APPENDIX R DEVIATION REQUEST NO. 13

ESSENTIAL REDUNDANT RACEWAY PROTECTION

DEVIATION REQUEST:

a) Protection of redundant safe shutdown cables in a fire zone may be accomplished through the use of one or a combination of methods identified in 10CFR50, Appendix R, Section III.G.2a, b, and c.

b) The safe shutdown cables required to ensure availability of a safe shutdown path in a particular fire zone need only be protected within that fire zone. The criteria that a fire is assumed to propagate into adjacent fire zones both horizontally and upward must be satisfied (see Deviation Request No. 7).

c) All raceways are protected by the use of a 1-hour fire rated barrier where automatic suppression/detection exists or by the use of a 3-hour fire rated barrier where automatic suppression/detection does not exist (See attached Drawing B-213424).

FIRE AREAS/ZONES AFFECTED:

This deviation request applies to all fire areas in the Unit 1 and Unit 2 Reactor Buildings.

REASON FOR DEVIATION REQUEST:

10CFR50 Appendix R Section III.G.2 requires that where cables or equipment of redundant trains of systems necessary to achieve safe shutdown are located within the same fire area, one of 3 means (III.G.2.a,b,c) of ensuring that one of the redundant trains is free of fire damage shall be provided. When using the methods of Sections III.G.2.b or c for raceway protection, it is required that the fire detection and an automatic fire suppression system be installed in (throughout) the fire area. Although we have fire detection, where appropriate, throughout the fire areas, we do not have an automatic fire suppression system installed completely throughout the fire areas. Based on the fire spread limitation criteria outlined in Deviation Request No. 7 and the wraparound area concept in Deviation Request No. 4, protection of the essential redundant train throughout an entire fire area is not warranted. In addition, certain fire zones have only partial automatic suppression coverage within the fire zone.

EXISTING CONDITIONS:

The 3-hour fire barrier method (III.G.2.a) and the 1-hour fire barrier with automatic fire suppression/detection method (III.G.2.c) are used to protect essential redundant raceways at Susquehanna SES. The choice of methods depends on the availability of automatic fire suppression/detection.

The wraparound areas at Susquehanna SES contain both divisions of redundant safe shutdown raceways and both divisions of these raceways are protected within the wraparound areas (see Deviation Request No. 4). The wraparound area provides a spatial separation between fire areas and the protection of both redundant safe shutdown raceway divisions within the wraparound area assures the availability of a safe shutdown path based on the limitation of fire spread across the wraparound area.

The fire spread limitation criteria (see Deviation Request No. 7) states that a fire will only propagate to the next adjacent fire zone. Therefore, different safe shutdown paths could be protected in fire zones remote from each other.

JUSTIFICATION:

The purpose of Appendix R, Section III.G.2, is to assure that one train of safe shutdown raceway and its associated circuits are free of fire damage so that they remain available for safe shutdown of the plant. The method of protection for these essential redundant raceways outlined in this deviation request is different than that required by Appendix R, Section III.G.2, but accomplishes the same purpose and intent of Section III.G.2.

Due to the large configurations of some of the Reactor Building fire areas and the fire spread limitation criteria presented in Deviation Request No. 7, the installation of an automatic suppression system throughout the fire areas would not significantly enhance the safety of the plant. Moreover, where an automatic suppression system does not exist, essential redundant raceway are protected by a 3-hour fire rated barrier.

In fire zones where automatic suppression is not complete throughout the entire fire zone, both one-hour and three-hour raceway protection (wrapping) is used. There are five fire zones at Susquehanna which have partial automatic suppression coverage within the fire zone. These five zones are listed below along with the conservatively developed maximum combustible loading as determined from the Combustible Loading Analysis.

Fire Zone	Maximum Combustible Loading
1-3A	60.7 minutes
1-3B-N	40.4 minutes
1-4A-N	22.9 minutes
2-3B-N	55.5 minutes
2-4A-S	25.9 minutes

Actual in-situ combustible loading durations are provided to document existing arrangement and justify the deviation request. These values are based on the initial combustible loading analysis. Modifications subsequent to this analysis have revised these values with the possibility of future modifications revising them again. The governing criteria for the combustible loading analysis is that the fire area resistance rating exceed the combustible loading duration. The combustible loading durations specified in the deviation request will not be updated in the future since program commitments require

that all modifications be evaluated to assure that additional combustibles are controlled to remain below the fire area fire resistance rating.

In all cases (with the exception of an approximate 1% exceedance in Fire Zone 1-3A) the conservative maximum combustible loading for each of these fire zones is less than 60 minutes. This is the tested acceptance level for the 1-hour wrapping used at Susquehanna. Additionally, wherever the 1-hour wrapping is being used, automatic suppression protection exists to mitigate the heat effect that a postulated fire would have on the wrapped raceway. Inspection of the boundary areas for each of these partially protected fire zones reveals that there are no significant fire hazards on either side of this boundary for a minimum distance of approximately 20 ft. (See attached Drawing B-213424). Therefore, we are assured that adequate protection exists for the given combustible configuration in each of these boundary areas.

Based on the criteria and justifications presented in this deviation request and in Deviation Requests No. 4 and No. 7, we are assured that one of the redundant trains of a required safe shutdown system is free from fire damage.

APPENDIX R DEVIATION REQUEST NO. 14

REACTOR BUILDING FIRE ZONES WITHOUT FIRE DETECTION

DEVIATION REQUEST:

Fire detection need not be provided in fire zones which do not contain safe shutdown raceway or do not represent an exposure hazard to safe shutdown equipment even if a fire zone within the same area contains redundant safe shutdown raceway. The provision of automatic sprinkler protection in lieu of fire detection is acceptable in Fire Zones 1-2C and 2-2C.

FIRE AREA/ZONES AFFECTED:

This deviation applies to Unit 1 and Unit 2 Reactor Buildings, Fire Area: R-1A, R-1B, R-2A and R-2B.

REASON FOR DEVIATION REQUEST:

The requirement of 10CFR50, Appendix R, Section III.G.2 require fire detection. The NRC guidance indicates fire detection should be provided throughout a fire area. Fire detection has not been provided in the Reactor Building fire zones listed below under Existing Arrangement.

EXISTING ARRANGEMENT:

The following fire zones do not have fire detection:

Fire Area	Fire Zones	Reason
R-1A	1-2C	Railroad Airlock/Access Shaft – No detection – Automatic sprinklers provided
	1-4E	CRD Room – No safe shutdown cables – very low combustible loadings
	0-6H	Cask Storage Pit – Filled with water.
	1-7B	Recirculation Fan Room – No safe shutdown cables – very low combustible loadings
	1-6F	Spent Fuel Pool – Filled with water.
R-1B	1-1J	Stairwell-no safe shutdown raceway or combustibles
	1-6F	Spent Fuel Pool – Filled with water.
	0-6H	Cask Storage Pit – Filled with water.
R-2A	2-2C	Same as 1-2C
	2-4E	Same as 1-4E
	2-6F	Same as 1-6F
R-2B	2-1J	Same as 1-1J
	2-6F	Same as 1-6F

JUSTIFICATION:

Fire Zones 1-2C and 2-2C have been provided with automatic sprinkler protection. Detection of a fire is provided via the sprinkler flow alarm when heat activates a sprinkler head. The remainder of the fire zones listed above do not contain safe

shutdown raceway or equipment. None of the zones listed above represent a fire hazard which impacts on adjacent fire zones.

The NRC requested additional detection for Fire Zones 1-7B and 1-6F in FSAR Question 281.17. There was no additional detection requested for Fire Zones 1-2C, 1-4E or 0-6H. Our response to the staff and our Fire Protection Review Report both indicated that additional smoke detection would be provided in zones which contain or present a fire exposure hazard to safe shutdown equipment. The fire zones delineated in this request do not present an exposure fire hazard to safe shutdown equipment.

APPENDIX R DEVIATION REQUEST NO. 15

FIRE AREAS CONTROL STRUCTURE WITHOUT FIRE SUPPRESSION

DEVIATION REQUEST:

Automatic fire suppression is not required for the protection of 1-hour wrapped redundant safe shutdown raceway in Fire Areas CS-11 and CS-20.

FIRE AREAS/ZONES AFFECTED:

This deviation applies to Fire Areas CS-11 (Fire Zone 0-28A-I) and CS-20 (Fire Zone 0-28A-II).

REASON FOR DEVIATION REQUEST:

The requirements of 10CFR50, Appendix R, Section III G.2.C require fire suppression if a one-hour fire rated barrier for cables and equipment is provided. Fire Areas CS-11 and CS-20 are not provided with automatic fire suppression.

EXISTING CONDITIONS:

Fire Areas CS-11 and CS-20 contain safe shutdown cables enclosed in conduits which are protected by a one-hour fire barrier. In addition, Fire Area CS-20 contains two 125V DC distribution panels (2D624 and 2D644) which are enclosed with a one-hour protective fire barrier. The present in-situ combustibles are evenly dispersed throughout the fire zones, and the presently calculated maximum average combustible loading (in-situ and transient) is calculated to be less than 30 minutes. All cables are in conduits or panels. No cable trays which could add to the combustible loading are located in either fire area.

Actual in-situ combustible loading durations are provided to document existing arrangement and justify the deviation request. These values are based on the initial combustible loading analysis. Modifications subsequent to this analysis have revised these values with the possibility of future modifications revising them again. The governing criteria for the combustible loading analysis is that the fire area fire resistance rated exceed the combustible loading duration. The combustible loading durations specified in the deviation request will not be updated in the future since program commitments require that all modifications be evaluated to assure that additional combustibles are controlled to remain below the fire area fire resistance rating.

JUSTIFICATION:

Fire Areas CS-11 and CS-20 are identical in function and hazard to Fire Zones 0-28B-I and 0-28B-II which were the subject of a request for variance (See Deviation Request No. 8). The NRC concluded in SER Supplement No. 4 that the approach in question was acceptable for Fire Zones 0-28B-I and 0-28B-II.

The combustible loadings may change over plant life. This Deviation Request will remain valid so long as:

a) The calculated maximum average combustible loading does not exceed 45 minutes.

b) The in-situ combustibles remain evenly dispersed.

DEVIATION REQUEST NO. 16 HAS BEEN WITHDRAWN

APPENDIX R DEVIATION REQUEST NO. 17

KAOWOOL SYSTEM AS AN ACCEPTABLE 1-HOUR FIRE BARRIER WRAP

DEVIATION REQUEST:

A Kaowool fire barrier wrap system along with an automatic suppression system is acceptable for use as a 1-hour fire barrier in plant areas where the installation currently exists.

FIRE AREAS/ZONES AFFECTED:

Kaowool has been installed in the following plant areas:

Fire Area	Fire Zones with Kaowool
R-1A	1-4A-S 1-4A-W 1-5A-S
R-1B	1-4A-W 1-4A-N
CS-10	0-27C
CS-30	0-25E
D-1	0-41A
D-3	0-41C

REASON FOR DEVIATION REQUEST:

The requirements of 10CFR50, Section III.G.2.C, allows the use of a 1-hour fire barrier wrap. NRC guidance letter 85-01, Section 3.2.1 indicates that the "Kaowool System", which had been accepted by the NRC, failed to meet the 325°F temperature limit. This system has been used at Susquehanna SES.

EXISTING ARRANGEMENT:

All fire zones in which Kaowool has been installed have automatic fire suppression. Fire detection is also provided in these fire zones.

JUSTIFICATION:

Kaowool was installed as a barrier wrap at Susquehanna SES prior to fuel load on Unit 1 (July, 1982). In NRC Generic Letter 85-01, the staff has stated that conduit and cable tray enclosure materials accepted by the NRC as a 1-hour barrier prior to Appendix R (e.g., some Kaowool and 3M materials) and already installed by the licensee need not be replaced even though they may not have met the 325°F criteria." The existing Kaowool installations at Susquehanna SES were previously approved by the NRC. Each installation is protected by an automatic fire suppression system. While another barrier design may be preferable and has been utilized at Susquehanna SES, Kaowool provides a sufficient level of protection for raceways when fire suppression is provided so as to not warrant its replacement in areas of the plant where it is currently installed.

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APPENDIX R DEVIATION REQUEST NO. 19

INCOMPLETE FIRE SUPPRESSION AND FIRE DETECTION IN DIESEL GENERATOR FIRE AREAS

DEVIATION REQUEST:

Existing fire protection in Fire Areas D-1 and D-3, consisting of automatic suppression and detection in the basement (El 660'-0") and ground floor (El 677'-0") only, is adequate to protect redundant safe shutdown equipment located within the fire areas. Specifically, no automatic suppression or detection is required for the top floor (El 710'-9").

FIRE AREAS/ZONES AFFECTED:

This deviation covers Diesel Generator Fire Areas D-1 (0-41A) and D-3 (0-41C). Fire Areas D-2 and D-4 do not contain redundant safe shutdown equipment and, therefore, are not in deviation.

REASONS FOR DEVIATION REQUEST:

The requirements of 10CFR50, Appendix R, Sections III.G.2 require fire detection, and fire suppression when redundant safe shutdown equipment exist within a fire area. NRC guidance indicates fire detection and suppression should be provided throughout a fire area. Portions of the Diesel Generator Building does not satisfy these requirements.

EXISTING ARRANGEMENT:

Fire Areas D-1 and D-3 contain redundant safe shutdown equipment. Automatic suppression and fire detection is provided for the basement (El 660'-0") and the ground floor (El. 677'-0") of each fire area. The top floor of each fire area (El. 710'-9"), neither of which contain redundant safe shutdown equipment, are not provided with fire suppression or fire detection.

JUSTIFICATION:

The top floor (El. 710'-9") of each fire area contains fan equipment only, has minimal combustibles, and does not contain any redundant safe shutdown equipment and consequently does not present a hazard to redundant safe shutdown equipment located in the basement elevations.

APPENDIX R DEVIATION REQUEST NO. 20

PENETRATION SEALS - CONDUITS

DEVIATION REQUEST:

It is acceptable to seal new and existing conduits at Susquehanna SES which penetrate fire rated barriers by installing a non-combustible seal internal to the conduit in order to contain the products of combustion within the fire area of fire origin.

FIRE AREAS/ZONES AFFECTED:

The requirements for sealing penetrations through fire rated barriers are contained in a specification and are applied throughout the facility. Therefore, this deviation request applies to all fire area boundaries.

REASON FOR DEVIATION REQUEST:

The requirements of 10CFR50, Appendix R, Section III.G.2 require fire areas to have rated fire boundaries. In NRC Generic Letter 86-10, Section 8.8, the NRC indicated guidelines for sealing conduits as they passed through fire rated boundaries. The conduits passing through fire rated barriers at Susquehanna SES are protected in an equivalent manner. The purpose of this deviation request is to document that equivalency.

EXISTING ARRANGEMENT:

The specification criteria along with an in-plant inspection of all conduits which penetrate fire rated barriers assures that the conduits are sealed internally with a non-combustible material to contain the products of combustion within the fire area of fire origin and maintain the integrity of the fire area boundary.

JUSTIFICATION:

In accordance with NRC Generic Letter 86-10, the term fire area as used in Appendix R means an area sufficiently bounded to withstand the hazards associated with the fire area and, as necessary, to protect important equipment within the fire area from a fire outside the area.

The installation of a non-combustible seal internal to conduits penetrating fire area boundaries accomplishes the above purpose. Typically, these seals consist of a ceramic fiber damming material topped with either silicone foam or a fire retardant putty installed at the first available access point on one side of the fire barrier.

See attached drawing B-213419 for examples of some typical installations.

APPENDIX R DEVIATION REQUEST NO. 21

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APPENDIX R DEVIATION REQUEST NO. 23

CONTROL STRUCTURE
FIRE AREA CS-9
PARTIAL FIRE SUPPRESSION

DEVIATION REQUEST:

Fire protection provided in Fire Area CS-9 is adequate to protect the identified hazard. Specifically, the fire area is constantly manned by operations personnel who would detect and react to a fire, the area is provided with partial suppression, manual suppression is available, and the capability to achieve safe shutdown through alternative equipment is provided by the remote shutdown panel located outside the fire area.

FIRE AREAS/ZONES AFFECTED:

This deviation applies to Fire Area CS-9.

REASON FOR THE DEVIATION REQUEST:

Dedicated shutdown capability in accordance with Appendix R, Section III.G.3 has been provided for use in the event of a fire in the control room. The above was provided since separation of redundant trains of safe shutdown equipment within the control room does not satisfy the requirements of 10CFR50, Appendix R, Section III.G.2. Complete Fire suppression has not been provided throughout Fire Area CS-9.

EXISTING CONDITIONS:

The following conditions exist in Fire Area CS-9:

Zone	Protection	Safe Shutdown Equipment
0-26A	None	None
0-26E	None	None
0-26F	Manual Spurt CO_2 under floor (Fixed Piping)	Yes
0-26G	Manual Spurt CO_2 under floor (Fixed Piping)	Yes
0-26H	Manual Spurt CO_2 under floor (Fixed Piping)	Yes
0-26I	Manual Spurt CO_2 under floor (Fixed Piping)	Yes
0-26J	Manual Spurt CO_2 under floor (Fixed Piping)	Yes
0-26K	Automatic Sprinkler Protection	Yes
0-26L	Automatic Sprinkler Protection	Yes
0-26M	Manual Spurt CO_2 (Fixed Piping)	Yes
0-26N	Manual Spurt CO_2 (Fixed Piping)	Yes
0-26P	Manual Spurt CO_2 (Fixed Piping)	Yes
0-26R	Manual Spurt CO_2 (Fixed Piping)	Yes

The release of CO_2 is controlled manually to minimize the effects of a CO_2 discharge on plant operation. Manual control stations are provided both inside and outside the fire area. Fire Zones with constant occupancy (0-26G, 0-26H, and 0-26I) are provided with under floor protection only.

Complete automatic sprinkler protection has been provided for Fire Zone 0-26K and 0-26L.

Fire Zones 0-26F and 0-26J are vestibules and contain safety related cables below the raised floor. These cables are protected by manual spurt CO_2.

Portable extinguishers are available for use in the fire area. A hose station is available within the control structure for use in the fire area.

JUSTIFICATION:

It has been demonstrated during the performance of startup and test program that full shutdown is achievable without reliance on the Control Room. The existing protection provided in Fire Area CS-9 is adequate to protect the identified cable hazards. It is expected that since the control room is constantly manned by operations personnel, any fire would be detected and extinguished prior to activation of a suppression system. The addition of more suppression capability would not enhance, to a significant degree, the protection of safe shutdown functions.

APPENDIX R DEVIATION REQUEST NO. 24

AUTOMATIC FIRE SUPPRESSION IN FIRE ZONE 2-5D

DEVIATION REQUEST:

The installation of an automatic fire suppression system in Fire Zone 2-5D in order to comply with Appendix R, Section III.G.2.b would not significantly enhance the fire protection for that zone nor overall plant safety, and therefore is not required.

FIRE ZONE AFFECTED:

This deviation request applies only to Fire Zone 2-5D, which is in Fire Area R-2A.

REASON FOR DEVIATION:

10CFR50, Appendix R, Section III.G.2.b requires the existence of an automatic fire suppression system, in addition to fire detectors, in those fire areas where separation of redundant safe shutdown cables and equipment is greater than 20 feet with no intervening combustibles. Fire Zone 2-5D contains cables for HV-E21-2F005A (Div. I) and power cables from 2D613 and 2D653A (Div. I) as well as Valve HV-G33-2F004 (Div. II).

Redundant safe shutdown equipment/cables in Fire Zone 2-5D are separated by a horizontal spatial distance of approximately 50 feet with negligible intervening combustibles. No automatic fire suppression system exists in the fire zone. Fire Zone 2-5D is a fire zone in which relief from the automatic fire suppression system requirement of Appendix R, Section III.G.2.b is sought.

EXISTING ARRANGEMENT:

RWCU Outboard Isolation Valve HV-G33-2F004 is normally open during power operation and is required closed to isolate reactor coolant letdown to the RWCU System when performing plant shutdown for an Appendix R scenario. In the event valve HV-G33-2F004 is unavailable, the RWCU Inboard Isolation Valve HV-G33-2F001 may be called upon to close to isolate reactor coolant letdown. Valve HV-G33-2F001 is located inside containment (Fire Zone 2-4F) and HV-G33-2F004 is located in Fire Zone 2-5D.

For a fire in Fire Zone 2-5D (physical location of valve HV-G33-2F004), HV-G33-2F004 (Div. II) and its cables may be disabled. The valve and its cables are located in the North-West corner of the fire zone (refer to Drawing C-1824). The cables travel West to Fire Zone 2-5C. No cables for Inboard Isolation Valve HV-G33-2F001 (Div. I) are located in Fire Zone 2-5D. Cables for Valve HV-G33-2F001 and its power supply wrapped in adjacent (i.e., communicating) Fire Zones (2-4A-W and 2-5A-W) except for 2-4A-S for which 3-hour barrier upgrades are provided between zones. Refer to Figures C-1732, sh. 1, R1, and C-1731, sh. 1, R1, for applicable fire zone layouts.

The total in-situ combustible loading in Fire Zone 2-5D is less than 10 minutes assuming all combustibles are fully consumed. The combustibles consist of a total of five (5) gallons of lube oil (five separate one gallon locations) and cable in cable trays.

Actual in-situ combustible loading durations are provided to document existing arrangement and justify the deviation request. These values are based on the initial combustible loading analysis. Modifications subsequent to this analysis have revised these values with the possibility of future modifications revising them again. The governing criteria for the combustible loading analysis is that the fire area fire resistance rating exceed the combustible loading duration. The combustible loading durations specified in the deviation request will not be updated in the future since program commitments require that all modifications be evaluated to assure that additional combustibles are controlled to remain below the fire area fire resistance rating.

Division I cable trays E2PK, E2KK, 2PKB, and 2KKB are located at the east end of Fire Zone 2-5D and are separated from Valve HV-G33-2F004 (Div. II) by a horizontal distance of about 49 feet at the closest point. The effect of combustible oil in the fire zone was evaluated with respect to Div. I cable trays. The five gallons total of lube oil in the fire zone is composed from 1 gallon in each of the Cleanup System Recirculation Pumps (2P221A and B) and 1 gallon in each of three valves (HV-G33-2F042, HV-G33-2F044, and HV-G33-2F104--each are non-safe shutdown valves). The pumps are located in individual cubicles each equipped with a floor drain which contains any spilled lube oil within the pump cubicles. The spatial separation between HV-G33-2F004 and the closest pump lube oil is approximately 17 feet and is separated by a pump cubicle wall. The pump cubicles are totally enclosed by concrete and/or masonry walls and communicate only with the valve HV-G33-2F004 area via a few penetrations in the labyrinth wall arrangement. The three valves and hence the three gallons of lube oil, are separated from valve HV-G33-2F004 by approximately 35 feet of horizontal spatial separation. Within the 35 feet between the valves exists two floor drains which would preclude a lube oil fire from affecting valve HV-G33-2F004. The lube oil is the only intervening combustible between HV-G33-2F004 and the redundant safe shutdown equipment cables (refer to C-1824).

The above-mentioned cable trays constitute the only other combustibles in Fire Zone 2-5D. However, the large horizontal spatial separation of the cable trays from HV-G33-2F004 and the intervening labyrinth wall arrangement make these combustibles inconsequential.

Fire Zone 2-5D is equipped with fire detection.

JUSTIFICATION:

A study performed, which included analyzing the combustible loading configuration of Fire Zone 2-5D, determined that a fire occurring in Fire Zone 2-5D is highly improbable based on the negligible level of in-situ combustible loading. However, assuming a fire did start in Fire Zone 2-5D, approximately 50 feet horizontal spatial separation exists between

redundant safe shutdown equipment/cables. Currently, the only intervening combustibles are five gallons of lube oil which are protected for spillage by pump cubicles and floor drains such that any spilled lube oil will not contribute to the propagation of a fire. Additionally, the closest lube oil to Valve HV-G33-2F004 is approximately 17 feet separated by an intervening concrete/masonry wall, which provides substantial assurance that a fire will not disable redundant safe shutdown equipment/cables that are approximately 50 feet apart.

Based on the low probability of a fire in Fire Zone 2-5D, and the insignificant consequences of a fire (due to the configuration of the room) if one were to start, the only possible concerns, therefore, are: 1) a fire may start due to the presence of transient combustibles, and 2) a fire may spread from an adjacent fire zone to Fire Zone 2-5D with the existence of transient combustibles as the fire propagation medium. Both of these concerns are alleviated by controlling the level of transient combustibles in Fire Zone 2-5D and by zone barrier upgrades to prevent such communication between zones where different shutdown paths are specified.

The introduction of transient combustibles into Fire Zone 2-5D would be limited due to infrequent access to the room since the fire zone is a high radiation area during normal operation. Additionally, NRC Generic Letter 86-10, Section 3.6.2 stipulates that transient combustibles need not be considered intervening combustibles. The second concern is further addressed in the communicating fire zone discussions below.

Fire Zone 2-5D has five adjacent fire zones as follows: 2-4A-S, 2-4A-W, 2-5A-S, 2-5A-W and 2-5C. Only Fire Zones 2-4A-S, 2-4A-W and 2-5A-W contain cables for redundant isolation valve HV-G33-2F001 or its power supply (2A203). A study conducted concluded that a fire involving the worst case spatial separation would have to start in Fire Zone 2-4A-S (a fire zone with low in-situ combustibles) damaging cables for valve 2F001 or power source 2A203, traverse into Fire Zone 2-5D through the small penetration (3 inch diameter, X-34-5-71), propagate 50 feet horizontally via negligible in-situ combustibles in Fire Zone 2-5D, and damage cables for valve 2F004 or the valve itself. This scenario is highly improbable based on the large spatial separation and low amounts of combustible loading in both fire zones. Hence, operability of RWCU Inboard Isolation Valve HV-G33-2F001 is assured for a fire in Fire Zone 2-5D. For a fire in Fire Zone 2-4A-S, HV-G33-2F004 is assured operable.

Therefore, based on the existence of: 1) large spatial separation between redundant safe shutdown equipment, 2) fire detection, 3) minimal in-situ combustibles and 4) negligible intervening combustible loading in Fire Zone 2-5D, the current configuration provides an equivalent degree of safety as that required by Section III.G.2 of Appendix R.

The installation of an automatic fire suppression system in Fire Zone 2-5D to meet the requirements of 10CFR50 Appendix R, Section III.G.2 would not significantly augment the level of fire protection for that fire zone.

Future Appendix R compliance is assured by: 1) Wrapping safe shutdown raceways that are needed for a fire in Fire Zone 2-5D, 2) installing three-hour fire rated penetration seals for any future penetrations in the barrier separating Fire Zones 2-5D and 2-4A-S and 3) by controlling the level of transient combustibles in Fire Zone 2-5D.

APPENDIX R DEVIATION REQUEST NO. 25

AUTOMATIC FIRE SUPPRESSION AND INTERVENING COMBUSTIBLES IN FIRE ZONE 1-3A

DEVIATION REQUEST:

The current location of the Core Spray flow instruments and the automatic suppression and combustible loading configuration in Fire Zone 1-3A provides an equivalent degree of safety as that required by Appendix R, Section III.G.2.b.

FIRE ZONE AFFECTED:

This deviation request applies only to Fire Zone 1-3A, which is in Fire Area R-1A.

REASON FOR DEVIATION:

10CFR50, Appendix R, Section III.G.2.b requires the existence of an automatic fire suppression system, in addition to fire detectors, in those fire areas where separation of redundant safe shutdown cables and equipment is greater than 20 feet with no intervening combustibles.

The redundant Core Spray flow instruments in Fire Zone 1-3A (in Fire Area R-1A) are separated by greater than 20 feet (approximately 45 feet) with partial automatic fire suppression and full detection in the local area of concern. However, cable trays are located between the redundant Core Spray flow instruments.

EXISTING ARRANGEMENT:

In Fire Zone 1-3A, Division 2 of safe shutdown equipment is assured available for plant shutdown. Core Spray (CS) System flow instruments FIS-E21-1N006B and FT-E21-1N003B are located in Fire Zone 1-3A and are required operable for proper functioning of the Division 2 CS System. The Division 2 CS flow instruments are separated by approximately 45 feet from Division 1 CS flow instruments FIS-E21-1N006A and FT-E21-1N003A, including instrument tubing for the respective instruments. Additionally, all other Division 1 safe shutdown components in Fire Zone 1-3A have greater spatial separation from Division 2 CS flow instruments than that mentioned above. Thus, the 45 feet horizontal spatial separation between redundant CS flow instruments is the limiting case requiring evaluation (refer to C-1834 Sheet 1). The combustible loading in Fire Zone 1-3A is approximately 60 minutes.

Actual in-situ combustible loading durations are provided to document existing arrangement and justify the deviation request. These valves are based on the initial combustible loading analysis. Modifications subsequent to this analysis have revised these values with the possibility of future modifications revising them again. The

governing criteria for the combustible loading analysis is that the fire area fire resistance rating exceed the combustible loading duration. The combustible loading durations specified in the deviation request will not be updated in the future since program commitments require that all modifications be evaluated to assure that additional combustibles are controlled to remain below the fire area fire resistance rating.

Automatic fire suppression exists in all of Fire Zone 1-3A except between Column Lines 23.5 and 25. The automatic fire suppression system configuration in Fire Zone 1-3A is such that adequate coverage (greater than 25 feet) is afforded between redundant CS flow instruments (refer to C-1834). The 45 feet separating the redundant CS flow instruments is fully covered by detection.

Several cable trays traverse North-South in Fire Zone 1-3A between the redundant CS flow instruments. The cable trays are the only source of combustibles located between the redundant CS flow instruments. The cable trays are entirely enclosed by sheet metal between Column Lines 25 and 26.5. This constitutes greater than 20 horizontal feet in which the enclosed raceways are protected by automatic fire suppression and detection systems. Additionally, the lowest cable tray has a vertical spatial separation of approximately 13 feet from the CS flow instruments located below (refer to C-1834 Sheet 2).

JUSTIFICATION:

To meet the requirements of 10CFR50, Appendix R, Section III.G.2.b, the following features must exist to ensure that a fire is limited so that only one division of redundant components important to safe shutdown is affected:

a. fire detection,
b. automatic fire suppression,
c. greater than 20 feet horizontal separation between redundant safe shutdown equipment/cables, and
d. no intervening combustibles.

In the local area where Section III.G.2.b separation is sought, detectors 1I-240, 1I-255 and 1I-256 provide the necessary fire detection to alert operators of the onset of a fire in the CS flow instrument location. Hence, the level of fire detection in Fire Zone 1-3A meets the requirements of Section III.G.2.b.

The automatic fire suppression system in the local area of concern in Fire Zone 1-3A (Fire Area R-1A) provides suppression capability to immediately suppress a fire in its incipient stages. Fire Zone 1-3A has automatic fire suppression coverage of greater than 25 feet in the local area where Section III.G.2.b separation is sought. Hence, although automatic fire suppression is not available in the entire Fire Zone 1-3A, the current configuration of automatic fire suppression provides more than adequate suppression to cover the 20 feet horizontal spatial separation required by Section III.G.2.b. The installation of an area-wide automatic fire suppression system in Fire Area R-1A to meet the requirements of

10CFR50 Appendix R, Section III.G.2 would not significantly augment the level of fire protection for the redundant CS flow instruments.

The spatial separation between redundant CS flow instruments (including their respective instrument tubing) in Fire Zone 1-3A is more than twice that required by Section III.G.2.b. The 45 feet separating the redundant components provides a high degree of margin for safety, in the event of a fire, to ensure both divisions of CS flow instruments will not be disabled. Hence, the spatial separation between redundant CS flow instruments more than meets the requirements of Section III.G.2.b. All necessary raceway are protected with fire rated wraps to ensure adequate protection between redundant divisions of safe shutdown cables in the local area of the flow instruments. In addition, the 13 feet vertical spatial separation between the CS flow instruments and the cable trays further reduces the possibility of a fire in the cable trays affecting the CS flow instruments.

Appendix R compliance assures that no intervening combustibles be located between the redundant CS flow instruments. The only combustibles located in this local area consist of cables in cable trays (note that cables routed in conduits, terminal boxes and junction boxes do not constitute intervening combustibles). However, each of the cable trays located in the local area of concern in Fire Zone 1-3A, is fully enclosed by sheet metal (top, bottom, and sides), for the 25 feet in which automatic suppression and detection exists. NRC Generic Letter 86-10, Section 3.6.2 states that "cables in cable trays having solid sheet metal bottom, sides and top, if protected by automatic fire detection and suppression systems and if the design is supported by a fire hazards analysis, have been found acceptable under the exemption process." This deviation request constitutes the documentation of the fire hazards analysis that supports the adequacy of the existing fire protection features in the local area of concern. Hence, based on the above discussion, the cables trays routed between the redundant CS flow instruments do not constitute intervening combustibles.

Also note that the introduction of transient combustibles is highly unlikely due to the narrow passageway (approximately three feet wide) in the location under review. Moreover, NRC Generic Letter 86-10 specifically states that transient materials are not considered intervening combustibles. Hence, Appendix R Section III.G.2.b requirements regarding intervening combustibles is currently met.

Therefore, based on: 1) the greater than 45 feet spatial separation between redundant safe shutdown equipment in Fire Zone 1-3A, 2) the existence of fire detection and automatic suppression of greater than 25 feet coverage in the local area of concern, and 3) no intervening combustible loading, the current configuration provides an equivalent degree of safety as that required by Section III.G.2 of Appendix R.

The installation of an area-wide automatic fire suppression system in Fire Area R-1A to meet the requirements of 10CFR50 Appendix R, Section III.G.2 would not significantly augment the level of fire protection for the redundant CS flow instruments.

APPENDIX R DEVIATION REQUEST NO. 26

SEPARATION OF REDUNDANT SAFE SHUTDOWN CAPABILITY IN FIRE ZONE 2-3B-N

DEVIATION REQUEST:

The current location of the Core Spray (CS) flow instruments and Residual Heat Removal (RHR) isolation valve control circuits and components relative to the combustible loading configuration in Fire Zone 2-3B-N provides a degree of safety equivalent to that required by Appendix R, Section III.G.2.b and their enclosure with fire rated barriers is not required. The affected instruments/circuits for CS include FIS-E21-2N006A, FT-E21-2N003A, FIS-E21-2N006B, FT-E21-2N003B and circuits. The affected components/circuits for RHR include HV-E11-2F008 and HV-E11-2F009 circuits, Pressure Instrument B31-N018A and Control Relay K33.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies only to Fire Zone 2-3B-N (Unit 2 Reactor Building Elevation 683'), which is in Fire Area R-2B.

REASON FOR DEVIATION:

10CFR50, Appendix R, Section III.G.2.b requires the absence of intervening combustibles between redundant safe shutdown equipment, in those fire areas where separation of redundant safe shutdown cables and equipment is greater than 20 feet with automatic suppression and detection.

The redundant Core Spray (CS) flow instruments in Fire Zone 2-3B-N (in Fire Area R-2B) are separated by greater than 20 feet (approximately 41 feet) with automatic fire suppression and detection coverage in the local area of concern. However, automatic fire suppression and detection does not completely cover Fire Zone 2-3B-N; and intervening combustibles (conduits with Thermo-Lag fire barriers and cable trays) are located between the redundant CS flow instruments.

The redundant Residual Heat Removal (RHR) isolation valve control circuits and components in Fire Zone 2-3B-N (in Fire Area R-2B) are separated by greater than 20 feet (approximately 36 feet) with automatic fire suppression and detection coverage in the local area of concern. However, automatic fire suppression and detection does not completely cover Fire Zone 2-3B-N; and intervening combustibles (conduits with Thermo-Lag fire barriers and cable trays) are located between the redundant RHR isolation valve control circuits and components.

EXISTING ARRANGEMENT:

Core Spray (CS):

In Fire Zone 2-3B-N, Division I of safe shutdown equipment is assured available for plant shutdown. CS flow instruments FIS-E21-2N006A and FT-E21-2N003A are located in Fire Zone 2-3B-N and are required operable for proper functioning of the Division I CS System. The Division I CS flow instruments are separated by approximately 41 feet from Division II CS flow instruments FIS-E21-2N006B and FT-E21-2N003B, including instrument tubing for the respective flow instruments. Additionally, all other unprotected Division II safe shutdown components in Fire Zone 2-3B-N have greater spatial separation from Division I CS flow instruments than that mentioned above. Thus the 41 feet horizontal spatial separation between redundant CS flow instruments is the limiting case requiring evaluation (refer to attached Drawing C-1835).

Automatic fire suppression and detection exist in Fire Zone 2-3B-N from Column Line P to Q. The 41 feet separating the redundant CS flow instruments is fully covered by automatic fire suppression and detection (refer to attached Drawing C-1835, Sheets 1 and 2).

Several cable trays with sheet metal covers (top and bottom) and some conduits with Thermo-Lag fire barriers traverse North-South in Fire Zone 2-3B-N between the redundant CS flow instruments. The cable in the cable trays and the Thermo-Lag on the conduits are the only source of combustibles located between the redundant CS flow instruments. The cable trays are entirely enclosed by sheet metal covers between Column Lines 31.5 and 33, which constitutes greater than 25 horizontal feet in which fully enclosed raceways are protected by automatic fire suppression and detection systems. The lowest cable tray has a vertical spatial separation of approximately 12 feet from the CS flow instruments located below (refer to attached Drawing C-1835, Sheet 2). The lowest conduit with a Thermo-Lag fire barrier has a vertical spatial separation of greater than 12 feet from the CS flow instruments located below (refer to attached Drawing C-1835, Sheet 2).

Adequate separation exists between CS flow instruments FIS-E21-2N006A and FIS-E21-2N006B such that FIS-E21-2N006A and raceway (junction box and flex conduit to FIS-E21-2N006A do not require fire barriers. Adequate separation exists between CS flow instruments FT-E21-2N003A and FT-E21-2N003B such that FT-E21-2N003A and raceway (junction box and flex conduit to FT-E21-2N003A) do not require fire barriers.

Residual Heat Removal (RHR):

As stated above, in Fire Zone 2-3B-N, Division I of safe shutdown equipment is assured available for plant shutdown. Redundant RHR isolation valves, HV-E11-2F008 and HV-E11-2F009, have control circuit cables and components located in Fire Zone 2-3B-N.

HV-E11-2F009 control circuit location is limited to the south end of 2-3B-N, south of Instrument Rack, 2C006. Pressure Instrument B31-N018A and Control Relay K33 are located on Instrument Rack 2C006 and provide an open permissive to Valve HV-E11-2F009. Relay K33 is mounted in Terminal Box TB2C006-B3 located on south end of Instrument Rack 2C006. Pressure Instrument B31-N018A is located about 1 foot above Terminal Box TB2C006-B3 and 2 feet below Terminal Box TB2C006-B2. These are the only Valve HV-E11-2F009 components outside of scheduled cable located in Fire Zone 2-3B-N. Flex conduit is used to connect wiring to these components at Instrument Rack 2C006. Rigid steel conduits E2K454 and E2K1Z1 route control circuit cables from TB2C006-B2 to Tray Section E2KH62. Tray Section E2KH62 is located directly above TB2C006-B2 at Elevation 708'-6". Adequate separation exists between RHR redundant components such that Pressure Instrument B31-N018A, Terminal Box TB2C006-B3 with Relay K33 and raceway (E2K454, E2K1Z1 and E2KH62*) do not require fire barriers.

* This section of E2KH62 is protected with Thermo-Lag because it contains circuits for Division I CS flow instruments. Valve HV-E11-2F009 control circuit cables immediately leave Fire Zone 2-3B-N in Tray Section E2KH62 through the south wall of Fire Zone 2-3B-N (refer to attached Drawing C-1835, Sheets 1 and 2).

RHR Valve HV-E11-2F008 Division II control circuits enter Fire Zone 2-3B-N at tray F2KF61 through a 3-hour fire rated floor penetration X-30-3-61 approximately 36 feet north of Terminal Box TB2C006-B3, and 7 feet north of Column Line 33. Division II control circuits are routed vertically to Elevation 711'-9" and then north towards MCC 2D274. Division II, HV-E11-2F008, redundant components are all located in the northern section of Fire Zone 2-3B-N at MCC 2D274 and Instrument Rack TB2C022. MCC 2D274 is approximately 105 feet north of Division I components at Instrument Rack 2C006 and Division II Instrument Rack, 2C022, is approximately 81 feet north and 60 feet east of Division I Instrument Rack 2C006. (refer to C-1730, Sheet 1).

Automatic fire suppression and detection exist in Fire Zone 2-3B-N from Column Line P to Q. The 36 feet separating the redundant RHR isolation valve control circuits or components is fully covered by automatic fire suppression and detection (refer to attached Drawing C-1835, Sheet 1).

The same cable trays and conduits with Thermo-Lag fire barriers mentioned in the CS flow instruments evaluation above exist between RHR isolation valve control circuits and components. The closest spatial distance between redundant RHR Valve

HV-E11-2F008 and HV-E11-2F009 control circuits or components is approximately 36 feet between Terminal Box TB2C006-B3 and Division II Tray F2KF61. The lowest cable tray has a vertical spatial separation of approximately 12 feet from the RHR isolation valve control circuits and components located below (refer to attached Drawing C-1835, Sheet 2). The lowest conduit with a Thermo-Lag fire barrier has a vertical spatial separation of greater than 12 feet from the RHR isolation valve control circuits and components located below (refer to attached Drawing C-1835, Sheet 2).

JUSTIFICATION:

To meet the requirements of 10CFR50, Appendix R, Section III.G.2.b, the following features must exist to ensure that a fire is limited so that only one division of redundant components important to safe shutdown is affected:

a. Fire detection,
b. Automatic fire suppression,
c. Greater than 20 feet horizontal separation between redundant safe shutdown equipment/cables, and
d. No intervening combustibles.

Fire Detection:

In the local areas where Section III.G.2.b separation is sought, ionization detectors provide the necessary fire detection to alert operators of the onset of a fire in the location of CS flow instruments or redundant RHR isolation valve control circuits and components. Hence, the level of fire detection in Fire Zone 2-3B-N meets the requirements of Section III.G.2.b (refer to attached Drawing C-1835, Sheet 1 for approximate fire detector locations).

Automatic Fire Suppression:

The automatic fire suppression system in the local areas of concern in Fire Zone 2-3B-N (Fire Area R-2B) provides ample suppression capability to immediately suppress a fire. Fire Zone 2-3B-N has full automatic fire suppression, i.e., Preaction System PA-231, in the areas in which Section III.G.2.b separation is sought. The portion of Fire Area R-2B without automatic suppression is located between Column Lines 29 and 30.5 from Column Lines Q and S (refer to Drawing C-1730, Sheet 3). The installation of an area-wide automatic fire suppression system in Fire Area R-2B to meet the requirements of 10CFR50 Appendix R, Section III.G.2 would not augment the level of fire protection for the redundant CS flow instruments and RHR isolation valve control circuits and components.

Spatial Separation:

The spatial separation between redundant CS flow instruments (including their respective instrument tubing) in Fire Zone 2-3B-N is more than twice that required by

Section III.G.2.b. The 41 feet separating the redundant CS flow instruments provides a high degree of margin for safety, in the event of a fire, to ensure both divisions of CS flow instruments will not be disabled. Due to spatial separation, E21-2N003A, FIS-E21-2N006A and raceway (junction boxes and flex conduit to FT-E21-2N003A and FIS-E21-2N006A) do not require fire barriers.

The minimum separation between redundant RHR isolation valve control circuits and components in Fire Zone 2-3B-N is sixteen feet greater than that required by Section III.G.2.b. The 36 feet separating the redundant control circuits and components provides a high degree of margin for safety, in the event of a fire, to insure both divisions of RHR valve control circuits and components will not be disabled. Due to spatial separation, Pressure Instrument B31-N018A, Instrument Rack TB2C006 with Relay K33 and raceway (E2K454, E2K1Z1 and E2KH62) do not require fire barriers.

The spatial separation between redundant CS flow instruments and RHR valve control circuits and components more than meets the requirements of Section III.G.2.b. All necessary raceways are protected with fire rated barriers to ensure adequate protection between redundant divisions of safe shutdown cables in the local areas of concern. In addition, the vertical spatial separation between the CS flow instruments and RHR isolation valve control circuits and components to the cable trays and conduits with Thermo-Lag fire barriers further reduces the possibility of a fire affecting the CS flow instruments or RHR isolation valve control circuits and components.

Intervening Combustibles:

Appendix R compliance requires that no intervening combustibles be located between the redundant CS flow instruments and RHR isolation valve controls and control circuits. The only combustibles located in this local area consist of cables in cable trays and conduits with Thermo-Lag fire barriers (note that cables routed in conduits, terminal boxes and junction boxes do not constitute intervening combustibles). However, each of the cable trays located in the local area of concern in Fire Zone 2-3B-N, is fully enclosed by sheet metal (top, bottom, and sides), for greater than 25 feet in which automatic suppression and detection exists. NRC Generic Letter 86-10, Enclosure 2, Section 3.6.2 states that "cables in cable trays having solid sheet metal bottom, sides and top, if protected by automatic fire detection and suppression systems and if the design is supported by a fire hazards analysis, have been found acceptable under the exemption process." Based on the above discussion, the cable trays routed between the redundant CS flow instruments and between RHR isolation valve control circuits and components do not constitute intervening combustibles. However, the Thermo-Lag fire barriers on the raceway must be considered as intervening combustibles and this deviation request constitutes the documentation of the fire hazards analysis that supports the adequacy of the existing fire protection features in the local area of concern.

Actual in-situ combustible loading fire durations of the existing arrangement have been determined. These values are based on the initial combustible loading analysis and

subsequent modifications. The governing criteria for the combustible loading analysis is that the Fire Zone fire resistance rating exceeds the combustible loading fire duration. The addition of Thermo-Lag to Fire Zone 2-3B-N as a combustible adds less than 6 minutes to the existing combustible loading fire duration. The additional fire loading due to the Thermo-Lag fire barriers on the raceway in Fire Zone 2-3B-N does not result in exceeding the Fire Zone fire resistance rating.

In the local area (located between the redundant CS flow instruments and RHR isolation valve controls and control circuits), the only in-situ combustible to be considered (as per above) is the Thermo-Lag fire barriers on the conduits. Thermo-Lag 330-1 has an ignition temperature of approximately 1000°F. Due to the presence of automatic suppression and detection in this fire zone, temperatures in this range will never be reached and a fire will not propagate along the Thermo-Lag on the conduits to either redundant CS or RHR components.

Also note that the likelihood of introduction of transient combustibles is highly unlikely due to the narrow passageway (approximately three feet wide) in the location under review. Moreover, NRC Generic Letter 86-10 specifically states that transient materials are not considered intervening combustibles.

Conclusion:

Based on: 1) the 41 and 36 foot spatial separations between redundant safe shutdown equipment in Fire Zone 2-3B-N, 2) the existence of fire detection and automatic suppression coverage in the local area of concern, and 3) the acceptable combustible loading analysis, the current configuration provides an equivalent degree of safety as that required by Section III.G.2.b of Appendix R without the addition of fire rated barriers.

In addition, the installation of automatic fire suppression throughout the remainder of Fire Area R-2B to meet the requirements of 10CFR50 Appendix R, Section III.G.2 would not significantly augment the level of fire protection for the redundant CS flow instruments or the RHR isolation valve control circuits and components in this specific section of Fire Area R-2B.

The future addition of intervening combustibles in the local area of interest is controlled by program commitments that require all modifications be evaluated to ensure that combustible loading fire durations remain below the Fire Zone fire resistance rating and conclusions made here-in are reviewed for applicability.

Therefore, the following components and raceway containing circuits for these components in this fire zone do not need to be protected.

Core Spray

- FIS-E21-2N006A
- FT-E21-2N003A
- Junction box and flex conduit to FIS-E21-2N006A
- Junction box and flex conduit to FT-E21-2N003A

RHR

- Pressure Instrument B31-N018A
- Relay K33 in TB2C006-B3 on Instrument Rack TB2C006
- Raceway E2K454, E2K1Z1 and E2KH62*

* E2KH62 is protected with a qualified raceway fire barrier for the CS flow instrument circuits, but is not required to be protected for the RHR HV-E11-2F009 circuits.

APPENDIX R DEVIATION REQUEST NO. 27

NUCLEAR BOILER INSTRUMENTATION IN FIRE ZONE 1-5A-S

DEVIATION REQUEST:

The current arrangement of Nuclear Boiler Instrumentation in Fire Zone 1-5A-S provides an equivalent degree of safety as that required by 10CFR50, Appendix R, Section III.G.2.b based on the present in-situ combustible loading configuration, horizontal separation of redundant safe shutdown ECCS interlock components of 14 feet, horizontal separation of redundant safe shutdown vessel indication components of 6 feet, plant procedure to control transient combustibles and the existing fire suppression and detection provided in the area.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies only to Fire Zone 1-5A-S, which is in Fire Area R-1A.

REASON FOR DEVIATION REQUEST:

10CFR50, Appendix R, Section III.G.2.b requires the existence of an automatic fire suppression system, in addition to fire detectors, in those fire areas where separation of redundant safe shutdown cables and equipment is greater than 20 feet with no intervening combustibles.

The redundant Nuclear Boiler Instrumentation in Fire Zone 1-5A-S as identified in Table DR27-1 does not meet the separation criteria as required by Appendix R, Section III.G.2.b. The horizontal separation of individual redundant ECCS interlock components is 14 feet and horizontal separation of the redundant vessel indication components is 6 feet. Automatic fire suppression and detection is provided in Fire Zone 1-5A-S above the instrument racks.

EXISTING ARRANGEMENT

Both divisions of required nuclear boiler instruments are located in Fire Zone 1-5A-S. The instruments and terminal boxes on instrument rack 1C004 required for Unit 1 safe shutdown are identified in Table DR27-1. The instruments and terminal boxes on instrument rack 1C005 required for Unit 1 safe shutdown are also identified on Table DR27-1. The arrangement of the instruments was designed to insure proper RPS input of the "1-out-of-2-taken-twice" logic for a single instrument line failure. A fire which damages these instruments or their circuitry could result in either a loss of automatic functions or a spurious signal to the automatic initiation logic. The existing arrangement of the nuclear boiler instrument racks and other related equipment is shown on Drawing C-213437.

The combustible loading in Fire Zone 1-5A-S is low. The area around these racks is protected by automatic fire suppression installed using NFPA 13 as a guide and fire detection installed using NFPA 72D and 72E as a guide.

Several cable trays traverse East-West in front of and above the nuclear boiler instrument racks. Three cable trays are enclosed by sheet metal, while one other is a ladder type tray enclosed on the top. The lowest cable tray is 13 feet above the floor and 7 feet above the instrument racks. Cable insulation meets the requirements of IEEE-383 Flame Test.

JUSTIFICATION:

To meet the requirements of 10CFR50, Appendix R, Section III.G.2.b, the following features must exist to ensure that a fire is limited so that one division of redundant components important to safe shutdown is available:

a. fire detection,
b. automatic fire suppression,
c. no intervening combustibles, and
d. greater than 20 feet horizontal separation between redundant safe shutdown equipment/cables.

Requirements a and b are met and a fire hazard analyses has demonstrated that the existing configuration is acceptable even though requirements c and d are not met.

Justification is as follows:

1. Fire Detection & Suppression

   Fire Zone 1-5A-S is protected by an automatic fire suppression and detection system.

   The automatic fire suppression system in Fire Zone 1-5A-S provides suppression capability to suppress a fire. This fire zone has full ceiling and lower level coverage in the area of the reactor building chillers and the instrument racks 1C004 and 1C005.

2. In-Situ Combustible Fire Hazard Analyses

   The only combustibles located in the immediate vicinity of the nuclear boiler instrumentation are fire protected raceways, cable trays, terminal blocks and the instruments themselves. The instruments contain negligible combustibles and are completely encased in metal enclosures which will contain any internal fire within the housing. Terminal blocks for external cable connections are also completely enclosed in metallic boxes. Therefore, even with very little horizontal spatial separation, any fire on an instrument rack will not be propagated to other

racks, equipment, or cable trays. There are four cable trays in the area; three are completely enclosed by sheet metal and one is a ladder type enclosed on top but open on the bottom. The trays completely enclosed are not considered to constitute intervening combustibles, while the open tray does constitute an intervening combustible. The cable tray that is not enclosed is equipped with fire resistant cables that have passed the IEEE-383 flame test. Due to the type of materials used, the cables have a low probability for spreading fire. Any fire in the cable trays will not propagate downward to impact the nuclear boiler instruments. All Division II safe shutdown cables in this fire zone have been addressed as a part of the Appendix R Safe Shutdown Analysis and have been protected if necessary. The fire protective barrier on the raceways in the vicinity of the racks is Thermo-Lag which is considered to be an intervening combustible. Due to the high ignition temperature and distance from the racks, the protective barrier has no impact on the required nuclear boiler instrumentation.

Other combustibles within the fire zone are various control panels and lube oil from the reactor building chillers and fuel pool cooling pumps. The control panels contain very little combustible materials within enclosed metallic housing, have spatial separation greater than 8 feet, and therefore, have no impact on the required nuclear boiler instrumentation. The lube oil equipment is located in areas where the floor is sloped to local floor drains. The drainage areas are of sufficient size to contain any oil spill. The areas are equipped with full suppression over the chillers and pumps to mitigate the spread of a fire. Horizontal spatial separation between pumps/chiller and the instruments rack is greater than 20 feet. In addition, the fuel pool cooling pumps are located within the fuel pool cooling room which is surrounded by concrete walls.

3. Transient Combustible Fire Hazard Analysis

Based on limited quantities of transient combustibles and fire suppression systems, any fire caused by transients will be limited in size. The resultant fire is defined to be a cylindrical area of influence with a radius of 5 feet and a height of 10 feet. Therefore, a transient combustible fire can only disable 3 of the 4 nuclear boiler instrument racks, 1C004, 1C224, and 1C225 or 1C005, 1C225, and 1C224. This will insure that either Rack 1C004 or 1C005 will always be unaffected by the postulated fire. A failure of this instrumentation which results in a loss of automatic functions will have no impact to Appendix R Safe Shutdown, since the manual operation of these systems is unaffected. Inadvertent operation of the safety systems is not a concern, because for this to occur, as a minimum, an instrument on each rack must provide a spurious signal. This evaluation has demonstrated that fire impact to both racks as a result of the same fire is not feasible.

Both divisions of nuclear boiler vessel wide range pressure and level transmitters, however, are located within the cylinder of influence and may be lost. Although availability of this instrumentation is highly desirable, its loss is

acceptable because safe shutdown can be achieved and maintained without it. Due to the number of alternative instruments available to monitor RPV level and pressure, the complete loss of RPV level and pressure indication due to this localized fire is highly unlikely. Should RPV level indication be lost and no alternate level indication be available, however, the operator would enter EO-100-114, RPV Flooding. EO-100-114 requires the operator to verify a minimum 62 psid between the RPV pressure and the suppression chamber pressure to assure adequate core cooling. Should the RPV pressure indication also be lost and no alternate pressure indication be available, the operator would enter EO-100-115, Primary Containment Flooding. In any case, safe shutdown conditions would be able to be established either by the use of alternative indication instrumentation or through implementation of the required steps in the Emergency Operating Procedures.

The main concern is a fire that results in a sufficient number of spurious signals to cause an inadvertent system actuation which results in an adverse impact to Appendix R Safe Shutdown. Based on the Spurious Operations Criteria provided to the NRC in Attachment A to PLA-4505 dated December 6, 1996 and accepted by the NRC in a SER dated October 21, 1997, the number of spurious operations required for inadvertent system actuation to occur is beyond the number required to be assumed. As an additional precaution, however, the following approach will be used to assess the impacts of fires on Appendix R Safe Shutdown in this fire zone. Since all required Division II safe shutdown raceways will be protected in Fire Zone 1-5A-S, loss of Division I components and Division II cables is not probable. However, it is possible for a fire to disable Division II components and Division I cables. Therefore, all Division I safe shutdown raceways in the area around Rack 1C005, which contains the Division II components, defined by:

- Height of 10 feet
- On the South by the fuel pool cooling room wall,
- On the East by a line 14 feet from the East end of Rack 1C005,
- On the North by the containment wall, and
- On the West by a line 10 feet from the West end of Rack 1C005,

have been evaluated for impact on achieving Appendix R Safe Shutdown. Those raceways identified as impacting Appendix R Safe Shutdown have been protected with 1-hour fire rated wrap.

4. Effects of Sprinklers

The actuation of the sprinkler system will not disable any safe shutdown nuclear boiler instrumentation.

The analysis provided above has demonstrated the following conclusions:

1. The in-situ combustible loading arrangement will not support a design basis fire that will disable both divisions of nuclear boiler instrumentation.

2. A transient combustible fire will not be of sufficient magnitude to disable both divisions of safe shutdown ECCS interlock components.

3. The necessary safe shutdown cables will be protected to insure that a fire will not disable one division's components and the opposite division's cables where fire damage to such cables can have an adverse impact on the ability to achieve and maintain safe shutdown.

4. Initiation of the fire suppression system will not disable any required nuclear boiler system.

Therefore, the existing arrangement, along with protecting any critical Division I cables in the vicinity of Division II components, provides an equivalent degree of safety to that required by Appendix R, Section III.G.2.b.

From the justification above, it can be concluded that there is no fire (in-situ or transient) in Fire Zone 1-5A-S that will prevent achieving and maintaining cold shutdown. Therefore, it is concluded that the current configuration provides an equivalent degree of safety to that required by Section III.G.2.b of Appendix R.

TABLE DR27-1

UNIT 1 SAFE SHUTDOWN
NUCLEAR BOILER INSTRUMENTS

Instrument #	Description	Area	Elev.	Safe Shutdown Path	Fire Zone	Required Path	Rack
LIS-B21-1N024A	Level Indicating Switch for	29	749	1	1-5A-S	3	1C004
*LIS-B21-1N-024C	RPS & RCIC (High Water Level Trip)	27	749	3	1-5A-S	3	1C005
LIS-B21-1N024B	Level Indicating Switch for	29	749	1	1-5A-S	3	1C004
*LIS-B21-1N024D	RPS & HPCI (High Water Level Trip)	27	749	3	1-5A-S	3	1C005
LIS-B21-1N031A	Level Indicating Switch CS,	29	749	1	1-5A-S	3	1C004
*LIS-B21-1N031B	ADS & RHR (Level 1	27	749	3	1-5A-S	3	1C005
LIS-B21-1N-031C	Initiation Signal)	29	749	1	1-5A-S	3	1C004
*LIS-B21-1N031D		27	749	3	1-5A-S	3	1C005
LIS-B21-1N042A	Level Indicating Switch for	29	749	1,2	1-5A-S	3	1C004
*LIS-B21-1N042B	ADS (Confirmatory Level 3)	27	749	2,3	1-SA-S	3	1C005
LT-14201A	Wide Range Reactor Level	27	749	1	1-5A-S	3	1C225
*LT-14201B	Indication	27	749	3	1-5A-S	3	1C224
PS-B21-1N021A	Pressure Indicating Switch	29	749	1	1-5A-S	3	1C004
*PIS-B21-1N021B	for CS & RHR (High Drywell Permissive)	27	749	3	1-5A-S	3	1C005
PS-B21-1N023A	Pressure Switch for RPS	29	749	1	1-5A-S	3	1C004
PS-B21-1N023B	(High Pressure Trip)	29	749	1	1-5A-S	3	1C004
*PS-B21-1N023C		27	749	3	1-5A-S	3	1C005
*PS-B21-1N023D		27	749	3	1-5A-S	3	1C005
PT-14201A	Wide Range Reactor	27	749	1	1-5A-S	3	1C225
*PT-14201B	Pressure Indication	27	749	3	1-5A-S	3	1C224
TB1C004-A1	Terminal Box	29	749	1	1-5A-S	3	1C004
TB1C004-A2	Terminal Box	29	749	1	1-5A-S	3	1C004
TB1C004-B1	Terminal Box	29	749	1	1-5A-S	3	1C004
TB1C004-B2	Terminal Box	29	749	1	1-5A-S	3	1C004
TB1C005-A1	Terminal Box	27	749	3	1-5A-S	3	1C005
TB1C005-A3	Terminal Box	27	749	3	1-5A-S	3	1C005
TB1C005-B1	Terminal Box	27	749	3	1-5A-S	3	1C005
TB1C005-B2	Terminal Box	27	749	3	1-5A-S	3	1C005

*Denotes the Required Safe Shutdown Components for This Fire Zone

APPENDIX R DEVIATION REQUEST NO. 28

NUCLEAR BOILER INSTRUMENTATION IN FIRE ZONE 2-5A-N

DEVIATION REQUEST:

The current arrangement of nuclear boiler instrumentation in Fire Zone 2-5A-N provides an equivalent degree of safety as that required by 10CFR50, Appendix R, Section III.G.2.b, based on the present in-situ combustible loading configuration, horizontal separation of redundant safe shutdown ECCS interlock components of 14 feet, plant procedure to control transient combustibles, transient combustible fire hazards analysis, and protection of raceways within 10 feet of required safe shutdown components.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies only to Fire Zone 2-5A-N, which is in Fire Area R-2A.

REASON FOR DEVIATION REQUEST:

10CFR50, Appendix R, Section III.G.2.b requires the existence of an automatic fire suppression system, in addition to fire detectors, in those fire areas where separation of redundant safe shutdown cables and equipment is greater than 20 feet with no intervening combustibles.

The redundant nuclear boiler instrumentation in Fire Zone 2-5A-N as identified in Table 28-1 does not meet the separation criteria as required by Appendix R, Section III.G.2.b. The horizontal separation of individual redundant ECCS interlock components is 14 feet. Automatic fire suppression and detection is provided throughout Fire Zone 2-5A-N. An analysis has demonstrated the following conclusions:

1. The in-situ combustible loading arrangement will not support a fire that will disable both divisions of nuclear boiler instrumentation.

2. A transient combustible fire will not be of sufficient magnitude to disable both divisions of safe shutdown ECCS interlock components.

3. The necessary safe shutdown cables will be protected to insure that a fire will not disable one division's components and the opposite division's cables.

4. Initiation of the fire suppression system will not disable any required nuclear boiler system.

Therefore, the existing arrangement, along with protecting Division II cables in the vicinity of Division I components, provides an equivalent degree of safety as that required by Appendix R, Section III.G.2.b.

EXISTING ARRANGEMENT:

In Fire Zone 2-5A-N, Division I of safe shutdown equipment is assured available for plant shutdown. Both divisions of required nuclear boiler instruments are located in Fire Zone 2-5A-N. The instruments and terminal boxes on instrument rack 2C004 required for Unit 2 safe shutdown are identified on Table DR28-1. The instruments and terminal boxes on instrument rack 2C005 required for Unit 2 safe shutdown are also identified on Table DR28-1. The arrangement of the instruments was designed to insure proper RPS input of the "1-out-of-2-taken-twice" logic for a single instrument line failure. The existing arrangement of the nuclear boiler instrument racks and other relative equipment is shown on Drawing C-213438.

The combustible loading in the entire Fire Zone 2-5A-N was conservatively calculated to be relatively low. Automatic fire suppression is installed using the guidelines of NFPA 13 and fire detection is provided throughout Fire Zone 2-5A-N.

Three cable trays traverse east-west in front of and above the nuclear boiler instrument racks in Fire Zone 2-5A-N. Two cable trays are enclosed by sheet metal, while the other is enclosed with fireproof insulation. The lowest cable tray is 14 feet above the floor and 8 feet above the instrument racks. All cable is metallically shielded and the insulation meets all requirements of IEEE-383 Flame Test.

JUSTIFICATION:

To meet the requirements of 10CFR50, Appendix R, Section III.G.2.b, the following features must exist to ensure that a fire is limited so that one division of redundant components important to safe shutdown is available:

a. Fire detection.

b. Automatic fire suppression.

c. No intervening combustibles.

d. Greater than 20 feet horizontal separation between redundant safe shutdown equipment/cables.

Requirements a and b are met and a fire hazard analyses has demonstrated that the existing configuration is acceptable even though requirements c and d are not met.

Justification is as follows:

1. Fire Detection and Suppression

Fire Zone 2-5A-N is fully covered by an automatic fire detection system.

The automatic fire suppression system in Fire Zone 2-5A-N provides suppression capability to immediately suppress a fire in incipient stages. This fire zone has full ceiling and lower level coverage in the area of the Reactor Building chillers using the guidelines of NFPA 13.

2. In-Situ Combustible Fire Hazard Analyses

The only combustibles located in the immediate vicinity of the nuclear boiler instrumentation are the cable trays, terminal blocks, and the instruments themselves. The instruments contain negligible combustibles and are completely encased in metal enclosures which will contain any internal fire within the housing. Terminal blocks for external cable connections are also completely enclosed in metallic boxes. Therefore, even with very little horizontal spatial separation, any fire on an instrument rack will not be propagated to other racks, equipment, or cable trays.

There are three cable trays in the area; two are completely enclosed by sheet metal while the third is wrapped with fireproof insulation. The trays completely enclosed are not considered to constitute intervening combustibles. All Division I safe shutdown cables in this fire zone have been addressed in the hit resolution process and have been protected if required.

Other combustibles within the fire zone are various control panels and lube oil from the Reactor Building chillers and fuel pool cooling pumps. The control panels contain very little combustible materials within enclosed metallic housing, have spatial separation greater than 8 feet, and therefore, have no impact on the required nuclear boiler instrumentation. The lube oil equipment is located in areas where the floor is sloped to local drains. The drainage areas are of sufficient size to contain any oil spill. The areas are equipped with full suppression over the chillers and pumps to mitigate the spread of a resultant fire. Horizontal spatial separation between pumps/chiller and the instruments rack is greater than 20 feet. In addition, the fuel pool cooling pumps are located within the fuel pool cooling room which is surrounded by concrete walls.

3. Transient Combustible Fire Hazard Analysis

Based on limited quantities of transient combustibles and fire suppression systems, any fire caused by transients will be limited in size. The resultant fire is defined to be a cylindrical area of influence with a radius of 5 feet and a height of 10 feet. Therefore, a transient combustible fire will only disable two of the four

nuclear boiler instrument racks, 2C004 and 2C224, or 2C225 and 2C005, or 2C225 and 2C004. This will insure that either Rack 2C004 or 2C005 will always be operable and one division of nuclear boiler ECCS interlock components will be available to insure safe shutdown. Also, one division of nuclear boiler vessel wide range pressure and level instrumentation will be available.

The main concern is a fire that disables one division's components and the opposite division's cables. Since required Division I safe shutdown raceways will be protected in Fire Zone 2-5A-N, loss of Division II components and Division I cables is not probable. However, it is possible for a fire to disable Division I components and Division II cables. Therefore, all Division II safe shutdown raceways in the area around Rack 2C004, which contains the Division I components, defined by:

- Height of 10 feet,
- On the north by the fuel pool cooling room wall,
- On the east by a line 10 feet from the east end of Rack 2C004,
- On the south by the containment wall, and
- On the west by a line 14 feet from the west end of Rack 2C004,

have been protected by a one-hour fire-rated wrap.

4. Effects of Sprinklers

The actuation of the sprinkler system will not disable any safe shutdown nuclear boiler instrumentation.

From the justification above, it can be concluded that there is no fire (in-situ or transient) in Fire Zone 2-5A-N that will prevent achieving and maintaining cold shutdown. Therefore, it is concluded that the current configuration provides an equivalent degree of safety as that required by Section III.G.2.b of Appendix R.

TABLE DR28-1

UNIT 2 SAFE SHUTDOWN
NUCLEAR BOILER INSTRUMENTS

Instrument #	Description	Area	Elev.	Safe Shutdown Path	Fire Zone	Required Path	Rack
*LIS-B21-2N024A	Level Indicating Switch for	33	749'	1	2-5A-N	1	2C004
LIS-B21-2N024C	RPS & RCIC	30	749'	3	2-5A-N	1	2C005
*LIS-B21-2N024B	Level Indicating Switch for	33	749'	1	2-5A-N	1	2C004
LIS-B21-2N024D	RPS & HPCI	30	749'	3	2-5A-N	1	2C005
*LIS-B21-2N031A	Level Indicating CS, HPCI	33	749'	1	2-5A-N	1	2C004
LIS-B21-2N031B	and RHR	30	749'	3	2-5A-N	1	2C005
*LIS-B21-2N031C		33	749'	1	2-5A-N	1	2C004
LIS-B21-2N031D		30	749'	3	2-5A-N	1	2C005
LIS-B21-2N042A	Level Indicating Switch for	33	749'	1,2	2-5A-N	1	2C004
LIS-B21-2N042B	ADS	30	749'	2,3	2-5A-N	1	2C005
*LT-24201A	Wide Range Reactor Level	30	749'	1	2-5A-N	1	2C225
LT-24201B		33	749'	3	2-5A-N	1	2C224
*PIS-B21-2N021A	Pressure Indicating Switch	33	749'	1	2-5A-N	1	2C004
PIS-B21-2N021B	for CS & RHC	30	749'	3	2-5A-N	1	2C005
*PS-B21-2N023A	Pressure Switch for RPS	33	749'	1	2-5A-N	1	2C004
*PS-B21-2N023B		33	749'	1	2-5A-N	1	2C004
PS-B21-2N023C		30	749'	3	2-5A-N	1	2C005
PS-B21-2N0230		30	749'	3	2-5A-N	1	2C005
*PT-24201A	Wide Range Reactor	30	749'	1	2-5A-N	1	2C225
PT-24201B	Pressure	33	749'	3	2-5A-N	1	2C224
TB2C004-A1	Terminal Box	33	749'	1	2-5A-N	1	2C004
TB2C004-A2	Terminal Box	33	749'	1	2-5A-N	1	2C004
TB2C004-B1	Terminal Box	33	749'	1	2-5A-N	1	2C004
TB2C004-B2	Terminal Box	33	749'	1	2-5A-N	1	2C004
TB2C005-A1	Terminal Box	30	749'	3	2-5A-N	1	2C005
TB2C005-A3	Terminal Box	30	749'	3	2-5A-N	1	2C005
TB2C005-B1	Terminal Box	30	749'	3	2-5A-N	1	2C005
TB2C005-B2	Terminal Box	30	749'	3	2-5A-N	1	2C005

*Denotes the Required Safe Shutdown Components for this Fire Zone.

APPENDIX R DEVIATION REQUEST NO. 29

CATEGORY I COMPONENTS AND SAFE SHUTDOWN RACEWAY IN FIRE ZONES 1-3C-W AND 2-3C-W

DEVIATION REQUEST:

Automatic fire suppression is not required for the protection of redundant safe shutdown components in Fire Zones 1-3C-W and 2-3C-W. Additionally, the 13 feet spatial separation between the two redundant temperature elements in each of these fire zones is adequate to assure that all redundant safe shutdown equipment (i.e. components, cables and raceway) separated by more than 13 feet is free of fire damage for all postulated fires in these zones.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies to Fire Areas R-1A and R-1B (Fire Zone 1-3C-W) and R-2A and R-2B (Fire Zone 2-3C-W). These are Wraparound Zones as defined in Deviation Request No. 4.

REASON FOR DEVIATION REQUEST:

10CFR50 Appendix R, Section III.G.2.b, requires separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

Fire Zones 1-3C-W (Unit 1 Reactor Building Elevation 683'-0) and 2-3C-W (Unit 2 Reactor Building Elevation 683'-0) do not have automatic suppression and the redundant trains of safe shutdown equipment and cables in these fire zones are separated by less than 20 feet. Fire detection does not extend completely throughout the fire areas of which these fire zones are a part.

This deviation justifies that, even though these aspects of Appendix R Section III.G.2.b are not fully satisfied, there are additional compensating factors which demonstrate that the existing configuration provides an equivalent level of assurance to that provided by Appendix R Section III.G.2.b that safe shutdown can be achieved and maintained.

EXISTING ARRANGEMENT:

Drawing C-213431 shows the raceway and Category I component locations in Fire Zone 1-3C-W and Drawing C-213432 shows the raceway and Category I component locations in Fire Zone 2-3C-W.

The following Category I components located in these fire zones are included in this deviation request:

Division I Component	Division II Component	Spatial Separation	Component Description
Unit 1			
HV-E11-1F048A	HV-E11-1F048B	64 ft.	RHR Heat Exch. Bypass Valve
HV-E11-1F015A	HV-E11-1F015B	33 ft.	RHR Inboard Isolation Valve
TE-E11-1N027A	TE-E11-1N027B	13 ft.	RHR Heat Exch. Outlet Temp. Element
HV-E11-1F009 (Not in this Fire Zone)	HV-E11-1F008	N/A	RHR SDC Outboard Isolation Valve
Unit 2			
HV-E11-2F048A	HV-E11-2F048B	64 ft.	RHR Heat Exch. Bypass Valve
HV-E11-2F015A	HV-E11-2F015B	35 ft.	RHR Inboard Isolation Valve
TE-E11-2N027A	TE-E11-2N027B	13 ft.	RHR Heat Exch. Outlet Temp. Element
HV-E11-2F009 (Not in this Fire Zone)	HV-E11-2F008	N/A	RHR SDC Outboard Isolation Valve

All of the affected components and raceway are located in a controlled radiation area where transient combustibles are minimized due to limited accessibility within the room. The redundant safe shutdown components and raceway contained in these fire zones are shown on drawing C213431 sheet 1 for Fire Zone 1-3C-W and C213432 sheet 1 for Fire Zone 2-3C-W. The combustible loading for both of these rooms is relatively low and there are no intervening combustibles in the 13 ft. distance between the two redundant temperature elements. These fire zones have fire detection but do not have an automatic suppression system.

POTENTIAL SAFE SHUTDOWN IMPACTS:

Tables 1.0 and 2.0 list the non-fire protected safe shutdown raceway in Fire Zones 1-3C-W and 2-3C-W, respectively. For each raceway, the safe shutdown components that could be affected should a fire damage the circuits contained in the raceway are also provided along with an assessment of the worst case impact for each component. Cable faults are evaluated for the effects of hot shorts, open circuits and shorts to ground. The effects of associated circuits, including spurious operations, breaker coordination and multiple high impedance faults are also evaluated. The information compiled in these tables is later used in conjunction with the raceway layout information on the attached drawings in the justification section of this deviation request under the heading of "Physical Separation of Redundant Safe Shutdown Functions".

Circuits which are contained in non-fire protected raceways in Fire Zone 1-3C-W and which provide control or power to components required in support of safe shutdown in this fire zone are identified in Table 1.0 below.

Table 1.0 Control and Power Circuits for Safe Shutdown Components in non-fire protected raceway in Fire Zone 1-3C-W

Raceway No.	SSD Div.	Affected Component	Impact Assessment
Control & Instrument Circuits			
E1KH18-21	Div. I	RHR 1F009 Valve	Spurious Valve Opening[1]
		RHR 1F015A Valve	Loss of Valve Control
		RHR 1F048A Valve	Loss of Valve Control
E1K385	Div. I	RHR 1F048A Valve	Loss of Valve Control
E1K2L4	Div. I	RHR 1F009 Valve	Loss of Valve Control[2]
E1M209	Div. I	TE-E11-1N027A	Loss of Function
		CKT1Y11505/1Y21620	No Impact/SRU Isolates
F1KH50-54	Div. II	RHR 1F008 Valve	Loss of Valve Control
		RHR 1F015B Valve	Loss of Valve Control
		RHR 1F017B Valve	Spurious Valve Operation
		RHR 1F048B Valve	Loss of Valve Control
F1KH61-63	Div. II	RHR 1F015B Valve	Loss of Valve Control
		RHR 1F017B Valve	Spurious Valve Operation
		RHR 1F048B Valve	Loss of Valve Control
F1K388	Div. II	RHR 1F008 Valve	Loss of Valve Control
F1K395	Div. II	RHR 1F048B Valve	Loss of Valve Control
F1M068	Div. II	TE-E11-1027B	Loss of Function
		CKT1Y12505/1Y22623	No Impact/SRU Isolates

[1] Cable EK1Q3016M is in cable tray E1KH18 and a hot short on this cable could spuriously open the 1F009 valve. Cable Tray E1KH18, however, is outside of the 50 foot distance defined to be part of the wraparound area.

[2] A hot short could cause the spurious opening of this valve, except that the cable is routed in a dedicated conduit with no other energized circuits.

Table 1.0 Control and Power Circuits for Safe Shutdown Components in non-fire protected raceway in Fire Zone 1-3C-W			
Raceway No.	**SSD Div.**	**Affected Component**	**Impact Assessment**
Power to RHR Valves & Other Equipment			
E1PH18-21	Div. I	1B219 (RHR 15A & 7A)	Loss of Power to Valves
		1B237 (See Table 1.0a)	Loss of Power to Equipment
		RHR 1F015A Valve	Loss of Power to Valve
		RHR 1F048A Valve	Loss of Power to Valve
E1P364	Div. I	RHR 1F048A Valve	Loss of Power to Valve
		1B237 (See Table 1.0a)	Loss of Power to Equipment
E1P368 &	Div. I	1B219 (RHR 15A & 7A)	Loss of Power to Valves
JB 0446		RHR 1F015A Valve	Loss of Power to Valve
E1P372	Div. I	1B219 (RHR 15A & 7A)	Loss of Power to Valves
		RHR 1F015A Valve	Loss of Power to Valve
F1PH50-55	Div. II	RHR 1F008 Valve	Spurious Valve Opening
		RHR 1F017B Valve	Loss of Power to Valve
		RHR 1F048B Valve	Loss of Power to Valve
		1D274 (See Table 1.0b)	Loss of Power to Equipment
F1P023	Div. II	1B229 (RHR 7B & 15B)	Loss of Power to Valves
		RHR 1F015B Valve	Loss of Power to Valve
F1P364 &	Div. II	RHR 1F017B Valve	Loss of Power to Valve
JB 0311		RHR 1F048B Valve	Loss of Power to Valve
F1P368	Div. II	RHR 1F048B Valve	Loss of Power to Valve
F1P408	Div. II	RHR 1F048B Valve	Loss of Power to Valve
F1P510 &	Div. II	RHR F008 Valve	Spurious Valve Opening
JB 3946		1D274 (See Table 1.0b)	Loss of Power to Equipment
F1P511	Div. II	RHR F008 Valve	Spurious Valve Opening
		1D274 (See Table 1.0b)	Loss of Power to Equipment

The following table provides information related to the impacts to equipment powered from 1B237:

Table 1.0a - Components Powered from 1B237		
Comp. ID	**Comp. Description**	**Comments**
HV-11210A	RHRSW Heat Exch. Inlet Valve	normally closed/required open
HV-11215A	RHRSW Heat Exch. Outlet Valve	normally closed/required open
HV-15766	Supp. Pool Flow Div. Valve	normally closed/required closed
HV-E11-1F103A	RHR Heat Exch. A Vent Valve	not required for SSD
HV-E11-1F075A	RHR/RHRSW Cross Tie Iso. Valve	not required for SSD
HV-E11-1F024A	RHR SPC Return Valve	normally closed/required open
HV-E11-1F006C	RHR SDC Suction Valve	normally closed/required closed
HV-E11-1F004C	RHR Supp. Pool Pump Suction	not required for SSD
HV-E11-1F048A	RHR Heat Exch. Bypass Valve	normally open/required closed
HV-B31-1F023A	Rx. Recirc. Pump Suction Valve	not required for SSD in this area
1V208B	RCIC Pump Rm. Unit Cooler B	not required for SSD in this area
1V211C	CS Pump Rm. Unit Cooler C	not required for SSD
1V210C	RHR Pump Rm. Unit Cooler C	not required for SSD
HV-B21-1F016	MSL Drain Iso. Valve	normally open/required closed
HV-E11-1F022	RHR Head Spray Valve	not required for SSD
HV-E21-1F015A	CS Full Flow Test Valve	normally closed/required closed
HV-E41-1F002	HPCI Stm Supply Cont. Iso. Valve	not required for SSD in this area
1P210B	RBCCW Pump B	not required for SSD

The following table provides information related to the impacts to equipment powered from 1D274:

Table 1.0b - Components Powered from 1D274		
Comp. ID	**Comp. Description**	**Comments**
HV-15768	Supp. Pool Flow Div. Valve	normally closed/required closed
1P216	HPCI Vac. Tk. Cond. Pump	not used for SSD
HV-E41-1F066	HPCI Turb. Exh./Supp. Pool	not used for SSD in this area
1P213	HPCI Aux. Oil Pump	not used for SSD in this area
HV-B21-1F019	MSL Drain Iso.Valve	need to close this or 1F016
HV-G33-1F004	RWCU Iso. Valve	need to close this or 1F001
1P215	HPCI Bar. Cond. Vac. Pump	not used for SSD
HV-E11-1F023	RHR Head Spray	normally closed/not used for SSD
HV-E11-1F049	RHR Letdown to LRW/Cond.	normally closed/not used for SSD
HV-E11-1F008	RHR SDC Iso. Valve	normally closed/required closed
HV-E41-1F008	HPCI Test to CST	not used for SSD in this area
HV-E41-1F007	HPCI Pump Disch. Valve	not used for SSD in this area

Circuits which are contained in non-fire protected raceways in Fire Zone 2-3C-W and which provide control or power to components required in support of safe shutdown in this fire zone are identified in Table 2.0 below.

Table 2.0 Control and Power Circuits for Safe Shutdown Components in non-fire protected raceway in Fire Zone 2-3C-W

Raceway No.	SSD Div.	Affected Component	Impact Assessment
Control & Instrumentation Circuits			
E2KH22-25	Div. I	ESWS Pump 0P504C	Loss of Pump Control
		RWCU 2F001 Valve	Spurious Valve Opening
		RHR 2F009 Valve	Spurious Valve Opening
		RHR 2F015A Valve	Loss of Valve Control
		RHR 2F017A Valve	Loss of Valve Control
		RHR 2F048A Valve	Loss of Valve Control
E2M125	Div. I	TE-E11-2N027A	Loss of Function
		CKT2Y11505/2Y21620	No Impact/SRU Isolates
E2M098	Div. I	Div. I SPOTMOS	Loss of Function
F2KH32-37	Div. II	RHR 2F048B Valve	Loss of Valve Control
		Div. II ADS Logic	Loss of Div. II Control
		RHR 2F008 Valve	Loss of Valve Control
		RHR 2F015B Valve	Loss of Valve Control
		RHR 2F017B Valve	Loss of Valve Control
F2KH61-62	Div. II	RHR 2F048B Valve	Loss of Valve Control
		RHR 2F015B Valve	Loss of Valve Control
		RHR 2F017B Valve	Loss of Valve Control
F2K096	Div. II	RHR 2F008 Valve	Loss of Valve Control
F2K111	Div. II	RHR 2F048B Valve	Loss of Valve Control
F2K622	Div. II	RHR 2F048B Valve	Loss of Valve Control
F2M077	Div. II	TE-E11-2N027B	Loss of Function
		CKT2Y12505/2Y22623	No Impact/SRU Isolates

Table 2.0 Control and Power Circuits for Safe Shutdown Components in non-fire protected raceway in Fire Zone 2-3C-W			
Raceway No.	**SSD Div.**	**Affected Component**	**Impact Assessment**
Power to RHR Valves & Other Equipment			
E2PH22-25	Div. I	RHR 2F048A Valve	Loss of Power to Valve
		RHR 2F015A Valve	Loss of Power to Valve
		RHR 2F017A Valve	Loss of Power to Valve
		2B219 (RHR 7A & 15A)	Loss of Power to Valves
		2B237 (See Table 2.0a)	Loss of Power to Equipment
E2P181/182 &	Div. I	RHR 2F015A Valve	Loss of Power to Valve
JB 1957		2B219 (RHR 7A & 15A)	Loss of Power to Valves
F2PH32-37	Div. II	RHR 2F008 Valve	Spurious Valve Opening
		RHR 2F015B Valve	Loss of Power to Valve
		RHR 2F017B Valve	Loss of Power to Valve
		RHR 2F048B Valve	Loss of Power to Valve
		2B229 (RHR 15B & 7B)	Loss of Power to Valves
		2D274 (See Table 2.0b)	Loss of Power to Equipment
F2P086	Div. II	RHR 2F008 Valve	Spurious Valve Opening
		2D274 (See Table 2.0b)	Loss of Power to Equipment
F2P087 &	Div. II	RHR 2F017B Valve	Loss of Power to Valve
JB 1978		RHR 2F048B Valve	Loss of Power to Valve
F2P089	Div. II	RHR 2F048B Valve	Loss of Power to Valve
F2P092	Div. II	RHR 2F048B Valve	Loss of Power to Valve
F2P094	Div. II	RHR 2F015B Valve	Loss of Power to Valve
		2B229 (RHR 15B & 7B)	Loss of Power to Valves

The following table provides information related to the impacts to equipment powered from 2B237:

Table 2.0a - Components Powered from 2B237		
Comp. ID	**Comp. Description**	**Comments**
HV-21210A	RHRSW Heat Exch. Inlet Valve	normally closed/required open
HV-21215A	RHRSW Heat Exch. Outlet Valve	normally closed/required open
HV-25766	Supp. Pool Flow Div. Valve	normally closed/required closed
HV-E11-2F103A	RHR Heat Exch. A Vent Valve	not required for SSD
HV-E11-2F075A	RHR/RHRSW Cross Tie Iso. Valve	not required for SSD
HV-E11-2F024A	RHR SPC Return Valve	normally closed/required open
HV-E11-2F006C	RHR SDC Suction Valve	normally closed/required closed
HV-E11-2F004C	RHR Supp. Pool Pump Suction	not required for SSD
HV-E11-2F048A	RHR Heat Exch. Bypass Valve	normally open/required closed
HV-B31-2F023A	Rx. Recirc. Pump Suction Valve	not required for SSD in this area
2V208B	RCIC Pump Rm. Unit Cooler B	not required for SSD in this area
2V211C	CS Pump Rm. Unit Cooler C	not required for SSD
2V210C	RHR Pump Rm. Unit Cooler C	not required for SSD
HV-B21-2F016	MSL Drain Iso. Valve	normally open/required closed
HV-E11-2F022	RHR Head Spray Valve	not required for SSD
HV-E21-2F015A	CS Full Flow Test Valve	normally closed/required closed
HV-E41-2F002	HPCI Stm Supply Cont. Iso. Valve	not required for SSD in this area
2F116A/B	Instrument Air Dryer Towers	not required for SSD

The following table provides information related to the impacts to equipment powered from 2D274:

Table 2.0b - Components Powered from 2D274		
Comp. ID	**Comp. Description**	**Comments**
HV-25768	Supp. Pool Flow Div. Valve	normally closed/required closed
2P216	HPCI Vac. Tk. Cond. Pump	not used for SSD
HV-E41-2F066	HPCI Turb. Exh./Supp. Pool	not used for SSD in this area
2P213	HPCI Aux. Oil Pump	not used for SSD in this area
HV-B21-2F019	MSL Drain Iso.Valve	need to close this or 2F016
HV-G33-2F004	RWCU Iso. Valve	need to close this or 2F001
2P215	HPCI Bar. Cond. Vac. Pump	not used for SSD
HV-E11-2F023	RHR Head Spray	normally closed/not used for SSD
HV-E11-2F049	RHR Letdown to LRW/Cond.	normally closed/not used for SSD
HV-E11-2F008	RHR SDC Iso. Valve	normally closed/required closed
HV-E41-2F008	HPCI Test to CST	not used for SSD in this area
HV-E41-2F007	HPCI Pump Disch. Valve	not used for SSD in this area

JUSTIFICATION:

Fire Zones 1-3C-W and 2-3C-W are similar in physical layout including raceway layout and, with the exception of the abandoned in place Thermo-Lag 330-1 material in Fire Zone 2-3C-W, combustible loading. Where the differences are pronounced, the features of each fire zone are described separately. Otherwise, the description provided is the limiting condition which bounds both fire zones.

Fire Zones 1-3C-W and 2-3C-W are "wraparound zones" which, as described in Deviation Request (DR) No. 4, function to provide separation between Fire Areas R-1A and R-1B and Fire Areas R-2A and R-2B, respectively. Fire Areas R-1A and R-2A rely on Safe Shutdown Path No. 3. Fire Areas R-1B and R-2B rely on Safe Shutdown Path No. 1. In Deviation Request No. 4, it is stated that both safe shutdown paths are protected in the "wraparound area" unless a deviation is provided which specifically justifies the existing conditions. Due to the unique attributes of Fire Zones 1-3C-W and 2-3C-W, as described below, this deviation justifies a condition different than that described in Deviation Request No. 4.

Physical Separation of Redundant Safe Shutdown Functions:

Deviation Request No. 29 was previously evaluated in SAIC TAC No. 59647/48 attached to the NRC SER dated August 9, 1989 which accepted and granted the deviation. In performing the evaluation of the initial issue of DR No. 29, it was concluded that the installation of automatic suppression and the separation of the temperature elements by more than 13 feet would not significantly increase the level of plant fire safety. This conclusion was based on the fact that there are no intervening combustibles in the 13 foot distance between the temperature elements, the area is a high radiation area with limited access, the combustible loading in the area is low and there is a lack of an ignition source. Finally, the area is protected with fire detection and contains manual fire fighting equipment.

This change to DR No. 29 does not alter any of these conditions of the initial issue of the DR, but only provides additional information on the potential impacts to the redundant safe shutdown trains and additional justification on the acceptability of this condition.

All redundant components and raceway in Fire Zones 1-3C-W and 2-3C-W are separated by at least 20 feet, except for those associated with the RHR Heat Exchanger Outlet Temperature Elements.

Fire Zone 1-3C-W:

As shown on Drawing C213431 Sheet 1, all unprotected redundant safe shutdown components and raceway are separated by at least 20 feet except for the RHR Heat Exchanger Outlet Temperature Elements, TE-E11-1N027A and TE-E1-1N027B, and raceway E1M209 which contains the instrument cable for TE-E11-1N027A, F1M068, which contains the instrument cable for TE-E11-1N027B, and E1P368, E1P372 and JB0446, which contain power cables affecting the power feeds to the RHR LPCI Injection Inboard Containment Isolation Valve, 1F015A and the RHR Pump Min. Flow Valve, 1F007A. In the unlikely event that a fire were to impact all of these components and raceway, the worst case result would be a loss of the temperature reading on the RHR Heat Exchanger Outlet Temperature and a loss of power to the certain RHR System Valves with the following result:

> TE-E11-1N027A and B, the RHR Heat Exchanger Outlet Temperature Elements, provide an indication to the Control Room of the temperature of the water leaving the RHR Heat Exchanger. For safe shutdown in this area, RHR is used in the Suppression Pool Cooling mode of operation. Therefore, the temperature reading from these temperature elements would be an indication of the temperature of the water returning to the Suppression Pool. When using RHR in the Suppression Pool Cooling mode, these temperature elements are only a back-up to the Suppression Pool Temperature Monitoring System (SPOTMOS). For a fire in Fire Zone 1-3C-W, there is no impact to either of the redundant trains of SPOTMOS. Therefore, SPOTMOS will be available to provide information on

the Suppression Pool temperature to the plant Control Room operator and the reading from TE-E11-1N027A and B is not required to support safe shutdown.

1F007A, the Loop A RHR Pump Minimum Flow Valve, is initially required to be open and then close when the RHR Pump flow increases to an acceptable level. A loss of power would result in the failure of this valve to close. This failure, however, will not impact the ability to achieve and maintain safe shutdown. The flow capacity of one RHR Pump is approximately 12,000 gpm. The flow diversion through an open minimum flow valve is approximately 1,000 gpm. Any flow diversion through the 1F007A Valve would be returned to the Suppression Pool. The RHR flow through the RHR Heat Exchanger is to be limited to less than 10,000 gpm. Even with the postulated flow diversion, the RHR flow would need to be throttled back and, therefore, adequate flow through the heat exchanger would still be available.

1F015A, the RHR LPCI Injection Inboard Containment Isolation Valve, is normally closed and is required to be closed in support of safe shutdown. A loss of power to this valve would result in it remaining in the closed position.

The assessments provided above use the assumption from Calculation EC-013-0843 that at fire onset, all safe shutdown systems are assumed operable and available for post-fire shutdown. This assumption requires that all safe shutdown components are initially in their normal position. Therefore, there is no impact to safe shutdown as a result of fire damage to those components or raceway within Fire Zone 1-3C-W that are separated by less than 20 feet.

Fire Zone 2-3C-W:

As shown on Drawing C213432 Sheet 1, all unprotected redundant safe shutdown components and raceway are separated by at least 20 feet except for the RHR Heat Exchanger Outlet Temperature Elements, TE-E11-2N027A and TE-E11-2N027B, and raceway E2M125, which contains the instrument cable for TE-E11-2N027A, F2M077, which contains the instrument cable for TE-E11-2N027B, and E2P181, E2P182 and JB1957, which contain power cables affecting the power feeds to the RHR LPCI Injection Inboard Containment Isolation Valve, 2F015A, and the RHR Pump Min. Flow Valve, 2F007A. In the unlikely event that a fire were to impact all of these components and raceway, the worst case result would be a loss of the temperature reading on the RHR Heat Exchanger Outlet Temperature and a loss of power to the certain RHR System Valves with the following result:

TE-E11-2N027A and B, the RHR Heat Exchanger Outlet Temperature Elements, provide an indication to the Control Room of the temperature of the water leaving the RHR Heat Exchanger. For safe shutdown in this area, RHR is used in the Suppression Pool Cooling mode of operation. Therefore, the temperature reading from these temperature elements would be an indication of the temperature of the water returning to the Suppression Pool. When using RHR in

the Suppression Pool Cooling mode, these temperature elements are only a back-up to the Suppression Pool Temperature Monitoring System (SPOTMOS). For a fire in Fire Zone 2-3C-W, there is no impact to Division II of SPOTMOS. Therefore, Division II of SPOTMOS will be available to provide information on the Suppression Pool temperature to the plant Control Room operator and the reading from TE-E11-2N027A and B is not required to support safe shutdown.

2F007A, the Loop A RHR Pump Minimum Flow Valve, is initially required to be open and then close when the RHR Pump flow increases to an acceptable level. A loss of power would result in the failure of this valve to close. This failure, however, will not impact the ability to achieve and maintain safe shutdown. The flow capacity of one RHR Pump is approximately 12,000 gpm. The flow diversion through an open minimum flow valve is approximately 1,000 gpm. Any flow diversion through the 2F007A Valve would be returned to the Suppression Pool. The RHR flow through the RHR Heat Exchanger is to be limited to less than 10,000 gpm. Even with the postulated flow diversion, the RHR flow would need to be throttled back and, therefore, adequate flow through the heat exchanger would still be available.

2F015A, the RHR LPCI Injection Inboard Containment Isolation Valve, is normally closed and is required to be closed in support of safe shutdown. A loss of power to this valve would result in it remaining in the closed position.

The assessments provided above use the assumption from Calculation EC-013-0843 that at fire onset, all safe shutdown systems are assumed operable and available for post-fire shutdown. This assumption requires that all safe shutdown components are initially in their normal position. Therefore, there is no impact to safe shutdown as a result of fire damage to those components or raceway within Fire Zone 2-3C-W that are separated by less than 20 feet.

In-situ and Intervening Combustibles:

The only in-situ combustibles in these fire zones are cables in enclosed cable trays and, in Fire Zone 2-3C-W only, abandoned-in-place Thermo-Lag 330-1 raceway wrap. Due to the low level of in-situ combustibles in Fire Zone 2-3C-W, other than the abandoned Thermo-Lag 330-1 material, insufficient combustibles exist to involve the abandoned Thermo-Lag 330-1 material and, therefore, this abandoned Thermo-Lag does not represent a fire hazard of concern. Fire Zones 1-3C-W and 2-3C-W are radiation areas and are located in rooms with limited accessibility due to the physical layout and radiological conditions. Due to the limited accessibility of the rooms, the potential for the introduction of transient combustibles is remote. Additionally, both fire zones are provided with a fire detection system.

The redundant RHR Heat Exchanger Outlet Temperature Elements are separated by a distance of 13 feet with no intervening combustibles. All other redundant safe shutdown components are separated by greater distances with most being separated by more

than 20 feet. Due to the presence of fire detection, the low amount of in-situ combustibles, and the limited potential for the introduction of transient combustibles into this area, this separation distance is considered to be sufficient to preclude damage to redundant safe shutdown components and raceway.

Administrative Controls:

The floor area between the redundant safe shutdown raceway is identified to indicate that it is a restricted area for storage of transient combustible materials. No transient combustible materials will be stored in this area without the review and acceptance of the Site Fire Protection Engineer.

Fire Protection Features:

Both Fire Zones 1-3C-W and 2-3C-W are provided with fire detection.

SUMMARY AND CONCLUSION:

The configuration of the redundant safe shutdown components and raceway, the low quantity of combustibles, the limited access to this plant area and the administrative controls on transient combustible storage along with the presence of fire detection ensure that a fire will not damage the redundant safe shutdown components and raceway in these fire zones.

Therefore, the separation distance of 13 feet between the redundant temperature elements in these fire zones is adequate to ensure that a fire will not adversely affect the ability to achieve and maintain safe shutdown without any additional fire protection features in the form of qualified raceway fire barriers or automatic fire suppression systems.

DEVIATION REQUEST NO. 30 HAS BEEN WITHDRAWN

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APPENDIX R DEVIATION REQUEST NO. 32

OUTSIDE AREAS

LACK OF SEPARATION OF SAFE SHUTDOWN COMPONENTS AND ELECTRICAL CABLES

DEVIATION REQUEST:

The existing installation (location) of certain safe shutdown electrical cables in underground manholes and duct banks and components located in outside areas is considered acceptable.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies to Fire Area A-1 (Fire Zone 0-00).

REASON FOR DEVIATION REQUEST:

10CFR50, Appendix R, Section III.G.2.b requires that the redundant trains of cables and equipment required for safe shutdown be separated by a minimum distance of 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area. The fire hazards analysis for the outside areas has identified redundant safe shutdown electrical cables located in underground electrical manholes and safe shutdown components which are not separated by 20 feet and do not have fire detection or automatic suppression.

EXISTING CONDITIONS:

Electrical Manholes

Class IE electrical manholes 16,17,18,19,22,23,27,28,31 and 32 and their connecting duct banks contain safe shutdown cables. These manholes were located and plotted on Drawing C-21349. Electrical manholes 16,17,18&19 are located east of the underground diesel generator fuel oil tanks at a distance greater than 25 feet. Electrical manholes 22 and 23 are located along the east to west access road adjacent to the Service and Administration Building at a distance of 25 feet or more from either the building or road. Electric manholes 27 and 28 are located northeast of the Unit 2 Cooling Tower and southwest of the plant access road to the Emergency Service Water pumphouse at a distance in excess of 25 feet. The tops of manholes 27 and 28 extend above a mound of earth that is at least 6 feet above the road. Electrical manholes 31 and 32 are located adjacent to the south wall of the ESW Pumphouse.

Emergency Diesel Generator Fuel Oil Storage Tank Transfer Pumps

The four diesel generator fuel oil storage tank transfer pumps (OP514A, OP514B, OP514C and OP514D) which are required for SSD are submerged inside the diesel fuel oil tanks.

RHR Service Water Spray Pond Valves

Six RHR Service Water Spray Pond Valves are located in the spray pond valve vault. The Division I valves (HV-01222A, HV-01222A1, and HV-01222A2) are located in the north compartment of the valve vault structure and the Division II valves (HV-01222B, HV-01222B1 and HV-01222B2) are located in the south compartment of the structure.

JUSTIFICATION:

A Fire Hazards Analysis was conducted for the electrical manholes and the safe shutdown components located in the Outside Areas and it was concluded that no plausible fire hazards exist which affect safe shutdown.

The electrical manholes are seismically designed and constructed to be watertight concrete boxes which would resist the in-leakage of any combustible oils that might be present. In all cases, the manholes extended twelve (12) inches above grade and are seismically designed and constructed with walls, tops and bottoms of reinforced concrete with a minimum thickness of six (6) inches. The conduit ductbank penetrations are installed prior to pour and are an integral part of the manholes.

The affected manholes are separated by a distance of 100 ft. from any in situ combustibles (ESS transformers) and greater than 25 ft. from the underground diesel generator fuel oil tanks. The transient combustibles such as transferring fuel oil from tanker trucks to the diesel generator fuel storage tanks and the delivery of the lube oil truck to the Turbine Building were analyzed in the Fire Hazards Analysis. In each case, a fire hazard which could jeopardize safe shutdown was found not to exist.

Therefore, it is our position that the location and configuration of the subject electrical manholes and their associated safe shutdown cables provide an equivalent degree of safety as specified in 10CFR50, Appendix R, Section III.G.2.

The fuel oil transfer pumps are submerged inside the fuel oil tanks. The electrical cables are totally enclosed in rigid steel conduit and located in a vault above the diesel generator tanks. The vault is seismically designed and constructed and has a missile protective cover. The operating considerations, protective cover construction and lack of an ignition source provide acceptable fire protection, equivalent to the technical requirements of Appendix R, Section III.G.2.

The six RHR service water spray pond valves are located in a valve pit. Division I valves are separated from the Division 2 valves by a 3 foot thick concrete wall. There

are no penetrations between compartments. The valve pit construction, the routing of all safe shutdown cables in conduit and the lack of in-situ combustibles in the vicinity of the valve pits provides acceptable fire protection and provides protection equivalent to the technical requirements of Appendix R, Section III.G.2.

APPENDIX R DEVIATION REQUEST NO. 33

REACTOR COOLANT MAKEUP AND DEPRESSURIZATION SYSTEMS

DEVIATION REQUEST:

A deviation from the guidance of Appendix R to 10CFR50 to the extent that reactor coolant process variables will vary from those predicted for a loss of normal ac power since Core Spray/ADS is used to achieve safe shutdown.

FIRE AREAS/ZONES AFFECTED:

This deviation request affects all plant fire areas except Fire Area CS-9, R-1D, and R-2D.

REASON FOR DEVIATION REQUEST:

Our safe shutdown philosophy utilizes Core Spray/ADS, alternate shutdown cooling and suppression pool cooling. The reason that these systems were chosen is that they are clearly separated on an Electrical Divisional basis. A clear separation of paths ensures that long-term compliance can be maintained with a minimum of complexity, both at the design stage as well as at the actual field installation. Still another reason that they were chosen is that the systems are composed of "Quality Related" or "Q" components. Since these components are closely tracked from design specification, through purchase and actual installation, long-term compliance is again ensured.

EXISTING CONDITIONS:

The reactor depressurization function utilizing ADS with low pressure makeup systems is discussed in FSAR Section 15.2.9. The reactor heat removal process utilizing alternate shutdown cooling with suppression pool cooling is discussed in FSAR Section 15.2.9 and Table 15.2-15. More specifically to PPL's Appendix R analysis, reactor coolant makeup is provided by different divisions of core spray while the reactor depressurization function is provided by the ADS valves. Also, the reactor heat removal process utilizes alternate shutdown cooling with suppression pool cooling. Alternate shutdown cooling utilizes the core spray and ADS systems. To enter alternate shutdown cooling, the reactor head vents, the MSIVs, and main steam line drain lines must all be closed. Six safety relief valves are opened and one core spray pump taking a suction from the suppression pool slowly increases reactor water level. The suppression pool cooling mode of RHR is initiated, and the reactor water level is slowly raised to about 131" to flood the main steam lines and establish a flow path through the open SRVs and back to the suppression pool.

Discussion of LOOP and ADS/Core Spray

LOOP

The loss of offsite power (LOOP) results in a sequence of events similar to that resulting from a loss of feedwater flow. The most severe case occurs during power operation.

The reactor protection system and control rod drive system produce a scram after receiving either a main turbine trip signal or loss of reactor protection system power source signal. The turbine trip will initiate a recirculation pump trip. The Main Steam Isolation Valves (MSIVs) close and there is no flow diversion from the reactor vessel. After the MSIVs close, decay heat slowly raises system pressure to the lowest relief valve setting. Core cooling is necessary to restore and maintain water level. HPCI and RCIC initiate at level 2.

Core Spray/ADS

In the PPL Appendix R analysis, water level is maintained using the Core Spray System since RCIC and HPCI are assumed damaged by fire or unavailable. The Core Spray System is designed to provide cooling to the reactor core only when the reactor pressure is low. However, when Core Spray is used in conjunction with ADS, the RPV can be rapidly depressurized by ADS into the pressure range where the Core Spray System can be used for core cooling and RPV water level control.

ADS has six manually and automatically controlled safety relief valves that are installed on the main steam lines inside the primary containment. These six valves perform both the ADS and SRV function. The depressurization by manual or automatic action of the control system is intended to reduce reactor pressure during specific postulated size pipe breaks in which the HPCI system is not available so that the Core Spray System or RHR LPCI System can inject water into the reactor vessel. In the Appendix R analysis, no pipe break exists.

JUSTIFICATION:

Deviation from LOOP Parameters

Manual Actions

For the PPL Appendix R analysis, shutdown is achieved utilizing standard, emergency operating procedures where degraded modes can result from any cause including a postulated Appendix R fire.

Although the reactor coolant process variables are not maintained strictly within those predicted for a loss of offsite power (level may go lower than Level 2 and

the depressurization rate may be faster), the fission product boundary integrity will not be affected, i.e., there will be no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary.

The performance goal of the shutdown function will be met, i.e., the reactor coolant makeup function will be capable of maintaining the reactor coolant level above the top of the core. The other performance goals for the reactivity control function, the reactor heat removal function, the process monitoring function, and the supporting functions are unaffected.

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DEVIATION REQUEST NO. 36 HAS BEEN WITHDRAWN

APPENDIX R DEVIATION REQUEST NO. 37

CONTROL ROOM RAISED FLOOR AND CONTROL STRUCTURE CABLE CHASE FIRE PROTECTION

DEVIATION REQUEST:

Fire protection features for cable routed under the main control room raised floor, in the cable shafts and in the cable chases within the Control Structure are adequate and provide an equivalent degree of safety as that required by Appendix R, Section III.G.2.

FIRE AREAS/ZONES AFFECTED:

The deviation request applies to Fire Areas CS-6 (Fire Zones 0-24J, 0-25B, 0-26B, 0-26S, 0-27F and 0-28P), CS-7 (Fire Zones 0-24L, 0-24M, 0-25C, 0-25D, 0-26C, 0-26D, 0-26T, 0-26V, 0-27G, 0-27H, 0-28Q and 0-28R) and CS-9 (Fire Zones 0-26F, 0-26G, 0-26H, 0-26I, 0-26J, 0-26M and 0-26R) in the Control Structure. Fire Area CS-6 covers the south cable chase and CS-7 includes the north and center cable chases. For this Deviation Request, Fire Area CS-9 is limited to the area under the main control room, vestibules, Operational Support Center and Security Office raised floor and the cable shafts under the control room soffits.

REASON FOR DEVIATION REQUEST:

10CFR50, Appendix R, Section III.G.2a, b and c requires spatial separation or fire barrier-type protection features to separate redundant divisions of systems required for hot shutdown when they are located within the same fire area. Additionally, the specific requirements also include the absence of intervening combustibles and the installation of fire detectors and an automatic fire suppression system in the fire area.

Cable routed in raceways under the raised floor of the main control room and adjacent areas include redundant safety-related control and instrumentation circuits. The underfloor fire area is protected with ionization detectors and a fixed manual spurt fire suppression system. There are no discrete fire barriers between redundant trains and automatic CO_2 fire suppression is not provided in this fire area because of safety concerns for control room personnel.

The cable chases adjacent to the control room in the Control Structure are used for the vertical runs of cable trays, conduits and wireways which route safety-related and non-safety circuits between the control room and the relay rooms and cable spreading areas. Vertical shafts under soffits within the control room area are similarly used to install raceways for conveying cable between the control room and the upper and lower relay rooms. The cable chases are protected with ionization detectors and total flooding CO_2 automatic fire suppression systems. The control room cable shafts are provided

with ionization detectors and a manual spurt CO_2 fire suppression system. The cable trays and wireways in the cable chases and shafts are not provided with fire barriers to separate redundant divisions within the fire zones.

EXISTING CONDITIONS:

The space below the control room raised floor (Fire Zones 0-26F, 0-26G, 0-26H, 0-26I and 0-26J) and above the 13½" reinforced concrete floor on Elev. 728'-1" furnishes a convenient means to install raceways for routing cables to various panels, cabinets and equipment in the control room. There are a limited number of cables which pass through but do not terminate in the control room panels. The space is covered by the control room sectional and flame-retardant carpet access flooring which is supported on a steel framework independent of the underfloor raceway supports. The raceways consist of cable trays, wireways and conduit containing control instrumentation and small power cables for redundant safety-related and non-safety cables which enter the bottom of the control room panels. The space under the raised floor covers approximately 6,516 square feet, is 12-inches high and is protected by ionization detection and a manual spurt CO_2 fire suppression system activated by pushbutton stations inside and outside the control room. This area is bounded on all sides by fire-rated construction. Due to the confined space and fire protection features in this area, fire barriers are not provided between redundant safety-related cables. Automatic CO_2 fire suppression is not provided in this fire area due to the continual presence of control room personnel.

The three electrical cable chases in the west wall of the control room each have approximately 7 feet by 6 feet of open vertical space extending from Elevation 698'-0" to Elevation 783'-0" in the Control Structure. (See drawings E-205988 through E-205993 in Section 8). Each chase is enclosed by fire-rated construction on all sides. The chases contain cable trays, wireways and conduit used for routing redundant safety-related and non-safety circuits from the cable spreading areas to the control room, relay rooms and other areas in the Control Structure. An automatic total flooding CO_2 fire suppression system in conjunction with heat detectors protects the entire length of the cable chase except at the control room floor Elevation 729'-1" (Fire Zones 0-26B, 0-26C & 0-26D) where a manual spurt CO_2 system with ionization-type combustion detectors is installed. The chases are also provided with barriers and seals at every floor elevation which limit air supply and fire spread and control the concentration of carbon dioxide if the fire protection system is activated.

In addition to the cable chases in the west wall, the control room has two cable shafts under the north and south soffits (Fire Zones 0-26M & 0-26R). The cable shafts are basically 1-foot wide open spaces along the north and south walls of the control room and are used for vertical runs of trays and wireways for safety-related and non-safety circuits from the control room to the relay rooms. The cable shafts are enclosed by 3-hour fire-rated concrete walls at the north and south sides of the control room and by 2-hour gypsum board/metal stud walls on the inside. Each cable shaft and soffit is

protected by four ionization-type combustion detectors and manual spurt CO_2 fire suppression system.

JUSTIFICATION:

Appendix R, Section III.G.2 requires that fire protection features be provided to ensure that one division of redundant components important to safe shutdown is free of fire damage. When the redundant divisions of safe shutdown systems are located within a common fire area, one of the following features shall be provided:

1. 3-hour fire barrier.

2. More than 20-feet spatial separation with no intervening combustibles, plus installation of fire detectors and an automatic fire suppression system.

3. Cable and equipment enclosure with a 1-hour fire rating, plus installation of fire detectors and an automatic fire suppression system.

The areas under the control room raised floor are highly confined spaces. The spaces are not normally accessible since the control room sectional flooring must be removed to expose the raceway areas. Although redundant safety-related circuits exist in this area, the horizontally configured raceways consisting of Division I cable trays and wireways and a few Division II conduits are installed in conformity with minimum electrical separation requirements. There are no open raceways containing Division II circuits under the raised floor. Division II conduits vertically enter the bottom of the control room panels from the lower cable spreading area below, which is a different fire area isolated by a 3-hour fire-rated concrete floor and sealed floor penetrations. The only potential hazards in this fire area are those due to internal faults in the cable and this is mitigated by the fact that the circuits handle only control, instrument and small power functions. Cables use non-flame propagating insulation with fire-retardant jackets and are qualified in accordance with IEEE 383. The use of a manual spurt CO_2 fire suppression system in conjunction with ionization detection adequately protects the fire area since immediate operator action from the control room directly above is anticipated in the event of a fire.

The cable chases and cable shafts in Fire Area CS-6, CS-7 and CS-9 are limited access areas used mainly for the installation of electrical raceways. The steel doors provided at certain elevations of the south, center and north cable chases are alarmed to monitor unauthorized entry. Where raceways for redundant safety-related divisions are installed in a chase, the minimum electrical separation is observed. The use of combustion detectors and a total flooding CO_2 automatic fire suppression system in most of the cable chase fire zones meets Appendix R, Section III.G.2 requirements. The cable chases and cable shafts at the control room elevation are adequately protected by combustion detectors and a manual spurt CO_2 fire suppression system because of proximity to the control room where operators can quickly respond to any contingency. The only combustibles located in these fire areas consist of control and

instrument cables in open trays, which are subject to fire hazards caused by internal faults only. The low probability of inducing fire by self-ignition is further minimized by the use of non-flame propagating cable insulation which conforms to the requirements of IEEE 383.

The fire protection features provided under the control room raised floor and the cable chases and cable shafts as described above are adequate for the existing cable installation and provide an equivalent degree of safety as required by Appendix R. The addition of raceway wrapping and fully automatic fire suppression systems in Fire Areas CS-6, CS-7 and CS-9 to meet the requirements of 10CFR50 Appendix R, Section III.G.2 would not significantly increase the level of fire protection in these fire areas.

APPENDIX R DEVIATION REQUEST NO. 38

PROTECTION OF REDUNDANT SAFE SHUTDOWN RACEWAYS IN THE UNIT 2 MAIN STEAM PIPEWAY

DEVIATION REQUEST:

It is acceptable to protect redundant safe shutdown cables in raceways E2KJ78, E2KJ79, E2KJ80, E2KJ81, F2KO24, F2K409, F2K411, F2K412, F2K413, F2K414, JB3018 and JB1464 in Fire Zone 2-4G by installing them in conduits, junction boxes or metal enclosed trays.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies to Fire Zone 2-4G which is in Fire Area R-2B in the Unit 2 Reactor Building.

REASON FOR DEVIATION REQUEST:

10CFR50 Appendix R, Section III.G.2 requires that redundant safe shutdown cables be protected by a fire barrier having a 3-hour rating in areas where there is no automatic fire suppression system and no fire detection.

EXISTIING CONDITONS:

Fire Zone 2-4G is the Main Steam Pipeway. It is a high radiation area and is inaccessible during normal plant operation. It does not contain automatic fire suppression; however, it does contain fire detection. All cables are routed in conduits or metal enclosed trays. The combustible loading of the fire zone, not including cables, is less than 5 minutes. This combustible loading is comprised of lube oil contained within various valves in the piping systems in the pipeway. The largest single quantity of oil (8.5 gallons) is used in each of the Feedwater Stop Check Valves HV-241-FO32A&B.

Actual in-situ combustible loading durations are provided to document existing arrangement and justify the deviation request. These values are based on the initial combustible loading analysis. Modifications subsequent to this analysis have revised these values with the possibility of future modifications revising them again. The governing criteria for the combustible loading analysis is that the fire resistance rating of the fire area boundaries exceed the combustible loading duration. The combustible loading durations specified in the deviation request will not be updated in the future since program commitments require that all modifications be evaluated to assure that additional combustibles are controlled to remain below the fire area fire resistance rating.

Additionally, although Fire Zone 2-4G is contained in Fire Area R-2B, it is bounded on three sides and the floor by 3 hour fire rated construction. The fourth side is enclosed by primary containment wall; fire will neither originate in nor migrate to the containment due to the inerted nitrogen atmosphere during power operation.

The fire zone contains safe shutdown cables for Division I and II equipment which are routed in separate raceways within the pipeway. These cables include circuits for the four Division II outboard main steam isolation valves (MSIVs) HV-B21-2FO28A, B, C & D and for three of the four Division I inboard MSIVs HV-B21-2FO22A, B, & C. All MSIV cables are installed in conduit or metal enclosed cable trays. The outboard MSIVs and their valve operators are physically located in the fire zone; the electrical components are located approximately 10 feet above the enclosed tray containing cables for the redundant inboard MSIVs.

A fire hazards analysis has shown that other safe shutdown systems with Division I and II cables in this fire zone would be able to perform their safety functions and would not prevent safe shutdown in the event of a fire in the pipeway.

JUSTIFICATION:

Electrical raceways E2KJ78, E2KJ79, E2KJ80 and E2KJ81 containing Division I cables for MSIVs HV-B21-FO22A, B & C are totally enclosed metal covered trays. Raceways F2KO24, JB1464, F2K409, JB3018, F2K411, F2K412, F2K413 and F2K214 containing Division II cables for MSIVs HV-B21-FO28A, B, C & D are rigid steel conduits and junction boxes. These raceways are located in a normally inaccessible high radiation area containing very small quantities of combustible materials. Raceways E2KJ78, E2KJ79, E2KJ80 and E2KJ81 are single cable trays located approximately 18" below another cable tray which is also totally enclosed. The orientation of these raceways and the location of the outboard MSIVs are shown on attached Drawings C-213952, Shts. 1 and 2.

The location of the combustible materials in Fire Zone 2-4G are also shown on the attached drawings. In the unlikely event of the ignition of any of the combustibles, the resultant heat release would not impact any of the subject raceways. The ceiling of Fire Zone 2-4G is at Elevation 760'-7 ½", approximately 20 to 25 feet above the raceways. Any heat generated by a fire would rise to the ceiling level. Furthermore, as shown on Drawing E-213485, Sht. 1 in Section 8.0 of this report, the steam pipeway actually continues further up from Elevation 760'-7 ½" to allow air pressure to escape through blowout panels in the event of a pipe rupture in the steam pipeway.

The MSIVs must isolate for safe shutdown. Failure analysis for the cables of concern indicates that fire-induced hot shorts would have to occur on both the Division I (inboard MSIVs) and Division II (outboard MSIVs) cables to maintain the AC or DC solenoids energized and hold open both redundant MSIVs on a main steam line. Similarly, once the MSIVs have closed, multiple hot shorts on each MSIV's solenoids are required to reopen the valves. The limited quantity of combustible materials in the fire zone and the

use of separate metal-enclosed raceways for cable routing- would render these occurrences highly unlikely.

The introduction of transient combustibles into this fire zone is highly unlikely since the fire zone is a high radiation area with its entrance door locked and access prohibited during normal plant operation. During periods of low power operation or plant shutdown, access is restricted and controlled due to radiological concerns.

Fire Zone 2-4G has fire detection which alarms in the main control room. Although there is no automatic fire suppression system in this fire zone, manual hose reels and portable fire extinguishers are located in the immediate vicinity.

Fire Zone 2-4G is bounded by 3-hour fire rated walls and floor and the containment wall within the fire area. In the event of a fire in the main steam pipeway, the fire would not spread to adjacent fire zones. Similarly, fires in adjacent areas would not migrate into the pipeway.

Therefore, based on the negligible quantity of combustible materials in Fire Zone 2-4G, the location of these combustibles with respect to the raceway in question, the use of totally-enclosed metallic raceways, the unlikely addition of transient combustibles to the pipeway and the enclosure of the fire zone with fire rated walls, floor and the containment wall, raceways E2KJ78, E2KJ79, E2KJ80 and E2KJ81, F2KO24, F2K409, F2K411, F2K412, F2K413, F2K414, JB3018 and JB1464 do not require the protection of a 3-hour fire rated barrier material between redundant divisions.

NOTE: THIS DEVIATION REQUEST HAS NOT BEEN APPROVED BY NRC.

APPENDIX R DEVIATION REQUEST NO. 39

CATEGORY I COMPONENTS IN FIRE ZONES 1-6D AND 2-6D

DEVIATION REQUEST:

The redundant drywell pressure switches listed below are spatially separated by a minimum of 140 feet in Unit 1 and 115 feet in Unit 2. The specific combustible configurations and the presence of fire detection in Fire Zones 1-6D, 1-6B and 1-6A (2-6D, 2-6B and 2-6A) where these devices are located contain fire protection features equivalent to that required by 10CFR50 Appendix R Section III.G.2.b.

Unit	Component	Instrument Rack	Division	Fire Zone
1	PS-E11-1N010A	1C057	I	1-6D
	PS-E11-1N010C	1C057	I	1-6D
	PS-E11-1N011A	1C057	I	1-6D
	PS-E11-1N011C	1C057	I	1-6D
	PS-E11-1N010B	1C058	II	1-6A
	PS-E11-1N010D	1C058	II	1-6A
	PS-E11-1N011B	1C058	II	1-6A
	PS-E11-1N011D	1C058	II	1-6A
2	PS-E11-2N010A	2C057	I	2-6D
	PS-E11-2N010C	2C057	I	2-6D
	PS-E11-2N011A	2C057	I	2-6D
	PS-E11-2N011C	2C057	I	2-6D
	PS-E11-2N010B	2C058	II	2-6A
	PS-E11-2N010D	2C058	II	2-6A
	PS-E11-2N011B	2C058	II	2-6A
	PS-E11-2N011D	2C058	II	2-6A

FIRE AREAS/ZONES AFFECTED:

This deviation request applies to Fire Areas R-1A and R-1B (Fire Zone 1-6D) and R-2A and R-2B (Fire Zone 2-6D).

REASON FOR DEVIATION REQUEST:

10CFR50 Appendix R, Section III.G.2.b requires a minimum of 20 ft. separation of redundant safe shutdown cables and equipment with no intervening combustibles and the presence of fire detection and automatic suppression.

Although fire detection is provided, and the redundant components are located in excess of 140 feet apart for Unit 1 (115 feet for Unit 2), automatic fire suppression is not provided and intervening combustibles (in the form of cable in tray) are present.

EXISTING CONDITIONS:

The existing arrangement of the Unit 1 components is shown on Drawing C-1945. The Division I pressure switches are mounted on Instrument Rack 1C057 in Fire Zone 1-6D. The Division II switches are mounted on Rack 1C058 which is located in Fire Zone 1-6A. The existing arrangement of the Unit 2 components is shown on Drawing C-1946. The Division I pressure switches are mounted on Instrument Rack 2CO57 in Fire Zone 2-6D. The Division II switches are mounted on Instrument Rack 2CO58 which is located in Fire Zone 2-6A.

JUSTIFICATION:

Fire Zones 1-6D and 2-6D are similar in physical layout, component arrangement and combustible configuration. The primary source of combustibles in these areas are cable trays. The only remaining in-situ combustibles consist of wire internal to electrical cabinets.

The Category I components are located in Fire Zone 1-6D (2-6D) at the reactor center line. The redundant components are located on the opposite side of the Reactor Building in Fire Zone 1-6A (2-6A). In order for a fire to affect the redundant components, it must traverse a minimum of 140 feet for Unit 1 (115 feet for Unit 2). The fire must propagate through Fire Zones 1-6D (2-6D), through a 6 foot thick reinforced concrete wall, through intermediate Fire Zone 1-6B (2-6B), through a second 6 foot thick reinforced concrete wall and through Fire Zone 1-6A (2-6A). No cable trays penetrate either of these walls. Within intermediate Fire Zone 1-6B (2-6B), the only path for propagation of a fire is cable in 45 feet of overhead tray. All of the above fire zones have a relatively low combustible loading and automatic fire detection is provided throughout the above-mentioned fire zones. The raceways for the Division I pressure switches have been wrapped with a three-hour barrier up to the terminal box. Wrapping of the terminal boxes and pressure switches is not feasible since this equipment must be accessed for routine maintenance and calibration. Inhibiting such maintenance would result in degrading the system reliability/availability, not improve it.

Propagation of a fire through Fire Zones 0-8A and 1-6F (Unit 1) or 0-8A and 2-6F (Unit 2) is not considered credible. Fire Zone 0-8A (below Elevation 818') is the refueling cavity which is not accessible during operation and is flooded during refueling

outages. The inaccessibility during normal operation and flooded condition during refueling outages precludes the introduction of transient combustibles into this fire zone. Fire Zone 1-6F (2-6F) is the spent fuel pool.

Therefore, it is our position that the presence of two (2), six (6) foot thick reinforced concrete walls and the only path for propagation being forty-five (45) linear feet of overhead cable tray provides protection equivalent to twenty (20) feet of no intervening combustibles and automatic fire suppression.

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DEVIATION REQUEST NO. 41 HAS BEEN WITHDRAWN

APPENDIX R DEVIATION REQUEST NO. 42

PROTECTION OF SAFE SHUTDOWN RACEWAY IN FIRE ZONES 1-3B-W AND 2-3B-W

DEVIATION REQUEST:

Based on the fire protection features, administrative controls, combustible levels and physical separation distances between redundant safe shutdown functions described in this deviation request, the redundant trains of raceway depicted on drawing C240924 sheet 1 for Fire Zone 1-3B-W (Unit 1 Reactor Building Elevation 683'-0) and on drawing C240924 sheet 2 for Fire Zone 2-3B-W (Unit 2 Reactor Building Elevation 683'-0) do not require protection with a raceway fire barrier even though all aspects of Appendix R Section III.G.2.b are not satisfied.

Exceptions include raceways E1F132, E1F137, C1F033, C1F034, C1F055 and JB0008 in Fire Zone 1-3B-W and C1F040, C1F045, C2F030 and JB0013 in Fire Zone 2-3B-W. These raceways are protected with a qualified 1-hour fire barrier.

FIRE AREAS/ZONES AFFECTED:

This deviation request applies to Fire Areas R-1A and R-1B (Fire Zone 1-3B-W) and R-2A and R-2B (Fire Zone 2-3B-W). These are Wraparound Zones as defined in Deviation Request No. 4.

REASON FOR DEVIATION REQUEST:

10CFR50 Appendix R, Section III.G.2.b, requires separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

Fire Zones 1-3B-W has a minimum separation distance of 17 feet between unprotected raceway containing circuits for the redundant safe shutdown trains. In Fire Zone 1-3B-W there is also a group of raceway protected with Thermo-Lag 330-1 fire barrier material along the east wall. Thermo-Lag 330-1 has been determined to be a combustible material and, as such, must be considered as an intervening combustible. Finally, there are fire detectors and an automatic suppression system throughout this fire zone.

Fire Zones 2-3B-W has a minimum separation distance of 22 feet between unprotected raceway containing circuits for the redundant safe shutdown paths. In Fire Zone 2-3B-W there is a single repeater cable for the Radiax system (i.e., portable radio system) along the west wall and a group of raceway protected with Thermo-Lag 330-1 fire barrier material along the east wall. Thermo-Lag 330-1 has been determined to be a combustible material and, as such, must be considered as an intervening combustible

along with the single repeater cable. Finally, there are fire detectors and an automatic suppression system throughout this fire zone.

The automatic suppression system and fire detection in each of these fire zones extends throughout each wraparound zone and into the adjacent fire zones on either side of the wraparound zone, but the automatic sprinkler system and fire detection do not extend completely throughout the adjacent fire areas of which these fire zones are a part.

This deviation justifies that, even though these aspects of Appendix R Section III.G.2.b are not fully satisfied, there are additional compensating factors which demonstrate that the existing configuration provides an equivalent level of assurance to that provided by Appendix R Section III.G.2.b such that safe shutdown can be achieved and maintained.

EXISTING ARRANGEMENT:

Drawing C240924 Sheet 1 shows the layout, equipment and combustible configuration of Fire Zone 1-3B-W and drawing C240924 Sheet 2 shows the layout, equipment and combustible configuration (except for the single repeater cable) of Fire Zone 2-3B-W.

In-situ combustibles in these fire zones are limited to the cables in cable trays, Thermo-Lag 330-1 on conduits and junction boxes required to be protected, and any abandoned in place Thermo-Lag on cable trays, junction boxes and conduits not required to be protected. Of these in-situ combustibles, the only intervening combustibles are the Thermo-Lag 330-1 raceway fire barriers along the east wall in each fire zone and the single repeater cable for the Radiax system in Fire Zone 2-3B-W. Cable trays are separated by a minimum of 17 feet in Fire Zone 1-3B-W and 22 feet in Fire Zone 2-3B-W.

Both fire zones are provided with fire detection and automatic sprinkler protection.

The cable trays and conduits containing redundant safe shutdown circuits are approximately 28 feet above the floor in both fire zones. The embedded junction boxes along the east wall containing redundant safe shutdown circuits are separated from each other by a minimum distance of approximately 43 feet.

POTENTIAL SAFE SHUTDOWN IMPACTS:

In the attached tables, the safe shutdown raceway in these Fire Zones 1-3B-W and 2-3B-W are tabulated. For each raceway, the safe shutdown components that could be affected should a fire damage the circuits contained in the raceway are also provided. In addition, an assessment of the worst case impact for each component is also provided. The cable faults are evaluated for the effects of hot shorts, open circuits and shorts to ground along with the effects of associated circuits, including spurious operations, breaker coordination and multiple high impedance faults. The information compiled in these tables is later used in conjunction with the raceway layout information

on the attached drawings in the justification section of this deviation request under the heading of "Physical Separation of Redundant Safe Shutdown Functions".

Circuits which are contained in non-fire protected raceways in Fire Zone 1-3B-W and which provide control or power to components required in support of safe shutdown in this fire zone are identified in Table 1.0 below.

Table 1.0 Control and Power Circuits for Safe Shutdown Components in non-fire protected raceway in Fire Zone 1-3B-W

Raceway No.	SSD Div.	Affected Component	Impact Assessment
Control Circuits for RHR Valves			
E1KH21-25	Div. I	RHR 1F009 Valve	Loss of Valve Control
		RHR 1F015A Valve	Loss of Valve Control
		RHR 1F017A Valve	Loss of Valve Control
E1K2L4	Div. I	RHR 1F009 Valve	Loss of Valve Control[(1)]
F1KH47-50	Div.II	RHR 1F008 Valve	Loss of Valve Control
		RHR 1F015B Valve	Loss of Valve Control
		RHR 1F017B Valve	Loss of Valve Control
		RHR 1F048B Valve	Loss of Valve Control
Power to RHR Valves & Other Equipment			
E1PH21-23	Div. I	1B219 (RHR 15A & 7A)	Loss of Power to Valves
E1PJ63	Div. I	1B219 (RHR 15A & 7A)	Loss of Power to Valves
F1PH47-50	Div. II	RHR 1F008 Valve	Spurious Valve Opening
		RHR 1F017B Valve	Loss of Power to Valve
		RHR 1F048B Valve	Loss of Power to Valve
		1D274 (See Table 1.0a)	Loss of Power to Equipment
Power to Switchgear and Pumps			
JB0009	Div. I	1/2A201 4.16 kv Swgr.	Loss of Power to 4.16 kv
		CS Pump 1P206A	Loss of Power to Pump
		ESWS Pump 0P504A	Loss of Power to Pump
		RHR Pump 1P202A	Loss of Power to Pump
JB0007	Div.II	1/2A202 4.16 kv Swgr.	Loss of Power to 4.16 kv
		CS Pump 1P206B	Loss of Power to Pump
		ESWS Pump 0P504B	Loss of Power to Pump
JB0073	Div. II	RHR Pump 1B202B	Loss of Power to Pump

(1) A hot short could cause the spurious opening of this valve, except that the cable is routed in a dedicated conduit with no other energized circuits.

The following table provides information related to the impacts to equipment powered from 1D274.

Table 1.0a - Components Powered from 1D274		
Comp. ID	**Comp. Description**	**Comments**
HV-15768	Supp. Pool Flow Div. Valve	normally closed/required closed
1P216	HPCI Vac. Tk. Cond. Pump	not used for SSD
HV-E41-1F066	HPCI Turb. Exh./Supp. Pool	not used for SSD in this area
1P213	HPCI Aux. Oil Pump	not used for SSD in this area
HV-B21-1F019	MSL Drain Iso.Valve	need to close this or 1F016
HV-G33-1F004	RWCU Iso. Valve	need to close this or 1F001
1P215	HPCI Bar. Cond. Vac. Pump	not used for SSD
HV-E11-1F023	RHR Head Spray	normally closed/not used for SSD
HV-E11-1F049	RHR Letdown to LRW/Cond.	normally closed/not used for SSD
HV-E11-1F008	RHR SDC Iso. Valve	normally closed/required closed
HV-E41-1F008	HPCI Test to CST	not used for SSD in this area
HV-E41-1F007	HPCI Pump Disch. Valve	not used for SSD in this area

Circuits which are contained in non-fire protected raceways in Fire Zone 2-3B-W and which provide control or power to components required in support of safe shutdown in this fire zone are identified in Table 2.0 below.

Table 2.0 Control and Power Circuits for Safe Shutdown Components in non-fire protected raceway in Fire Zone 2-3B-W

Raceway No.	SSD Div.	Affected Component	Impact Assessment
Control & Instrumentation Circuits			
E2KH26-28	Div. I	ESWS Pump 0P504C	Loss of Pump Control
		RWCU 2F001 Valve	Spurious Valve Opening
		RHR 2F009 Valve	Spurious Valve Opening
		RHR 2F017A Valve	Loss of Valve Control
E1K715	Div. I	RHRSW 24A1 Valve	Loss of Valve Control
		RHRSW 24A2 Valve	Loss of Valve Control
		RHRSW 22A Valve	Loss of Valve Control
E2M098	Div. I	Div. I SPOTMOS	Loss of function
F2KH29-32	Div. II	RHR 2F048B Valve	Loss of Valve Control
		Div. II ADS Logic	Loss of Div. II Control
Power to RHR Valves & Other Equipment			
F2PH29-32	Div. II	RHR 2F008 Valve	Spurious Valve Opening
		RHR 2F015B Valve	Loss of Power to Valve
		RHR 2F017B Valve	Loss of Power to Valve
		RHR 2F048B Valve	Loss of Power to Valve
		2B229 (RHR 15B & 7B)	Loss of Power to Valves
		2D274 (See Table 2.0a)	Loss of Power to Equipment
Power to Switchgear and Pumps			
JB0012	Div. I	1/2A201 4.16 kv Swgr.	Loss of Power to 4.16 kv
		CS Pump 2P206A	Loss of Power to Pump
		RHR Pump 2P202A	Loss of Power to Pump
		RHRSW Pump 2P506A	Loss of Power to Pump
JB0014	Div. II	1/2A202 4.16 kv Swgr.	Loss of Power to 4.16 kv
		CS Pump 2P206B	Loss of Power to Pump
		RHRSW Pump 2P506B	Loss of Power to Pump
JB0075	Div. II	RHR Pump 2P202B	Loss of Power to Pump

The following table provides information related to the impacts to equipment powered from 2D274:

Table 2.0a - Components Powered from 2D274		
Comp. ID	**Comp. Description**	**Comments**
HV-25768	Supp. Pool Flow Div. Valve	normally closed/required closed
2P216	HPCI Vac. Tk. Cond. Pump	not used for SSD
HV-E41-2F066	HPCI Turb. Exh./Supp. Pool	not used for SSD in this area
2P213	HPCI Aux. Oil Pump	not used for SSD in this area
HV-B21-2F019	MSL Drain Iso.Valve	need to close this or 2F016
HV-G33-2F004	RWCU Iso. Valve	need to close this or 2F001
2P215	HPCI Bar. Cond. Vac. Pump	not used for SSD
HV-E11-2F023	RHR Head Spray	normally closed/not used for SSD
HV-E11-2F049	RHR Letdown to LRW/Cond.	normally closed/not used for SSD
HV-E11-2F008	RHR SDC Iso. Valve	normally closed/required closed
HV-E41-2F008	HPCI Test to CST	not used for SSD in this area
HV-E41-2F007	HPCI Pump Disch. Valve	not used for SSD in this area

JUSTIFICATION:

Fire Zones 1-3B-W and 2-3B-W are similar in physical layout including raceway layout and combustible loading. Where the differences are pronounced, the features of each fire zone are described separately. Otherwise, the description provided is the limiting condition which bounds both fire zones.

Fire Zones 1-3B-W and 2-3B-W are "wraparound zones" which, as described in Deviation Request No. 4, function to provide separation between Fire Areas R-1A and R-1B and Fire Areas R-2A and R-2B, respectively. Fire Areas R-1A and R-2A rely on Safe Shutdown Path No. 3. Fire Areas R-1B and R-2B rely on Safe Shutdown Path No. 1. In Deviation Request No. 4, it is stated that both safe shutdown paths are protected in the "wraparound area" unless a deviation is provided which specifically justifies the existing conditions. Due to the unique attributes of Fire Zones 1-3B-W and 2-3B-W, as described below, this deviation justifies a condition different than that described in Deviation Request No. 4.

Physical Separation of Redundant Safe Shutdown Functions:

Fire Zone 1-3B-W:

As shown on Drawing C240924 Sheet 1, all non-fire protected redundant safe shutdown circuits are separated by more than 20 feet except those contained in E1PH22, E1PJ63 and F1KH 49-50. In the unlikely event that a fire were to impact all of these raceway, the worst case result would be a loss of power to the following RHR System Valves with the following result:

1F007A, Loop A RHR Pump minimum flow valve, is initially required to be open and then to close when the RHR Pump flow increases to an acceptable level. A loss of power would result in the failure of this valve to close. This failure, however, will not impact the ability to achieve and maintain safe shutdown. The flow capacity of one RHR Pump is approximately 12,000 gpm. The flow diversion through an open minimum flow valve is approximately 1,000 gpm. Any flow diversion through the 1F007A Valve would be returned to the Suppression Pool. The RHR flow through the RHR Heat Exchanger is to be limited to less than 10,000 gpm. Even with the postulated flow diversion, the RHR flow would need to be throttled back and, therefore, adequate flow through the heat exchanger would still be available.

1F008, the RHR SDC Outboard Containment Isolation Valve, is normally closed and is required to be closed in support of safe shutdown. A loss of power to this valve would result in this valve remaining in the closed position.

1F015A and B, the RHR LPCI Injection Inboard Containment Isolation Valves, are normally closed and are required to be closed in support of safe shutdown. A loss of power to these valves would result in these valves remaining in the closed position.

1F017B, Loop B RHR LPCI Injection Outboard Containment Isolation Valve, is not required to be operated in support of safe shutdown in this area. Loss of valve control due to loss of power, therefore, is of no concern.

1F048B, Loop B RHR Heat Exchanger bypass valve, is normally open, but is required to be closed in support of safe shutdown. Failure of this valve to close would cause a flow diversion around the RHR Heat Exchanger. This could impact the efficiency and, therefore, the availability of the RHR System the Suppression Pool Cooling mode of operation.

The assessments provided above use the assumption from Calculation EC-013-0843 that at fire onset, all safe shutdown systems are assumed operable and available for post-fire shutdown. This assumption requires that all safe shutdown components are initially in their normal position.

The net result of the impacts described above would be a potential loss of RHR Loop B Suppression Pool Cooling. Loop A of RHR, however, would still be available to operate in the Suppression Pool Cooling mode. The only potential impact to Loop A of RHR is to the 1F007A Valve. The failure of the 1F007A Valve to close would have no impact on the ability of RHR to operate efficiently in the Suppression Pool Cooling mode.

All other raceway and redundant safe shutdown functions are separated by greater than 20 feet with insignificant intervening combustibles and, as such, there will be no other impacts to safe shutdown functions.

Fire Zone 2-3B-W:

As shown on Drawing C240924 Sheet 2 all non-fire protected redundant safe shutdown circuits are separated by more than 20 feet with insignificant intervening combustibles. Therefore, there will be no impacts to safe shutdown functions.

In-situ and Intervening Combustibles:

The only in-situ combustibles in these fire zones consist of cables in enclosed raceway (e.g., conduits, cable trays and junction boxes), Thermo-Lag 330-1 installed on raceway required to be protected, abandoned in place Thermo-Lag 330-1 on raceway not required to be protected, and a single repeater cable for the Radiax system (Fire Zone 2-3B-W only). The Thermo-Lag 330-1 on the protected raceway along the east wall, which represent intervening combustibles, are shielded to a great extent from the redundant raceway on the west wall by structural steel floor framing for Elevation 719'-1. The non-protected redundant raceway themselves are separated by a minimum of 17 feet and, in most cases, by greater than 20 feet. Due to the presence of fire detection and automatic sprinkler protection in this fire zone, this 17 foot distance is considered to be sufficient to preclude damage to redundant raceway due to in-situ combustibles. Since the combustible material contribution from the single repeater cable for the Radiax System is insignificant, it is not considered to be a fire hazard.

A transient fire, such as a trash can fire, would not affect the safe shutdown raceway which are in close proximity to each other since the safe shutdown raceways are located approximately 28 feet above the Elevation 683'-0 floor.

Administrative Controls:

The floor area between the redundant safe shutdown cable trays are identified to indicate that it is a restricted area for storage of transient combustible materials. No transient combustible materials will be stored in this area without the review and acceptance of the Site Fire Protection Engineer.

Fire Protection Features:

Both Fire Zones 1-3B-W and 2-3B-W are provided with fire detection and automatic sprinkler protection. Due to the limited amount of in-situ combustibles in this area and the administrative controls described above for controlling the introduction of transient combustibles, the automatic suppression system and fire detection installed in these fire zones are adequate to ensure that both redundant trains will not be damaged. Therefore, an automatic suppression system and fire detection do not need to be installed throughout the fire areas of which these fire zones are a part.

SUMMARY AND CONCLUSION:

The configuration of the redundant raceway, the use of qualified raceway fire barriers where shown on Drawing C240924 Sheets 1 and 2 and the low quantity of combustibles ensure that the fire detection and fire suppression installed in Fire Zones 1-3B-W and 2-3B-W will prevent damage to redundant safe shutdown raceway. Therefore, protection of the redundant raceway with a qualified 1-hour fire barrier is not required in Fire Zone 1-3B-W, other than E1F132, E1F137, C1F033, C1F034, C1F055 and JB0008 which are protected with a qualified 1-hour fire barrier, and in Fire Zone 2-3B-W, other than C1F040, C1F045, C2F030 and JB0013 which are protected with a qualified 1-hour fire barrier.

8.0 DRAWINGS

The drawings listed below contain the key information for the design and control of fire protection features at the plant.

DRAWING #	TITLE	SHEETS
E-105002	General Site Arrangement	1
E-105176	Yard Main Arrangement	1 and 2
E-106227	P&ID – Fire Protection	1 thru 7 and 9
E-205949	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 645'-0"	1,2
E-205950	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 670'-0"	1,2
E-205951	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 683'-0"	1,2
E-205952	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 719'-1"	1,2
E-205953	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 749'-1"	1,2
E-205954	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 779'-1"	1,2
E-205955	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 799'-1"	1,2
E-205956	SSES Unit 1 Reactor Building Fire Zone Plan of Elevation 818'-1"	1,2
E-205957	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 645'-0"	1,2
E-205958	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 670'-0"	1,2
E-205959	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 683'-0"	1,2
E-205960	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 719'-1"	1
E-205961	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 749'-1"	1
E-205962	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 779'-1"	1
E-205963	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 799'-1"	1
E-205964	SSES Unit 2 Reactor Building Fire Zone Plan of Elevation 818'-1"	1,2

DRAWING #	TITLE	SHEETS
E-205965	SSES Units 1 & 2 Reactor Building Fire Zone Section A-A	1
E-205966	SSES Units 1 & 2 Reactor Building Fire Zone Section B-B	1
E-205967	SSES Units 1 & 2 Reactor Building Fire Zone Section C-C	1
E-205968	SSES Units 1 & 2 Reactor Reactor Building Fire Zone Section D-D	1
E-213485	SSES Units 1 & 2 Reactor Reactor Building Fire Zone Sections G-G and H-H	1
E-205985	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 656'-0"	1,2
E-205986	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 676'-0"	1
E-205987	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 686'-0"	1,2
E-205988	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 698'-0"	1,2
E-205989	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 714'-0"	1,2
E-205990	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 729'-1"	1
E-205991	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 741'-1"	1
E-205992	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 754'-0"	1,2
E-205993	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 771'-0"	1,2
E-205994	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 783'-0"	1,2
E-205995	SSES Units 1 & 2 Control Structure Fire Zone Plan of Elevation 806'-0"	1,2
E-205996	SSES Units 1 & 2 Control Structure Fire Zone Section A-A	1
E-205997	SSES Units 1 & 2 ESSW Pumphouse Fire Zone Plan of Elevation 660'-0"	1,2
E-205998	SSES Units 1 & 2 ESSW Pumphouse Fire Zone Plan of Elevation 686'-6"	1,2
E-205999	SSES Units 1 & 2 ESSW Pumphouse Fire Zone Section A-A	1
E-206000	SSES Units 1 & 2 Diesel Generator Building Fire Zone Plan of Elevation 660'-0"	1,2

DRAWING #	TITLE	SHEETS
E-206001	SSES Units 1 & 2 Diesel Generator Building Fire Zone Plan of Elevation 677'-0"	1,2
E-206002	SSES Units 1 & 2 Diesel Generator Building Fire Zone Plan of Elevation 710'-9"	1,2
E-206003	SSES Units 1 & 2 Diesel Generator Building Fire Zone Section A-A	1
E-213410	SSES Units 1 & 2 Diesel Generator E Building Fire Zone Plan of Elevation 656'-6"	1,2
E-213411	SSES Units 1 & 2 Diesel Generator E Building Fire Zone Plan of Elevation 675'-6"	1,2
E-213412	SSES Units 1 & 2 Diesel Generator E Building Fire Zone Plan of Elevation 708'-0"	1,2
E-213413	SSES Units 1 & 2 Diesel Generator E Building Fire Zone Plan of Elevation 726'-0" and 741'-6"	1,2
E-213414	SSES Unit 1 & 2 Diesel Generator E Building Fire Zone Section A-A	1