaces should be devoid of combustibles.	14	D.1.f	NC	See Section 3.1.2

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
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39.	High voltage - high amperage transformers in buildings containing safety-related systems should be dry or cooled with noncombustible liquid.	14	D.1.g	C	All indoor transformers are air cooled, dry type, or cooled by noncombustible fluids.
40.	Protection of buildings containing safety-related systems from exposure or spill fires involving oil-filled transformer.	14	D.1.h	C	All outdoor oil-filled transformers are located more than 50 feet from any safety-related structure.
41.	Floor drains sized for expected fire fighting water flow should be provided for areas with fixed suppression systems.	15	D.1.i	C	Adequate floor drainage is provided in all plant areas provided with fixed water fire suppression systems.
42.	Floor drains should be provided where needed to prevent fire hose water from causing unacceptable damage to equipment.	15	D.1.i	NC	See Section 3.1.2
43.	Equipment should be mounted on pedestals or curbs should be provided to contain and direct water to floor drains.	15	D.1.i	C	Floor-mounted safety-related components are raised above floor level either by the use of an extended frame base or by mounting on a pedestal.
44.	Drains in areas containing combustible liquids should have provisions for preventing the spread of fire throughout the drain system.	15	D.1.i	C	See Section 3.1.2
45.	Water drainage from areas which may contain radioactivity should be sampled and analyzed before discharge to environment.	15	D.1.i	C	Potentially radioactive liquid wastes are collected and monitored prior to discharge.
46.	Floors, walls, and ceilings enclosing separate fire areas should have a minimum fire rating of 3 hours.	15	D.1.j	NC	See Section 3.1.2
47.	Doors in barriers separating fire areas should be 3-hour rated.	15	D.1.j	NC	See Section 3.1.2

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
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48.	Doors in barriers separating fire areas should be normally closed and locked, or provided with annunciation in the control room.	15	D.1.j	NC	See Section 3.1.2
49.	Ventilation system penetrations in barriers separating fire areas should be protected by a standard "fire door damper" where required.	16	D.1.j	C	Fire dampers or fire doors, compatible with the fire barrier, are installed at all ventilation duct penetrations through fire barriers.
	Control of Combustibles				
50.	Safety-related systems should be separated from combustible materials where possible and when not, special protection should be provided to prevent a fire from defeating the safety system function.	16	D.2.a	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.
51.	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.	16	D.2.b	NC	See Section 3.1.2
52.	High pressure gas storage containers should be located with the long axis parallel to building walls.	17	D.2.b	C	High pressure gas storage cylinders are stored vertically.
53.	Use of compressed gases inside buildings should be controlled.	17	D.2.b	WC	See Section 3.1.2

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54.	Plastic material usage should be minimized. Halogenated plastics such as PVC and neoprene should be used only when substitute non-combustible materials are not available.	17	D.2.c	C	See Section 3.1.2
55.	Storage of flammable liquids should comply with NFPA 30.	17	D.2.d	C	Liquid fuels are stored either in aboveground tanks that have been provided with suitable fire barriers or in underground tanks.
	Electrical Cable Construction, Cable Trays and Penetrations				
56.	Only noncombustible materials should be used for cable tray construction.	18	D.3.a	C	Aluminum cable trays are used.
57.	Cable spreading rooms fire protection guidelines.	18	D.3.b	-	See items 138 through 151
58.	Automatic water sprinkler systems should be provided for cable trays outside the cable spreading room.	18	D.3.c	NC	See Section 3.1.2
59.	Cables should be designed to allow wetting down without electrical faulting.	18	D.3.c	C	Cable insulating systems include proprietary jacketing materials designed for wetting.
60.	Cable trays should have manual hoses and portable extinguishers provided as backup to automatic sprinklers.	18	D.3.c	AC	See Section 3.1.2
61.	Safety-related equipment in in vicinity of cable trays should be protected from sprinkler system operation or malfunction.	18	D.3.c	C	See Section 3.1.2

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
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62.	Cable and cable tray penetration of fire barriers should be sealed to give protection equivalent to that of the fire barrier. The design of fire barriers for cable trays should meet the requirements of ASTM E-119.	18	D.3.d	WC	See Section 3.1.2
63.	Fire breaks should be provided as deemed necessary by fire hazards analysis. Flame or fire retardant coatings may be used as a fire break for grouped electrical cables.	18	D.3.e	C	See Section 3.1.2
64.	Electrical cable construction should pass the IEEE 383 flame test.	19	D.3.f	AC	See Section 3.1.2
65.	To the extent practical, cable construction that does not give off corrosive gases while burning should be used.	19	D.3.g	C	See Section 3.1.2
66.	Cable trays, raceways, conduit, trenches, or culverts should be used only for cables. Miscellaneous storage should not be permitted, nor should piping for flammable or combustible liquids or gases be installed in cable routing area.	19	D.3.h	C	Electrical cable raceways are used only for cables.
67.	The design of cable tunnels, culverts, and spreading rooms should provide for automatic or manual smoke venting as required to facilitate manual fire fighting.	19	D.3.i	AC	Building ventilation systems are capable of being manually controlled to effect smoke removal in safety-related areas with cable concentrations.
68.	Cables in the control room should be kept to the minimum necessary number. All cables entering the control room should terminate there.	19	D.3.j	C	Cables entering the control room are essential to the operation of the control room and terminate within the control room.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
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69.	Cables should not be installed in trenches or culverts in the control room.	19	D.3.j	C	See Section 3.1.2
	Ventilation				
70.	Smoke and corrosive gases in specific fire areas - evaluation and control; discharge to outside.	20	D.4.a	AC	See Section 3.1.2
71.	Ventilation systems exhausting smoke or corrosive gases should be evaluated to assure single failure or inadvertent operation does not violate controlled areas of the plant design.	20	D.4.b	AC	See Section 3.1.2
72.	Power supply and controls for ventilation systems should be run outside the fire area served by the system.	20	D.4.c.	AC	See Section 3.1.2
73.	Fire suppression systems should be installed to protect charcoal filters in accordance with Regulatory Guide 1.52.	20	D.4.d	AC	See Section 3.1.2
74.	Air intakes for ventilating systems serving areas containing safety-related systems should be remote from exhaust and smoke outlets of other fire areas.	20	D.4.e	C	Air intakes serving areas which contain safety-related systems are remote from exhaust and smoke outlets of other fire areas.
75.	Design and use of stairwells and elevators.	21	D.4.f	AC	See Section 3.1.2
76.	Smoke and heat vents; minimum ratios for natural convection and forced convection.	21	D.4.g	AC	See Section 3.1.2
77.	Requirements for breathing apparatus for fire brigade, damage control, and control room personnel.	21	D.4.h	WC	See Section 3.1.2

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
78.	For total flooding gas extinguishing systems, area intake and exhaust ventilation dampers should close upon initiation of gas flow.	22	D.4.i.	C	Initiation of the carbon dioxide total flooding system for the cable spreading room actuates pressure switches which initiate isolation of the steam flooding dampers in the ventilation ducts penetrating the cable spreading room walls.
	Lighting and Communication				
79.	Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.	22	D.5.a	NC	See Section 3.1.2
80.	Sealed beam battery-powered portable hand lights should be provided for emergency use.	23	D.5.b	WC	Portable lights will be provided.
81.	Fixed emergency communication should use voice powered head sets at preselected stations.	23	D.5.c	NC	See Section 3.1.2
82.	Fixed repeaters for portable radio communication units should be protected from fire damage.	23	D.5.d	NA	See Section 3.1.2
	Fire Detection and Suppression				
	Fire Detection				
83.	Fire detection compliance with NFPA 72D.	23	E.1.a	NC	See Section 3.1.2
84.	Fire detection system should give audible and visual alarm and annunciation in the control room.	23	E.1.b	C	Fire and smoke detection signals are annunciated audibly and visually at the fire protection panel in the control room.
85.	Local audible alarms should also sound at the location of the fire.	23	E.1.b	AC	Local annunciators near the critical hazards sound audible alarms.
86.	Fire alarms should be distinctive and unique.	23	E.1.c	C	Audible fire alarms are unique and distinct from other plant alarms.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
87.	Fire detection and actuation systems should be connected to the plant emergency power supply.	23	E.1.d	C	See Section 3.1.2
	Fire Protection Water Supply Systems				
88.	An underground yard fire main loop should be installed furnish anticipated fire water requirements; use of NFPA 24.	23	E.2.a	C	The yard fire main has been installed in compliance with NFPA No. 24.
89.	Lined steel or cast iron pipe should be used to reduce turberculation.	24	E.2.a	C	The yard fire main untilizes cement-lined cast iron pipe.
90.	Means for treating and flushing of fire main should be provided.	24	E.2.a	AC	Water used for fire protection service meets the requirements of NFPA No. 22 and does not require treatment. Flushing of the fire main is possible by sectionalized control of the fire main loop.
91.	Approved visually indicating sectional control valves should be provided for isolation of fire main portions during maintenance or repair without shutting off entire system.	24	E.2.a	C	Post indicator valves provide sectionalized control and isolation of portions of the fire main loop.
92.	Fire main system piping separate from service or sanitary water system piping.	24	E.2.a	C	The fire main loop is separate from service water and domestic water system piping.
93.	A common yard fire main loop may loop may serve multi-unit nuclear power plant sites, if cross-connected between units.	24	E.2.b	C	A common fire main loop is provided and cross-connected between units.
94.	Redundant 100% capacity fire pumps.	25	E.2.c	C	Two UL-listed fire pumps are provided, each capable of supplying 100% of the fire water-system flow requirements.
95.	Fire pump connections to the yard fire main should be widely separated.	25	E.2.c	AC	See Section 3.1.2

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		Page	Item		
96.	Each pump should have its own driver with independent power supplies and control.	25	E.2.c	C	Each fire pump is provided with individual drive, power source, and controls.
97.	At least one fire pump should be driven by non-electrical means, preferably diesel engine.	25	E.2.c	C	One fire pump is diesel engine-driven.
98.	Fire pumps and drivers should be located in rooms separated from the remaining pumps and equipment by 3-hour fire walls.	25	E.2.c	NC	See Section 3.1.2
99.	Fire pump alarms indicating pump running, driver availability, or failure to start should be provided in the control room.	25	E.2.c	C	Fire pump availability, running, and trouble alarms are annunciated in the control room.
100.	Fire pump installation should conform to NFPA 20 as a minimum.	25	E.2.c	C	The fire pump installation conforms to the requirements of NFPA 20.
101.	Two separate reliable water supplies should be provided.	25	E.2.d	C	Fire protection water is normally supplied from two cooling tower basins.
102.	Requirements for tanks used to supply fire protection water.	25	E.2.d	NA	Tanks are not utilized for fire protection water supply.
103.	The fire water supply should be based on the largest expected flow rate for a period of 2 hours (300,000 gallon minimum).	26	E.2.e	C	See Section 3.1.2
104.	Lakes or fresh water ponds of sufficient size may qualify as sole source of water for fire protection.	26	E.2.f	NA	Two cooling tower basins are utilized for fire protection water supply.
105.	If a common water supply is used for fire protection and ultimate heat sink, then fire water requirements should be included in total storage capacity, and failure of the fire protection system should not degrade the ultimate heat sink.	26	E.2.f	NA	The fire protection system and the ultimate heat sink do not use a common water supply.

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106.	Outside manual hose stations should be able to reach any location approximately every 250 feet on yard main).	27	E.2.g	AC	Hydrants are spaced between 250 and 300 feet apart along the fire main loop.
107.	Yard main laterals to hydrants should be controlled by a visually indicating or key operated (curb) valve.	27	E.2.g	C	Each hydrant is provided with a key-operated gate valve with a curb box.
108.	Hose houses should be equipped as recommended in NFPA 24, and should be provided as needed, but at least every 1000 feet.	27	E.2.g	AC	See Section 3.1.2
109.	Threads on hydrants, hose couplings, and standpipe risers should be compatible with those used by local fire departments.	27	E.2.g	C	The hose threads are compatible with those of the local fire department.
	Water Sprinkler and Hose Standpipe Systems				
110.	Each automatic sprinkler and manual hose station standpipe should have an independent connection to the yard main or to headers fed from each end.	27	E.3.a	NC	See Section 3.1.2
111.	Each sprinkler and standpipe system should be equipped with OS&Y gate valve, or other approved shutoff valve, and water flow alarm.	28	E.3.a	AC	See Section 3.1.2
112.	Safety-related equipment should be protected from sprinkler discharge if such discharge could result in unacceptable damage to the equipment.	28	E.3.a	AC	See Section 3.1.2
113.	Fire water system valves should be electrically supervised with indication in the control room and other locations as appropriate.	28	E.3.b	NC	See Section 3.1.2

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114.	Automatic sprinkler systems conform to appropriate NFPA standard as a minimum.	28	E.3.c	C	Automatic sprinkler and deluge systems comply with the applicable requirements of NFPA Nos. 13 and 15.
115.	Recommendations for interior manual hose installations.	28	E.3.d	NC	See Section 3.1.2
116.	Location of hose stations based on whether an area is normally occupied or normally unoccupied; location of shutoff valves and pressure-reducing devices outside safety-related areas.	29	E.3.d	NC	See Section 3.1.2
117.	Hose nozzle selection should be based on the fire hazard analysis; electrically safe nozzles should be provided in vicinity of electrical hazards.	30	E.3.e	AC	See Section 3.1.2
118.	Foam fire suppression.	30	E.3.f	AC	See Section 3.1.2
	Halon Suppression Systems				
119.	Recommendations for Halon suppression systems.	31	E.4	C	See Section 3.1.2
	Carbon Dioxide Suppression Systems				
120.	Recommendations for carbon dioxide suppression systems.	31	E.5	C	See Section 3.1.2
	Portable Extinguishers				
121.	Fire extinguishers should be provided in accordance with NFPA 10.	32	E.6	C	Portable extinguishers compatible with the combustible material are provided in accordance with NFPA 10 and the requirements of OSHA.
122.	Dry chemical extinguishers should be installed with due consideration of cleanup problems and possible adverse effects on equipment in area.	32	E.6	WC	Dry chemical extinguishers will be provided as required.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
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	Guidelines for Specific Plant Areas				
	Primary and Secondary Containment				
123.	Fire protection requirements should be provided on the basis of specific identified hazards.	32	F.1.a	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.
124.	Because of inaccessability of these areas, protection should be provided by automatic fixed systems.	33	F.1.a	NC	See Section 3.1.2
125.	Operation of the fire protection systems should not compromise integrity of the containment or other safety-related systems.	33	F.1.a	C	The fire protection system does not penetrate the primary containment boundary. Also see item 9.
126.	Fire detection systems should alarm and annunciate in the control room.	33	F.1.a	C	Actuation of the early warning fire detection system, as well as actuation of any automatic fire suppression system, is annunciated on the fire protection panels in the control room. Type and location of fire detectors used is indicated in Table A-1.
127.	A backup fire detection capability should be provided for the primary containment.	33	F.1.a	NC	See Section 3.1.2
128.	Manual fire fighting capability should be permanently installed in containment.	34	F.1.b	AC	See Section 3.1.2
129.	Independent self-contained breathing apparatus should be provided near containment entrances.	34	F.1.b	WC	See item 77

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
	Control Room				
130.	The control room should be separated from other areas of the plant by 3-hour fire barriers.	35	F.2	C	See Section 3.1.2
131.	Recommendations for manual fire fighting capability.	35	F.2	C	See Section 3.1.2
132.	Fire detection in the control room.	36	F.2	AC	See Section 3.1.2
133.	Breathing apparatus for control room operators should be readily available.	36	F.2	WC	See item 77
134.	All penetration seals should be airtight.	36	F.2	C	All penetrations in the control room walls, floor, and ceiling will be sealed airtight.
135.	Control room ventilation provisions; smoke detection, automatic isolation, and venting.	36	F.2	AC	See Section 3.1.2
136.	Cables should not be located in concealed floor and ceiling spaces.	36	F.2	NC	See items 38 and 69
137.	All cables that enter the control room shall terminate in control room	36	F.2	C	Cables entering the control room are essential to the operation of the control room and terminate within the control room.
	Cable Spreading Room				
138.	Use of automatic water or foam extinguishing systems in the cable spreading room.	37	F.3.a.1	AC	See Section 3.1.2
139.	Manual hoses and portable extinguishers should be provided as backup.	38	F.3.a.2	C	Manual hose stations and portable extinguishers are located outside both entrances to the cable spreading room.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
140.	Each cable spreading room should have divisional cable separation.	38	F.3.a.3	NC	All four divisions of safety-related cabling are routed through the cable spreading room. The raceways through which the different divisions are routed are separated from each other in accordance with Regulatory Guide 1.75.
141.	The cable spreading room should be separated from other areas of plant by a 3-hour rated fire wall.	38	F.3.a.3	C	The cable spreading rooms of the two reactor units are separated from each other and from other plant areas by 3-hour rated fire barriers.
142.	Two remote and separate entrances to the cable spreading room should be provided.	38	F.3.a.4	C	Two remote and separate entrances are provided for access to each cable spreading room.
143.	Aisle separation between tray stacks should be 3 feet wide by 8 high.	38	F.3.a.5	NC	The minimum aisle separation between stacks is approximately 3 feet wide. The minimum clear headroom is approximately 6-1/2 feet high.
144.	Divisiona. cable separation should meet the guidelines of Regulatory Guide 1.75.	38	F.3.b.1	C	Safety-related cable divisions are located in cable raceways that are separated from each other and from nonsafety-related raceways in accordance with Regulatory Guide 1.75.
145.	Cabling should be covered with a suitable fire retardant coating.	38	F.3.b.2	NC	Although no cables are covered with fire retardant coating, cable insulation systems used pass the IEEE-383 flame test.
146.	Automatic gas systems are acceptable for primary fire suppression if a fixed water system is used as backup	38	F.3.b.3	AC	See item 138.
147.	An auxiliary shutdown system with cabling independent of the cable spreading room should be provided if R.G. 1.75 guidelines are not met.	39	F.3.b.4	C	Even though the guidelines of Regulatory Guide 1.75 are met, each reactor unit is provided with a remote shutdown panel with cabling that is not routed through the cable spreading room.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
148.	For multiple reactor unit sites, cable spreading rooms should not be shared.	39	F.3	C	Each reactor unit is served by a separate cable spreading room.
149.	The ventilation system to the cable spreading room should be designed to isolate the area upon actuation of a gas extinguishing system.	39	F.3	C	In the event of actuation of the CO_2 system in the cable spreading room, ventilation ducts penetrating the boundaries of the room are automatically isolated by steam flooding dampers. The dampers are actuated by pressure switches connected to the CO_2 distribution piping.
150.	Smoke venting of the cable spreading room should be controlled automatically by the fire detection or suppression system.	39	F.3	NC	Automatic smoke venting for areas served by gas extinguishing systems is not recommended and is not needed in the cable spreading room.
151.	Capability for remote manual control of smoke venting should be provided.	39	F.3	AC	See item 76
	Plant Computer Room				
152.	Fire protection recommendations for safety-related computers.	39	F.4	NA	The plant computer is not safety-related.
	Switchgear Rooms				
153.	Switchgear rooms should be separated from the remainder of the plant by 3-hour rated fire barriers to the extent practicable.	40	F.5	NC	The switchgear rooms at El. 239 feet in the control structure are separated from each other by 3-hour rated fire walls. These rooms and the one at El. 217 feet in the control structure are separated from the remaining areas of the plant by 3-hour rated fire walls. The floors and ceilings of the rooms are capable of 3-hour fire ratings with the exception of exposed structural steel supporting the slabs.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
154.	Automatic fire detection should alarm locally and in the control room	40	F.5	C	Each emergency switchgear room is provided with heat and ionization smoke detectors with local and control room alarm and annunciation.
155.	Hose stations and portable fire extinguishers should be readily available.	40	F.5	C	CO_2 hose stations are provided in the 13.2 kV switchgear room, and water hose stations are provided near the entrances to the 4 kV switchgear rooms. Portable fire extinguishers will be provided for use in both areas.
156.	Fire protection provisions for remote safety-related panels; fire detection, combustible material control, and manual extinguishment.	40	F.6	C	See Section 3.1.2.
	Station Battery Rooms				
157.	Battery rooms should be separated from each other and other plant areas by 3-hour rated fire barriers.	41	F.7	C	See Section 3.1.2
158.	Ventilation should maintain hydrogen concentration below 2% by volume.	41	F.7	C	See Section 3.1.2
159.	Hose stations and portable extinguishers should be provided.	41	F.7	C	Hose stations and portable extinguishers are located in the vicinity of the battery rooms to provide effective coverage of these areas.
	Turbine Lubrication and Control Oil Storage and Use Areas				
160.	A fire wall with a minimum rating of 3 hours should separate all safety-related areas and equipment from turbine oil systems.	41	F.8	C	Three-hour fire walls with Class A fire doors separate areas containing safety-related equipment from the turbine oil systems.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
	Diesel Generator Areas				
161.	Diesel generators should be separated from each other and from other plant areas by fire barriers having a minimum rating of 3 hours.	42	F.9	AC	The diesel-generators are separated from each other and other parts of the plant by 3-hour fire walls with Class A fire doors.
162.	Automatic fire suppression such as AFFF (foam) or sprinklers should be installed.	42	F.9	C	Each diesel-generator room is provided with a pre-action sprinkler system actuated by heat detectors.
163.	Automatic fire detection should be provided to alarm locally and to alarm and annunciate in control room.	42	F.9	C	Each diesel-generator is provided with fire detectors which alarm locally and also annunciate in the control room.
164.	Drainage for fire fighting water and means for local manual venting of smoke should be provided.	42	F.9	AC	See Section 3.1.2
165.	The day tank should be located in separate 3-hour rated enclosure capable of containing the entire tank capacity.	42	F.9.a	C	Each day tank is located in a separate 3-hour rated enclosure capable of containing the entire tank capacity of 800 gallons.
166.	The day tank enclosure should be ventilated to avoid accumulation of of oil fumes.	42	F.9.a	NC	Each day tank is located in a totally enclosed vault area.
167.	The day tank enclosure should be protected by automatic fire suppression.	42	F.9.b	C	See Section 3.1.2
	Diesel Fuel Oil Storage Areas				
168.	Recommended locations for diesel fuel oil storage tanks.	42	F.10	C	See Section 3.1.2
169.	Diesel fuel oil tanks located in separate buildings should be provided with automatic fire suppression.	43	F.10	NA	Diesel fuel oil tanks are buried.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
170.	Diesel fuel oil tanks should not be located directly above or below safety-related systems or equipment regardless of fire rating separation.	43	F.10	C	No safety-related equipment is located above the buried tanks.
	Safety-Related Pumps				
171.	Separation of safety-related pumps by fire barriers; use of automatic sprinklers.	44	F.11	C	See Section 3.1.2
172.	Early warning fire detection should be installed with alarm and annunciation locally and in the control room.	44	F.11	C	Early warning fire detection is provided in all areas housing safety-related pumps.
173.	Local hose stations and portable extinguishers should also be provided.	44	F.11	NC	Except for the spray pond pump structure, hose stations and portable fire extinguishers are provided for use in all areas housing safety-related pumps. 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.
174.	Equipment pedestals or curbs and drains should be provided to remove and direct water away from safety-related equipment.	44	F.11	C	Safety-related equipment is mounted on pedestals or suitable framework. Drainage facilities are provided throughout the plant as required.
175.	Provisions should be made for manual control of the ventilation system for smoke removal.	44	F.11	C	See item 76
	New Fuel Area				
176.	Portable extinguishers should be located within this area.	44	F.12	C	A portable extinguisher is available in the area immediately adjacent to the new fuel storage vault.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
177.	Hose stations should be located within hose reach of this area.	44	F.12	C	A hose station is located adjacent to the new fuel storage vault.
178.	Automatic fire detection should alarm and annunciate in the control room and alarm locally.	44	F.12	NC	There is no fire detection provided on the refueling floor level in the reactor enclosure.
179.	Combustibles should be limited to a minimum in the new fuel area.	45	F.12	WC	Combustibles will be controlled by administrative procedures. See note 1.
180.	Storage area drainage capability	45	F.12	C	See Section 3.1.2
181.	The storage configuration of new fuel should be such that criticality is precluded for any water density that might occur during fire fighting.	45	F.12	C	See Section 3.1.2
	Spent Fuel Pool Area				
182.	Local hose stations and portable extinguishers should be provided.	45	F.13	C	Hose stations and portable extinguishers are available at the spent fuel storage pool.
183.	Automatic fire detection should be provided to alarm and annunciate in the control room and to alarm locally.	45	F.13	NC	See item 178
	Radwaste Enclosure				
184.	The radwaste enclosure should be separated from other areas of the plant by fire barriers having at least 3-hour ratings.	45	F.14	C	The radwaste enclosure is separated from other parts of the plant by 3-hour fire barriers with Class A fire doors.
185.	Automatic sprinklers should be used in areas where combustible materials are located.	45	F.14	C	See Section 3.1.2
186.	Automatic fire detection should be provided to annunciate and alarm in the control room and alarm locally.	45	F.14	AC	See Section 3.1.2

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
187.	Ventilation systems should be capable of being isolated during a fire.	45	F.14	C	The radwaste enclosure ventilation system is capable of being isolated. Fire dampers and doors restrict the spread of fire.
188.	Water should drain to liquid radwaste sumps.	45	F.14	C	All drainage in the radwaste enclosure is to liquid radwaste sumps.
	Decontamination Areas				
189.	The decontamination areas should be protected by automatic sprinklers if flammable liquids are stored.	46	F.15	C	See Section 3.1.2
190.	Automatic fire detection should be provided to annunciate and alarm locally.	46	F.15	NC	No automatic fire detection is provided for the decontamination areas.
191.	The ventilation system should be capable of being isolated.	46	F.15	C	The ventilation systems for the access control and radwaste enclosure decontamination rooms can be isolated.
192.	Hose stations and portable extinguishers should be provided.	46	F.15	C	Hose stations and portable extinguishers are available for use in all decontamination areas.
	Safety-Related Water Tanks				
193.	Fire protection provisions for safety-related water tanks.	46	F.16	NA	The plant has no safety-related water tanks.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
	Cooling Towers				
194.	Cooling towers should be of non-combustible construction, or located so that a fire will not affect safety-related systems.	46	F.17	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.
195.	Cooling towers should be of noncombustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply.	46	F.17	AC	See Section 3.1.2
	Miscellaneous Areas				
196.	Miscellaneous areas (e.g., record storage areas, shops, warehouses, auxiliary boiler rooms) should be located so that a fire in such areas will not adversely affect any safety-related systems.	47	F.18	C	Warehouse, machine shop, record storage, auxiliary boiler room, and other miscellaneous areas are separated from areas containing safety-related systems by 3-hour rated fire barriers so that safe shutdown will not be jeopardized.
197.	Fuel oil tanks for auxiliary boilers should be buried, or provided with dikes to contain the entire tank contents.	47	F.18	C	No. 2 fuel oil and No. 6 fuel oil for the auxiliary boilers is stored in aboveground outdoor tanks which are provided with dikes large enough to contain the entire tank contents.
	Welding and Cutting, Acetylene-Oxygen Fuel Gas Systems				
198.	Storage locations should be chosen to permit fire protection by sprinkler systems.	47	G.1	AC	Compressed gas storage cylinders for welding are located outdoors. The requirements of NFPA No. 51 and 51B will be followed.

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
199.	Local hose stations and portable extinguishers should be provided.	47	G.1	C	A local hose station and portable extinguishers are available.
200.	The requirements of NFPA 51 and 51B are applicable to these hazards.	47	G.1	WC	See item 198
201.	A permit system should be required for utilization of this equipment.	47	G.1	WC	See note 1
	Storage Areas for Dry Ion Exchange				
202.	Dry ion exchange resins should not be near essential safety-related systems.	47	G.2	WC	Storage areas will be remote from essential safety-related systems.
203.	Dry unused resins should be protected by automatic wet pipe sprinkler systems.	47	G.2	NC	Local hose stations and portable fire extinguishers are provided in the vicinity of storage areas for dry resins.
204.	Fire detection by smoke and heat detectors should alarm and annunciate in the control room and alarm locally.	47	G.2	NC	No fire detection is provided for dry resin storage areas.
205.	Local hose stations and portable extinguishers should be provided.	47	G.2	C	See item 203
206.	Storage areas of dry resins should have curbs and drains.	47	G.2	NC	No curbs are provided.
	Hazardous Chemicals				
207.	Recommendations for storage of hazardous chemicals.	48	G.3	WC	See Section 3.1.2
208.	Materials that collect and contain radioactivity (e.g., spent ion exchange resins, charcoal filters, HEPA filters) should be stored in closed metal tanks or containers located in areas free from ignition sources or combustibles.	48	G.4	WC	See note 1

NO.	APPENDIX A GUIDELINE	APPENDIX A LOCATION		COMPARISON	REMARKS
		Page	Item		
209.	These materials should be protected from exposure to fires in adjacent areas.	48	G.4	WC	See note 1
210.	Consideration should be given to requirements for removal of isotopic decay heat from entrained radioactive materials.	48	G.4	C	Provisions for accommodating decay heat are considered when selecting containers.

(1) Administrative controls and procedures concerning fire protection will be developed during preparation of plant procedures.

3.1.2 EXPLANATORY NOTES FOR APPENDIX A COMPARISON

Item 7

Appendix A Guideline

A single failure in the fire suppression system should not impair both the primary and backup fire suppression capability. For example, redundant fire water pumps with independent power supplies and controls should be provided.

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 flowrate 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 can affect both fire pumps. By the use of sectional isolation valves, damaged portions of the yard fire main loop can be isolated without affecting the major portion of the loop. The provision of hose reels and portable extinguishers for manual fire fighting precludes the possibility of a single failure in an automatic fire suppression system from disabling all means of fire suppression for a given area.

Item 9

Appendix A Guideline

Failure or inadvertent operation of the fire suppression system should not incapacitate safety-related systems or components.

LGS Design

Although it can be postulated that failure or inadvertent operation of the fire suppression system may incapacitate safety-related systems or components, such failure or inadvertent operation will not prevent safe shutdown from being achieved through the use of redundant safety-related systems.

Item 13

Appendix A Guideline

On multiple-reactor sites where there are operating reactors and construction of remaining units is being completed, the fire protection program should provide continuing evaluation and include additional fire barriers, fire protection capability, and administrative controls necessary to protect the operating units from construction fire hazards. The superintendent of the operating plant should have the lead responsibility for site fire protection.

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 14

Appendix A Guideline

Simultaneous fires in more than one reactor need not be postulated, where separation requirements are met. A fire involving more than one reactor unit need not be postulated except for facilities shared between units.

LGS Design

The fire protection program is based on the occurrence of a fire in only one reactor unit or one common area at a time. The unitized portions of the turbine enclosures and reactor enclosures are separated from each other and from common areas by 3-hour rated fire walls. The operating floor of the turbine enclosures and the refueling floor of the reactor enclosures are common areas which serve both units. The control structure and the radwaste enclosure are common areas which are separated from the adjacent reactor enclosures and turbine enclosures by 3-hour rated fire walls. The Unit 1

At least two extra air bottles should be located onsite for each self-contained breathing unit. In addition, an onsite 6-hour supply of reserve air should be provided and arranged to permit quick and complete replenishment of exhausted supply air bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air should be used. Special care must be taken to locate the compressor in areas free of dust and contaminants.

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.

Item 79

Appendix A Guideline

Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.

LGS Design

The emergency lighting system consists of an ac subsystem and an ac/dc subsystem. The emergency ac lighting is powered from Class IE buses which automatically transfer to the standby diesel-generators upon loss of the normal power source. Emergency ac lighting is provided throughout the plant to maintain minimum lighting levels necessary for access to and operation of all safe shutdown equipment for a period greater than 24 hours.

The emergency ac/dc lighting is normally powered from the Class IE buses. In the event of loss of the Class IE ac source, an automatic transfer switch immediately transfers this lighting to the 125 V dc non-Class IE station battery source. This power source is sufficient to sustain the ac/dc lighting load for approximately 1 hour if offsite power is lost indefinitely. All emergency ac/dc lighting fixtures are of the incandescent type. Emergency ac/dc lighting is provided for the following areas:

a. Control room
b. Auxiliary equipment room
c. Cable spreading room

d. Static inverter room
e. 4kV switchgear compartment
f. 13kV switchgear compartment
g. Drywell
h. HPCI, RCIC, and RHR pump compartments (at exit doors only)
i. Diesel-generator compartments
j. Stairways and access corridors.

The cables for both emergency lighting subsystems are routed exclusively in conduit, most of which is embedded in concrete. In lieu of lighting associated with the emergency ac/dc subsystem, lighting fixtures with individual battery packs are provided in the spray pond pump structure. The battery packs are rated for 3.75 hours.

Item 81

Appendix A Guideline

Fixed emergency connunication should use voice powered head sets at preselected stations.

LGS Design

Requirements for the reporting of fires and the direction of fire fighting efforts are considered in the design of the plant communication system. Fixed emergency communication equipment is located at every floor level of the plant at preselected stations but does not include voice powered head sets.

Item 82

Appendix A Guideline

Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure fire damage.

LGS Design

Portable radio communication units will not be provided at the site.

The use of portable radios has been known to energize or de-energize electrical equipment and components. This effect has been considered in light of the requirement that fire protection equipment should not adversely affect shutdown equipment.

design of cooling towers with PVC and polyester fill material and without fire protection sprinklers.

Item 207

Appendix A Guideline

Hazardous chemicals should be stored and protected in accordance with the recommendatons of NFPA 49, "Hazardous Chemicals Data." Chemicals storage areas should be well-ventilated and protected against flooding conditions since some chemicals may react with water to produce ignition.

LGS Design

Hazardous chemicals are stored in areas that are remote from safety-related areas, are well ventilated, and are protected against flooding. The controls and precautions relative to hazardous chemicals to be commonly used in the plant will be set forth in the administrative procedures.

Hazardous chemicals will be transported in the usual shipping containers, stored in suitable areas. Protection, separation, and isolation criteria will be followed in accordance with the recommendations of NFPA 49, "Hazardous Chemical Data."

The ventilation system provided for the chemical storage areas will assure that the toxicity level and potentially explosive gaseous mixtures in these areas meet the requirements of NFPA 49.

Adequate drainage will be provided.

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3.2 APPENDIX R OF 10 CFR PART 50

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 Appendix R of 10 CFR Part 50.

To identify areas of potential impact and to facilitate comparison, a matrix addressing each guideline of Appendix R and relating to the plant systems, equipment, and components is included as Section 3.2.1. The matrix has extracted all suggested guidelines from Appendix R and given each an item number, 1 through 45. Each item has condensed a particular guideline and makes reference to the section in Appendix R 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 3.2.2.

AC - indicates conformance to the guidelines by alternate means or methods. The manner of conformance is included in the matrix or discussed in Section 3.2.2.

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 are discussed in Section 3.2.2.

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 3.2.2.

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 3.2.1.

In the "remarks" column, additional information is provided to explain or expand on the degree of conformance. Alternatively, reference may be made to Section 3.2.2 for a more detailed discussion. The item numbers in Section 3.2.2 correspond to those in Section 3.2.1.

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SECTION 3.2.1

DETAILED COMPARISON TO APPENDIX R OF 10 CFR PART 50

NO.	APPENDIX R GUIDELINE	APPENDIX R ITEM NO.	COMPARISON	REMARKS
	Water Supplies for Fire Suppression Systems			
1.	Two separate water supplies shall be provided to furnish necessary water volume and pressure to the fire main loop.	A	C	
2.	Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves.	A	AC	In lieu of storage tanks, 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 main loop.
3.	These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply.	A	C	See Section 3.2.2
4.	Each supply of the fire water distribution system shall be capable of providing the maximum expected water demands for a period of 2 hours.	A	C	The storage capacity of each cooling tower is 7,000,000 gallons, which is well in excess of the 370,000-gallon volume required for two-hour operation of the largest sprinkler system concurrent with hose stream operation at 1000 gpm.
5.	Requirements for ensuring minimum water volume when storage tanks are used for combined service-water/ fire-water uses.	A	NA	See Section 3.2.2
6.	Requirements for other water systems used as sources of fire protection water.	A	AC	See Section 3.2.2
	Sectional Isolation Valves			
7.	Sectional isolation valves such as post indicator valves or key operated valves shall be installed in the fire main loop to permit isolation of portions of the main fire main loop for maintenance or repair without interrupting the entire water supply.	B	C	

NO.	APPENDIX A GUIDELINE	APPENDIX B ITEM NO.	COMPARISON	REMARKS
	Hydrant Isolation Valves			
8.	Valves shall 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	C	
	Manual Fire Suppression			
9.	Standpipe and hose systems shall be installed so that at least one effective hose stream will be able to reach any location that contains or presents an exposure fire hazard to structures, systems, or components important to safety.	D	NC	See Section 3.2.2
10.	Access to permit effective functioning of the fire brigade shall be provided to all areas that contain or present an exposure fire hazard to structures, systems, or components important to safety.	D	C	
11.	Standpipe and hose stations shall be inside PWR containments and BWR containments that are not inerted.	D	NA	The primary containment is inerted with nitrogen during reactor operation.
12.	For BWR drywells, standpipe and hose stations shall be placed outside the drywell with adequate lengths of hose to reach any location inside the drywell with an effective hose stream.	D	NC	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.
	Hydrostatic Hose Tests			
13.	Fire hose shall be hydrostatically tested at a pressure of 150 psi or 50 psi above maximum fire main operating pressure, whichever is greater. Hose stored in outside hose houses shall be tested annually. Interior standpipe hose shall be tested every three years.	E	NC	
	Automatic Fire Detection			
14.	Automatic fire detection systems shall be installed in all areas of the plant that contain or present an exposure fire hazard to safe shutdown safety-related systems or components.	F	C	

NO.	APPENDIX R GUIDELINE	APPENDIX R ITEM NO.	COMPARISON	REMARKS
	These fire detection systems shall be capable of operating with or without offsite power.			
	Fire Protection of Safe Shutdown Capability			
15.	Fire damage shall 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.	G.1.a	WC	
16.	Fire damage shall 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.	G.1.b	WC	
17.	Consideration of associated non-safety circuits as requiring protection to ensure freedom from fire damage.	G.2 (part of first paragraph)	C	As described for item 36, properly coordinated Class IE protective devices are provided to prevent fire-caused circuit faults from propagating from the faulted circuit to other circuits in the power distribution system. Therefore, the capability to achieve and maintain hot shutdown conditions is ensured without providing special protection from fire for circuits not directly related to the safe shutdown systems and components.
18.	Alternative means of ensuring that one train of systems necessary to achieve and maintain hot shutdown is free of fire damage (where cables or equipment of redundant trains are located in the same fire area).	G.2.a G.2.b G.2.c	AC	See Section 3.2.2
19.	Alternative means of providing fire protection inside non-inerted containments.	G.2.d G.2.e G.2.f	NA	The primary containment is inerted with nitrogen during reactor operation.
20.	Provision of alternative or dedicated shutdown capability in certain fire areas.	G.3		See Section 3.2.2

NO.	APPENDIX R GUIDELINE	APPENDIX R ITEM NO.	COMPARISON	REMARKS
	Fire Brigade			
21.	Requirements for the onsite fire brigade.	H	WC	
	Fire Brigade Training			
22.	Requirements for training of fire brigade members.	I	WC	
	Emergency Lighting			
23.	Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.	J	AC	See Section 3.2.2
	Administrative Controls			
24.	Establishment of administrative controls to minimize fire hazards.	K	WC	
	Alternative and Dedicated Shutdown Capability			
25.	The shutdown capability provided for a specific fire area shall be able to achieve and maintain subcritical reactivity conditions in the reactor, maintain reactor coolant inventory, achieve and maintain hot shutdown conditions, achieve cold shutdown conditions within 72 hours, and maintain cold shutdown conditions thereafter.	L.1	C	
26.	During the postfire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal ac power, and the fission product boundary integrity shall not be affected.	L.1	C	
27.	Performance goals for the shutdown functions.	L.2	C	The systems and components relied on for hot shutdown and cold shutdown in the event of a fire have been selected so as to ensure that the listed goals are achieved.
28.	The alternative shutdown capability shall be independent of the specific fire areas.	L.3	NA	As discussed in item 20, the addition of alternative or dedicated shutdown capability is not needed to ensure that hot shutdown can be achieved.
29.	The shutdown capability shall accommodate postfire conditions where offsite power is available and	L.3	C	All systems and components relied on for hot shutdown and cold shutdown

NO.	APPENDIX R GUIDELINE	APPENDIX R ITEM NO.	COMPARISON	REMARKS
	where offsite power is not available for 72 hours.			in the event of a fire are capable of being powered from the onsite power supplies, i.e., the station batteries and standby diesel-generators.
30.	If the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and systems comprising the means to achieve and maintain the hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved.	L.4	C	
31.	If the equipment and systems comprising the means to achieve and maintain hot shutdown conditions will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided.	L.4	NA	See Section 3.2.2
32.	Equipment and systems comprising the means to achieve and maintain cold shutdown conditions shall not be damaged by fire; or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown can be achieved within 72 hours.	L.5	WC	
33.	Materials for such repairs shall be readily available on site and procedures shall be in effect to implement such repairs.	L.5	WC	The materials required and repair procedures that will be necessary in order to achieve cold shutdown remain to be identified.
34.	If the equipment and systems comprising the means to achieve and maintain cold shutdown conditions (and which are used prior to 72 hours after the fire) will not be capable of being powered by both offsite and onsite power systems because of fire damage, an independent onsite power system shall be provided.	L.5	NA	See Section 3.2.2
35.	Shutdown systems installed to ensure postfire shutdown capability need not be designed to meet seismic Category I criteria, single failure criteria, or other design basis accident criteria, except where required for other reasons.	L.6	C	
36.	Isolation of safe shutdown equipment and systems from associated non-safety circuits.	L.7	C	See Section 3.2.2

NO.	APPENDIX R GUIDELINE	APPENDIX R ITEM NO.	COMPARISON	REMARKS
	Fire Barrier Cable Penetration Seal Qualification			
37.	Penetration seal designs shall utilize only noncombustible materials.	M	C	
38.	Penetration seal designs shall be qualified by tests that are comparable to tests used to rate fire barriers.	M	C	See Section 3.2.2
39.	Acceptance criteria for tests of penetration seal designs.	M.1 M.2 M.3	C	The listed criteria are included in documents discussed under item 38.
	Fire Doors			
40.	Fire doors shall be self-closing or provided with closing mechanisms.	N	AC	See Section 3.2.2
41.	Fire doors shall be inspected semi-annually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.	N	AC	Fire doors that are not electrically supervised will be inspected semi-annually. For doors that are electrically supervised, this supervision provides continual verification that the doors are in the closed position.
42.	Alternative means for ensuring that fire doors protect the door opening as required in case of fire.	N.1 N.2 N.3 N.4	C	See Section 3.2.2
43.	The fire brigade leader shall have ready access to keys for any locked fire doors.	N	WC	
44.	Areas protected by automatic total flooding gas suppression systems shall have electrically supervised self-closing fire doors or shall satisfy option 1 above.	N	C	The cable spreading rooms are the only compartments provided with automatic total flooding gas suppression systems. All fire doors in the cable spreading room boundary walls have self-closers and are electrically supervised.
	Oil Collection System for Reactor Coolant Pump			
45.	The reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation.	O	NA	The primary containment is inerted with nitrogen during normal reactor operation.

3.2.2 EXPLANATORY NOTES FOR APPENDIX R COMPARISON

Item 3

Appendix R Guideline

These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply.

LGS Design

The Unit 1 and Unit 2 circulating water systems are completely separate, so that any failures occurring in one system will not affect the other system. The two fire pumps are located in separate compartments within the circulating water pump structure. The connections of the fire pump discharge lines to the fire main loop are located underground to minimize the potential for damage to the piping.

Item 5

Appendix R Guideline

When storage tanks are used for combined service-water/fire-water uses, the minimum volume for fire uses shall be ensured by means of dedicated tanks or by some physical means such as a vertical standpipe for other water service. Administrative controls, including locks for tank outlet valves, are unacceptable as the only means to ensure minimum water volume.

LGS Design

Storage tanks are not used as the sources of fire protection water. As noted in items 2 and 4 of Section 3.2.1, fire protection water is obtained from the cooling tower basins of the Unit 1 and Unit 2 circulating water systems, each of which has a storage capacity of 7,000,000 gallons. Although the cooling tower basins also serve as the water sources for the service water systems, the storage capacity of the cooling tower basins is sufficient to ensure an adequate water supply for both systems (service water and fire protection water) without dedicating a certain volume of water to either system.

One of the two cooling tower basins will become unavailable as a source of fire protection water if the basin is drained to allow maintenance of it, or if the stop logs are inserted in the 96-inch circulating water lines from the cooling tower to allow work on some portion of the circulating water system. In this situation, the fire pump suction valves from the affected circulating water line will be closed in order

to avoid jeopardizing the operability of the fire pumps. The unaffected circulating water lines and cooling tower will remain available to provide fire protection water to both the fire pumps.

Item 6

Appendix R Guideline

Other water systems used as one of the two fire water supplies shall be permanently connected to the fire main system and shall be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems shall satisfy the requirements for the main fire pumps. The use of other water systems for fire protection shall not be incompatible with their functions required for safe plant shutdown. Failure of the other system shall 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 9

Appendix R Guideline

Standpipe and hose systems shall be installed so that at least one effective hose stream will be able to reach any location that contains or presents an exposure fire hazard to structures, systems, or components important to safety.

LGS Design

Hose reels 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, with the exception of the spray pond pump structure. Fire suppression capability for the spray pond pump structure is provided by portable fire extinguishers.

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 method A are located on the west side of this wall and components needed for shutdown method B 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 18

Appendix R Guideline

2. Except as provided for paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided:

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

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

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

LGS Design

For fire areas in which redundant trains of systems needed to achieve and maintain hot shudown conditions are located, protection against fire-caused damage will be provided either by separating cables and equipment of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles, or by enclosing the cable and equipment of one redundant train in a fire barrier having a 1-hour rating. Fire detectors with control room annunciation are provided in all such fire areas.

For the case of postulated fires in the control room or cable spreading rooms, the capability to achieve safe shutdown is assured by use of the remote shutdown panels. Cables for the circuits involved in providing the remote shutdown capability are not routed through the control room or cable spreading rooms. Transfer switches are provided on the remote shutdown panels so that fire-damaged circuits in the control room or cable spreading rooms can be isolated from the circuits involved in providing the remote shutdown capability.

Certain fire areas containing cables and/or equipment of redundant trains of systems needed to maintain hot shutdown conditions are not provided with automatic fire suppression systems. The low combustible loading in these areas, in combination with the separation between redundant divisions of safe shutdown equipment and the 1-hour rated fire barriers enclosing certain electrical raceways, provides assurance that safe shutdown capability will be retained in the event of a fire in any of these areas. The fire areas involved include the following:

a. 13-kV switchgear area (fire area 2)
b. Corridor at elev. 239 feet (fire area 7)
c. Static inverter compartments (fire areas 20 and 21)
d. Auxiliary equipment room (fire area 26; the raised flooring in this area is provided with an automatic Halon 1301 suppression system)
e. Corridor at elev. 177 feet (fire area 40)
f. Safeguard system isolation valve area (fire area 43)
g. Safeguard system access area (fire area 44)
h. CRD hydraulic equipment area and neutron monitoring system area (fire area 45)
i. RWCU compartments, FPCC compartment, and general equipment area (fire area 47)
j. RWCU holding pump compartments, RERS fan area, and corridors (fire area 48)
k. Service water pipe tunnel (fire area 75)

All other fire areas containing cables and/or equipment of redundant trains of systems needed to maintain hot shutdown conditions will be provided with automatic fire suppression systems.

Item 20

Appendix R Guideline

3. Alternative or dedicated shutdown capability and its associated circuits, independent of cables, systems or components in the area, room or zone under consideration, shall be provided:

   a. Where the protection of systems whose function is required for hot shutdown does not satisfy the requirement of paragraph G.2 of this section; or

   b. Where redundant trains of systems required for hot shutdown located in the same fire area may be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems.

LGS Design

Systems whose function is required for hot shutdown are provided with protection against fire-caused damage in order to ensure that at least one of the redundant trains of these systems remains available in the event of a postulated fire and/or operation of a fire suppression system in any fire area. Therefore, the addition of alternative or dedicated shutdown capability is not needed to ensure that hot shutdown can be achieved. The means for providing this protection against fire-caused damage are discussed under item 18 of this section.

To the greatest extent practicable, components required for hot shutdown are designed so that rupture or inadvertent operation of fire suppression systems will not adversely affect the operability of these components. Where necessary, appropriate protection is provided to prevent impingement of water spray on components required for hot shutdown. Redundant trains of components that are susceptible to damage from water spray are physically separated so that manual fire suppression activities will not adversely affect the operability of components not involved in the postulated fire.

Item 23

Appendix R Guideline

Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

LGS Design

The emergency lighting system consists of an ac subsystem and an ac/dc subsystem. The emergency ac lighting is powered from Class IE buses which automatically transfer to the standby diesel-generators upon loss of the normal power source. Emergency ac lighting is provided throughout the plant to maintain minimum lighting levels necessary for access to and operation of all safe shutdown equipment for a period greater than 24 hours.

The emergency ac/dc lighting is normally powered from the Class IE buses. In the event of loss of the Class IE ac source, an automatic transfer switch immediately transfers this lighting to the 125 V dc non-Class IE station battery source. This power source is sufficient to sustain the ac/dc lighting load for approximately 1 hour if offsite power is lost indefinitely. All emergency ac/dc lighting fixtures are of the incandescent type. Emergency ac/dc lighting is provided for the following areas:

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. Stairways and access corridors.

The cables for both emergency lighting subsystems are routed exclusively in conduit, most of which is embedded in concrete.

In lieu of lighting associated with the emergency ac/dc subsystem, lighting fixtures with individual battery packs are provided in the spray pond pump structure. The battery packs are rated for 3.75 hours.

Item 31

Appendix R Guideline

If the equipment and systems comprising the means to achieve and maintain hot shutdown conditions will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided.

LGS Design

There is no postulated fire in any given fire area that could cause the simultaneous loss of both the offsite and onsite power supplies. Therefore, an additional redundant onsite power supply is not needed to ensure that safe shutdown can be achieved.

Item 34

Appendix R Guideline

If the equipment and systems comprising the means to achieve and maintain cold shutdown conditions (and which are used prior to 72 hours after the fire) will not be capable of being powered by both onsite and offsite power systems because of fire damage, an independent onsite power system shall be provided.

LGS Design

There is no postulated fire in any given fire area that could cause the simultaneous loss of both the offsite and onsite power supplies. Therefore, an additional redundant onsite power supply is not needed to ensure that safe shutdown can be achieved.

Item 36

Appendix R Guideline

The safe shutdown equipment and systems for each fire area shall be known to be isolated from associated non-safety circuits in the fire area so that hot shorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment. The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated circuits or safe shutdown cables from the redundant division, or the isolation of these associated circuits from the safe shutdown equipment, shall

be such that a postulated fire involving associated circuits will not prevent safe shutdown.

LGS Design

All systems and components that are relied on for achieving safe shutdown are powered from the Class IE ac or dc power supply systems. All non-Class IE circuits that are energized from the Class IE power supply systems are provided with properly coordinated Class IE protective devices. In the event of any abnormal conditions such as hot shorts or shorts tc ground due to fire-caused damage to these circuits, the protective devices will prevent the fault from propagating to other circuits in the power distribution system.

Cabling for non-Class IE circuits is routed only in raceways designated for non-Class IE use, just as cabling for Class IE circuits is routed only in raceways designated for Class IE use. Class IE and non-Class IE raceways are separated from each other in accordance with Regulatory Guide 1.75 and IEEE Std 384-1975 in order to maintain the independence of the circuits.

Item 38

Appendix R Guideline

Penetration seal designs shall be qualified by tests that are comparable to tests used to rate fire barriers.

LGS Design

The designs of penetration seals in fire-rated barriers are tested to verify that the penetration seals are adequate to provide a specific degree of protection against the propagation of fire through the barriers. These tests are performed in accordance with the guidelines provided in the following documents:

a. Institute of Electrical and Electronics Engineers, IEEE Std 634-1978, "IEEE Standard Cable Penetration Fire Stop Qualification Test"

b. USNRC, Draft Regulatory Guide, "Qualification Test for Cable Penetration Fire Stops for Use in Nuclear Power Plants" (July 1979)

c. NEL-PIA/MAERP, "Standard Method of Fire Tests of Cable and Pipe Penetration Fire Stops" (February 1976)

d. American Nuclear Insurers, "ANI Position on Fire Stop Test Standards" (September 1979)

Item 40

Appendix R Guideline

Fire doors shall be self-closing or provided with closing mechanisms.

LGS Design

With the exception of watertight doors, all fire doors are provided with one of the following two features:

a. A self-closer to ensure that a normally-closed door returns to the closed position after someone passes through it.

b. An automatic closing mechanism to ensure that a normally-open door will close if there is a fire in the vicinity of the door.

Watertight doors that also serve as fire doors cannot be provided with self-closers or automatic closing mechanisms, due to the inherent restrictions of their design and function. These watertight doors are electrically supervised so that plant operations personnel are immediately notified if any of the doors are opened.

Item 42

Appendix R Guideline

One of the following measures shall be provided to ensure they will protect the opening as required in case of fire:

1. Fire doors shall be kept closed and electrically supervised at a continuously manned location;

2. Fire doors shall be locked and inspected weekly to verify that the doors are in the closed position;

3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or

4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position.

LGS Design

Appropriate steps are taken to ensure that fire doors either are closed or will close when required in the event of a fire. One of the four measures listed above is followed for each fire door.