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May 13, 1983

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

Docket Nos: 50-352
50-353

SUBJECT: Limerick Generating Station, Units 1 and 2
Draft Fire Protection Section of the
Safety Evaluation Report

REFERENCE: Letter, A. Schwencer to E. G. Bauer, Jr.
dated April 19, 1983

Dear Mr. Schwencer:

Transmitted herewith are draft responses to open items which were transmitted by the reference letter. This material is provided in draft form at the request of Mr. Eberly, NRC staff reviewer. Final responses and any related FPER page changes will be submitted subsequent to the meeting scheduled for May 18 and 19, 1983 with the Fire Protection Section.

Very truly yours,

Eugene J. Bradley

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JLP/cam d/2
Copy to: See attached service list

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NRC Open Item #2: Fire Hazards Analysis

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. However, we cannot determine if mechanisms by which fire and fire fighting systems may cause the simultaneous failure of redundant or diverse trains have been considered in the design. We require that the applicant identify such mechanisms that were considered in its fire hazards analysis and the measures taken to preclude the fire or fire suppressant induced failure of redundant or diverse safety trains.

CMEB Position

Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components. [Excerpt from General Design Criterion 3, Appendix A to 10 CFR Part 50].

LGS Response

The Limerick design with respect to the potential for rupture or inadvertent operation of fire suppression systems is addressed in FPER Section 3.1, Item 24. As noted in Item 24, moderate-energy leakage cracks in fire suppression system piping were analyzed as discussed in FSAR Section 3.6. FSAR Section 3.6.1.2.2 summarizes the results of the moderate-energy fluid system analysis and also provides references to other FSAR sections that discuss the design bases and criteria that were used in the moderate-energy fluid system analysis. The analysis demonstrates that the occurrence of a crack in moderate-energy piping, including the fire suppression system piping, will not prevent the plant from being brought to a safe, cold shutdown.

Automatic suppression systems have been designed and located so that operation of the systems, either intentional or inadvertent, will not cause damage to redundant trains of safety-related equipment that is needed for safe shutdown of the plant. To the greatest extent practical, safety-related electrical components are located outside the coverage zones of automatic suppression systems. Where necessary, components that are needed in order to achieve safe shutdown and also are located within automatic suppression system coverage zones are designed to remain functional in the event of suppression

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system actuation. Three of the areas that are provided with automatic water-type suppression systems are the HPCI pump compartment, the RCIC pump compartment, and the diesel-generator cells. Actuation of the suppression systems in the HPCI and RCIC pump compartments could cause damage significant enough to affect the operability of the systems in those compartments. In the diesel-generator cells, baffles are provided to protect the generators and control devices from damage due to suppression system actuation, but each diesel-generator will be automatically tripped if the suppression sysem in its cell is actuated. Loss of any of these three systems (HPCI, RCIC, or a single diesel-generator) due to suppression system actuation is acceptable, since redundant systems will remain available to bring the plant to a safe, cold shutdown.

Automatic (water) suppression systems located in safety-related areas of the plant are of the type that have fusible heads (either pre-action or wet pipe). These systems cannot be actuated in the absence of a significant heat source in the vicinity of the sprinkler heads. Therefore, electrical anomalies in the circuits of the smoke and heat detection systems or the suppression system power supplies cannot cause inadvertent actuation of these suppression systems.

Section 5.1 of the FPER describes the methodology that was used in evaluating the effects of postulated fires on the capability to achieve safe shutdown of the plant. The assumptions and design bases involved in this evaluation are identified in Section 5.1. Section 5.2.2 of the FPER provides a description of the four methods of achieving safe shutdown that were analyzed, including identification of the individual components that are utilized in each of the shutdown methods. Consideration of the need to manually position certain motor-operated valves is included in Section 5.2.2.

Postulated fires are considered to be capable of rendering a component inoperable either by directly damaging the component or by damaging electrical cabling that serves the component to the extent that circuit faults occur. Possible failure modes of circuits that are damaged by fire are considered to include open circuits, hot shorts, and shorts to ground. Components and/or cables that are associated with redundant shutdown methods and are horizontally separated from each other by less than 20 feet within the same fire area are considered to be damaged simultaneously by a postulated fire, unless one of the redundant trains of components/cables is enclosed by a fire barrier having a minimum rating of 1 hour. The measures that have been taken to preclude a postulated fire from causing concurrent damage to all four of the specified shutdown methods are discussed for each individual fire area in Sections 5.3 through 5.9 of the FPER.

References

1. Branch Technical Position ASB 9.5.1, Appendix A, Section A.2 and D.1(b)

2. Branch Technical Position CMEB 9.5-1, Section C.1.b.

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NRC Open Item #5: 3-Hour Fire Barriers

In many areas the structural steel supports of floor assemblies are not provided with a fire protective covering, resulting in unrated floor assemblies.

CMEB Position

We will require the exposed steel structural supports to be protected to provide 3-hour fire resistance in all areas containing safe shutdown systems and in all other areas where the structural failure of the unprotected steel would affect areas containing safe shutdown systems in accordance with Section C.5.a of BTP CMEB 9.5-1.

LGS Response

The structural steel supports of floor assemblies at elevations 254 ft., 269 ft., 289 ft. and 304 ft of the Control Structure are provided with a fire protective coating to give a 3-hour rated assembly. All other structural steel supporting floor assemblies in the Control Structure and Reactor Enclosure are not provided with a fire protective coating for the reasons described below.

1. The fire loading below the uncoated areas is considered to be very low. All fire areas with a fire severity of 10 mins. or less have been eliminated from further consideration due to the extremely low combustible loading in these areas. Any fire area provided with a water suppression system has also been eliminated as the water suppression system is considered to provide sufficient protection and cooling of the area to prevent the failure of the structural steel supports. Table A-1 of the FPER provides a tabulation of the fire areas, combustible loading and equivalent severity for all areas of the plant.

   After elimination of the above described areas, the following areas remain for further consideration.

Area	Elevation	Combustible Loading(lb/ft^2)	Equivalent Severity(min)
44	217'-0"	3.94	22
45B	253'-0"	2.63	16
47A	283'-0"	2.28	14
47B	295'-3"	2.07	12

2. In order to adequately assess the fire resistance of the unprotected structural steel supports, an analysis was performed to determine the maximum temperatures

reached by the subject steel members at the end of the fire duration. These maximum temperatures were then compared to the temperatures at which the steel members may fail, as determined by several recognized experts in the field, to determine acceptability of the steel members. See References 1, 2 and 3.

Transient combustibles have not been considered in this analysis as the amount carried and location will be administratively controlled. The fire was assumed to occur due to a faulted cable in a tray.

This analysis considered the possibility of point loadings or a heavy concentration of in-situ combustible material in a localized area of the compartment. A point loading has been defined as an area which contains 6 vertically stacked horizontal cable trays with 1 adjacent vertical tray.

The following is a list of major assumptions that was used in the analysis:

- Duration of fire is determined based on stoichiometric combustion
- There are 2.5 air changes per hour
- Fire is extinguished at one hour
- One-fourth of total in-situ combustible is involved in the fire
- No transient combustibles are assumed

The results of the analysis show that the maximum temperature of any steel member is less than 1000°F which is much lower than the failure temp of 1600°F for full composite action as determined by Pearch and Stanzak, Ref. 3.

Conservatisms in the analysis are as follows:

- All of the combustible material, one-fourth of that located in the fire area, was assumed to be involved in the fire from start to extinguishment.
- The heat of combustion of IEEE-383 approved cable was taken as 9950 BTU/lb as compared to 8,000 BTU/lb for wood.
- No heat was transmitted from the steel members into the concrete.

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- The calculation of temperature rise of steel was based on the entire surface area of the beam except the top flange. In fact, in the as-built condition, one-half of the beams are embedded.

- The maximum initial temperature of 104°F in compartment was used as the initial steel temperature. This corresponds to an outside air temperature of 95°F and 100°F relative humity.

Based on the results of the worst case analysis and the conservatisms delineated above, it is concluded that coating of the exposed structural is not required.

References

1. Lie, T.T., Fire and Buildings, Applied Science Publishers Ltd., London, 1972, p. 158.

2. Stanzak, W.W., "The Calculation of the Fire Resistance of Steel Constructions," National Research Council of Canada, Technical Translation 1425, 1971, p.8.

3. Pearch, N.S. and Stanzak, W.W., "Load and Fire Test Data on Steel-Supported Labor Assemblies", Symposium on Fire Test Methods, Restraint and Smoke, 1966, ASTM STP 422, Am. Soc. Testing Mats., 1967, p. 5-20.

4. Branch Technical Position ASB 9.5-1, Appendix A, Sections B.4 and B.5.

5. Branch Technical Position CMEB 9.5-1, Section C.3

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NRC Open Item #6: Penetration Seals

The applicant will provide penetration seals for all penetrations of fire rated walls or floor/ceiling assemblies. The penetration seals have been subjected to qualification tests using the time-temperature curve specified by ASTM Standard E-119, "Fire Test of Building Construction and Materials". The test acceptance criteria used by the applicant would permit temperatures up to 325°F above ambient on the unexposed side of the seal. Our guidelines recommend that a maximum temperature of 325°F be used as the acceptable level.

The applicant's higher acceptance criteria of 325°F above ambient could permit the acceptance of penetration seals that would cause fire damage to unexposed cables in a shorter time period than would penetration seals meeting our guidelines.

CMEB Position

We require the applicant to verify that none of the penetration seals used will permit a temperature in excess of 325°F on the unexposed side as recommended by BTP CMEB 9.5-1, Section C.5.a(3), or to justify the deviation from our guidelines.

LGS Response

Each type of penetration seal design that is planned to be used in fire-rated barriers at Limerick has been qualified for the intended used by fire testing of prototype penetration seals. The test results show that, for each type of penetration seal, the maximum temperature on the unexposed side does not exceed 325°F. This is in compliance with Section C.5.a(3)(b) of BTP CMEB 9.5-1.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.1(j)

2. Branch Technical Position CMEB 9.5-1, Section C.5.a(3)

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NRC Open Item #7: Fire Doors

The doors between the turbine building and areas of the plant containing safe shutdown systems are not labeled fire doors. Although these steamtight doors are certified by the manufacturer to be constructed in the same manner as the labeled doors, their method of installation as a steamtight door generally precludes the necessary gaps for expansion and distortion for a labeled fire door assembly and would probably not provide the necessary fire resistance.

CMEB Position

We will require that either labeled 3 hr. fire door assemblies be provided at all such openings or replicate assemblies of the steamtight doors be tested by a nationally recognized testing laboratory to show that they provide equivalent fire protection when subjected to the ASTM E-119 time temperature curve for 3 hours.

LGS Response

All single-leaf steamtight doors that are located in 3-hour fire walls are rated as Class A UL-labeled doors. Seven double steamtight doors in the walls between the control structure and the turbine enclosure are designated as fire rated but are not provided with UL labels. These double doors are similar to the UL-labeled doors with the exception of the following design differences from UL tested and approved assemblies:

a. Door size - the size tested by UL is 6'-0" by 7'-2" whereas the maximum size of the Limerick doors is 10'-0"x11'-0".

b. Door thickness - the maximum thickness tested by UL is 2-3/4" whereas the maximum thickness of the Limerick doors is 9".

c. Limerick doors contain a removable mullion that is not present in the UL tested assemblies.

d. Minor hardware differences as follows:

   1. Customized hinges
   2. Locksets by Sonicbar Door Systems
   3. Additional security hardware

e. Limerick doors are equipped with elastomeric gaskets to assure steam tightness.

These double steamtight doors are certified by the manufacturer to be constructed as closely as possible to the Underwriters Laboratories procedure for 3-hour rated, Class A, special purpose door units (file No. R7643, Vol. 1).

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.1(j)
2. Branch Technical Position CMEB 9.5-1, Section C.5.a(5)

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NRC Open Item #8: Metal Deck Roof Construction

Metal roof deck construction is a UL listed Class A assembly. The Class A rating indicates that the roof assembly is effective against severe external fire exposures. This does not meet our guidelines in Section C.5.a(10) of BTP CMEB 9.5-1, as the roof assembly has not been tested for performance under internal fire exposures.

CMEB Position

We will require the applicant to provide metal roof deck construction that is classed "acceptable for fire" in the UL Building Materials directory or which meets the criteria for Class 1 roof deck systems in the FM system approval guide.

LGS Response

Metal deck roof construction is used only for the turbine enclosure, which is a nonsafety-related structure. The roof is constructed of metal decking and non-reinforced concrete covered by "Gacoflex N-3S", which is a single-ply membrane supplied by Gates Engineering Company. "Gacoflex N-3S" is listed as Class A in the UL Building Materials Directory. The entire turbine enclosure roof assembly meets the requirements for a Class 1 system in the Factory Mutual System Approval Guide.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.1(e)

2. Branch Technical Position CMEB 9.5-1, Section C.5.a(10)

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NRC Open Item #9: Floor Drains

Some areas of the plant are not equipped with floor drains. The applicant states that collected fire fighting water could be drained through the doorways to the adjacent rooms. This is not consistent with our guidelines in Section C.5.a(14) of BTP CMEB 9.5-1. It is our concern that redundant trains of safety-related equipment in unaffected areas could be flooded by excess fire fighting water.

CMEB Position

We require that the applicant provide suitable floor drains or a system of drains and curbs to prevent flooding of safety related equipment.

LGS Response

The only fire areas that are not provided with floor drains and which contain safety-related equipment that is needed for safe shutdown are the 4-kV switchgear compartments (fire areas 12 through 19) and the static inverter compartments (fire areas 20 and 21). The use of hand-held fire hoses in any of these fire areas will not result in flooding that causes unacceptable damage to safety-related equipment.

A fire hose can be used in the 4-kV switchgear compartments only by bringing the hose in through a doorway from adjacent fire areas. For fire areas 12, 14, 16, and 18, the fire hose would be brought in from the generator equipment area (fire zone 113B) along the north side of the control structure. Water discharged from a hose in one of these 4-kV switchgear compartments would flow through the open doorway to fire zone 113B and drain into the floor drains in that area. For fire areas 13, 15, 17, and 19, the fire hose would be brought in from the equipment hatch corridor (fire areas 97 for Unit 1 and 110 for Unit 2) via the control structure corridor (fire area 7). Water discharged from a hose in one of these 4-kV switchgear compartments would flow through the open doorway to fire area 7 and then through the doorway to the equipment hatch corridor. The equipment hatch corridor is provided with floor drains to dispose of the fire fighting water. For either case of the two water discharge paths described above, water discharge from a fire hose in one of the 4-kV switchgear compartments has been determined to result in a maximum water level lower than the water level that would cause damage to the safe shutdown components in the compartment. Therefore, additional floor drains are not needed to ensure that safe shutdown capability is retained.

A fire hose can be used in the Unit 1 static inverter compartment (fire area 20) only by bringing the hose in from the Unit 1 cable spreading room through an open doorway. The Unit 2 static

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inverter compartment (fire area 21) contains a manual hose station, so that a hose would not have to be brought in from outside the compartment in order to initiate manual fire fighting. However, the fire brigade would gain access to the Unit 2 static inverter compartment through a doorway from either the Unit 2 cable spreading room or the generator equipment area (fire zone 113B). The doorway that is used for access will remain open during fire fighting activities within the compartment. Water discharged from a hose in the Unit 1 static inverter compartment would flow through the open doorway to the Unit 1 cable speading room, whereas water discharged from a hose in the Unit 2 static inverter compartment would flow to either the Unit 2 cable spreading room or the generator equipment area. The cable spreading rooms and the generator equipment area are each provided with floor drains to dispose of the fire fighting water. For either of these water flow paths, water discharge from a fire hose in one of the static inverter compartments has been determined to result in a maximum water level lower than the water level that would cause damage to the safe shutdown components in the compartment. Furthermore, loss of the safe shutdown components in a static inverter compartment would not prevent safe shutdown from being achieved, since the redundant safe shutdown components would remain operable. Therefore, additional floor drains are not needed to ensure that safe shutdown capability is retained.

The provisions discussed above for drainage of fire fighting water out of the 4-kV switchgear compartments and the static inverter compartments are in full compliance with Section C.5.a(14) of BTP CMEB 9.5-1.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.1(i)

2. Branch Technical Position CMEB 9.5-1, Section C.5.a(14)

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NRC Open Item #10: Stairwell Enclosures

The applicant has not provided a description of the 2-hour rated fire barriers for the plant enclosed stairwells for us to independently verify compliance with our guidelines.

CMEB Position

We require the applicant to provide details showing compliance with Section C.5.c of BTP CMEB 9.5-1.

LGS Response

All stairwells that serve as escape routes, access routes for fire fighting, or access routes to areas containing equipment necessary for safe shutdown are enclosed by a 2-hr fire rated envelope consisting of reinforced concrete unit masonry walls with a minimum thickness of 8 inches. Each door opening which is a part of the above fire barrier has a fire rating of 1 1/2 hr. and is provided with Underwriters Laboratories "B" label doors which qualify for use in a 2-hr barrier.

All penetrations in the above barrier are sealed using penetration seal details that have been qualified for use in 3-hr rated fire barriers.

Based on the above, it is concluded that Limerick complies with the BTP CMEB 9.5-1 guidelines concerning fire protection for stairwells.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.4(f)

2. Branch Technical Position CMEB 9.5-1, Section C.5.a(6)

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DSER Open Item: #12

"We have evaluated the fire protection provided for the remote shutdown panel and conclude that it is not physically separated from the control room in accordance with our guidelines in Section C.5.c of BTP CMEB 9.5-1. The remote shutdown panel is located in the Auxiliary Equipment Room (Fire Area 25) along with PGCC cabinets and therefore, this area contains systems for both the normal shutdown system and the alternative shutdown capability for both units. The applicant has orally indicated that additional information will be submitted on this item."

BTP CMEB 9.5-1, Section C.5.c:

C.5.c. Alternative or Dedicated Shutdown Capability

(1) Alternative or dedicated shutdown capability provided for a specific fire area should be able to achieve and maintain subcritical reactivity conditions in the reactor, maintain reactor coolant inventory, achieve and maintain hot standby conditions for a PWR (hot shutdown for a BWR) and achieve cold shutdown conditions within 72 hours and maintain cold shutdown conditions thereafter. During the postfire shutdown, the reactor coolant system process variables shall be maintained with those predicted for a loss of normal ac power, and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture, or any primary coolant boundary, or rupture of the containment boundary.

(2) The performance goals for the shutdown functions should be:

(a) The reactivity control function should be capable of achieving and maintaining cold shutdown reactivity conditions.

(b) The reactor coolant makeup function should be capable of maintaining the reactor coolant level above the top of the core for BWRs and be within the level indication in the pressurizer for PWRs.

(c) The reactor heat removal function should be capable of achieving and maintaining decay heat removal.

(d) The process monitoring function should be capable of providing direct readings of the process variables necessary to perform and control the above functions.

(e) The supporting functions should be capable of providing the process cooling, lubrication, etc., necessary to permit the operations of the equipment used for safe shutdown functions.

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(3) The shutdown capability for specific fire areas may be unique for each such area, or it may be one unique combination of systems for all such areas. In either case, the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodate postfire conditions where offsite power is available and where offsite power is not available for 72 hours. Procedures shall be in effect to implement this capability.

(4) 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 standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved. If such equipment and systems 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. The number of operating shift personnel, exclusive of fire brigade members, required to operate such equipment and systems shall be onsite at all times.

(5) Equipment and systems comprising the means to achieve and maintain cold shutdown conditions should not be damaged by fire; or the fire damage to such equipment and systems should be limited so that the systems can be made operable and cold shutdown achieved within 72 hours. Materials for such repairs shall be readily available onsite and procedures shall be in effect to implement such repairs. If such equipment and systems used prior to 72 hours after the fire will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system should be provided. Equipment and systems used after 72 hours may be powered by offsite power only.

(6) 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, e.g., because of interface with or impact on existing safety systems, or because of adverse valve actions due to fire damage.

(7) The safe shutdown equipment and systems for each fire area should be known to be isolated from associated 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, should be such that a postulated

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fire involving associated circuits will not prevent safe shutdown.

LGS Response:

The Remote Shutdown Panels (10C201 and 20C201) will be enclosed by walls which will separate these panels from the rest of the Auxiliary Equipment Room. These walls will have a three hour fire rating. All cabling going to the Remote Shutdown Panels which pass through the Auxiliary Equipment Room will be encapsulated by a three hour fire barrier. Access to the new remote shutdown room will be provided so that operating personnel will not be required to pass through the Auxiliary Equipment Room to gain access to the Remote Shutdown Panels. These measures will assure that the units can be brought to a safe cold shutdown condition during a fire in the Auxiliary Equipment Room.

The addition of the walls around the Remote Shutdown Panels creates a new fire area (Area 26, Remote Shutdown Room). For a fire within this room, safe shutdown can be achieved from the Control Room using either shutdown methods B or D. Under this scenario, however, control of the following safe shutdown components will be lost in the Control Room:

HV51-F009	RHR Shutdown Cooling Suction Valve
152-11602	Div II 4160V Bus Breaker
152-11607	Div II 480V Load Center Breaker
152-11609	Div II 4160V Bus Breaker

The three circuit breakers will be controlled directly at the Division II switchgear. Valve HV51-F009 will be operated manually by turning the valve hand wheel.

The above provisions assure that alternate shutdown capability exists for fires in the Control Room, Auxiliary Equipment Room, Remote Shutdown Room and Cable Spreading Room. The requirements of the above cited section of BTP CMEB 9.5-1 are therefore satisfied.

Limerick will comply with the requirements of BTP CMEB 9.5-1, Section C.5.c, in Fire Area 25 and 26.

References: None

Drawings: FPER Figure B-21 (attached)

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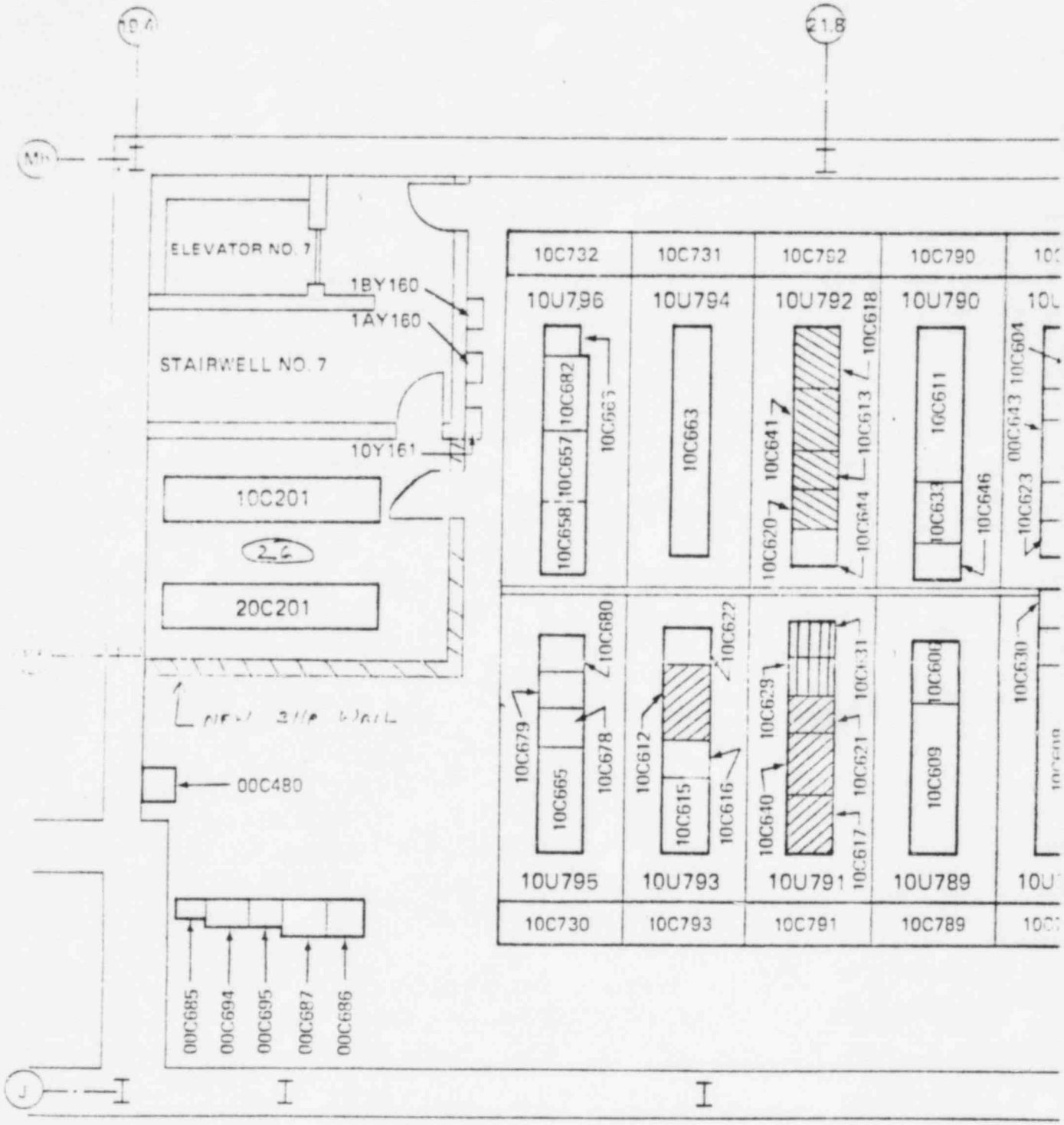

LEGEND

- CABINETS CONTAINING DEVICES ASSOCIATED WITH SHUTDOWN METHODS A AND/OR C
- CABINETS CONTAINING DEVICES ASSOCIATED WITH SHUTDOWN METHODS B AND/OR D
- RELAY PANELS CONTAINING DEVICES ASSOCIATED WITH ADS (SHUTDOWN METHODS A, B, C & D)

NOTES

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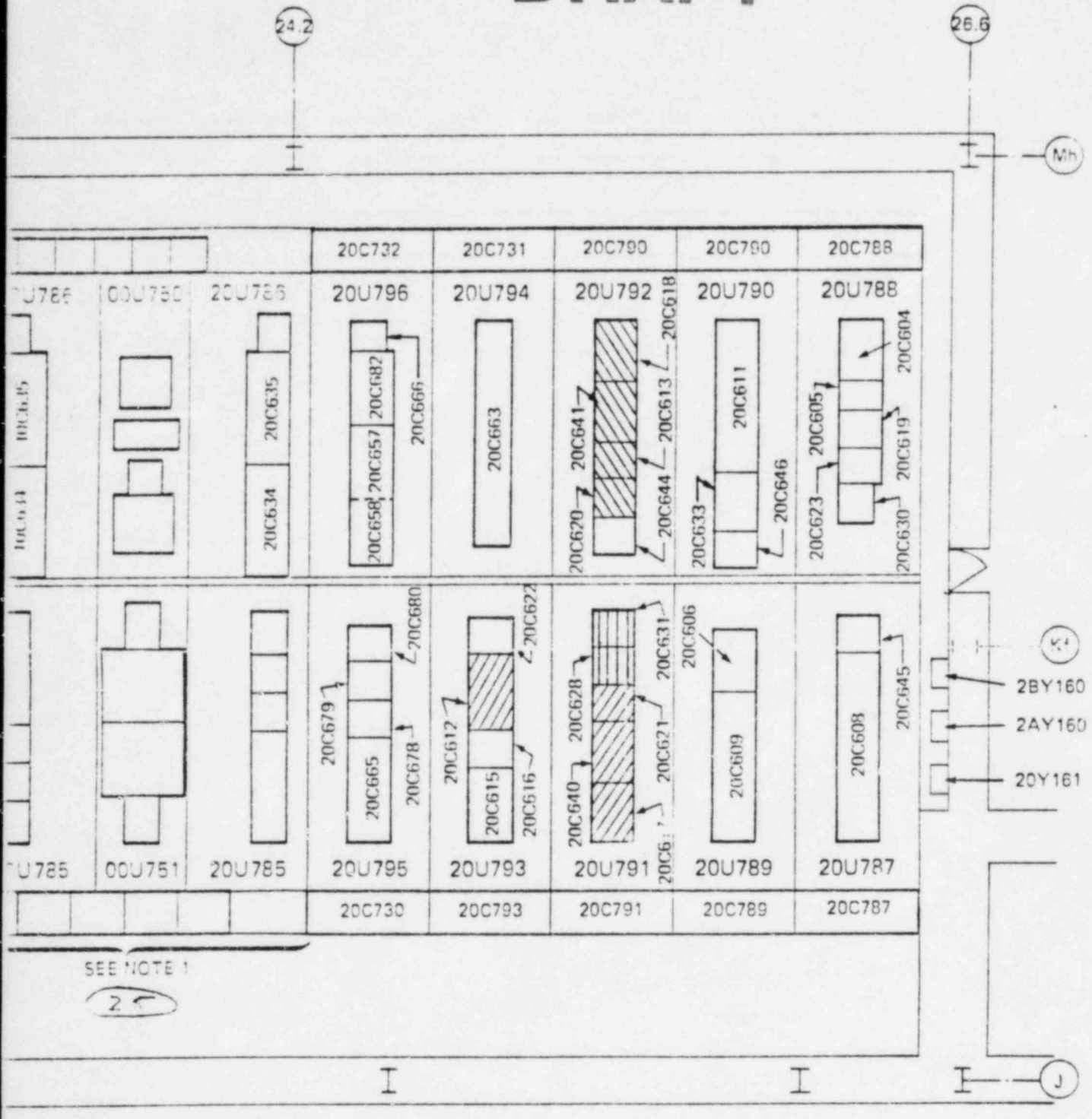

D CABINETS LOCATED
IS 00U750, 00U751,
U785 AND 20U786
NTIFICATION NUMBERS
SOCIATED WITH THE

LIMERICK GENERATING STATION
UNITS 1 AND 2
FIRE PROTECTION EVALUATION REPORT

AUXILIARY EQUIPMENT
ROOM ARRANGEMENT

FIGURE B-21

REV. 3, 04/83

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NRC Open Item #13: Control of Combustible Gases

Safety-related systems have been isolated or separated from combustible materials as much as possible. The storage of flammable liquids complies with NFPA 30. Compressed gases are stored either outdoors or in nonsafety-related structures whenever possible. However, compressed gas cylinders associated with the primary containment instrument gas system and containment combustible gas monitoring system are located in the reactor enclosure. This does not meet our guidelines in Section C.5.d of BTP CMEB 9.5-1.

CMEB Position

We require that either the cylinders be moved to nonsafety-related areas or a combination of the conditions of storage plus fire protection provided be demonstrated to achieve an equivalent level of safety.

LGS Response

The compressed gas cylinders associated with the primary containment instrument gas system are filled with nitrogen. The cylinders are located inside secondary containment, with their longitudinal axes parallel to the reactor enclosure wall. This gas is noncombustible, and therefore does not constitute a hazard with respect to fire protection.

Similarly, the oxygen cylinders associated with the containment combustible gas monitoring system have been located in the reactor enclosure, in accordance with NFPA 51 guidelines. In contrast to primary containment, the oxygen concentration inside the secondary containment is not maintained at reduced levels during plant operation. Since the volume of compressed oxygen is negligible in comparison to the volume of oxygen in the atmosphere within the oxygen cylinder storage area, the oxygen cylinders do not constitute a hazard with respect to fire protection.

In accordance with the guidelines of Section C.5.d of BTP CMEB 9.5-1, the hydrogen cylinders associated with the containment combustible gas monitoring system are being located outside of safety-related structures. These cylinders will be stored with their longitudinal axes parallel to the reactor enclosure walls.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.2(b)

2. Branch Technical Position CMEB 9.5-1, Section C.5.d(2)

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NRC Open Item #14: Line Type Heat Detectors and Suppression

Safety related cable trays outside the cable spreading room are not provided with continuous line type heat detectors, and in many areas automatic water suppression systems are not provided. The applicant states that smoke detectors are provided in the vicinity of cable trays, and separation of one hour barriers are provided in lieu of automatic sprinklers. This does not meet our guidelines in Section C.5.e(2) of BTP CMEB 9.5-1.

CMEB Position

Line type heat detectors will detect overheating in cable trays prior to combustion. Automatic sprinklers permit a means of promptly suppressing incipient fires. To meet our guidelines, we require that the applicant provide line-type heat detectors and automatic sprinklers.

LGS Response

Limerick has provided smoke and fire detectors (ionization or photo-electric type) at ceiling level in areas through which safety-related cable trays are routed. The detectors are located throughout the plant as discussed in FPER section 2.11 and as listed in FPER Table A-1. This type of smoke and fire detection provides a means to detect an incipient cable tray fire, whereas thermally actuated line-type heat detectors will not initiate an alarm until the fire has passed beyond the incipient stage. Automatic sprinklers do not provide a means to promptly suppress incipient fires since they must be thermally actuated.

Adequate manual fire fighting means are provided in areas through which safety-related cable trays are routed, as described in the response to Open Item #21, and all of these areas are easily accessible. In general, the cable trays are not provided with automatic suppression system coverage because all raceways that are needed for safe shutdown are separated as described in the response to Open Item #11, thus assuring that a fire occurring in any fire area will not result in loss of safe shutdown capability. Testing has shown that electrical cable tray fires involving cables of the type used at Limerick (IEEE 383 qualified) will not propagate to adjacent trays that are separated in accordance with Regulatory Guide 1.75. Raceway separation at Limerick is in conformance with Regulatory Guide 1.75. Therefore, the Limerick design can accommodate any cable tray fire due to either an electrical failure or an exposure fire, and the use of line-type heat detectors and automatic suppression systems for the cable trays would not provide any enhancement of safe shutdown capability.

The Limerick design for fire detection systems and fire suppression capability in areas through which safety-related cable trays are routed is adequate to ensure that fires involving cable trays will not prevent safe shutdown of the plant from being achieved.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.3(c)
2. Branch Technical Position CMEB 9.5-1, Section C.5.e(2)

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NRC Open Item #15: Power Supplies for Ventilation

The power supply and controls for the ventilation systems for the control structure fan rooms are not run outside the fire area served by the system. The applicant has not provided sufficient details for us to independently verify compliance with our guidelines in Section C.5.f of BTP CMEB 9.5-1.

CMEB Position

We require the applicant to demonstrate that a single fire will not disable both trains of ventilation needed for safety-related areas in the control structure.

LGS Response

In accordance with the guidelines of BTP CMEB 9.5-1, Section C.5.f(3), the routing of the power supply and control cables for mechanical ventilation systems was studied. Considering the plant's configuration and equipment location, it was determined to be impractical to run the power supply and controls for the ventilation systems for the control structure fan room outside the fire area served by the system. This is because ventilation for the control structure fan room is provided by one of the fan systems located in the fan room. Portable smoke ejectors will be provided to assist in removal of the products of combustion from the fan room if the normal ventilation system becomes unavailable due to fire damage to both divisions of the ventilation control/power cables.

As discussed in FPER Section 5.3.26, Revision 3, neither of the trains of the ventilation system are needed for safety-related areas in the control structure either during or after fire. If a fire should cause the loss of redundant trains of the ventilation system, the room(s) affected will gradually increase in temperature. Appropriate countermeasures such as opening of doors and use of portable fans will be implemented to re-establish air flow and limit the temperature rise in the affected rooms.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section D.4(c)

2. Branch Technical Position CMEB 9.5-1, Section C.5.f(3)

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DSER Open Item: #16

"This does not meet our guidelines in Section C.5.g of BTP CMEB 9.5-1 because upon loss of offsite power only one hour of emergency lighting capability is provided. We require the applicant to provide 8-hour self-contained battery powered lighting units in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto."

BTP CMEB 9.5-1, Section C.5.g:

C.5.g. Lighting and Communication

Lighting and two-way voice communication are vital to safe shutdown and emergency response in the event of fire. Suitable fixed and portable emergency lighting and communication devices should be provided as follows:

(1) Fixed self-contained lighting consisting of fluorescent or sealed-beam units with individual 8-hour minimum 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. Safe shutdown areas include those required to be manned if the control room must be evacuated.

(2) Suitable sealed-beam battery-powered portable hand lights should be provided for emergency use by the fire brigade and other operations personnel required to achieve safe plant shutdown.

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

(4) 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.

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LGS Response:

All areas needed for the operation of safe shutdown equipment and the access and egress paths thereto are provided with two diverse emergency lighting systems, an AC system and an AC/DC system. The AC system is fed from the four diesel generator busses. The DC feed to the AC/DC system is from the BOP battery. The chargers for this battery are fed from a diesel generator bus, therefore, DC emergency lighting will be provided indefinetly during loss of offsite power. The AC and DC emergency lighting levels are shown in FSAR Table 9.5-12 for all safety related areas. Table 9.5-13 will be revised to show the areas needed for operation of safe shutdown equipment and the lighting levels provided.

Where the DC emergency lighting system does not provide at least ½ foot candle in these areas, self-contained 8-hour battery powered lighting units will be provided.

This design assures that emergency lighting is available in all areas. The Limerick emergency lighting design is equivalent to the emergency lighting requirements of the above cited BTP section.

References:

1. LGS FSAR Section 9.5.3
2. LGS FSAR Table 9.5-12
3. LGS FSAR Questions 430.65 through 430.69

Drawings: None

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NRC Open Item #17: Fire Detection

We cannot verify, from the applicant's fire protection report, that detection is provided for adjacent areas which present a hazard to safety related equipment (e.g., the refueling floor area of the reactor enclosure and the decontamination areas.)

We will require the applicant to verify that detection is provided for all areas that present a hazard to safety related equipment in accordance with our guidelines in Section C.6.a of BTP CMEB 9.5-1.

The fire and smoke detection system is in compliance with NFPA 72A. The system does not comply with the requirements of NFPA 72D in the following areas:

1. No device is provided for permanently recording incoming signals with the date and time of receipt.

2. Operation and supervision of the system is not the primary function of the operators.

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

This does not meet our guidelines in Section C.6.a of BTP CMEB 9.5-1. We will require the applicant to provide a system which complies with NFPA 72D for a Class A system, with detectors installed in accordance with NFPA 72.E.

CMEB Position

1) Detection systems should be provided for all areas that contain or present a fire exposure to safety-related equipment.

2) Fire detection systems should comply with the requirements of Class A systems as defined in NFPA 72D, "Standard for the Installation, Maintenance, and Use of Proprietary Protective Signaling Systems," and Class 1 circuits as defined in NFPA 70, "National Electrical Code."

3) Fire detectors should be selected and installed in accordance with NFPA 72E, "Automatic Fire Detectors."

LGS Response

Fire detection capability is provided for all areas containing combustible materials that present a hazard to equipment or

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cabling that is needed for achieving and maintaining safe shutdown. Fire detection is not provided for the refueling floor area (fire zone 78A) or the shower and dressing areas (fire zones 78B and 78C) since the combustible loading in these areas is zero and none of the areas contain safe shutdown equipment or cabling. Further discussion of fire area 78 is provided in Section 5.4.27 of the FPER.

The fire and smoke detection system is designed in conformance with NFPA 72D except for the three items noted in Section 2.11 of the FPER. These three exceptions are justified by the following considerations:

1. The logging of fire events by a device for permanently recording incoming signals is not required as the standard operating procedures will require the operator on duty in the main Control Room to enter the date and time of the receipt of an alarm from the fire detection system or initiation of any fire suppression system in the plant log book.

2. The plant operator's duties include monitoring and supervision of the fire protection system.

3. The location of early warning fire and smoke detectors was determined and performed under the direction of a registered fire protection engineer. The location of fire and smoke detectors complies with NFPA 72E except for the location of ionization detectors in high-bay areas. Ionization detectors are not located in each bay formed by the deep beams.

At locations in areas where composite construction is used, the diffusion of ionized particles throughout the compartment volume produced during the incipient stage of the fire will negate the effect of beam depth and result in acceptable levels of detection coverage.

Detector location conforms to NFPA 72E is met because the deep beams do not interfere with the circulation of ionized particles to the detector.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section F.13 & F.15.

2. Branch Technical Position CMEB 9.5-1, Section C.6.A.

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NRC Open Item #18: System Piping Connections

Pressure for the fire protection water system is provided by a 2 in. connection to the service water system. This does not meet our guidelines in Section C.6.b(4) of BTP CMEB 9.5-1. We require the applicant to provide a separate jockey pump to maintain pressure.

CMEB Position

The fire main system piping should be separate from service or sanitary water system piping, except as described in Position C.5.c(4).

LGS Response

The fire protection water system does not include any piping that also functions as part of the service water or sanitary water systems. The 2-inch line that provides pressure maintenance for the fire protection water system is part of that system only and has no function in the operation of the service water system. This design is in conformance with Section C.6.b(4) of BTP CMEB 9.5-1.

The pressure-maintenance feature of Limerick's fire protection water system is designed in accordance with NFPA 20, in that the 2-inch connection from the service water system meets the requirements and function of a supply from a pressure-maintenance pump having the required rated capacity not less than the normal leakage rate and having a discharge pressure sufficient to maintain the desired fire protection system pressure. The water source for the service water system is the cooling tower basin, which is the same water source that the fire pumps utilize.

The service water system serves as a highly reliable source of pressure, in that (a) connections are provided between the fire protection system and both the Unit 1 and Unit 2 service water systems, and (b) each service water system inlcudes three 50% capacity service water pumps. This design results in a more reliable pressure source than would be provided by a jockey pump.

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The use of a 2-inch line from the service water system to maintain pressure in the fire protection water system is appropriate because it is in conformance with NFPA 20 as well as with Section C.6.b(4) of BTP CMEB 9.5-1.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section E.2(c)

2. Branch Technical Position CMEB 9.5-1, Section C.6.b

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NRC Open Item #19: Valve Supervision

Supervision has not been provided for all valves in the fire protection water supply in accordance with NFPA 26.

CMEB Position

To meet our guidelines, in Section C.6.c of BTP CMEB 9.5-1 the type of valve supervised and the frequency at which its position is verified should be as listed below.

Type of Valve	Type of Supervision	Frequency of Inspection with Written Record
Post-indicator valves	*	every 7 days
Sectional control valves	*	every 7 days
Valves in the suction and discharge piping of the fire pumps	*	every 7 days
Valves controlling water supply to aqueous fire suppression or manual hose station standpipe systems	**	every 30 days

* Sealing valves so that the valve cannot be operated without breaking seals. Seals should be of a character to prevent injury in handling and prevent reassembly when broken.

**Electrically in accordance with NFPA 26 with electrical supervisory signals annunciated in the control area.

LGS Response

Control and sectional valves in the fire protection water system are either electrically supervised or administratively controlled. The features that provide the electrical supervision or administrative control, and also the inspection program that will be implemented for the two categories of valves, are described below.

The valves that will be electrically supervised are those valves that control the water supply to fixed (water) suppression systems and the valves that control the water supply to standpipe systems and to groups of manual hose stations. These valves are shown in FPER Figure B-2. The electrically supervised valves are provided with normally

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open contacts that close in the event of valve movement. The electrical supervision signal is indicated at fire protection alarm panel 00C926, located near the entrance to the control room, and is annunciated inside the control room. Each of the electrically supervised valves is inspected monthly, with written record, in order to verify the position of the valve.

The valves that will be administratively controlled are the valves in the suction and discharge of the fire pumps, plus the post indicator valves in the yard area that provide for sectional control of the fire main loop and control of the fire water headers branching into the various structures. These valves are padlocked in the open position so that they cannot be operated without breaking the padlocks. Padlocks are of a frangible design. Each of the administratively controlled valves is inspected weekly, with written record, in order to verify the position of the valve.

Thus LGS design provides appropriate supervision of the fire protection system control and sectionalizing valves.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section E.2.

2. Branch Technical Position CMEB 9.5-1, Section C.6.c.

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NRC Open Item #20: Branch Connections for Standpipes

The sprinkler systems and manual hose station standpipe connections to the looped interior fire protection headers are arranged and valved such that 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 connected to the same header.

This does not meet our guidelines in Section C.6.c(1) of BTP CMEB 9.5-1 because a single break in the water supply piping could impair both the primary and backup fire suppression systems.

CMEB Position

We will require the applicant to modify the design to prevent a single break or malfunction from incapacitating multiple automatic protection systems and standpipes hose systems.

LGS Response

The standpipes supplying the sprinkler system and the manual hose station were designed to NFPA piping requirements, where the materials and construction are the same as for Power Piping Code, ANSI B31.1. The standpipes were seismically analyzed for safe shutdown earthquake (SSE) loads to ensure piping integrity, and are considered an extension of the yard main system. Each sprinkler and manual hose station supplied from the main standpipe are equipped with an approved shutoff valve and waterflow alarm. Safety related equipment in the vicinity of the sprinkler water fire protection is either protected or will not be damaged by sprinkler water discharge.

References

1. Branch Technical Position ASB, Appendix A, 9.5-1, Section E.2.b & E.3

2. Branch Technical Position CMEB 9.5-1, Section C.6.c.1

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NRC Open Item #21: Hose Station Coverage

Manual hose stations are not located throughout the plant in accordance with NFP 14.

CMEB Position

We will require the applicant to provide sufficient hose stations to enable the fire brigade to reach any location that culd present a fire exposure hazard to safety related equipment with at least one effective hose stream.

LGS Response

Clarification on the provisions for hose stations in the areas of concern is provided below:

1. Reactor Enclosure

   a. Elevation 177ft:- No manual hose stations are provided at this elevation for fire zones 31 thru 40. However, in the event hose coverage is required, the hose stations at elevation 201 feet can be used for this purpose. Additional lengths of 1-1/2 inch hose are stored in the vicinity of the hose stations at elevation 201 ft. for extension down to elevation 177 ft.

   b. Elevation 313 ft; Fire Zones 49 and 72:- Hose stations 1HR-207 in Unit 1 and 2HR-207 in Unit 2 are capable of providing coverage of fire zones 49 and 72. An additional 50-foot length of hose is stored in the vicinity of each of the above hose stations to provide the necessary hose reach.

   c. Elevation 331 ft. - Manual hose stations will be provided on El. 331 ft. in fire zones 50A and 73A.

2. Radwaste Building

   Elevation 195 ft; Fire zones 119A through H:- Table A-1 of the FPER indicates that no suppression capability is available for these areas. This is incorrect. The hoses from manual hose stations OHR-303 and OHR-304 (located in fire zone 118B) can be used for fire suppression in fire zone 119. Table A-1 will be revised to show manual suppression for this area.

3. Service Water Pipe Tunnel

   Elevation 198ft; Fire zone 75: - Table A-1 of the FPER indicates that manual hose stations are available for

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use in this area. The hoses from 1HR-240 and 2HR-240 (located in fire zones 42 and 65) can be used for fire suppression in fire zone 75. An additional 50 foot length of hose is stored in the vicinity of each of the above hose stations to provide the necessary hose reach. Thus adequate manual suppression is provided as there are no in-situ combustibles in this tunnel.

4. Turbine Building

   a) Elevation 200 ft; Fire zone 88A:- The condenser and feedwater areas are protected by a wet pipe sprinkler system and do not present a fire exposure hazard to safety-related equipment. Therefore manual hose coverage is not required for fire zone 88A.

   b) Elevation 217 ft. Fire zone 91:- The air ejector and steam packing exhauster compartment does not present a fire exposure hazard to safety-related equipment. Therefore, manual hose coverage is not required for fire zone 91.

   c) Elevation 200 ft; Fire zone 101A:- Same response as given in 4.b above.

   d. Elevation 217 ft: Fire zone 104A:- Same response as given in 4.b above.

5. Diesel Generator Enclosure

   Fire zones 79 through 86:- The diesel generator cells are protected by pre-action sprinkler systems. The fire hose required is met by the fire hydrants Nos. 8 and 9, with two hoses available from each hydrant.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Sections E.2.g & E.3

2. Branch Technical Position CMEB 9.5-1, Section C.6.c.4

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NRC Open Item #22: 3" Diameter Standpipes

3-inch piping is used to serve up to two hose stations and does not meet NRC guidelines in Section C.6.c(4) of BTP CMEB 9.5-1.

CMEB Position

We will require the applicant to either provide 4" diameter piping or verify by calculation that the fire protection system can provide the flow and pressures required in NFPA 14 for these standpipe locations, considering the operation of two hose stations simultaneously with the largest water demand flowing from any automatic suppression systems in the vicinity of the hose stations.

LGS Response

Standpipes serving hose stations and sprinkler systems are capable of delivering 250 gpm of which 100 gpm is supplied to the hose stations at not less than 65 psig at the highest hose stations while the sprinkler system is operating. The largest single sprinkler demand in the Reactor Building is 140 gpm.

The design and installation of the fire protection standpipes and hose stations is in accordance with NFPA-14.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section E.3.d

2. Branch Technical Position CMEB 9.5-1, Section C.6.c.4

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NRC Open Item #23: Seismic Support of Standpipes

Standpipe system piping supply hose stations protecting safe shutdown equipment are not seismically supported or designed. This does not meet our guidelines in Section C.6.c(4) of BTP CMEB 9.5-1.

CMEB Position

We require the applicant to provide seismically supported piping.

LGS Response

The standpipe system piping supply to hose stations protecting safe shutdown equipment has been evaluated to verify piping integrity under seismic loading and was found to be acceptable. This meets the guidelines of Section C.6.c(4) of BTP CMEB 9.5-1.

References

1. Branch Technical Position CMEB 9.5-1, Appendix A, Section E.3(d)

2. Branch Technical Position ASB 9.5-1, Section C.6.c(4)

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NRC Open Item #24: PGCC Fire Protection Specifications

The applicant has not provided sufficient information to verify compliance with the fire protection specifications contained in the NEDO-10466 Report, Revision 2, dated March 1978, which was previously approved by us, and is the basis for our acceptance of the PGCC system. We will require the applicant to verify that the fire protection for the PGCC meets these specifications.

LGS Response

The following table provides a comparison of NEDO-10466-A (or Revision 2) commitments versus the actual plant design. It will be seen that either the NEDO-10466 commitments or an equivalent design of at least the same integrity is incorporated.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section E.4
2. Branch Technical Position CMEB 9.5-1, Section C.6.d
3. GE Report NEDO-10466, Revision 2
4. Bechtel Specification 8031-M-49
5. GE Drawings 262A6019, 262A6020, & 1H707182
6. Bechtel Vendor Prints 8031-M-1-H12-U787-C-2-2,-C-3-2,-C-5-2.

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NRC OPEN ITEM # 24: COMPARISON TABLE (19 sheets)

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
SECTION (not in lower case)		DESCRIPTION (lower case)	YES, NO OR EQUIVALENT	~~COMPLIANCE ON LIMERICK~~ (lower case) DETAILS OF COMPLIANCE
3.3.2.3	f.	The floor plates are covered at site by a customer selected vinyl-asbestos floor tile designed for commercial use. Of utmost importance is the fire retardent properties of the material. The tile must meet the following requirements as a minimum:	Yes	Floor tile material will be Armstrong Excelon Imperial Modern Vinyl Tile # 51856 per SS-T-312
	i	Flame spread index (max) 2.0	YES	per UL 992 test
	ii	Complies with HUD/FHA UM69	Not Applicable	
	iii	Conforms to FED Spec. 35-T-312 (SS)	YES	
3.3.2.4		Fire Detection Equipment		
	a	Detection is accomplished through two thermal detectors...	Yes	Vendor drawings provide details
	b	and one product of combustion detector...	Yes	-ditto-
	c	...mounted in each of the floor section longitudinal raceways (Fig. 3-9.).	Yes	-ditto-
	d	The thermal detector is 5 inches in diameter and 1 inch deep...	Equivalent	4 5/8" diamter by 1" deep
	e	...and the product of combustion detector is 6 inches in diameter and 3 inches deep.	Equivalent	6 5/8" diameter by 2 3/4" deep
	f	Both are mounted on 4-inch octagonal boxes.	Yes	GE drawing provides detail agreement

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK
SECTION		DESCRIPTION		DETAILS OF COMPLIANCE
3.3.2.4.	g	Products of combustion detectors respond to 0.006 grams of product per cubic foot of air.	Yes	Detector is Edwards. Manufactured by Response is standard in the trade.
	i	The thermal detectors respond to a temperature rate of rise of 15°F per minute (minimum) or ambient temperature of 140°F (minimum).	Yes	140°F temperature setting is used.
	j	Therefore the POCs (product of combustion detectors) are usually used as pre-alarms...	Yes	Statement is correct
	k	...and the thermal detectors for suppressant initiation.	Yes	-ditto-
	l	There are terminal boards on the rear of each of the detectors...	Yes	GE drawings confirm use
	m	...and the operational functions are wired out with 18 gauge insulated wire...	Yes	-ditto-
	n	...inside flexible steel conduit to	Yes	-ditto-
	o	...contact points in the terminal cabinet (Figure 3.9).	Equivalent	Floor section U750, U751 & U786 have no terminal cabinets but do not have terminal box in the floor section.
	p	These contact points in the termination cabinet are the electrical interface with the customer/AE wiring.	Equivalent	-ditto-

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK
SECTION		DESCRIPTION		DETAILS OF COMPLIANCE
3.3.2.4.	a	It is a requirement on the customer/ AE to connect the detectors in a "zoned" configuration by floor section.	Yes	GE arrangement drawings give zoned area requirements guidance for final design
3.3.2.5	a	The fire suppression equipment is also illustrated in Figure 3-9. along with the dection in the floor section.	Equivalent	All floor sections are covered by halon injection
	b	This equipment consists of four nozzles attached to manifold...	Yes	Field walkdown confirms the NEDO commitment
	c	...located at the termination cabinet end of the floor section.	Yes	-ditto-
	d	Each nozzle is designed to flood each longitudinal raceway	Yes	-ditto-
	e	The suppresant has a low toxicity, is electrically non-conductive, leaves no residue and does not react with materials in the control room.	Yes	Halon 1301 will be used in compliance with NFPA 12A requirements.
	f	The Halon suppressant and its accessory equipment...connects at the piping interface.	Yes	Field walkdown confirms the NEDO commitment
	g	If fire stops create isolated longitudinal raceway sections, provisions will made so that suppresant material will reach these areas.	Yes	Field review confirms the NEDO commitment

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK
SECTION (lower case)		DESCRIPTION		DETAILS OF COMPLIANCE
		Fire Stops		
3.3.2.6.	a	Semi-permanent fire stops are located at the ends of each longitudinal raceway...	Yes	Installation is incomplete. Fire stops will be installed per NEDO 10446 requirements.
	b	...at the ends of the eight lateral raceways for panel-to-panel cabling (4 raceways at each end of floor section)...	Yes	-ditto-
	c	...and in those lateral raceways carrying cable...	Yes	-ditto-
	d	...and are located directly under the structural I beams that support the panels.	Yes	-ditto-
	e	The fire stops consist of a refractory material (such as sand)...	Equivalent	G.E. is in the process of specifying other~~s~~ than sand, etc.
	f	...poured over the cables to fill the interslices...	Equivalent	G.E. is in the process of specifying other~~s~~ than sand, etc. - ditto -
	g	...then covered by a low viscostisite (approximately 16 poise) fire retardant silicone rubber...	Equivalent	G.E. is in the process of specifying other~~s~~ than sand, etc. - ditto -
	h	...such as GE RTV 6428 two component liquid compound.	Equivalent	G.E. is in the process of specifying other~~s~~ than sand, etc. - ditto -

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK
SECTION (lower case)		DESCRIPTION		DETAILS OF COMPLIANCE (lower case)
3.3.2.6	i	This combination of materials provides a fire stops and a seal for limiting air flow.	Yes	
Figure 3.9	a	Manifold and nozzle arrangement and location	Equivalent	see section 3.2.2.5. a, response
	b	product at combustion detector quantity and location	Equivalent	See section 3.3.2.4. a&b responses
	c	rate of rise temperature sensors quantity and location	Equivalent	See section 3.3.2.4 a&b responses
4.2.1.6	a	In cabinets containing more than one division of a critical system (i.e., RPS, ESF), the divisions are separated by a 3/18 inch thick steel fire barrier	Equivalent Stet. OK as is	Separation is provided per Regulatory Guide 1.75 - ~~ditto~~ - see 4.2.1.6.a response also
	b	Conduit and junction boxes are used within the termination cabinets for additional separation (i.e., RPS rod group power and neutral conductors).	Yes	Separation is provided per Regulatory Guide 1.7 — ditto —

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK
SECTION		DESCRIPTION		DETAILS OF COMPLIANCE
4.2.1.6	c	Although there may be more than one division in cabinet, there is never more than one division in any one bay.	Equivalent	Separation is provided per Regulatory Guide 1.75. See 4.2.1.6.a. response also.
	d	In the floor sections, separation is achieved by four longitudinal metal-covered raceways (see Figure 4-1)	Yes	Field walkdown confirms the NEDO commitment.
	e	Each pair of parallel raceways is separated by a steel fire barrier	Yes	-ditto-
	f	Conduit is also used within the raceways for additional cable separation where necessary (i.e., RPS contactor conductors to ESS logic cabinets)	Yes	-ditto-
	g	Metal barrier separation practices are used for the crossing of a raceway of one division over a raceway of another division.	Equivalent	Flexible conduit is sometime used.
	h	In the crossover raceway locations within the floor section, fire is prevented from occuring by sealing both ends of the lateral raceway where the cable runs from a longitudinal to a lateral and where it enters the bottom of the panel. This enclosed area limits the oxygen and eliminates air flow, thus preventing a fire from starting.	Yes	Field walkdown confirms the NEDO commitment

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK
SECTION (lower case)		DESCRIPTION (lower case)		DETAILS OF COMPLIANCE
4.2.1.6	i	As mentioned in the above paragraph, the lateral raceways are blocked-off or sealed at specific locations to control fire propagation and air flow.	Yes	Field walkdown confirms the NEDO commitment
	j	longitudinal raceways are also blocked-off at the ends for the same reason. These fire stops are easy to install, maintain and repair.	Yes	-ditto-
	k	The interslices between the cables and the air space above the cables to the bottom of the crossover raceway are filled with a refractory material.	Equivalent	See section 3.2.2.6.e, f & g responses
	l	A two-part silicone rubber RTV compound is poured over the refractory material to form a cap and a seal.	Yes	— d.Ho — ~~See section 3.2.2.6.e, f & g~~
	o	On each of the critical systems panels (i.e., RPS, ESS and NSSS) a steel fire barrier, or equivalent, is installed from the bottom of the floor section (center area) to the bottom of the ends of each control panel.	Yes	
	p	To ensure that sneak common mode failures do not occur, the raceway openings at the bottom of the panels are sealed with a semi-permanent firestop consisting of a layer of refractory material (such as sand) over the cables and a cap of silicone rubber.	Yes	Final design will comply with NEDO requirement.

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NRC OPEN ITEM # 24: COMPARISON TABLE

SECTION	NEDO 10446-A FIRE PROTECTION REQUIREMENTS DESCRIPTION	YES, NO OR EQUIVALENT	COMPLIANCE ON LIMERICK DETAILS OF COMPLIANCE
4.2.2	Fire Protection Design		
a	Since the floor section is simply a steel structure containing control room cables the assessment of combustible materials can be easily made and controlled and therefore can be concluded that the combustible material is minimized and limited to cable insulation.	Yes	Field walkdown confirms the NEDO commitment
b	The floor sections are designed to limit the flow of air and exhaust gases by the sealing of all penetrations with semi-permanent fire stops.	Yes	-ditto-
c	Thermal and smoke defectors are located in each longitudinal duct.	Yes	Vendor drawings provide the details.
d	The alarm is zoned to indicate the floor section requiring attention	Yes	See response to 3.3.2.4.~~f~~ g
e	And finally, accessibility to the potential fire area is easily provided for manual suppression.	Yes	Field walkdown confirms the NEDO commitment
f	Tefzel insulated cables are an additional defense-in-depth factor along with the fixed detection, fixed manual suppression and portable extinguishers to locally suppress fires.	Equivalent	Limerick uses Raychem Firetrol and Rockbestos Firewall III

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NRC OPEN ITEM # 24: COMPARISON TABLE stet. ok. as is

NEDO 10446-A FIRE PROTECTION REQUIREMENTS		COMPLIANCE ON LIMERICK	
Section	Description	Yes, No or Equivalent	Details of Compliance
4.2.2	g Under "Fire Prevention", one of the objectives is "Control Ignition Energy" (Heat Source). In the PGCC floor sections, the only combustible material in the design is the cable insulation and the only ignition source is an electrical overload.	Yes	
	h Another objective in preventing ignition is "Control Thermal Energy Transfer". The cable insulation is TEFZEL which is a high temperature jacket material.	Equivalent	See response to 4.2.2.f.
	i Under "Manage the Fire", consideration is given to "Control by Construction". The support members as well as all duct covers and floor plates are made of steel.		
	j Steel barriers between redundant Class 1E systems are a minimum thickness of 3/16 inch steel.	Yes	Barriers between panels are 3/16 inch steel.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.2 (cont'd)	k	Penetrations, passages or openings between panels and PGCC under-floor areas are sealed closed with a semi-permanent fire stop consisting of a base mound of sand covered by an approximate 1/2 inch layer of silicone rubber, thus not only limiting fire propogation but also providing a limited amount of oxygen.	Equivalent	See responses to 3.2.2.6 "e" through "h".
	l	The second factor is "Control Combusion". The floor sections are designed to eliminate the inflow of air in the normal configuration. In this case, any fire is difficult to start and is suppressed immediately. Exhaust of combustion gases is as limited as inflow and sustained burning in the floor section is prevented.	Yes	Field walkdown confirms the NEDo commitment.
	m	"Suppress the Fire" is accomplished by detecting the fire with thermal and smoke detectors in each longitudinal duct and suppressing the fire with a fixed, manual Halon 1301 suppression system backed up by customer supplied portable extinguishers.	Yes	Installation is incomplete. Halon injection will be automatic.
	n	In "Managing the Exposed", one objective is to "Limit the Exposed". The redundant Class 1E systems are routed in separate ducts and are usually 3 feet apart.	Yes	Field walkdown confirms the NEDo commitment.
	o	Control equipment power is also routed in conduit to further control overload conditions.	Yes	Field walkdown confirms the NEDo commitment.
	p	In addition to limiting the fire to one division the size of the ducts also limit the exposed since only a maximum of fifty to sixty, 19 conductor cables are routed in the ducts.	Yes	Field walkdown confirms the NEDO commitment.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.2 (cont'd)	~~a~~	"Defend in Place" is achieved since each duct is completely enclosed and thus there is no concern for those ducts not involved in the original fire.	Yes	Floor section longitudinal and lateral ducts are completely enclosed.
	~~b~~	The lack of combustible materials, the limited inflow of oxygen, the flame retardent properties of TEFZEL, the use of fire stops, the use of zoned detectors and the accessibility to exposed areas utilizing portable extinguishers formulates a sound design basis for fire protection.	Yes	Statement is correct noting that TEFZEL is not used on Limerick but ~~an~~ a equivalent.
	~~c~~	As a result of NRC requirements for fire protection features a fixed manually actuated suppression system is also included.	Yes	See response to 4.2.2.~~l~~m
4.2.4.2		4.2.4 Regulatory Guide 1.75 Design Compliance		
		4.2.4.2 The electrical systems mounted on PGCC are designed using the philosophy of "associated circuits" and the PGCC cables also adhere to this requirement. The cables that contain associated circuits meet the same cable derating, environmental qualification, flame retardance, splicing restrictions and raceway fill as Class 1E cables since materially they are the same cables.	Yes	Separation is in accordance with Regulatory Guide 1.75 as discussed in FSAR section 8.1.6.1.14.
4.2.5.6	a	4.2.5 IEEE 384-1974 Design Compliance		
		4.2.5.6 The termination cabinets are simular in construction to control room panels. They do not contain any of the electronic equipment found in the panels and only include termination devices and cables. These materials are flame retardant.	Yes	Field walkdown confirms the NEDO commitment.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.5.6 (cont'd)	b	The actual separation in the cabinets is much more than the 6 inches allowed in Section 4.1.5.6.	Equivalent	See response to 4.2.4.2.
	c	Redundant Class 1E systems are routed in separate bays of a cabinet. Redundant Class 1E systems do not appear in the same bay.	Equivalent	See response to 4.2.4.2.
	d	The barrier separating the bays is a 3/16 inch steel plate.	Yes	Field walkdown confirms the NEDO commitment.
	e	In addition to the steel barrier the routing of the wiring inside the cabinet is also done to maximize the distance between redundant Class 1E sysems.	Yes	Field walkdown confirms the NEDO commitment.
	h	An air space of approximately 1 inch exists between the wiring and the barrier in this case to prevent barrier surface contact.	Equivalent	Separation is justified by test. See FSAR Section 8.1.6.1.14.
4.2.6.1		4.2.6 Regulatory Guide 1.120 Design Compliance		
		The only exception to the guidelines has to do with fire stop spacing. A minimum of 27 feet instead of 20 feet is used to close up with the ends of the longitudinal wireway.	Yes	Field walkdown confirms the NEDO commitment.
4.2.6.2	a	4.2.6.2 The only work within PGCC equipment involving ignition sources is the task of welding the termination cabinets and floor sections to the embedded structural members in the building floor. Precautionary warnings	No	Stud welding is performed for mounting separation cans. Grinding is also performed.
	b	are noted in the GE installation instructions for PGCC (See reference 23).	Yes	Review of G.E. Specification 22A4185 confirms NEDO commitment.
	b c	Fire-proof blankets are required to be placed over the cables during this operation.	Yes	Field ~~walkdown~~ review confirms the NEDO commitment.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.6.3		4.2.6.3 The cable insulation materials used in the PGCC performed well in both the IEEE 383 (Reference 5) and PGCC Fire Barrier Tests (Appendix F). This is the only application of plastic materials except for the terminal boards in the cabinets. A suitable non-combustible terminal board is not available.	Yes	All wiring has been tested and passed IEEE 383 requirements.
4.2.6.4	a	4.2.6.4 As stated previously, all cable raceways are metal and form an integral part of the steel floor section.	Yes	Field walkdown confirms the NEDO commitment.
	b	The flexible conduit is only used for providing a ground path and not for fire barrier separation.	Yes	Flexible conduit is used for electrical separation.
	c	The flexible conduit is only routed within a raceway which in itself is a rigid, steel conduit.	Yes	
4.2.6.5	a	4.2.6.5 The fire stops located in the floor sections are rated for more than 30 minutes.	Yes	GE will carry out a walkdown to verify compliance after all cables are pulled.
	b	It is noted that each fire stop includes at least 3 inches of refractory material.	Yes	GE will carry out a walkdown to verify compliance after all cables are pulled.

DRAFT NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.6.5 (cont'd)	c	A spacing of 27 feet for longitudinal raceway fire stops is more than adequate for the PGCC design.	Yes	GE will carry out a walkdown to verify compliance after all cables are pulled.
4.2.6.6	a	4.2.6.6 Since the cables are routed in the floor sections with the connectors located in the panels and termination cabinets, the connectors would not be exposed to fire suppression water.	Yes	Field walkdown confirms the NEDO commitment.
	b	The cable jacket insulation is either Tefzel, Raychem Flamtrol or GE Geoprene, which are waterproof materials.	Equivalent	Limerick also uses Raychem Firetrol & Rockbestos Firewall III.
	c	Wetting down with fire suppression water, therefore, will not cause an electrical fault.	Yes	Field walkdown confirms the NEDO commitment.
4.2.6.8	a	4.2.6.8 The fire detection system meets the requirements of a Class A system defined in NFPA72D (Reference 15) and Class 1 circuits defined in NFPA70 (Reference 21).	Yes	The in-floor detector circuitry is electrically supervised.
	b	The selection and installation also complies with NFPA72E.	Yes	

DRAFT NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.6.8 (cont'd)	c	The detectors are wired to a contact in the termination cabinet associated with each floor section.	Equivalent	See section 3.3.2.4.o response.
	d	The customer/AE continues the circuit to a fire protection panel which is wired up to give audible and visual alarms that are zoned to the individual floor sections.	Yes	Panel #_____ wiring indicates connection requirements are _____.
	e	Primary and secondary power is supplied to the detection system. The primary system is 120VAC and the secondary system is 24VDC.	Equivalent	The fire detection system power backup is from the diesel generators.
4.2.6.9	a	4.2.6.9 The primary system is a fixed manual Halon 1301 suppression system which is designed to flood each individual floor section.	Yes	Halon will flood all floor sections simultaneously.
	b	The backup system is portable extinguishers (or other similar means selected by the customer) located in the control room.	Equivalent	Located in adjacent areas.
	c	Persons trained in fire lighting can reach the fire area by quickly removing the floor plates and applying the extinguishant.	Yes	Field walkdown confirms the NEDO commitment.
	d	Since these are two completely independent methods, a failure in the primary system will not affect the operation of the backup system.	Yes	Field walkdown confirms the NEDO commitment.
	e	The PGCC Halon 1301 Fire Suppression System has been designed for total flooding of the protected volume in accordance with NFPA Standard 12A(1973).	Yes	Design is incomplete at this time but will conform to the NEDO commitment.
4.2.6.10	a	4.2.6.10 All PGCC cables that enter the control room terminate in the control room panels.	Yes	Field walkdown confirms the NEDO commitment.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
4.2.6.10 (cont'd)	b	The floor section ducts provide a network of steel conduit for Class 1E cables.	Yes	Field walkdown confirms the NEDO commitment.
	c	A piping manifold and nozzles for a fixed manual Halon 1301 fire suppression system (as required by the NRC for the PGCC floor sections) is provided for suppressant injection.	Yes	Field walkdown confirms the NEDO commitment.
5.1.8	a	...Cables routed in the floor section should be Tefzel or equivalent insulated to minimize smoke production...	Equivalent	Limerick uses Raychem Firetrol and Rockbestos Firewall III.
	b	...Cables added to the PGCC by the customer/AE must be Tefzel or an equivalent.	Equivalent	Limerick uses Raychem Firetrol and Rockbestos Firewall III.
5.1.9	a	Thermal and smoke detector circuits for each panel module are wired in conduit to contact points in the termination cabinet.	Equivalent	See section 3.3.2.4.o response
	b	...With the requirement to connect the detectors in a "zoned" configuration for each floor section.	Yes	See section 3.3.2.4.q response
	c	The wiring to a central alarm in the control room...	Yes	See section 3.3.2.4.q response
6.2.1.1	a	Thermal and smoke detectors are located in the floor section as shown in Figure 3.9...	Yes	Vendor drawings confirm equivalency. See response to 3.3.2.4.a,b and c.
	b	Additional smoke detectors are located in the termination cabinet in Bays A and D.		See response to NRC Open Item #28.
	c	Detector contacts are available for the customer/AE to use as an alarm or suppressant initiation.	Yes	Field walkdown confirms the NEDO commitment.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
6.2.2.1		The suppression equipment in this plant consist of piping and nozzles in the floor section which allows the suppressant to be supplied at the piping interface. This is the same as BWR16 Figure 3-9.	Yes	Field walkdown confirms the NEDO commitment.
Errata and Addenda No. 1 of June 1978				
3.3.1	c	The T/C enclosures are made of 3/16 inch thick steel plate welded to 3/8 inch steel corner angles.	Yes	Field walkdown confirms the NEDO commitment.
	d	Each T/C is divided into four bays.	Yes	Field walkdown confirms the NEDO commitment.
	e	Swing barriers are used between Bays A and B and between Bays C and D to provide better access for wiring.	Yes	When required for separation.
	k	Products of combustion detectors are located at the top of each termination cabinet which contain redundant safety cable divisions to sense smoke generated in any bay.	No	See response to NRC Open Item #28.
	l	These detectors provide an alarm signal for locating a fire within the termination cabinet.	No	See response to NRC Open Item #28.
	m	The alarm signal...is to be connected to the main control room fire protection annunciator panel...	Yes	Design is incomplete at this time but will conform to NEDO commitment.
	n	...Unless the cabinets are located in a "~~marred~~ manned area" ...where local alarm is sufficient.	N/A	Not applicable.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
5.1.9	d	These detector alarm circuits may also provide initiation for fire suppression as necessary.	Yes	Thermal detectors will initiate halon release.
	e	...Tefzel insulated cable based plants, the fire suppression system shall be manually initiated.	N/A	Not applicable.
	f	...Non-Tefzel insulated cable based plants, the fire suppression system shall be automatically initiated.	Yes	
5.2.3	h	The suppression piping interface is a 3/4 tube - 3/4 pipe female connector. This fitting is located in the bottom of the floor section near the termination cabinet.	Yes	Field walkdown confirms the NEDO commitment.
	i	The flow rate for the gas shall be enough to achieve a 20% concentration...	Yes	Flow & volume requirements will ensure the NEDO commitments are met.
	j	...and a 20 minute holding time in the floor sections.	Yes	Flow & volume requirements will ensure the NEDO commitments are met.
	k	Installation and testing of the suppression system shall be in accordance with NFPA Standard 12A.	Yes	NFPA Standard 12A requirements will be followed.

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NRC OPEN ITEM # 24: COMPARISON TABLE

NEDO 10446-A FIRE PROTECTION REQUIREMENTS			COMPLIANCE ON LIMERICK	
Section		Description	Yes, No or Equivalent	Details of Compliance
5.2.5	a	...installation procedures are defined in the PGCC installation instructions...includes...fire stop installation and checkout (Reference 23).	Yes	Review of GE Specification 22A4185 indicates procedures are provided.
	b	These instructions will also require that doors on termination cabinets remain unlocked for quick access in case of fire.	Yes	Terminal cabinets are <u>not</u> provided with locks.

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NRC Open Item #25: Separation of Safety Related Components in Secondary Containment

The separation of redundant cables does not meet our guidelines in Section C.7.a(1)(f) of BTP CMEB 9.5-1. This was previously discussed in Section C.5.e(2).

CMEB Position

We require the applicant to provide protection of cable trays in accordance with Section C.7.a.1(f) of BTP CMEB 9.5-1.

LGS Response

Refer to the response to Open Item #14 for a discussion of compliance with Section C.7.a(1)(f) of BTP CMEB 9.5-1 concerning line-type heat detection.

In addition, as required by Section C.5.e(2) of BTP CMEB 9.5-1, all areas are accessible for manual firefighting.

References

1. Branch Technical Position CMEB 9.5-1, Appendix A, Section D.3.

2. Branch Technical Position CMEB 9.5-1, Section C.5.e(2)

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NRC Open Item #26: Control Room Complex

The applicant states that the control room complex is separated from all other areas of the plant by 3-hour-rated assemblies. Peripheral rooms in the control room complex consist of offices. Each room is separated from the control room by 1-hour-fire-rated barriers. Smoke detectors that alarm and annunciate in the control room panel are provided in each room.

However, the applicant has not provided sufficient details of the control room complex for us to independently verify compliance with our guidelines.

CMEB Position

We require the applicant to provide details showing compliance with Section C.7.b of BTP CMEB 9.5-1 of our guidelines.

LGS Response

Elevation 269'-0" of the control structure consists of the main control room and peripheral rooms, all contained within a 3-hr fire rated envelope, separating this portion of the structure from the rest of the plant.

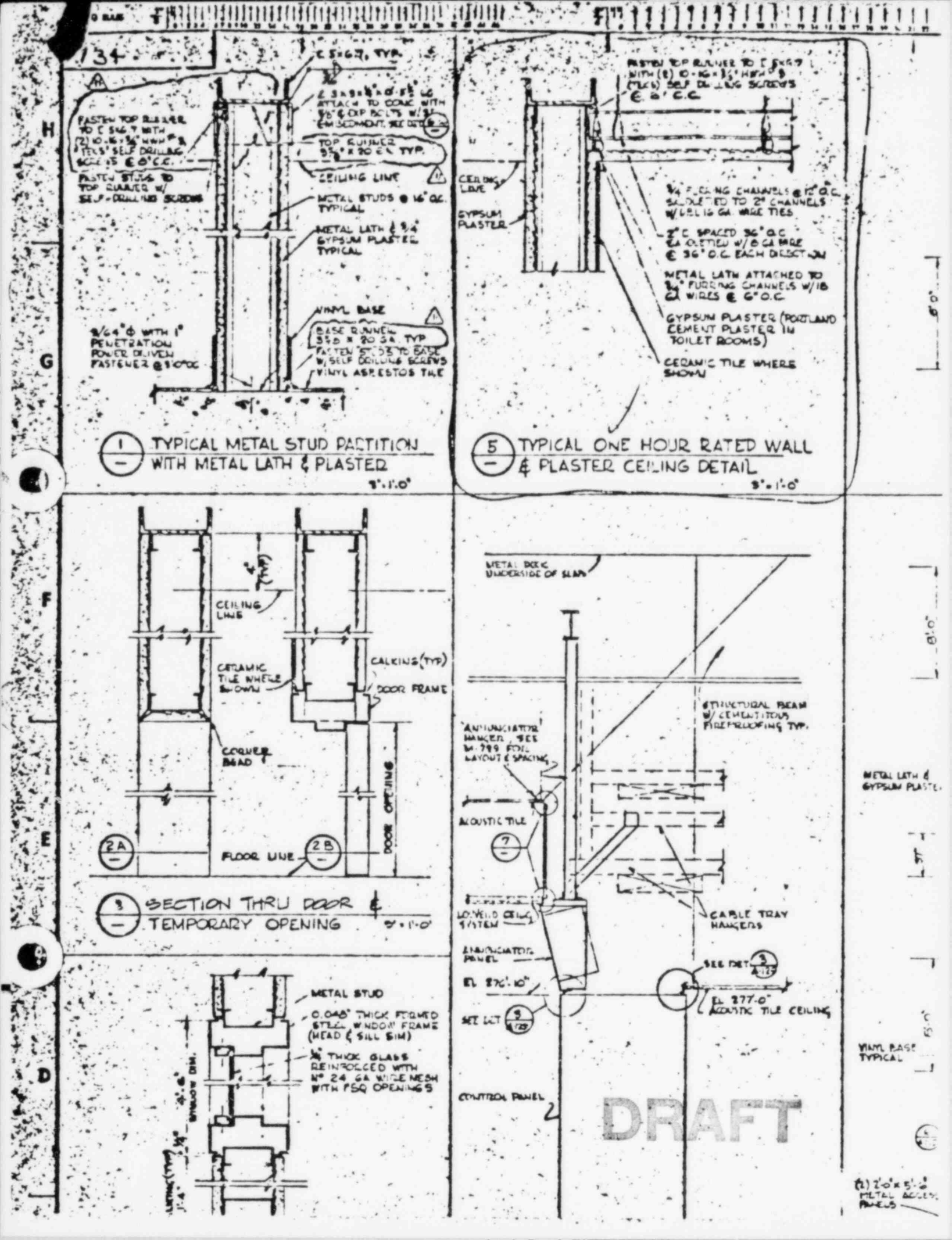
All interior partitions are 1-hr fire rated, with exception of the shift supervisor's office, which has a glazed opening to enable observation of control room activities.

All finishes and components in the area have flame spread, fuel contribution, and smoke developed ratings of 25 or less as determined in accordance with ASTM E-84.

References

1. Branch Technical Position CMEB 9.5-1, Appendix A, Section F.2

2. Branch Technical Position CMEB 9.5.1, Section C.7.b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C 5x6.7, TYP.
FASTEN TOP RUNNER TO C 5x6.7 WITH (2) 10-16x3/8" HWH SELF DRILLING SCREWS @ 8" C.C.
FASTEN STUDS TO TOP RUNNER W/ SELF-DRILLING SCREWS
TOP RUNNER 3 5/8" x 20 GA TYP.
CEILING LINE
METAL STUDS @ 16" O.C. TYPICAL
METAL LATH & 3/4" GYPSUM PLASTER TYPICAL
VINYL BASE
BASE RUNNER 3 5/8 x 20 GA. TYP
FASTEN STUDS TO BASE W/ SELF DRILLING SCREWS
VINYL ASBESTOS TILE
3/64"Φ WITH 1" PENETRATION POWER DRIVEN FASTENER @ 8" O.C.
1 TYPICAL METAL STUD PARTITION WITH METAL LATH & PLASTER
3" = 1'-0"
FASTEN TOP RUNNER TO C 5x6.7 WITH (2) 10-16x3/8" HWH SELF DRILLING SCREWS @ 8" C.C.
CEILING LINE
GYPSUM PLASTER
3/4" FURING CHANNELS @ 12" O.C. SUSPENDED TO 2" CHANNELS W/ #16 GA WIRE TIES
2" C SPACED 36" O.C. GA. OLETTED W/ 8 GA WIRE @ 36" O.C. EACH DIRECTION
METAL LATH ATTACHED TO 3/4" FURRING CHANNELS W/ 18 GA WIRES @ 6" O.C.
GYPSUM PLASTER (PORTLAND CEMENT PLASTER IN TOILET ROOMS)
CERAMIC TILE WHERE SHOWN
5 TYPICAL ONE HOUR RATED WALL & PLASTER CEILING DETAIL
3" = 1'-0"
4" (TYP)
CEILING LINE
CERAMIC TILE WHERE SHOWN
CALKING (TYP)
DOOR FRAME
CORNER BEAD
DOOR OPENING
2A
FLOOR LINE
2B
3 SECTION THRU DOOR & TEMPORARY OPENING
3" = 1'-0"
METAL DECK UNDERSIDE OF SLAB
STRUCTURAL BEAM W/ CEMENTITOUS FIREPROOFING TYP.
ANNUNCIATOR HANGER, SEE M-799 FOR LAYOUT & SPACING
ACOUSTIC TILE
7
LOW VOLT CEILING SYSTEM
CABLE TRAY HANGERS
ANNUNCIATOR PANEL
SEE DET 3/A-125
EL 276'-10"
EL 277'-0" ACOUSTIC TILE CEILING
SEE DET 3/A-125
CONTROL PANEL
METAL LATH & GYPSUM PLASTER
VINYL BASE TYPICAL
(2) 2'-0" x 5'-0" METAL ACCESS PANELS
METAL STUD
0.048" THICK FORMED STEEL WINDOW FRAME (HEAD & SILL SIM)
3/8" THICK GLASS REINFORCED WITH #24 GA WIRE MESH WITH FSQ OPENINGS
WINDOW DIM.
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NRC Open Item #27: Suppression in Control Room Ceiling

Automatic suppression systems are not provided for the electrical cabling routed through the space above the suspended ceiling in the control room.

CMEB Position

We will require the applicant to provide an automatic fire suppression system above the control room ceiling to meet Section C.7.b of BTP CMEB 9.5-1.

LGS Response

Automatic suppression systems are not provided for the electrical cabling routed through the space above the suspended ceiling in the control room for the following reasons:

1. The fire loading above the suspended ceiling is very light and gives an equivalent severity of only seven minutes. No transient combustibles are considered credible above the suspended ceiling since the only available access to this area is through use of a ladder. Catwalks or storage areas above the ceiling are not provided.

2. No power cables are routed through the space above the suspended ceiling. Only control and instrumentation cables are present, therefore the probability of a fire generated by an overload and faulted cable is considered to be extremely low because this scenario would require the simultaneous failure of two overcurrent protective devices. All cables routed in the trays have 600V insulation and contain 125VDC or 120VAC circuits. The 277V lighting circuits are all routed in conduit and are the highest voltage circuits routed above the suspended ceiling.

3. No safety related cables are routed in the cable trays above the suspended ceiling. All safety related cables are routed in fully enclosed gutter or conduit.

4. Since Limerick uses IEEE-383 qualified cable and completely meets the requirements of Regulatory Guide 1.75 concerning cable tray separation, any fire that does occur in a tray above the suspended ceiling will be limited to the tray in which the fire starts. This is based on the fire tests conducted by Sandia as described in Ref. 3.

5. Ten smoke detectors are located above the suspended ceiling to provide prompt indication of a fire.

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6. Two portable ladders will be located immediately outside the control room access doors to provide access to the area above the suspended ceiling for manual fire fighting.

7. The individual panels of the suspended ceiling are easily removable to provide access.

8. Portable fire extinguishers are located in the control room and CO_2 hose reels are located immediately outside the control room access doors to provide a manual fire fighting capability.

9. The control room is continuously manned, therefore prompt response to any alarm indicating a fire above the suspended ceiling is assured.

Based on the above, it is concluded that manual suppression provides an acceptable alternative to the installation of an automatic fire suppression system.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section F.2

2. Branch Technical Position CMEB 9.5-1, Section C.7.b

3. NUREG/CR-2931 Burn Mode Analysis of Horizontal Cable Tray Fires.

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DSER Open Item: #28

"Ionization smoke detectors have been installed in the control room, but not inside the individual cabinets and consoles within the control room. This does not meet our guidelines in Section C.7.b of BTP CMEB 9.5-1. We require the applicant to provide cabinet detectors in accordance with Section C.7.b of BTP CMEB 9.5-1."

BTP CMEB 9.5-1, Section C.7.b:

C.7.b. Control Room Complex

Smoke detectors should be provided in the control room, cabinets, and consoles. If redundant safe shutdown equipment is located in the same control room cabinet or console, additional fire protection measures should be provided. Alarm and local indication should be provided in the control room.

LGS Response:

The provision of smoke detectors in the Control Room cabinets is not needed to provide adequate protection of redundant systems from the effects of internal panel fires for the following reasons:

1. Because the panels are closed except when personnel are performing interior panel maintenance, an undetected exposure fire originating in the panel is not a credible event.

2. The design basis fire for control room panels is an electrical failure-induced ignition of panel internal wiring. The effects of electrical failures of control panel wiring and components was thoroughly investigated by PECO during our separation test program. It was shown by test that the separation criteria used in the LGS panels will prevent the effects of any electrical failure from propagating to a redundant division of wiring. This was proven by demonstrating and analyzing worst case effects of electrical failures on the types of wires used in the control panels. All wire types are qualified to the IEEE 383 flame test requirements. It is our position that through the use of the panel internal wiring separation criteria, an electrical fire in any control panel will not result in the loss of safe shutdown capability as only one division of one system would be affected.

3. The PECO test program demonstrated that prior to the ignition of any wire, copious quantities of smoke were first generated. This smoke has an acrid odor. A single six foot conductor generated enough smoke to completely fill a 19½ x 10½ ft. room. From the test program it is evident that this failure mode will generate enough smoke to be detected by the ceiling ionization detectors in the room as well as an odor that will be detected by the operator. We therefore believe that no further enhancement of plant safety or safe shutdown capability will be achieved by adding smoke detectors in the control cabinets.

References: PECO Test Report #48503, dated September 1, 1982.

Drawings: None

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NRC Open Item #29: Cable Spreading Room

The cable spreading room is separated from the balance of the plant by 3-hour-fire-rated walls and floor/ceiling assemblies. All penetrations through fire-rated barriers are fitted with 3-hour-fire-rated dampers and/or 3-hour-fire-rated penetration seals.

However, the applicant has not provided sufficient information for us to independently verify compliance with our guidelines. We will require the applicant to provide details showing compliance with the guidelines in BTP CMEB 9.5-1 Section C.7.c.

CMEB Position

Section C.7.c

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 sytem. 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 cable 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.

Open-head deluge and open directional spray systems should be zoned.

The use of foam is acceptable.

Cable spreading rooms should have:

(1) At least two remote and separate entrances for access by fire brigade personnel;

(2) An aisle separation between tray stacks at least 3 feet wide and 8 feet high;

(3) Hose stations and portable extinguishers installed immediately outside the room;

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(4) Area smoke detection; and

(5) Continuous line-type heat detectors for cable trays inside the cable spreading room.

Drains to remove firefighting water should be provided. 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.

A separate cable spreading room should be provided for each redundant division. Cable spreading rooms should not be shared between reactors. Each cable spreading room should be separated from the others and from other areas of the plant by barriers with a minimum fire rating of 3 hours. If this is not possible, a dedicated system should be provided.

The ventilation system to each cable spreading room should be designed to isolate the area upon actuation of any gas extinguishing system in the area. Separate manually actuated smoke venting that is operable from outside the room should be provided for the cable spreading room.

LGS Response

Automatic fire suppression in the cable spreading room consists of a total flooding carbon dioxide system and a wet pipe sprinkler system. The wet pipe sprinkler systems installed at ceiling level, with directional sprinkler heads laid out to provide coverage for all cable trays and any possible transient combustibles that could present exposure hazards to the cable system.

The cable spreading room has the following:

(1) Two separate entrances, each rated as a Class A opening with a 3-hour rated fire door in the east and west wall respectively. Walls are constructed of concrete masonry or reinforced concrete a minimum of 12-in. thick. Ceiling and floor are a minimum of 1-ft. thick reinforced concrete supported by fireproofed steel.

(2) Cable trays in the cable spreading room are arranged to provide aisleways with a minimum head room approximately 5 feet high and a mininum width between tray stacks of approximately three feet. At certain locations, structural supports for the cable trays reduce the aisle width to a minimum of 17 inches; however, all points may be reached by an effective hose stream.

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(3) Hose stations and portable extinguishers are located just outside the entrance to each cable spreading room. For the Unit 1 cable spreading room, the hose station and extinguishers are located in the control structure stairwell. For the Unit 2 cable spreading room, the hose station and extinguishers are located in the Unit 2 static inverter compartment.

(4) Smoke detectors are provided at the ceiling of the cable spreading room to alarm during the incipient stage of a fire.

(5) For the LGS position on line-type heat detectors, see the response to Open Item #14.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section F.3.

2. Branch Technical Position CMEB 9.5-1, Section C.7.c

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NRC Open Item #30: Switchgear Rooms - Drains and Exposed Structural Steel

The Division I and Division II switchgear rooms are not separated from each other and from other plant areas by 3-hour-fire-rated walls and floor/ceiling assemblies. Structural steel supporting the floors is not protected by fire rated barriers as discussed in Section 9.5.a of this SER. We require the applicant to protect the exposed structural steel supporting the floor assembly in accordance with Section C.5.a of BTP CMEB 9.5-1.

Automatic fire detection is provided by ionization smoke detectors. Manual protection is provided by standpipe hose stations and portable extinguishers. Floor drains have not been provided in the switchgear rooms. We require the applicant to provide floor drains or a system of drains and curbs in accordance with our guidelines in Section C.7.e of BTP CMEB 9.5-1.

LGS Response

See the response to Open Item #5 for the exposed structural steel and Open Item #9 for floor drains.

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DSER Open Item: #31

"The auxiliary equipment room (Fire Area 25) is located directly above the control room and contains the PGCC panels for both units and the remote shutdown panels for both units. A fire in this area could prevent the safe shutdown of both units. The separation of redundant components in this area does not meet our guidelines in Section C.7.f of BTP CMEB 9.5-1. We require the applicant to provide separation of safety related equipment in accordance with our guidelines."

BTP CMEB 9.5-1 Section C.7.f:

C.7.F. Remote Safety-Related Panels

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. 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.

LGS Response:

The Limerick FPER will be revised to indicate that the Auxiliary Equipment Room (Fire Area25) now complies with the above cited section of BTP CMEB 9.5-1 as discussed in the response to DSER Open Item #12. The separation of the Remote Shutdown Panels and cables from the Auxiliary Equipment Room panels and cables by three hour barriers assures that safe shutdown can be achieved in the event of a fire in Fire Area 25.

References: Response to DSER Open Item #12

Drawings: None

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NRC Open Item #32: Battery Rooms - Exposed Structural Steel

The battery rooms are not separated from each other and from the balance of the plant by 3-hour-fire-rated barriers, because their floor slabs are supported by exposed structural steel. We require the applicant to protect the exposed structural steel in accordance with our guidelines in Section C.5.a of BTP CMEB 9.5-1.

LGS Response

See the response to Open Item #5 for a discussion of exposed structural steel.

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NRC Open Item #33: Diesel Generator Separation

The applicant states that each diesel generator and its day tank are enclosed by 3-hour-fire-rated barriers. However, the applicant has not provided sufficient information for us to independently verify compliance with our guidelines.

CMEB Position

We will require the applicant to provide details showing compliance with our guidelines in Section C.7.i of BTP CMEB 9.5-1.

LGS Response

Each Diesel Generator Day Tank is enclosed by a 3-hr fire rated envelope consisting of the following:

a. Walls - poured in place 24" thick reinforced concrete.
b. Roof - poured in place 24" thick reinforced concrete.
c. Floor - concrete slab on grade.
d. Doors - UL labeled Class "A"
e. Penetrations - 3-hr rated

Each Diesel Generator is separated from any adjacent redundant safety related equipment by a 3-hr rated barrier consisting of a 24" thick reinforced concrete wall.

This complies with the guidelines of Section C.7.i of BTP CMEB 9.5-1.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section F.9.

2. Branch Technical Position CMEB 9.5-1, Section C.7.i.

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Item 34: Cooling Towers

The cooling towers are constructed using combustible PVC material. This does not meet the guidelines of BTP CMEB 9.5-1, Section C.7. The sole source of fire suppression water is provided from the cooling tower basins.

CMEB Position

We require that automatic suppression system be provided in accordance with the guidelines of NFPA 214-1977 and Section C.7.g of BTP CMEB 9.5-1.

LGS Response

FPER Section 3.1.2, Item 247, describes the construction of each cooling tower. The American Nuclear Insurers (ANI) accepted the cooling tower design without a sprinkler system after a successful large scale burn test was conducted by Marley in July 1978 and witnessed by ANI.

Based on the test conducted by Marley, the cooling tower design is acceptable.

References

1. Branch Technical Position ASB 9.5-1, Appendix A, Section F.17

2. Branch Technical Position CMEB 9.5-1, Section C.7.g