APPENDIX 9B

APPENDIX R REVIEW
SAFE SHUTDOWN EVALUATION

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SECTION 9B.1

INTRODUCTION

On November 19, 1980, a revised Section 10CFR50.48 and a new Appendix R to 10CFR50 regarding fire protection features of nuclear power plants were published. The revised Section 50.48 and Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specifies requirements for a particular aspect of the fire protection features at a nuclear power plant. This submittal specifically outlines the methodology used to address the provisions of Section III.G, III.J, and III.L of Appendix R, which deals with the fire protection of safe shutdown and remote shutdown capability, and emergency lighting. Other subsections of Section III outlining the fire protection methods and administrative procedures are addressed in Appendix 9A.

Subsequent to the issuance of Regulatory Guide (RG) 1.75 Revision 1, "Physical Independence of Electrical Systems," in January 1975 and the Browns Ferry Fire accident, substantial changes were made to provide barrier type separation between redundant safety areas of the plant. This resulted in a plant design which inherently met the intent of Appendix R in the areas like cable spreading and cable routing rooms, cable tunnels, etc. This approach, however, could not be applied to some general plant areas like the reactor building where the combination of trains/divisions was unavoidable. The purpose of this study is to evaluate in sufficient detail the effects of fire in such areas and to recommend means for the safe shutdown of the plant.

This submittal outlines the methodology used to assemble, analyze, and document the results of the assessment of the fire protection features at Nine Mile Point Nuclear Station - Unit 2 (Unit 2) Nuclear Generating Station for conformance to the specific requirements of Section III.G, III.J and III.L of Appendix R to 10CFR50.

SECTION 9B.2

DEFINITIONS

For the purpose of this analysis, the following definitions are provided:

Safe Shutdown (SSD) - Hot or cold shutdown (reactor subcritical) with control and coolant inventory and decay heat removal.

Hot Shutdown - The reactor is shut down, the reactor coolant inventory is being controlled while the reactor is being depressurized, and the reactor temperature is greater than 200°F.

Cold Shutdown - The reactor is shut down, the reactor coolant inventory is being maintained with the reactor depressurized so that decay heat is being removed from the reactor vessel and transferred to the ultimate heat sink, and reactor temperature is less than or equal to 200°F.

Fire Area - Areas within the plant that are totally enclosed by 3-hr fire barriers. Under certain circumstances, barriers of less than 3 hr are acceptable (see 9A.3.1.2.5 and BTP CMEB 9.5-1). Structural steel forming a part or supporting such fire barriers to be protected to provide fire resistance equivalent to that required of the barrier. A Fire Area consists of one or more Fire Zones. The Fire Zones are defined below.

Fire Subarea - A fire subarea is defined as a subdivision of a fire area that is totally separated from other plant areas by a combination of acceptable fire boundaries as defined in Appendix R, III.G.2, or exemptions. A Fire Subarea consists of one or more Fire Zones. The Fire Zones are defined below.

Fire Zone - A plant area whose boundaries need not consist of rated or approved fire barriers, but are chosen based on the plant's physical design, convenience and layout of the fire detection and suppression system.

Associated Circuits[1] - Those cables (safety related, nonsafety related, Class 1E, and non-Class 1E) that:

1. Have a physical separation less than that required by Section III.G.2 of Appendix R, and

2. Have one of the following:

    a. A common power source with the shutdown equipment (redundant or alternative) and the power source is not electrically protected from the circuit of

[1] The definition of the associated circuits is not exactly the same as the definition presented in IEEE-384-1977.

concern by coordinated breakers, fuses or similar devices, or

b. A connection to circuits of equipment whose spurious operation would adversely affect the shutdown capability, or

c. A common enclosure with the shutdown cables and,

(1) are not protected by circuit breakers, fuses or similar devices, or

(2) will allow propagation of the fire into the common enclosure.

Safe Shutdown System (SSDS) - A safe shutdown system includes components, panels, cable raceways, conduits, etc., necessary for the system to perform a safe shutdown function. A safe shutdown system is one of several combinations of various plant systems that is capable of achieving safe shutdown of the plant.

Safety Division I - Those systems that receive their emergency ac power from standby diesel generator 2EGS*EG1.

Safety Division II - Those systems that receive their emergency ac power from standby diesel generator 2EGS*EG3.

Safety Division III - Those systems that receive the emergency ac power from high-pressure core spray (HPCS) diesel generator 2EGS*EG2.

SECTION 9B.3

THE INFORMATION ON THIS PAGE HAS BEEN DELETED.

SECTION 9B.4

SAFE SHUTDOWN SYSTEM CAPABILITY

9B.4.1 Introduction

When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to plant and public safety. The methodology for this analysis consisted of establishing performance criteria for achieving safe shutdown, identifying those systems which would be utilized in attaining the required performance criteria, then evaluating those systems as to their safe shutdown capability. The system requirements for the safe shutdown analysis were established from Standard Review Plan (SRP) 9.5.1, Revision 3, which states that "one train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of fire damage by a single fire, including an exposure fire..." and that "both trains or equipment necessary to achieve cold shutdown may be damaged by a single fire, including an exposure fire, but damage must be limited so that at least one train can be repaired or made operable within 72 hr using onsite capability."

9B.4.2 Safe Shutdown Model

The limiting safety consequences that have been established and are used in evaluating a fire event at Unit 2 are:

1. No calculated fuel failures.

2. Reactor coolant boundary integrity.

3. Primary containment integrity.

These limiting safety consequences have been translated into a set of functional performance criteria to establish system requirements for safe shutdown with or without offsite power available. These performance criteria are (Figure 9B.4-1):

1. Reactivity control - achieve and maintain reactor subcritical.

2. Decay Heat Removal to Hot Shutdown - provide a heat sink for decay heat removal to hot shutdown.

3. Peak Cladding Temperature - ensure that the peak cladding temperature remains below 1500°F.

4. Depressurize - safely reduce reactor vessel pressure.

5. Decay Heat Removal to Cold Shutdown - provide a heat sink for decay heat removal to cold shutdown.

9B.4.3 Safe Shutdown Capability

In the event of a fire, safe shutdown of Unit 2 can be achieved in several diverse means depending upon the location of the fire, the availability of electrical power, and the components rendered inoperable. A fire event coincident with a loss of offsite power (LOOP) is the limiting scenario and generally represents a "worst case" approach. For this reason the safe shutdown capability of fire areas, with the exception of fire area 60 (service water pump area), has been analyzed for a fire that occurs in any one subarea simultaneously with a LOOP. For fire area 60, an analysis was performed and concluded that this area does not contain any alternative shutdown equipment which requires the assumption of a LOOP to the equipment, and a fire in this area will not induce a LOOP. Therefore, for fire area 60, a LOOP assumption was not applied. However, assumption of a LOOP concurrent with a fire in a fire area is more limiting than any other scenarios wherein offsite power is available. In the fire scenario where offsite power remains available, a maximum of flexibility is afforded in the selection of systems unaffected by the fire which could be used to reach safe shutdown conditions.

The options available to achieve a safe shutdown in the event of a LOOP are:

1. If the HPCS system is available, reactor water level can be maintained, as required, using HPCS. Reactor overpressurization can be relieved by the main steam safety relief valves (SRVs). Suppression pool cooling can be accomplished by the residual heat removal (RHR) system. To achieve cold shutdown from this point, it may be necessary to manually depressurize the reactor vessel using the SRVs automatic depressurization system (ADS), so that the shutdown cooling mode of RHR can be initiated.

2. If reactor core isolation cooling (RCIC) is available, it can be used, as required, to maintain vessel inventory.

3. If HPCS and RCIC are not available, the "pseudo" LPCI mode of RHR can be used to maintain vessel inventory. Controls for HPCS are not available from the RSP and RCIC is postulated to be unavailable.

   <u>"Pseudo" LPCI Mode</u>

   An alternate method of maintaining level in the reactor vessel is provided. This alternate method is described as the "pseudo" LPCI mode of RHR and is used for maintaining reactor level subsequent to an Appendix R fire in the control room.

The "pseudo" LPCI mode will take suction from the suppression pool and deliver water to the reactor vessel through remote manual shutdown cooling valve 2RHS*MOV40A/B via the discharge piping of 2RCS*P1A or 2RCS*P1B. This valve can be operated from the remote shutdown room. This mode differs from the normal shutdown cooling mode of RHR in that relatively cold water from the suppression pool is delivered to the RCS, which is at near rated temperature. Due to the significant differential water temperature between the RPV and the suppression pool, this mode can be used one time only for the postulated Appendix R fire.

For this "pseudo" LPCI mode of RHR, it is postulated that the high-pressure injection systems of HPCS and RCIC are not available. Controls for HPCS are not available from the remote shutdown panel (RSP), and RCIC is postulated to be inoperable due to hot shorts resulting from a fire in the main control room. Thus, to depressurize the RPV to allow the RHR pumps to operate, four of the SRVs will be used since the controls for only four SRVs are available from the RSPs.

The ADS "pseudo" LPCI mode of RHR will satisfy the safe shutdown criteria, and allow the reactor water level to be maintained, such that peak cladding temperature remains below 1500°F, while plant operation is from the RSP or control room during and after a postulated fire in any area of the plant, including the control room/relay room.

Suppression pool cooling can be accomplished by RHR. To achieve cold shutdown from this point, it may be necessary to manually depressurize the reactor vessel using the SRVs (ADS) so that the shutdown cooling mode of RHR can be initiated.

Two redundant trains of systems are available to achieve a safe shutdown under each of these options. Each train is powered from a separate emergency diesel generator (2EGS*EG1-Division I and 2EGS*EG3-Division II). Either train, in conjunction with RCIC, HPCS, or ADS "pseudo" LPCI can be relied upon to shut down the plant.

Likewise, should a fire affect a portion of one train, the corresponding portion in the other train can remain available. The HPCS system is powered from a separate diesel generator (2EGS*EG2-Division III). If both HPCS and RCIC equipment and cables required for safe shutdown are located in the same fire area, an analysis was performed and corrective actions taken to ensure that at least one train is always available to safely shut down the plant.

For a detailed description of those systems required to achieve a shutdown, the following cross-reference is provided:

System	FSAR Section
ADS	6.3
HPCS	6.3
LPCS	6.3
RCIC	5.4.6
RHR	5.4.7
Service Water	9.2.1
Diesel Generator Support Systems	9.5.4 to 9.5.8
HVAC Systems	9.4
Onsite Power Systems	8.3
Control Systems for ESF Systems	7.3
Control Systems Required for Safe Shutdown	7.4
Other Control Systems Required for Safety	7.6
Safety-Related Display Instrumentation (other than those provided at remote shutdown panels)	7.5

9B.4.4 Safe Shutdown Analysis

The SSDSs have been divided into a total of four trains consistent with the options discussed in Section 9B.4.3 (Figure 9B.4-2).

9B.4.4.1 Event Description

The evaluation fire event is selected to cover the range of postulated conditions required by SRP 9.5.1 Revision 3. The reactor is operating at rated power when a fire event occurs in and is confined to a single fire area. The safe shutdown train is evaluated for all fire areas except fire area 60 (service water pump area) assuming that offsite power is not available for 72 hr. For fire area 60, an analysis performed concluded that this area does not contain any alternative shutdown equipment which requires the assumption of a LOOP for 72 hr and a fire in this area will not induce a LOOP condition. However, the LOOP assumption results in a loss of feedwater and main condenser as a heat sink.

9B.4.4.2 Assumptions

This analysis of the SSDSs is based on the following assumptions:

1. No credit is assumed for offsite power except in fire area 60.

2. Reactor scrams automatically or Operator scrams reactor. All control rods are fully inserted.

3. All of the SSDSs not affected by the fire event are considered to be available and to function normally.

4. For all fire areas except fire area 60 (service water pump area), the fire event does not occur simultaneously or coincident with any other abnormal conditions except a LOOP. For fire area 60, an analysis was performed and concluded that this area does not contain any alternative shutdown equipment requiring a LOOP assumption and, in addition, will not cause a fire-induced LOOP condition. Therefore, a LOOP assumption was not applied to fire area 60. No other challenges to the SSDSs are considered as part of this analysis.

5. Plant operating and system actuation parameters are consistent with the plant safety analysis and Technical Specifications for the initiating event.

6. Components inside the primary containment are not affected by the fire since it is inerted.

9B.4.4.3 Results

An analysis was performed to evaluate the capability of the four principal trains of systems to achieve the objectives specified in SRP 9.5.1. The minimum required components within each train were analyzed to demonstrate the ability of the subsystems within each train to meet the performance goals. In addition, environmental control systems were identified and evaluated to ensure the operability of the required safe shutdown equipment.

9B.4.4.3.1 Shutdown with HPCS Available

There are at least two distinct trains of systems available to reach a safe shutdown under this option. Safe shutdown can be accomplished with either Division I or Division II components available. These two cases represent the most limiting cases, since a maximum of flexibility is afforded when both divisions are available.

In this scenario, it is assumed that the reactor is isolated (i.e., main steam isolation valves (MSIVs) closed) due to the scram and LOOP. The pressure buildup within the vessel resulting from the scram can be limited by the actuation of the main steam SRVs. HPCS can be initiated upon low water level to make up for the steam that is being blown down to the suppression pool through the SRVs. The SRVs can cycle opened and closed periodically as reactor vessel temperature and pressure rise and fall. HPCS can also operate periodically to maintain reactor water inventory, as necessary. In addition, low-pressure core spray (LPCS) and low-pressure coolant injection (LPCI) can be used to maintain water level once the vessel pressure has been sufficiently reduced.

The suppression pool cooling mode of RHR (either Division I-loop A or Division II-loop B or both if available) can be initiated to limit the peak suppression pool temperature and to provide a path for the removal of core decay heat to the UHS through the RHR heat exchanger(s) and the service water (SWP) system.

Once hot shutdown has been achieved and it is decided to proceed to a cold shutdown, it may be necessary to manually actuate the SRVs (ADS) (either Division I or Division II or both if available) to further depressurize the vessel to 335°F and 95 psig. At this point, the shutdown cooling mode of RHR can be initiated to reach cold shutdown.

9B.4.4.3.2 Shutdown with RCIC Available

There are at least two distinct trains of systems available to reach a safe shutdown under this option, too. Safe shutdown can again be accomplished with RCIC and either Division I or Division II components available.

It is again assumed that the reactor is isolated due to the scram and LOOP. RCIC can be initiated upon low water level to make up for the steam that is being blown down to the pool through the SRVs. In addition, LPCS and LPCI can be used to maintain water level once the vessel pressure has been sufficiently reduced.

The pool cooling mode of RHR can be initiated to limit the peak suppression pool temperature and to provide a path for the removal of core decay heat to the UHS through the RHR heat exchanger(s) and the SWP system.

Once hot shutdown has been achieved and it is decided to proceed to a cold shutdown, it may be necessary to manually actuate the SRVs (ADS) (either Division I or Division II or both, if available) to further depressurize the vessel to 335°F and 95 psig. At this point, the shutdown cooling mode of RHR can be initiated to reach cold shutdown.

9B.4.4.3.3 Shutdown With ADS "Pseudo" LPCI

In the event of control room/relay room fire, or fire in any other fire area, and loss of the RCIC/HPCS systems, ADS with pseudo injection of the LPCI system (through the recirculation lines) can be used to accomplish safe shutdown.

Once hot shutdown has been established and it is decided to proceed to a cold shutdown, it may be necessary to manually actuate the SRVs (either Division I or II or both, if available) to further depressurize the vessel to 95 psig and 335°F. At this point, the shutdown cooling mode of RHR can be initiated to achieve cold shutdown.

9B.4.4.3.4 Auxiliary and Support Systems

All of the auxiliary and support systems that are required to operate to ensure a safe shutdown of the plant have two distinct trains. The analysis assumed that either the Division I or Division II portions of these systems were always available. In case both Divisions were to be available, maximum flexibility would be provided since either or both trains could be operated as needed to support safe shutdown.

The auxiliary and support systems reviewed include:

1. SWP System - Required to provide cooling water for:

   a. RHR heat exchangers

   b. RHR pump seal coolers

   c. Spent fuel heat exchangers

   d. Diesel generators

   e. Safety-related heating, ventilating and air conditioning (HVAC) systems

2. Spent Fuel Pool Cooling (SFC) System - If needed to remove decay heat generated within the spent fuel pool.

3. HVAC Systems - Required to maintain environmental control. These systems include:

   a. Reactor Building Ventilation (HVR) - Provides space cooling within the reactor building and auxiliary bays for safety-related components.

   b. Control Building Ventilation (HVC) and Chilled Water (HVK) - Provide cooling for control room, relay rooms, standby switchgear area, battery areas, and the remote shutdown area.

   c. Yard Structures Ventilation (HVY) - Provides space cooling for the SWP pumps.

   d. Diesel Generator Building Ventilation (HVP) - Provides space cooling for the diesel generator building.

4. Diesel Generator Support Systems - Required to support the startup and operation of the diesel generators. These systems include:

a. Diesel Generator Air Startup (EGA)

b. Diesel Generator Fuel Oil (EGF)

5. Reactor Building Closed Loop Cooling Water (CCP) System - The only portions of CCP required to operate are the block valves that must close to allow for cooling water flow to the residual heat system (RHS) pump seal coolers, and the SFC heat exchangers from the SWP system instead of the CCP system.

9B.4.4.3.5 Safe Shutdown Control Monitoring Systems

There are certain parameters which must be controlled to ensure that safe shutdown is achieved and the fission product release barriers are retained.

Fuel integrity is ensured if reactivity is controlled and heat transfer from the reactor core to the primary coolant is maintained within limits.

Heat rejection from the reactor coolant system (RCS) at an acceptable rate ensures that the reactor vessel pressure limits are not exceeded.

Containment integrity is ensured if there are no failures in the isolation features and pressure limits are not exceeded.

For a discussion of the control systems provided to control and monitor a safe shutdown, see Final Safety Analysis Report (FSAR) Sections 7.3, 7.4, and 7.6. These instrumentation systems are redundant so that at least one division can be available.

9B.4.4.4 Conclusions

The above analysis demonstrates that at least four distinct trains are available to achieve a safe shutdown. When HPCS is available, the two trains discussed achieve a shutdown in a similar manner, the only difference being electrical power supply, Division I or Division II. Likewise, the two trains discussed for the case in which RCIC is available achieve a shutdown in a similar manner, the only difference again being electrical supply power, Division I or Division II. This analysis demonstrates that each of the four principal trains satisfies the five functional performance criteria given in Section 9B.4.2 and, therefore, does not exceed any of the limiting safety consequences.

9B.4.5 Safe Shutdown Electrical Power Supply

The emergency electrical power sources and distribution systems required to maintain operability of safe shutdown equipment are discussed in detail in Chapter 8 of the FSAR.

9B.4.6 Safe Shutdown Monitoring Instrumentation

There are certain parameters that must be controlled to ensure that safe shutdown is achieved and the fission product release barriers are retained.

Detailed descriptions of systems to monitor these parameters are given in FSAR Chapter 7.

SECTION 9B.5

ASSOCIATED CIRCUITS

9B.5.1 Introduction

Associated circuits are circuits which are not completely independent of the SSDSs and components. Failure of these circuits can potentially affect the SSDSs. A fire in a given fire area can potentially affect systems and components which were thought to be independent of that area. The three categories of the associated circuits are:

1. Circuits that are not needed for safe shutdown but share a common power supply with safe shutdown circuits and are susceptible to fire.

2. Circuits which can affect components whose spurious operation would adversely affect safe shutdown capability and are susceptible to fire.

3. Circuits which share an enclosure (raceway, panel, junction box, etc.) with safe shutdown circuits but are themselves not needed for safe shutdown and are susceptible to fire.

9B.5.2 Analysis

Each of the three safety divisions (I, II, and III) supplies its own safety loads on Unit 2. The design of the electrical distribution system does not permit connection of an out-of-division or nonsafety load to a safety bus (without interposing a qualified and coordinated isolation device). In addition, redundant divisions are physically separated in accordance with Section III.G-2 of Appendix R. These design features negate the possibility of Type 1 and 3 associated circuits as defined above. However, an analysis performed identified a small number of Type 1 associated circuits. These circuits are administratively controlled in the event of a fire to achieve and maintain safe shutdown. In addition, the results of the multiple high-impedance faults (MHIF) analysis conclude that all Appendix R associated circuits by common power source are appropriately protected so that any fire-induced MHIF in any fire area will not adversely affect the safe shutdown capability of the plant.

Associated circuits of Type 2 that result as a consequence of spurious operation of certain devices are described in Section 9B.5.3.

9B.5.3 Spurious Operation

Spurious operation of powered components can potentially have a serious effect on the safety of the plant. Spurious operation is the result of a hot short for components which are energized to actuate. Open circuits and short-to-ground will not affect energized-to-actuate components (motor-operated valves [MOVs], pumps, fans, etc.). De-energized to actuate components (fail-safe air-operated valve [AOV], solenoid-operated valve [SOV], or a relay) can change position on loss of power.

The approach that will be used in the evaluation of spurious operation will be to:

1. Identify remotely-controlled components or groups of components that would have an adverse effect on safe shutdown as a result of spurious operation.

2. Determine the electrical circuits that are electrically associated with the devices identified in Item 1.

3. Determine routing of cables by fire area.

4. Determine if spurious operation is both possible as a result of routing and unacceptable for safe shutdown.

Spurious operation will be evaluated on a function-by-function basis. Those functions are:

1. Reactivity control.

2. Decay heat removal control.

3. Reactor coolant inventory control.

4. Containment isolation control.

Important components will be identified for each function and mode of operation. Once it is determined that cables for important components are susceptible to fire, a further evaluation of the specific cable will be performed.

The following guidelines will be used in evaluating the potential for spurious operation.

1. Phase-to-phase hot shorts in a 3-phase cable will not cause operation except in high/low interface.

2. Open circuits are of no consequence in normally de-energized-to-operate circuits.

3. Hot shorts in control cables can cause spurious operation.

4. There has to be a mechanistic short in a cable that is in the fire area for spurious operation to take place (i.e., a motor starter can be spuriously actuated if its contactor is energized). This can only happen in

certain wires, not all wires. Therefore, the appropriate wire(s) must be in the fire zone for spurious operation to occur.

Valves can be mispositioned, thus causing a variety of effects on plant systems. Closure can block required flow paths. Opening can divert fluid from the process via the primary system connection or can bypass a heat exchanger or create a flow path that bypasses the core.

9B.5.3.1 Reactivity Control

Reactivity control is attained by insertion of the control rods into the reactor. The control rod drive (CRD) system provides the means to insert and retract the control rods within the reactor core.

Once the reactor has been shut down by the insertion of the control rods, there is no available mechanism for a return to criticality other than rod withdrawal. The design layout of the reactor protection system (RPS) and the CRD system does not provide any mechanism for return to criticality other than manual control rod withdrawal by the Operators.

9B.5.3.2 Decay Heat Removal

Identification of Systems and Components

Those systems needed for decay heat removal were determined by first identifying heat transfer paths between the reactor core and the UHSs. Those systems which are necessary for the maintenance of these heat transfer paths were then identified.

Decay heat removal systems can fail from spurious operation which:

1. Blocks flow.

2. Diverts flow such as bypass of a heat exchanger.

3. Diverts fluid inventory from the cooling path.

4. Fails an auxiliary system that can cause failure of a component in the heat removal path.

Those components that can cause system failure due to spurious operations will be identified as part of the analysis.

There are two redundant loops for each of the decay heat removal systems (ADS, suppression pool cooling mode of RHR, and shutdown cooling mode of RHR), the SWP system, and other support systems. Flow blockage or bypassing of flow around a RHR heat exchanger in one loop is not a concern, provided that the remaining loop is available to remove decay heat.

9B.5.3.3 Reactor Coolant Inventory Control

The reactor vessel water level must be maintained such that peak cladding temperature remains below 1500°F. This objective is achieved by ensuring that inventory loss does not exceed inventory makeup. The potential for loss of inventory was investigated by review of the plant fluid systems interfacing with the reactor vessel. It is determined that, considering plant design bases and Appendix R assumption for spurious operations of devices, loss of inventory is not a concern.

The review also included high-pressure to low-pressure interfaces that exist in the systems that interface with the reactor vessel. These interfaces were examined to determine whether spurious actuation of a sufficient number of devices could result in the overpressurization and subsequent failure of low pressure systems leading to a loss of inventory. Changes necessary for those valves identified as the boundary between the high pressure to low pressure systems were identified and implemented. Table 9B.5-1 lists the system boundaries reviewed, and identified resolution.

The reactor vessel level can also decrease if there is ADS blowdown or a decrease in makeup from the core spray or injection systems (HPCS, RCIC, LPCS, and LPCI). Review of the present design layout and system operations indicated that, based on Appendix R design base requirements and assumptions, for a single fire in any fire area of the plant, at minimum one train of core spray and/or injection system would be available which can maintain vessel water level.

9B.5.3.4 Containment Isolation

Containment integrity is ensured if the containment is not overpressurized and containment leakage paths are isolated. Pathways with an excess flow check valve or a reverse flow check valve are not included in the Appendix R analysis since they will prevent containment leakage. Pathways that form a closed loop with the containment are not considered since they do not provide a leakage path. Instrument and other small lines (1 in and less) also are excluded since any inventory loss would be insignificant. Only those systems which penetrate the containment and have the potential for releasing coolant inventory to the environment are included in the Appendix R program.

TABLE 9B.5-1

HIGH-/LOW-PRESSURE INTERFACES

System Boundaries	Description	Resolution
DER-Reactor Building Equipment Drain 2DER*MOV128	WCS drain valve	Note 1
MSS-Main Steam 2MSS*MOV112 2MSS*AOV6A, B, C, D 2MSS*AOV7A, B, C, D 2MSS*MOV118 2MSS*MOV119	 Main steam drain Main steam isolation Main steam isolation Reactor Head Vent Valve Reactor Head Vent Valve	 Note 1 Note 3 Note 3 Note 4 Note 4
RHS-Residual Heat Removal 2RHS*MOV113 2RHS*MOV67A, B 2RHS*MOV112 2RHS*MOV142 2RHS*MOV149	 Shutdown cooling suction Shutdown cooling return Shutdown cooling supply isolation valve RHR drain to radwaste isolation valve RHR drain to radwaste isolation valve	 Note 1 Note 1 Note 1 Note 1 Note 1
WCS-Reactor Water Cleanup 2WCS-MOV106 2WCS-MOV107 2WCS-AOV26A, B, C, D 2WCS-AOV28A, B, C, D 2WCS-AOV29A, B, C, D 2WCS-AOV30A, B, C, D 2WCS-AOV44A, B, C, D 2WCS-AOV51A, B, C, D 2WCS-AOV52A, B, C, D 2WCS-AOV53A, B, C, D 2WCS-AOV54A, B, C, D 2WCS-AOV61A, B, C, D	 Drain to liquid waste Drain to main condenser Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain Demineralizer vent/drain	 Note 1 Note 1 Note 2a Note 2b Note 2b Note 2b Note 2b Note 2b Note 2a Note 2c Note 2c Note 2b

NOTES:

1. Valve is de-energized and disconnected from power source (breaker open, fuse pulled) during normal plant operation. This is not meant to preclude use of these valves during normal operation but to ensure that valves remain de-energized when not in use.

2a. Outboard AOVs 2WCS-AOV26A, B, C and D are in series with inboard AOVs 2WCS-AOV52A, B, C and D. The mechanical air supply valve to these outboard and inboard AOVs is normally closed during plant normal operation. This is not meant to preclude use of these

TABLE 9B.5-1 (cont'd.)

valves during normal operation but to ensure that valves remain closed when not in use. Changes to inboard AOVs 2WCS-AOV52A, B, C and D are not required but the inboard and outboard valves are supplied by the same mechanical air supply.

2b. Control circuits of these AOVs are wired in series with redundant isolation switch contacts located in different fire areas separated by 3-hr fire barriers. No single fire could cause sufficient spurious operations to violate the high-/low-pressure interface paths. Isolation switches will be normally in open position during plant normal operation. This is not meant to preclude use of these valves during normal operation but to ensure that valves remain closed when not in use.

2c. Outboard AOVs 2WCS-AOV53A, B, C and D are in series with inboard AOVs 2WCS-AOV54A, B, C and D. The mechanical air supply valve to these outboard AOVs is normally closed during normal plant operation. This is not meant to preclude use of these valves during normal operation but to ensure that valves remain closed when not in use. Changes to inboard AOVs 2WCS-AOV54A, B, C and D are not required because mechanical air supply to outboard AOVs is administratively controlled and spurious actuation of inboard AOVs would not cause high-/low-pressure interface failure.

3. These valves are normally open in the event of a control room fire. They are closed by the Operator and subsequently disconnected from their power source to ensure no spurious operation.

4. 2MSS*MOV118 and 2MSS*MOV119 are 2" vent lines that connect to the suppression pool through ¼" tubing. The valves are in series, normally closed, remote manually controlled motor-operated valves which fail in the as-is position. The valves are not required during an accident or post accident condition other than to maintain the pressure boundary integrity of the main steam system. As per NER-2E-005, no additional requirements are applied due to minimal inventory loss from instrument tubing of 1" and less.

SECTION 9B.6

METHODOLOGY FOR FIRE PROTECTION EVALUATION

9B.6.1 Introduction

This section documents the methodology used to demonstrate the safe shutdown capability of Unit 2 consistent with the fire protection goals of the regulations in 10CFR50, Appendix R. The flow path for the fire protection analysis is shown on Figure 9B.6-1. This methodology is utilized to perform the analysis as described in Section 9B.8.

9B.6.2 Fire Area/Zone Identification

The boundaries of the individual fire areas are defined by the plant layout (walls, ceilings, floors, doors, etc.), and based on Nuclear Regulatory Commission (NRC) and ANI guidelines.

Those areas that do not meet the requirements of Section III.G.2 are classified as follows:

1. The existing protection features provide an equivalent level of protection.

2. Justification is provided or an exemption is requested to qualify these areas as fire subareas.

Table 9B.6-1 lists the fire areas/fire subareas/fire zones. Table 9B.6-3 provides a cross-reference of the fire zones and the fire zone plans shown in Figures 9A.3-2 through 9A.3-8.

9B.6.3 Methodology for Fire Protection Evaluation

The following is a description of the step-by-step procedure for analyzing the adequacy of the fire protection features for safe shutdown of Unit 2 to meet the specific requirements of Section III.G of Appendix R to 10CFR50. These steps are also summarized in Figure 9B.6-1.

Step 1 - Identification of the Fire Areas/Zones

The first step in the evaluation is to divide the plant into fire areas/zones as identified in Table 9B.6-1. Physical plan and unique identification of each fire zone are marked on Figures 9A.3-2 through 9A.3-8.

Step 2 - Identification of Systems, Equipment, and Instruments Required for Shutdown

The next step in the evaluation is to identify the systems, components, and instruments, including the auxiliary support systems, pertaining to the three safety shutdown divisions.

Step 3 - Listing of Equipment in Each Fire Area

Starting with one fire area, list all the safe shutdown equipment and components in each fire area. For convenience of handling volume of data, this step is first done by fire zone and then all fire zones forming the fire area are combined together.

Step 4 - Listing of Safety-Related Cables and Equipment

Select a single fire area. List all equipment pertaining to Division I, Division II, and Division III that are inoperable due to the fire occurring in the area considered (either because it is located inside this area or because it is served by a circuit that traverses the area).

Determine if any of the equipment listed is an electrical power source feeding numerous safety-related equipment in the same or different fire area. If so, add all such equipment in the list of safety-related equipment. For convenience of handling volume of data, this step was first performed per fire zone and then all the fire zones forming the fire area were combined together.

Step 5 - Comparison of the Two Lists

Compare the results of Steps 3 and 4 to ensure that all equipment in each fire area under consideration has been included.

Step 6 - Assignment of Safe Shutdown Train

Assign the appropriate safe shutdown train number 1, 2, 3, or 4 for the applicable system component. Discard any cable or equipment that is not required for safe shutdown at this stage.

Step 7 - Identify Consequences of Spurious Operation

Identify spurious operation by system (see Section 9B.5.3). List equipment and cables affected by spurious operation in different fire areas.

Step 8 - Evaluation of the Effects of a Postulated Fire

Postulate an exposure fire in each of the fire areas and determine whether a safe shutdown is achievable with equipment and cable not affected by the fire by actuation from the control room. (The effects of spurious operation of equipment should be considered [see Step 7] in making this determination.) If a safe shutdown can be achieved, no further action is required.

If a safe shutdown cannot be achieved, proceed to Step 9.

Step 9 - Recommended Modifications

Based on the fire area/zone in question, consider the following options for hot/cold shutdown:

1. If the fire area is equipped with a fire detection system and an automatic fire suppression system, enclose one train in a 1-hr fire barrier.

2. If the fire area is not equipped with a fire detection system and an automatic fire suppression system, a cost study should be conducted so that a choice can be made between the following:

    a. Relocate one train in another area.

    b. Install a fire detection system and an automatic fire suppression system, and enclose one train in a 1-hr fire barrier.

    c. Protect one train in a 3-hr fire barrier.

Step 10 - Implementation

Proceed to implement the recommendation made in Step 9.

TABLE 9B.6-1

FIRE AREA/FIRE SUBAREA/FIRE ZONE IDENTIFICATION

Fire Area/Fire Subarea	Fire Zone	Description
North Aux Bldg/FA1	201SW 202SW 203SW 211SW 231SW 221SW	LPCS Room, North Auxiliary Bay, El 175 ft RHS Pump Room A, North Auxiliary Bay, El 175 ft RHS Heat Exchanger Room A, North Auxiliary Bay, El 175 ft North Auxiliary Bay, El 198 ft North Auxiliary Bay, Electrical Room, El 240 ft Auxiliary Bay, North Access Area B, El 215 ft
Reactor Bldg/FA2	204SW	Reactor Building, RCIC Pump Room, El 175 ft
South Aux Bldg/FA3	207SW 208SW 206SW 214SW 239SW 224SW	RHS Pump Room B, South Auxiliary Bay, El 175 ft RHS Pump Room C, South Auxiliary Bay, El 175 ft RHS Heat Exchanger Room B, South Auxiliary Bay, El 175 ft South Auxiliary Bay, El 198 ft South Auxiliary Bay, Electrical Room, El 240 ft Auxiliary Bay, South Access Area B, El 215 ft
Reactor Bldg/ FA4	205NZ	Reactor Building, HPCS Room, El 175 ft
FA8	301NW 302NW	Electrical Tunnel, 140° Electrical Tunnel, 35°
Control Bldg/FA21	327NW 342XL	Control Building, HPCS Cable Routing Area, El 244 ft Control Building, HPCS Switchgear Room, El 261 ft
Diesel Gen Bldg/ FA28	402SW	Division I, Diesel Generator Room Division I, Diesel Generator Control Room
FA29	403SW	Division II, Diesel Generator Room Division II, Diesel Generator Control Room
FA30	404SW	Division III, HPCS Diesel Generator Room Division III, HPCS Diesel Generator Control Room
Control Bldg/FA75	339NZ	Control Building, Division III, Battery Room, El 261 ft
Control Building/ FA16	306NZ 312NZ 321NW 332NW 352NW 371NW	Control Building General Area, El 214 ft Control Building General Area, East, El 214 ft Control Building Cable Chase, West, El 237 ft Control Building Cable Chase, West, El 261 ft Control Building Cable Chase, West, El 288 ft Control Building Cable Chase, West, El 306 ft
FA17	305NW 322NW	Control Building Cable Chase, West, El 214 ft Control Building, Division I Cable Routing Area, El 237 ft

TABLE 9B.6-1 (Cont'd.)

Fire Area/Fire Subarea	Fire Zone	Description
	325NW	Control Building, Division I, Cable Routing Area, El 244 ft
	333XL	Control Building, Division I Standby Switchgear Room, El 261 ft
	334NZ	Control Building, Division I Battery Room, El 261 ft
	343NZ	Control Building Remote Shutdown Room, West
FA18	304NW	Electrical Tunnel, 230°
	309NW	Control Building Cable Chase, East, El 214 ft
	324NW	Control Building Cable Chase, East, El 237 ft
	337NW	Control Building Cable Chase, East, El 261 ft
	359NW	Control Building Cable Chase, East, El 288 ft
	377NW	Control Building Cable Chase, East, El 306 ft
FA19	323NW	Control Building, Division II, Cable Routing Area, El 237 ft
	326NW	Control Building, Division II, Cable Routing Area, El 244 ft
	336XL	Control Building, Division II, Standby Switchgear Room, El 261 ft
	335NZ	Control Building, Division II Battery Room, El 261 ft
	338NZ	Control Building Remote Shutdown Room, East
FA22	340NZ	Control Building, Division I, HVAC Room, El 261 ft
FA23	341NZ	Control Building, Division II, HVAC Room, El 261 ft
FA24	356NZ	Control Building, PGCC Relay Room, El 288 ft
	353SG	Control Building, PGCC Relay Room, El 288 ft
	354SG	Control Building, PGCC Relay Room, El 288 ft
	357XG	Control Building, PGCC Computer Room, El 288 ft
	358XG	Control Building, PGCC Computer Room, El 288 ft
	362SG	Control Building, PGCC Relay Room, El 288 ft
FA25	360NZ	Control Building, Division I, HVAC Room, El 288 ft
FA26	373NZ	Control Building, Main Plant Control Room, El 306 ft
	374SG	Control Building, PGCC Underfloor, West, El 306 ft
	375SG	Control Building, PGCC Underfloor, East, El 306 ft
	376XG	Control Building, PGCC Underfloor, South, El 306 ft
	381SG	Control Building, PGCC Underfloor Bench, El 306 ft
FA27	378NZ	Control Building, Division II, HVAC Room, El 306 ft
FA72	351NZ	Control Building Corridor/Instrument Shop, El 288 ft
FA76	380NZ	Control Building Corridor, Lunch Room, Work Release Room, and Ladies' & Men's Toilet Rooms, El 306 ft
FA88	331NW	Control Building Corridor, El 261 ft

TABLE 9B.6-1 (Cont'd.)

Fire Area/Fire Subarea	Fire Zone	Description
Tunnels/FA50	256NZ	Main Steam Tunnel
FA48	236NZ	Electrical Tunnel Vent Room, El 237 ft, Div. I
FA55	361NZ	Pipe Tunnel
	363NZ	Pipe Tunnel, El 244 ft
	237NZ	Electrical Tunnel Vent Room, El 237 ft, Div. II
	362NZ	Radwaste Tunnel
Service Water Pump Area/FA60	807NZ	Service Water Pump Room B
FA61	806NZ	Service Water Pump Room A
Intake Area/FA71	802NZ	Intake Area
	803NZ	Screenwell Building
Reactor Building/FSA34	212SW	Reactor Building General Area, North, El 175 ft & El 196 ft
	222SW	Reactor Building General Area, North, El 215 ft
	232SW	Reactor Building General Area, North, El 240 ft
	243SW	Reactor Building General Area, North, El 261 ft
	252SW	Reactor Building General Area, North, El 289 ft
	261SW	Reactor Building General Area, North, El 306 ft
	271SW	Reactor Building General Area, Northwest, El 328 ft
	273SW	Reactor Building General Area, Northeast, El 328 ft
	281NZ	Reactor Building General Area
FSA35	213SW	Reactor Building General Area, South, El 175 ft & El 196 ft
	223SW	Reactor Building General Area, South, El 215 ft
	238SW	Reactor Building General Area, South, El 240 ft
	245SW	Reactor Building General Area, South, El 261 ft
	255SW	Reactor Building General Area, South, El 289 ft
	262SW	Reactor Building General Area, South, El 306 ft
	274SW	Reactor Building General Area, Southeast, El 328 ft
FA87	087SW	Reactor Building Division I, SFC Pump Room, El 289 ft

TABLE 9B.6-2

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TABLE 9B.6-3

LIST OF FIRE ZONES/AREAS BY DRAWING NUMBERS

Drawing No.	Building/Elevation	Fire Zone I.D. Numbers
Figure 9A.3-2	Reactor Bldg LPCS Room North Aux Bay El 175'-0"	201SW
	Reactor Bldg RHS Pump Rm A North Aux Bay El 175'-0"	202SW
	Reactor Bldg RHS Heat Exchanger Rm A North Aux Bay El 175'-0"	203SW
	Reactor Bldg RCIC Pump Rm El 175'-0"	204SW
	Reactor Bldg HPCS Room El 175'-0"	205NZ
	Reactor Bldg RHS Heat Exchanger Rm B South Aux Bay El 175'-0"	206SW
	Reactor Bldg RHS Pump Rm B South Aux Bay El 175'-0"	207SW
	Reactor Bldg RHS Pump Rm C South Aux Bay El 175'-0"	208SW
	North Aux Bay El 198'-0"	211SW
	Reactor Bldg General Area North El 175'-0" & El 196'-0"	212SW
	Reactor Bldg General Area South El 175'-0" & El 196'-0"	213SW
	South Aux Bay El 198'-0"	214SW
Figure 9A.3-3	Access Area B North Aux Bay El 215'-0"	221SW
	Reactor Bldg General Area North El 215'-0"	222SW
	Reactor Bldg General Area South El 215'-0"	223SW
	South Aux Bay El 215'-0"	224SW
	Electrical Tunnel 140°	301NW
	Electrical Tunnel 35°	302NW
	Electrical Tunnel 315°	303NW
	Electrical Tunnel 230°	304NW
	Control Bldg Cable Chase West El 214'-0"	305NW
	Control Bldg General Area West El 214'-0"	306NZ
	Control Bldg Cable Chase East El 214'-0"	309NW
	Control Bldg General Area East El 214'-0"	312NZ
	Pipe Tunnel El 244'-0"	363NZ

TABLE 9B.6-3 (Cont'd.)

Drawing No.	Building/Elevation	Fire Zone I.D. Numbers
Figure 9A.3-4	North Aux Bay Motor Control Centers El 240'-0" Reactor Bldg General Area North El 240'-0" HVAC Rm Div 1 El 237'-0" HVAC Rm Div 2 El 237'-0" Reactor Bldg General Area South El 240'-0" South Aux Bay Motor Control Centers El 240'-0" Control Bldg Cable Chase West El 237'-0" Control Bldg Div 1 Cable Routing Area El 237'-0" Control Bldg Div 2 Cable Routing Area El 237'-0" Control Bldg Cable Chase East El 237'-0" Control Bldg Div 1 Cable Routing Area El 244'-0" Control Bldg Div 2 Cable Routing Area El 244'-0" Control Bldg HPCS Cable Routing Area El 244'-0" Pipe Tunnel El 244'-0" Pipe Tunnel El 244'-0" Pipe Tunnel El 244'-0" Service Water Pump Room A and Stairwell Enclosures El 224'-0" Service Water	231SW 232SW 236NZ 237NZ 238SW 239SW 321NW 322NW 323NW 324NW 325NW 326NW 327NW 361NZ 362NZ 363NZ 806NZ 807NZ
Figure 9A.3-5	Reactor Bldg General Area North El 261'-0" Reactor Bldg General Area South El 261'-0" Standby Gas Treatment Rm A El 261'-0" Standby Gas Treatment Rm B El 261'-0" Main Steam Tunnel El 240'-0" Control Bldg Corridor El 261'-0" Control Bldg Div 1 Cable Chase West El 261'-0" Control Bldg Div 1 Standby Switchgear Room El 261'-0" Control Bldg Div 1 Battery Room El 261'-0" Control Bldg Div 2 Battery Room El 261'-0" Control Bldg Div 2 Standby Switchgear Rm El 261'-0" Control Bldg Div 2 & 3 Cable Chase West El 261'-0" Control Bldg Remote Shutdown Room B El 261'-0" & HVAC Rm El 274'-0" Control Bldg HPCS Battery Room El 261'-0" Control Bldg Div 1 Chiller Room B El 261'-0" Control Bldg Div 2 Chiller Room El 261'-0" Control Bldg High Pressure Core Spray Switchgear Room Control Bldg Remote Shutdown Rm A El 261'-0" & HVAC Rm El 274'-0" Div 1 Diesel Generator Rm El 261'-0" & Day Tank Rm El 272'-0"	243SW 245SW 247NZ 248NZ 256NZ 331NW 332NW 333XL 334NZ 335NZ 336XL 337NW 338NZ 339NZ 340NZ 341NZ 342XL 343NZ 402SW

TABLE 9B.6-3 (Cont'd.)

Drawing No.	Building/Elevation	Fire Zone I.D. Numbers
Figure 9A.3-5 (cont'd.)	Div 2 Diesel Generator Rm El 261'-0" & Day Tank Room El 272'-0"	403SW
	HPCS Diesel Generator Rm El 261'-0" & Day Tank Room El 272'-0"	404SW
	Service Water Intake and Discharge Shafts	802NZ
	Screenwell Bldg El 261'-0"	803NZ
	Diesel Fire Pump Room	804NW
	Service Water Pump Room A	806NZ
	Service Water Pump Room B	807NZ
Figure 9A.3-6	Standby Gas Treatment Bldg HVAC Room El 286'-0"	251NW
	Reactor Bldg General Area North El 289'-0"	252SW
	Reactor Bldg General Area South El 289'-0"	255SW
	Control Bldg Instrument Shop and Corridor El 288'-6"	351NZ
	Control Bldg Cable Chase West El 288'-6"	352NW
	Control Bldg PGCC Relay Rm El 288'-6"	353SG
	Control Bldg PGCC Relay Rm El 288'-6"	354SG
	Control Bldg PGCC Computer Rm El 288'-6"	357XG
	Control Bldg PGCC Computer Rm El 288'-6"	358XG
	Control Bldg PGCC Relay Rm El 288'-6"	362SG
	Control Bldg PGCC Relay Rm El 288'-6"	356NZ
	Reactor Bldg Div 1 SFC Pump Room El 289'-0"	087SW
	Control Bldg Div 2 & 3 Cable Chase East El 288'-6"	359NW
	Control Bldg Div I HVAC Rm El 288'-6"	360NZ
	Turbine Bldg Cols 8-12 El 277'-6"	731SW
	Screenwell Bldg El 261'-0"	803NZ
Figure 9A.3-7	Reactor Bldg Pipe Chase El 306'-6"	261SW
	Reactor Bldg General Area South El 306'-6"	262SW
	Control Bldg Div 1 Cable Chase West El 306'-0"	371NW
	Control Bldg Main Plant Control Room El 306'-0"	373NZ
	Control Bldg PGCC Underfloor West El 306'	374SG
	Control Bldg PGCC Underfloor East El 306'	375SG
	Control Bldg PGCC Underfloor South El 306'	376XG
	Control Bldg PGCC Underfloor Bench El 306'	381SG
	Control Bldg Div 2 & 3 Cable Chase East El 306'-0"	377NW
	Control Bldg Div 2 HVAC Rm El 306'-0"	378NZ
	Control Bldg Corridor El 306'-0"	380NZ
	Screenwell Bldg El 261'-0"	803NZ

TABLE 9B.6-3 (Cont'd.)

Drawing No.	Building/Elevation	Fire Zone I.D. Numbers
Figure 9A.3-8	Reactor Bldg General Area NW El 328'-10" Reactor Bldg General Area NE El 328'-10" Reactor Bldg General Area SE El 328'-10" Reactor Bldg General Area El 353'-10" & 409'-3 1/4"	271SW 273SW 274SW 281NZ

SECTION 9B.7

EQUIPMENT AND CABLE IDENTIFICATION NUMBER DESCRIPTIONS

Equipment and scheduled cable in the plant are uniquely identified and readily traceable through the system with which they are associated. Examples of mechanical equipment, electrical equipment, and cable identification are given as follows:

1. Mechanical Equipment ID No. Example

   2SWP*MOV107A

   2 - Nine Mile Point Unit 2
   SWP - Service Water System
   * - Nuclear Safety Related
   MOV - Motor-Operated Valve
   107A - Unique Identification Number

2. Electrical Equipment ID No. Example

   2ENS*MCC101

   2 - Nine Mile Point Unit 2
   ENS - Emergency 600 V Motor Control Center System
   * - Nuclear Safety Related (Class 1E)
   MCC - Motor Control Center
   101 - Unique Identification Number

3. Cable ID No. Example

   2CSLAGC200

   2 - Nine Mile Point Unit 2
   CSL - Low-Pressure Core Spray System
   A - Alpha or Numeric Character Designating Associated Group of Like Equipment
   G - Color Designation:
   O = Orange Y = Yellow
   P = Purple B = Blue
   N = No Color G = Green
   C - Control Level
   J - 13,800 V ac Power
   H - 4,160 V ac Power
   L - 600 V ac Power
   K - 600 V ac Power and Lower
   C - 120 V ac and 125 V dc Control
   X - Instrumentation
   200 - Three-Digit Numeric Sequential Cable ID No.

SECTION 9B.8

RESULTS OF FIRE PROTECTION ANALYSIS FOR SAFE SHUTDOWN CAPABILITY IN ACCORDANCE WITH 10CFR50 APPENDIX R

9B.8.1 Balance of Plant Areas

The results of the fire protection analysis for the SSDSs by fire areas/subareas where safe shutdown equipment is located are provided in Tables 9B.8-1 and 9B.8-2. Table 9B.8-1 lists by fire area/fire zone all equipment located in the fire area and required for safe shutdown in the event of a fire. This list also indicates the safe shutdown train associated with each item of equipment. Table 9B.8-2 gives the conclusion of the analysis.

The assumptions used in this analysis are as follows:

1. Fire occurs in any one fire area at a time.

2. All safe shutdown cables and equipment located in the fire area where the fire occurs are lost.

3. All safe shutdown equipment located outside of the fire area, but fed by the cables passing through the fire area, is disabled.

4. Spurious maloperation of the equipment fed by cables passing through the fire area may occur under the condition stated in Section 9B.5.3.

5. Safe shutdown cables not passing through the fire area where the fire occurs remain unaffected.

The evaluation considered cable routing as of April 30, 1988. Controls have been established to ensure that future cable routing will not affect the safe shutdown analysis (SSA).

The primary containment was not included in the evaluation since it is inerted.

9B.8.2 Control Room and Relay Room

The main control and relay rooms fire protection analysis postulates a fire in the main control or relay rooms that necessitates evacuation of the main control room and verifies that capability for safe shutdown of the plant exists from the remote shutdown room and other local control stations outside the main control or relay rooms. An exposure fire in the main control or relay rooms involving in situ combustibles which may disable all safe shutdown trains is not considered a credible event. A fire involving transient combustibles in the main control or relay rooms which disables all safe shutdown trains is also considered unlikely since the main control room is continuously manned; both the main control and relay rooms are provided with ionization-type smoke detection and Halon suppression systems (for floor sections or modules); and, administrative procedures would generally limit transient combustibles from being brought into the main control or relay rooms. However, since the NRC requires that a major fire be postulated in the control or relay rooms, the following information addresses this contingency.

The fire areas and fire zones involved are as follows:

<u>Fire Area</u> FA26, Main Control Room, El 306 ft

<u>Fire Zones</u>

373 NZ	Control room panels
374 SG	PGCC underfloor, west
375 SG	PGCC underfloor, east
376 XG	PGCC underfloor, south
381 SG	PGCC underfloor bench

<u>Fire Area</u> FA24, Relay Room, El 288 ft

<u>Fire Zones</u>

353 SG	PGCC Relay Room
354 SG	PGCC Relay Room
356 NZ	PGCC Relay Room
357 XG	PGCC Computer Room
358 XG	PGCC Computer Room
362 SG	PGCC Relay Room

The assumptions used in this analysis are as follows:

1. A fire occurs and requires evacuation of the main control room. Operators scram the reactor and initiate MSIV closure before evacuating the area.

2. The entire main control or relay room is considered lost; no automatic initiation signals for mitigating systems are available after evacuation.

3. LOOP occurs coincidental with the fire in the main control or relay rooms (this provides the limiting safe shutdown scenario).

4. A single, spurious maloperation in addition to the loss of all automatic signals is considered for evaluation purposes for components controlled from the main control room. The worst-case spurious maloperation is one SRV remaining open until corrected by Operator action. The loss-of-coolant inventory is the worst-case scenario since other scenarios, such as

vessel overfill due to failure to isolate the feedwater system, is not a credible scenario. Multiple hot shorts are required to cause an event worse than a loss-of-coolant scenario. However, for RHR shutdown cooling mode of operation, the worst-case maloperation is loss of any one of the shutdown cooling supply line isolation valves.

5. In cases of high-/low-pressure interface, multiple devices located in series and controlled from the main control room may spuriously maloperate, resulting in any one high-/low-pressure interface failure at a time.

6. For a control room fire with no LOOP, the Operators have to place the SWP system in a one-pump-per-division configuration prior to exiting the control room.

9B.8.2.1 Safe Shutdown Systems

Selected equipment in safe shutdown trains 1, 2, 3, and 4 are used to mitigate the effect of fires in the main control or relay rooms. Most of this equipment is located in the remote shutdown room and includes manual control of four ADS SRVs, the RCIC system, the "pseudo" LPCI, and the shutdown cooling and suppression pool cooling modes of the RHR system. In the case of shutdown from the remote shutdown panel (RSP), and availability of the RCIC system, RCIC operation followed by RHR shutdown cooling is the preferred safe shutdown method. The ADS "pseudo" LPCI operation would be utilized if the RCIC system is not available.

Due to the control room fire, alternate shutdown cooling may be required to achieve and maintain cold shutdown. Manual manipulation of the RHR minimum flow valves and the RHR LPCI injection valves for alternate shutdown cooling would be required.

A more complete description follows:

Various systems that may be used for safe shutdown of the plant in case of a fire in the main control or relay rooms are as follows:

1. RCIC/ "Pseudo" LPCI - To maintain reactor water level.

2. ADS - To depressurize the reactor pressure vessel (RPV), if required.

3. RHR - To maintain suppression pool temperature within design limits and for shutdown cooling.

4. CMS/RSS - Instrumentation systems to indicate plant parameters necessary to perform the shutdown function, such as reactor water level and pressure, suppression pool level and temperature, etc.

5. Other support systems

    a. EGA, EGS, EGF - Emergency diesel generators (Divisions I and II) and their auxiliary systems (such as fuel oil and starting air).

    b. ENS/EJS/EHS/BYS/LAC - Onsite emergency power distribution systems.

    c. SWP - Cooling water for the emergency diesel generator jacket coolers, SFC and RHR heat exchangers, and various area unit coolers as required.

    d. Ventilation and air conditioning for cooling remote shutdown room, emergency switchgear rooms, diesel generator rooms, electrical tunnels, and others.

    e. SFC - To cool the spent fuel pool.

All of the above systems, except EJS and EHS, have monitoring/control automatic actuation circuits in the main control room. The necessary instrumentation and controls for monitoring and operating RCIC, SRV, RHR, CMS, RSS, and SWP are provided at the RSP.

The necessary controls/monitoring for diesel generator support systems are available on local control panels outside the main control or relay rooms.

The equipment associated with the above systems that may be used for safe shutdown from the RSP are listed in Table 9B.8-3.

9B.8.2.2 Safe Shutdown Scenario

The sequence of plant response and Operator actions assumed in this analysis after a major fire in the control/relay room, including the spurious maloperation, is as follows:

Time	Event
0	Control Room Operator initiates reactor scram by placing the reactor mode switch in shutdown position, closes MSIVs and trips the feedwater pumps from the main control room. LOOP occurs.

Time	Event
	Note:
	In the event of a control room fire with no LOOP, Operators have to place the SWP system in a one-pump-per-division configuration prior to exiting the control room.
	Operators leave main control room (control building el 306'-0").
3-5 sec	MSIVs close.
<10 sec	Main steam SRVs lift discharging to suppression pool; one SRV fails to reclose due to fire-initiated spurious maloperation.
<90 sec	Operator operates the disconnect switch (control building el 306'-0") to ensure that the feedwater pumps are tripped.
5 min	Operator action is taken (such as de-energizing MSIV solenoid breakers) which provides confirmation that the MSIV closure has occurred (control building el 261'-0").
	Operators operate disconnect switches (control building el 306'-0") to isolate the control room.
≤10 min	Operators operate transfer switches in RSP to transfer control to RSP (control building el 261'-0").
	Complete start of RCIC from the RSP (if not already running). Note: In the event of RCIC failure to operate, the ADS "pseudo" LPCI mode of RHR operation should be initiated within 10 min.
	De-energize (close) the open SRV from the RSP.
	At this point, hot shutdown is achieved.
≤15 min	Operators locally control cooling fans 2HVP*FN1A-D and reposition the recirculation dampers 2HVP*MOD6A-D and/or discharge dampers 2HVP*MOD1A-D as appropriate to maintain acceptable temperature conditions in the diesel generator rooms.
25 min	As required, other support systems are started locally.

Time	Event
>30 min	If required to maintain suppression pool temperature within limits, the Operator initiates suppression pool cooling with Division I RHR system.
>60 min	As required, other support systems are started locally.
<120 min	Operators turn off standby unit coolers and lights to ensure the north and south auxiliary bay switchgear room temperatures do not exceed 120°F.
>120 min	After reactor pressure decreases to <105 psig, Operators initiate Division II RHR shutdown cooling to place the reactor in cold shutdown condition from the RSP.
≤72 hr	The reactor reaches cold shutdown (≤200°F) condition.

The reactor vessel/core containment parameters and spent fuel pool will remain within acceptable limits during this scenario.

9B.8.2.3 Solutions to Control/Relay Room Fire

1. Administrative controls
2. Justification by analysis
3. Modifications

In case of a fire in the main control or relay rooms, design modifications were implemented to maintain availability and controllability of systems required for safe shutdown and to prevent spurious maloperations of the control circuits. This included the following:

1. Added manual control switches on the RSP.

   See Table 9B.8-3 for circuits that are added to the RSP.

2. Provided disconnect switches outside the main control or relay rooms to prevent spurious maloperations.

   See Table 9B.8-3 for circuits provided with disconnect switches.

3. Removed permissives/interlocks from the main control/relay rooms under RSP operating mode.

Specific procedures have been developed to address administrative control of this equipment to ensure safe operation from the RSP.

4. Provided control switch shorting contacts (shunts) to short valve opening contactor coils to prevent spurious valve openings.

5. Provided additional protection for control power supplies to circuits on the RSP.

Additional protection for control power supplies to the circuits on the RSP has been provided by adding an additional fuse in parallel with each existing fuse, connected through the transfer switches. When the transfer switches are operated to isolate the control and relay rooms and establish control of the RSP, the new sets of fuses are put into service. This eliminates the possibility of loss of control power supply at the RSP due to a fire in the control or relay rooms.

Table 9B.8-3 lists the circuits provided with the additional fuse.

9B.8.2.4 Conclusions

With the above design modifications, capability exists for safe shutdown of the plant from the RSP and other local control stations outside the main control and relay rooms in the unlikely event of a fire in the main control or relay rooms, requiring evacuation of these areas. After scram, tripping of the feedwater system (FWS) pumps, and MSIV closure, all manual operations, including the initiation of core cooling, can be completed within 10 min of evacuation of the main control room. After this initial period, additional actions can be initiated from the RSP or locally, as required, to bring the reactor to cold shutdown. The reactor vessel/core containment fuel pool parameters remain within acceptable limits during the postulated scenario. Necessary administrative procedures, operating instructions, and Operator training are provided for the main control and relay rooms fire event.

TABLE 9B.8-1

LIST OF AFFECTED SAFE SHUTDOWN EQUIPMENT
BY FIRE AREA/FIRE ZONE

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

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TABLE 9B.8-1 (Cont'd.)

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Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

LEGEND OF NOTES

NOTE 1 -	This fire area does not contain any alternative shutdown equipment requiring the LOOP assumption. In addition, a fire in this area will not cause and induce offsite power condition. Therefore, LOOP assumption is not applied for this fire area. Motor-operated valves 2SWP*MOV50A and 50B are normally open and, even if it remains open during a fire condition, safe shutdown can be achieved.
NOTE 2 -	In case of loss of this device, the associated air conditioning unit can be manually energized from the control room; therefore, safe shutdown capability exists.
NOTE 3 -	In case of loss of this device, enough infiltration will be available to maintain design temperature; therefore, safe shutdown capability exists.
NOTE 4 -	In case of loss of this equipment, an alternate shutdown cooling path will be used; therefore, safe shutdown capability exists.
NOTE 5 -	The damper operates in safe mode in case of loss of power supply; therefore, safe shutdown capability exists.
NOTE 6 -	Mechanical devices are not affected by failure of electrical systems.
NOTE 7 -	Alternate equipment is available in another fire subarea.
NOTE 8 -	Deleted.
NOTE 9 -	This equipment is fail-safe design; therefore, safe shutdown capability exists.
NOTE 10 -	The junction box feeds fail-safe design equipment; therefore, safe shutdown capability exists.
NOTE 11 -	Deleted.
NOTE 12 -	In case of a fire in this area, the auto function of the MOV could be affected. Although this function is not credited for safe shutdown, if required, MOV can be operated manually using an administrative procedure.

TABLE 9B.8-1 (Cont'd.)

LEGEND OF NOTES (Cont'd.)

NOTE 13 - In case of a fire in this area, pool cooling will be initiated through proper administrative procedure.

NOTE 14 - In case of loss of these outboard isolation valves, inboard isolation valves are available to close the main steam lines.

NOTE 15 - The unmitigated fire load in fire zone 252SW is less than 1 min. A concrete barrier is provided between 2HVR*UC413A and 2HVR*UC413B. The wall is 2-ft thick, extends 1.25 ft above the top, 8 ft beyond the end of each unit cooler which contains the fan motor, and 1 ft beyond the opposite end.

The unit coolers are noncombustible except for motor insulation which is contained within the steel fan casing. The only credible fire (involving motor insulation) would be contained within the casing and would not involve both unit coolers.

A fire involving transient combustibles would be limited to either side of the wall due to the lack of continuity of combustibles in the area.

NOTE 16 - Deleted.

NOTE 17 - Remote shutdown panel 2CES*PNL405 is divided into two separate sections located in separate fire zones/fire areas. All green components and cables are located in the green section (343NZ/FA17), and all yellow components and cables are located in the yellow section (338NZ/FA19).

NOTE 18 - For fire in any fire area outside the control room/relay room, controls associated with the available safe shutdown train/trains for the fire area, as indicated in Table 9B.8-2, will be used.

NOTE 19 - Loss of this device will not impair safe shutdown capability.

NOTE 20 - The functional failure of this component does not affect safe shutdown capability since only the operation of the HPCS system is impacted. Alternate safe shutdown path is available.

TABLE 9B.8-1 (Cont'd.)

LEGEND OF NOTES (Cont'd.)

NOTE 21 -	This valve is "fail closed," and closing is the safe mode of operation. Loss of power to this valve does not affect safe shutdown capability.
NOTE 22 -	In case of loss of this device, RCIC suction can be transferred to the suppression pool manually from the control room, if required.
NOTE 23 -	Even if this equipment is lost, the temperature in the electrical tunnel will not exceed the design temperature for the cables.
NOTE 24 -	This equipment is not required for safe shutdown. It is required to protect CSH pump internals from overheating caused by operating the pump continuously at shutoff head. Since HPCS pump is operating and no other single failure is assumed (Appendix R requires only LOOP with fire), this equipment is not required to operate.
NOTE 25 -	In case of a fire in this fire area, this equipment could be lost. Due to this loss, the control room Division I air conditioning units 2HVC*ACU1A/2A could be inoperable. The redundant division air conditioning units will be initiated through proper administrative procedures.
NOTE 26 -	In case of a fire in this fire area, this equipment could be lost. Due to this loss, the control room Division II air conditioning units 2HVC*ACU1B/2B could be inoperable. The redundant division air conditioning units will be initiated through proper administrative procedures.
NOTE 27 -	No impact on the system operation or safe shutdown requirement since valve feeder breaker is in OPEN position and MOV is disconnected from the power source; therefore, no spurious operation is anticipated.
NOTE 28 -	This component is located in an area with no combustible material (pipe chase area at 185° of the reactor building) and isolated from fire area FSA 35.
NOTE 29 -	A confirmed fire in either of the following fire areas has the potential to cause spurious operation of the main steam SRVs. In case of inadvertent

TABLE 9B.8-1 (Cont'd.)

LEGEND OF NOTES (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-1 (Cont'd.)

LEGEND OF NOTES (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-2

RESULTS OF FIRE PROTECTION ANALYSIS FOR
SAFE SHUTDOWN CAPABILITY
IN ACCORDANCE WITH 10CFR50 APPENDIX R

BALANCE OF PLANT AREAS

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-2 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-2 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

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TABLE 9B.8-2 (Cont'd.)

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TABLE 9B.8-2 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-2 (Cont'd.)

Security-Related Information Figure Withheld Under 10 CFR 2.390

TABLE 9B.8-3

APPENDIX R CONTROL ROOM/RELAY ROOM FIRE CIRCUIT ANALYSIS

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
ABS	2ABS-XI	Auxiliary Boiler Service Transformer	Black	No	Disconnected at ENS Switchgear
BYS	2BYS*CHGR2A2	125-V Battery Charger Division I	Green	No	N/R, Not Controlled in PGCC
BYS	2BYS*CHGR2A1	125-V Battery Charger Standby Division I	Green	No	N/R, Not Controlled in PGCC
BYS	2BYS*CHGR2B2	125-V Battery Charger Division II	Yellow	No	N/R, Not Controlled in PGCC
BYS	2BYS*CHGR2B1	125-V Battery Charger Standby Division II	Yellow	No	N/R, Not Controlled in PGCC
BYS	2BYS*SWG002A	125-V dc Switchgear Division I	Green	No	N/R, Fused Both Inside and Outside PGCC
BYS	2BYS*SWG002B	125-V dc Switchgear Division II	Yellow	No	N/R, Fused Both Inside and Outside PGCC
BYS	2BYS*PNL201A	125-V dc Distribution Panel Division I	Green	No	N/R, Not Controlled in PGCC
BYS	2BYS*PNL204A	125-V dc Distribution Panel Division II	Green	No	N/R, Not Controlled in PGCC
BYS	2BYS*PNL201B	125-V dc Distribution Panel Division I	Yellow	No	N/R, Not Controlled in PGCC
BYS	2BYS*PNL204B	125-V dc Distribution Panel Division II	Yellow	No	N/R, Not Controlled in PGCC
BYS	2BYS*BAT2A	125-V Standby Battery Division I	Green	No	N/R, Not Controlled in PGCC
BYS	2BYS*BAT2B	125-V Standby Battery Division II	Yellow	No	N/R, Not Controlled in PGCC
CCP(2)	2CCP*MOV18A	RBCLCW Spent Fuel HX 2SFC*E1A	Green	No	N/R
CCP(2)	2CCP*MOV18B	RBCLCW Spent Fuel HX 2SFC*E1B	Yellow	No	N/R
CCP(2)	2CCP*AOV37A	RBCLCW 2RHS*P1A SL Coolers	Green	No	N/R
CCP(2)	2CCP*AOV37B	RBCLCW 2RHS*P1B SL Coolers	Yellow	No	N/R
CCP(2)	2CCP*AOV38A	RBCLCW 2RHS*P1A SL Coolers	Green	No	N/R
CCP(2)	2CCP*AOV38B	RBCLCW 2RHS*P1B SL Coolers	Yellow	No	N/R
CMS	2CMS*TE50A	Suppression Pool Temperature Elements	Green	Yes	TE Wired to 2RSS*TI103
CMS	2CMS*TE51B	Suppression Pool Temperature Elements	Yellow	Yes	TE Wired to 2RSS*TI104
CMS	2CMS*TE52A	Suppression Pool Temperature Elements	Green	Yes	TE Wired to 2RSS*TI103
CMS	2CMS*TE53B	Suppression Pool Temperature Elements	Yellow	Yes	TE Wired to 2RSS*TI104
CMS	2CMS*TE54A	Suppression Pool Temperature Elements	Green	Yes	TE Wired to 2RSS*TI103
CMS	2CMS*TE55B	Suppression Pool Temperature Elements	Yellow	Yes	TE Wired to 2RSS*TI104
CMS	2CMS*TE56A	Suppression Pool Temperature Elements	Green	Yes	TE Wired to 2RSS*TI103
CMS	2CMS*TE57B	Suppression Pool Temperature Elements	Yellow	Yes	TE Wired to 2RSS*TI104
CMS	2CMS*TE58A	Suppression Pool Temperature Elements	Green	Yes	TE Wired to 2RSS*TI103
CMS	2CMS*TE59B	Suppression Pool Temperature Elements	Yellow	Yes	TE Wired to 2RSS*TI104
CSH(2)	2CSH*MOV110	HPCS Test Bypass to CND Tank	Purple	No	Note 6
CSL(2)	Various	Various	Green	No	N/R
DER(2)	2DER*MOV128	Reactor Water Drain Isolation Valve	Black	No	Note 6
DER(2)	2DER*MOV129	Reactor Water Drain Isolation Valve	Black	No	N/R, In Series with 2DER*MOV128

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
DMS DMS	2DMS*MCCA1 2DMS*MCCB1	125-V dc MCC Reactor Building El 240 125-V dc MCC Reactor Building El 240	Green Yellow	No No	N/R, Not Controlled in PGCC N/R, Not Controlled in PGCC
EGA(3)	Various	Emergency Diesel Generator Starting Air System	Green/Yellow	No	N/R
EGF(3)	Various	Emergency Diesel Generator Fuel Oil System	Green/Yellow	No	N/R (LCL Controls with no PGCC Interlock)

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
EGP	2EGS*EG1	4160-V ACB-101-1 Division I EDG Output	Green	No	Dedicated Disconnect Switch to Isolate PGCC Controls and Engage Local Test Switch
EGP	2EGS*EG3	4160-V ACB-103-14 Division II EDG Output	Yellow	No	Dedicated Disconnect Switch to Isolate PGCC Controls and Engage Local Test Switch
EGP	2EGS*EG1	4160-V ACB-101-N1 Division I EDG Neutral	Green	No	N/R for Diesel Generator Operation
EGP	2EGS*EG3	4160-V ACB-103-N1 Division II EDG Neutral	Yellow	No	N/R for Diesel Generator Operation
EGS[(3)]	2EGS*EG1	2EGS*EG1 Control	Green	No	Dedicated Disconnect Switch to Isolate PGCC Dedicated Disconnect Switch to Bypass PGCC to Permit Auto Start/Control
EGS[(3)]	2EGS*EG3	2EGS*EG3 Control	Yellow	No	Dedicated Disconnect Switch to Isolate PGCC Dedicated Disconnect Switch to Bypass PGCC to Permit Auto Start/Control
EHS	2EHS*MCC101	600-V MCC Screenwell El 261	Green	No	Individually Listed in Respective Systems
EHS	2EHS*MCC102	600-V MCC Reactor Building El 240	Green	No	Individually Listed in Respective Systems
EHS	2EHS*MCC103	600-V MCC Control Building Room A 240	Green	No	Individually Listed in Respective Systems
EHS	2EHS*MCC301	600-V MCC Screenwell El 261	Yellow	No	Individually Listed in Respective Systems
EHS	2EHS*MCC302	600-V MCC Reactor Building El 240	Yellow	No	Individually Listed in Respective Systems
EHS	2EHS*MCC303	600-V MCC Control Building Room B El 240	Yellow	No	Individually Listed in Respective Systems
EJA	2EJA*PNL100A	Reactor Building 120-V Heater Panel	Green	No	N/R, Not Controlled in PGCC
EJA	2EJA*PNL101A	Control Building 120/240 Heater Panel	Green	No	N/R, Not Controlled in PGCC
EJA	2EJA*PNL300B	Reactor Building 120-V Heater Panel	Yellow	No	N/R, Not Controlled in PGCC
EJA	2EJA*PNL301B	Control Building 120/240 Heater Panel	Yellow	No	N/R, Not Controlled in PGCC
EJS	2EJS*US1	4.16-kV FDR to Transformer 2EJS*X1A/1B	Green	No	Disconnect Switch to Isolate PGCC
EJS	2EJS*US3	4.16-kV FDR to Transformer 2EJS*X3A/3B	Yellow	No	Control and Engage Local Test Switch
EJS	2EJS*US1	600-V U.S. Emergency Switchgear Normal Supply Breaker	Green	No	Disconnect Switch to Isolate PGCC
EJS	2EJS*US3	600-V U.S. Emergency Switchgear Normal Supply Breaker	Yellow	No	Control and Engage Local Test Switch
EJS	2EJS*PNL100A	Switchgear Room A Emergency 600-V Panel	Green	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL300B	Switchgear Room B Emergency 600-V Panel	Yellow	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL101A	Switchgear Room A Emergency 600-V Panel	Green	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL103A	AB-N Emergency 600-V Panel	Green	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL104A	AB-N Emergency 600-V Panel	Green	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL302B	AB-S Emergency 600-V Panel	Yellow	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL303B	AB-S Emergency 600-V Panel	Yellow	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL304B	AB-S Emergency 600-V Panel	Yellow	No	N/R, Not Controlled in PGCC
EJS	2EJS*PNL301B	Switchgear Room B Emergency 600-V Panel	Yellow	No	N/R, Not Controlled in PGCC
EJS	2EJS*US1	600-V U.S. Emergency Switchgear Altn Supply Breaker	Green	No	N/R, Not Used for Appendix R Control Room Fire Scenario
EJS	2EJS*US3	600-V U.S. Emergency Switchgear Altn Supply Breaker	Yellow	No	N/R, Not Used for Appendix R Control Room Fire Scenario
EJS	2EJS*PNL102A	AB-N Emergency 600-V Panel	Green	No	N/R, Not Controlled in PGCC

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
ENS	2ENS*SWG101	4160-V ACB-101-11 Feed to Normal Bus 2NNS-SWG014	Green	No	Disconnect Switch to Isolate PGCC Control and Engage Local Test Switch
ENS	2ENS*SWG101	4160-V ACB-101-10, 101-13 Feed From RSST	Green	No	Disconnect Switch to Isolate PGCC Control and Engage Local Test Switch
ENS	2ENS*SWG103	4160-V ACB-103-8 Feed to Normal Bus 2NNS-SWG015	Yellow	No	Disconnect Switch to Isolate PGCC Control and Engage Local Test Switch
ENS	2ENS*SWG103	4160-V ACB-103-2, 103-4 Feed From RSST	Yellow	No	Disconnect Switch to Isolate PGCC Control and Engage Local Test Switch
ENS	2ENS*SWG101	LOCA Activated Relays 71X1, 71X3 for Diesel Generator Auto Start	Green	No	Disconnect Switch to Isolate Local Relays from PGCC
ENS	2ENS*SWG103	LOCA Activated Relays 71X1, 71X3 for Diesel Generator Auto Start	Yellow	No	Disconnect Switch to Isolate Local Relays from PGCC
EPS	2EPS*SWG001	13.8-kV Emergency SWG001	Green	No	N/R, Not on Diesel Generator Buses. Controls are Fail-Safe Design
EPS	2EPS*SWG003	13.8-kV Emergency SWG003	Green	No	N/R, Not on Diesel Generator Buses. Controls are Fail-Safe Design
EPS	2EPS*SWG002	13.8-kV Emergency SWG002	Yellow	No	N/R, Not on Diesel Generator Buses. Controls are Fail-Safe Design
EPS	2EPS*SWG004	13.8-kV Emergency SWG004	Yellow	No	N/R, Not on Diesel Generator Buses. Controls are Fail-Safe Design
FWS	2FWS-P1A	Reactor Feed Pump P1A Breaker 1-8	Black	No	Dedicated Disconnect Switch to Preclude Vessel Overfill
FWS	2FWS-P1B	Reactor Feed Pump P1B Breaker 3-7	Black	No	Dedicated Disconnect Switch to Preclude Vessel Overfill
FWS	2FWS-P1C	Reactor Feed Pump P1C ACB 1-13	Black	No	Dedicated Disconnect Switch to Preclude Vessel Overfill
FWS	2FWS-P1C	Reactor Feed Pump P1C ACB 3-12	Black	No	Dedicated Disconnect Switch to Preclude Vessel Overfill
GTS	2GTS*MOV1A	Standby Gas Treatment Filter Train A Inlet	Green	No	Not Required for Safe Shutdown
GTS	2GTS*AOV2A	Standby Gas Treatment Filter Train A Inlet	Green	No	Not Required for Safe Shutdown
GTS	2GTS*FN1A	*Flt 1A Discharge Fan	Green	No	Not Required for Safe Shutdown
GTS	2GTS*MOV1B	Standby Gas Treatment Filter Train B Inlet	Yellow	No	Not Required for Safe Shutdown
GTS	2GTS*AOV2B	Standby Gas Treatment Filter Train B Inlet	Yellow	No	Not Required for Safe Shutdown
GTS	2GTS*FN1B	*Flt 1B Discharge Fan	Yellow	No	Not Required for Safe Shutdown

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
HVC[(3)]	2HVC*FN4B	Battery Room Exhaust Fan Division II	Yellow	No	Disconnect Switch and Second Fuse at MCC to Start and Run Equipment
HVC[(3)]	2HVC*FN4A	Battery Room Exhaust Fan Division I	Green	No	Disconnect Switch and Second Fuse at MCC to Start and Run Equipment
HVC[(3)]	2HVC*UC101A	Standby Switchgear Room A Unit Cooler	Green	No	Disconnect Switch and Second Fuse at MCC to Start and Run Equipment
HVC[(3)]	2HVC*UC101B	Standby Switchgear Room B Unit Cooler	Yellow	No	Disconnect Switch and Second Fuse at MCC to Start and Run Equipment
HVC[(3)]	2HVC*UC104	Control Building Cable Tunnel Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVC	2SWP*AOV572	Electrical Tunnel N*UC104 Service Water Vlv	Green	No	Disconnect Switch to Open Service Water Valve

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
HVC(3)	2HVC*UC105	Control Building Cable Tunnel Unit Cooler	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVC	2SWP*AOV571	Electrical Tunnel S*UC105 Service Water Valve	Yellow	No	Disconnect Switch to Open Service Water Valve
HVC(3)	2HVC*UC106	Cable Area Base Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVC	2SWP*AOV573	Cable Area Division I *UC106 Service Water Valve	Green	No	Disconnect Switch to Open Service Water Valve
HVC(3)	2HVC*UC107	Cable Area Base Unit Cooler	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVC	2SWP*AOV574	Cable Area Division II *UC107 Service Water Valve	Yellow	No	Disconnect Switch to Open Service Water Valve
HVC(3)	2HVC*UC108A	Control Building Standby Switchgear Room A	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVC	2SWP*AOV154A	Standby Switchgear Room *UC101A Service Water Valve	Green	No	Disconnect Switch to Open Service Water Valve
HVC(3)	2HVC*AOD170	HVC Unit Cooler Discharge Dampers	Green	No	Disconnect to Open Discharge Dampers
HVC(3)	2HVC*AOD178	HVC Unit Cooler Discharge Dampers	Yellow	No	Disconnect to Open Discharge Dampers
HVC(3)	2HVC*AOD183	HVC Unit Cooler Discharge Dampers	Green	No	Disconnect to Open Discharge Dampers
HVC(3)	2HVC*AOD193	HVC Unit Cooler Discharge Dampers	Yellow	No	Disconnect to Open Discharge Dampers
HVC(3)	2HVC*UC108B	Control Building Standby Switchgear Room B	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVC	2SWP*AOV154B	Standby Switchgear Room *UC101B Service Water Valve	Yellow	No	Disconnect Switch to Open Service Water Valve
HVC	2SWP*AOV78A	Control Building Standby Switchgear Room A Unit Cooler *UC108A Service Water Valve	Green	No	Disconnect Switch to Open Service Water Valve
HVC	2SWP*AOV78B	Control Building Standby Switchgear Room A Unit Cooler *UC108B Service Water Valve	Yellow	No	Disconnect Switch to Open Service Water Valve
HVK(3)	Various	Various	Green/Yellow	No	Manual Alignment of SWP for Long-Term Cooling
HVP(3)	2HVP*AOD4A	2EGS*G1 Room Inlet Damper	Green	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*FN1A	Safety-Related Axial Fans - DG	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVP(3)	2HVP*MOD1A	Standby Diesel Generator Room Exhaust	Green	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*AOD4C	2EGS*G1 Room Inlet Damper	Green	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*FN1C	Safety-Related Axial Fans - DG	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVP(3)	2HVP*MOD1C	Standby Diesel Generator Room Exhaust	Green	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*AOD4B	2EGS*G3 Room Inlet Damper	Yellow	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*FN1B	Safety-Related Axial Fans - DG	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVP(3)	2HVP*MOD1B	Standby Diesel Generator Room Exhaust	Yellow	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*AOD4D	2EGS*G3 Room Inlet Damper	Yellow	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*FN1D	Safety-Related Axial Fans - DG	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVP(3)	2HVP*MOD1D	Standby Diesel Generator Room Exhaust	Yellow	No	Disconnect Switch to Open Dampers
HVP(3)	2HVP*UC1A	DG 1 Unit Cooler Standby Diesel Generator Room	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
HVP[3]	2HVP*UC1B	DG 3 Unit Cooler Standby Diesel Generator Room	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVP[3,2]	2HVP*MOD6A	Standby Diesel Generator Room Recirc Dmpr	Green	No	Manual Repositioning of Dampers to Maintain Acceptable Temperature Conditions
	2HVP*MOD6C	Standby Diesel Generator Room Recirc Dmpr	Green	No	Manual Repositioning of Dampers to Maintain Acceptable Temperature Conditions
	2HVP*MOD6B	Standby Diesel Generator Room Recirc Dmpr	Yellow	No	Manual Repositioning of Dampers to Maintain Acceptable Temperature Conditions
	2HVP*MOD6D	Standby Diesel Generator Room Recirc Dmpr	Yellow	No	Manual Repositioning of Dampers to Maintain Acceptable Temperature Conditions
HVR	2HVR*TIS23A	RHR Pump Room A	Green	No	N/R
HVR[3]	2HVR*UC401A	RHR Pump Room A - Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVR[3]	2HVR*UC401D	RHR Pump Room A - Unit Cooler	Green	No	N/R
HVR[3]	2HVR*UC401F	RHR Pump Room B - Unit Cooler	Yellow	No	N/R
HVR	2HVR*TIS23C	RHR Pump Room B	Yellow	No	N/R
HVR[3]	2HVR*UC401C	RHR Pump Room B - Unit Cooler	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVR	2HVR*TIS116	RHR Heat Exchanger Room A	Green	No	N/R
HVR[3]	2HVR*UC405	RHR Heat Exchanger Room - Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVR	2HVR*TIS115	RHR Heat Exchanger Room B	Yellow	No	N/R
HVR[3]	2HVR*UC406	RHR Heat Exchanger Room - Unit Cooler	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVR	2HVR*TIS30A	General Area El 261	Green	No	N/R
HVR[3]	2HVR*UC412A	RCIC Pump Room - Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVR	2HVR*TIS31A	*UC413A Inlet Temperature	Green	No	N/R
HVR[3]	2HVR*UC413A	Emergency Recirc Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVR[3]	2HVR*AOD6A	*UC413A Inlet Damper	Green	No	Disconnect Switch to Open Damper
HVR[2]	2HVR*FS18A	Reactor Building Emergency Recirc *UC413A	Green	No	N/R
HVR[2]	2HVR*FS18C	Reactor Building Emergency Recirc *UC413A	Green	No	N/R
HVR[3]	2HVR*UC408A/B	AB North Unit Coolers	Green	No	N/R
HVR[3]	2HVR*UC409A/B	AB South Unit Coolers	Yellow	No	N/R

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
HVY[3]	2HVY*UC2A	SWP Pump Bay A Unit Cooler	Green	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVY	2HVY*TIS33A	SWP Pump Bay A Area Temperature	Green	No	N/R
HVY[3]	2HVY*UC2B	SWP Pump Bay B Unit Cooler	Yellow	No	Disconnect Switch/Second Fuse to Start and Run Equipment
HVY	2HVY*TIS33B	SWP Pump Bay B Area Temperature	Yellow	No	N/R
IAS[3]	2IAS*SOVX181	ADS Header "A" Flow	Green	Yes	Disconnect Switch/Second Fuse at RSS Panel
IAS[3]	2IAS*SOVY181	ADS Header "A" Flow	Green	No	Disconnect Switch to Prevent Valve Opening
IAS[3]	2IAS*SOVX186	ADS Header "B" Flow	Yellow	Yes	Disconnect Switch/Second Fuse at RSS Panel
IAS[3]	2IAS*SOVY186	ADS Header "B" Flow	Yellow	No	Disconnect Switch to Prevent Valve Opening
IAS[3]	2IAS*SOV164	Instrument Air Containment Isolation Valve	Green	Yes	Disconnect Switch/Second Fuse at RSS Panel
IAS[3]	2IAS*SOV165	Instrument Air Containment Isolation Valve	Yellow	Yes	Disconnect Switch/Second Fuse at RSS Panel

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
ICS(3)	2ICS*MOV129	Pump Suction from Condensate Storage Tank	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS-C1	Gland Seal Compressor	Green	No	N/R
ICS(3)	2ICS*MOV124	RCIC Test FCV to Condensate Storage Tank	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*FV108	Test Bypass to Condensate Storage Tank	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV116	RCIC Lube Oil Water Supply	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV122	RCIC Turbine Exhaust to Suppression Pool	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV136	RCIC Pump Suction from Suppression Pool	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV143	RCIC Minimum Flow to Suppression Pool	Green	No	N/R
ICS(3)	2ICS*MOV148	RCIC Vacuum Breaker Isolation Valve (Inboard)	Yellow	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV164	RCIC Vacuum Breaker Isolation Valve (Outboard)	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV150	2ICS-T1 Turbine Throttle Valve	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*HYV151	2ICS-T1 Turbine Governing Valve	Green	No	N/R (local control)
ICS(3)	2ICS*MOV120	RCIC Steam Supply Valve to Turbine	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV126	RCIC Injection Shutoff Valve	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV121	Steam Supply Line Isolation Valve (Outboard)	Green	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV128	RCIC Steam Supply Line Isolation Valve (Inboard)	Yellow	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*MOV170	RCIC Steam Line Warmup	Yellow	Yes	RSS Transfer Switch Disconnects PGCC and Enables Emergency Fuse at MCC
ICS(3)	2ICS*P2	RCIC System Pressure Pump	Green	No	N/R
ISC(2)	Various	Various	Yellow	No	See Individual System
LAC	2LAC*PNL100A	Control Room A Emergency Lighting Panel	Green	No	N/R, Not Controlled in PGCC
LAC	2LAC*PNL300B	Control Room B Emergency Lighting Panel	Yellow	No	N/R, Not Controlled in PGCC
LAC	2LAC*PNLE01	Lighting Panel	Green	No	N/R, Not Controlled in PGCC
LAC	2LAC*PNLE04	Lighting Panel	Green	No	N/R, Fusing Outside PGCC is Sufficient
LAC	2LAC*PNLE06	Lighting Panel	Green	No	N/R, Fusing Outside PGCC is Sufficient
LAC	2LAC*PNLE02	Lighting Panel	Yellow	No	N/R, Not Controlled in PGCC
LAC	2LAC*PNLE05	Lighting Panel	Yellow	No	N/R, Fusing Outside PGCC is Sufficient
LAC	2LAC*PNLE07	Lighting Panel	Yellow	No	N/R, Fusing Outside PGCC is Sufficient

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
MSS[3]	2MSS*AOV6A	Main Steam Isolation Valve (Inboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV6B	Main Steam Isolation Valve (Inboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV6C	Main Steam Isolation Valve (Inboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV6D	Main Steam Isolation Valve (Inboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV7A	Main Steam Isolation Valve (Outboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV7B	Main Steam Isolation Valve (Outboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV7C	Main Steam Isolation Valve (Outboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[3]	2MSS*AOV7D	Main Steam Isolation Valve (Outboard)	Green/Yellow	No	Manually pull inboard/outboard isolation breakers
MSS[2]	2MSS*MOV111	Main Steam Drain Isolation Valve (Inboard)	Yellow	No	N/R
MSS[2]	2MSS*MOV112	Main Steam Drain Isolation Valve (Outboard)	Green	No	Note 6
MSS[2]	2MSS*MOV208	Inboard MSIV Drain	Green	No	N/R
MSS[3]	2MSS*PSV121	Main Steam Line A Safety/Relief Valve	Green/Yellow	Yes	Disconnect Switch to Disconnect PGCC Interlocks
MSS[3]	2MSS*PSV127	Main Steam Line B Safety/Relief Valve	Green/Yellow	Yes	Disconnect Switch to Disconnect PGCC Interlocks
MSS[3]	2MSS*PSV129	Main Steam Line C Safety/Relief Valve	Green/Yellow	Yes	Disconnect Switch to Disconnect PGCC Interlocks
MSS[3]	2MSS*PSV137	Main Steam Line D Safety/Relief Valve	Green/Yellow	Yes	Disconnect Switch to Disconnect PGCC Interlocks
MSS[2]	2MSS*PSV126	Main Steam Line B Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV130	Main Steam Line C Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV134	Main Steam Line D Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV120	Main Steam Line A Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV122	Main Steam Line A Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV123	Main Steam Line A Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV124	Main Steam Line B Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV125	Main Steam Line B Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV128	Main Steam Line B Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV131	Main Steam Line C Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV132	Main Steam Line C Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV133	Main Steam Line C Safety/Relief Valve	Green/Yellow	NO	Disconnect Switch to Disconnect Relief Valve Function

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
MSS[2]	2MSS*PSV135	Main Steam Line D Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
MSS[2]	2MSS*PSV136	Main Steam Line D Safety/Relief Valve	Green/Yellow	No	Disconnect Switch to Disconnect Relief Valve Function
SVV[8]	2SVV-TE129	Main Steam Line C Relief Temp	Black	No	N/R
SVV[8]	2SVV-TE137	Main Steam Line D Relief Temp	Black	No	N/R
NNS	2NNS-SWG016	4160-V Switchgear 16	Black	No	N/R, Not Required for Safe Shutdown
NNS	2NNS-SWG017	4160-V Switchgear 17	Black	No	N/R, Not Required for Safe Shutdown
NNS	2NNS-SWG018	4160-V Switchgear 18	Black	No	N/R, Not Required for Safe Shutdown
RCS[2]	2RCS*SOV104	2RCS-P1A Discharge Sample Isolation Valve (Inboard)	Yellow	No	N/R
RCS[2]	2RCS*SOV105	2RCS-P1A Discharge Sample Isolation Valve (Outboard)	Green	No	N/R
RHS[2]	2RHS*MOV15A	RHR A Reactor Containment Spray	Green	No	Control Switch Shorting Contact to Prevent Spurious Valve Opening
RHS[2]	2RHS*MOV25A	RHR A Reactor Containment Spray	Green	No	Control Switch Shorting Contact to Prevent Spurious Valve Opening
RHS[2]	2RHS*MOV15B	RHR B Reactor Containment Spray	Yellow	No	Control Switch Shorting Contact to Prevent Spurious Valve Opening
RHS[2]	2RHS*MOV25B	RHR B Reactor Containment Spray	Yellow	No	Control Switch Shorting Contact to Prevent Spurious Valve Opening
RHS[2]	2RHS*MOV33A	RHR A Suppression Pool Spray	Green	No	Disconnect Switch/Second Fuse to MCC
RHS[2]	2RHS*MOV33B	RHR B Suppression Pool Spray	Yellow	No	To Drive Valve Closed
RHS[2]	2RHS*SOV120	Sampling System Test Return	Green	No	N/R
RHS[2]	2RHS*SOV121	Sampling System Test Return	Yellow	No	N/R
RHS[2]	2RHS*MOV26A	RHR H. E. A Vent to Suppression Pool	Green	No	N/R
RHS[2]	2RHS*MOV27A	RHR H. E. A Vent to Suppression Pool	Green	No	N/R
RHS[2]	2RHS*MOV26B	RHR H. E. B Vent to Suppression Pool	Yellow	No	N/R
RHS[2]	2RHS*MOV27B	RHR H. E. B Vent to Suppression Pool	Yellow	No	N/R
RHS[2]	2RHS*SOV35A	RHR A Reactor Sampling System Isolation Valve	Yellow	No	N/R
RHS[2]	2RHS*SOV36A	RHR A Reactor Sampling System Isolation Valve	Green	No	N/R
RHS[2]	2RHS*SOV35B	RHR B Reactor Sampling System Isolation Valve	Green	No	N/R
RHS[2]	2RHS*SOV36B	RHR B Reactor Sampling System Isolation Valve	Yellow	No	N/R
RHS[2]	2RHS*MOV115	RHR Service Water Crosstie	Yellow	No	N/R
RHS[2]	2RHS*MOV116	RHR Service Water Crosstie	Yellow	No	N/R
RHS[3]	2RHS*MOV9A	RHR Heat Exchanger A Shell Side Inlet	Green	Yes	Second Fuse at MCC
RHS[3]	2RHS*MOV9B	RHR Heat Exchanger B Shell Side Inlet	Yellow	Yes	Second Fuse at MCC
RHS[3]	2RHS*MOV12A	RHR Heat Exchanger A Shell Side Outlet	Green	Yes	Second Fuse at MCC

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
RHS(3)	2RHS*MOV12B	RHR Heat Exchanger B Shell Side Outlet	Yellow	Yes	Second Fuse at MCC
RHS(3)	2RHS*P1A	Residual Heat Removal Pump A	Green	Yes	Second Fuse at Switchgear
RHS(3)	2RHS*P1B	Residual Heat Removal Pump B	Yellow	Yes	Second Fuse at Switchgear
RHS(3)	2RHS*MOV40A	RHR A Shutdown Cooling Return	Green	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV40B	RHR B Shutdown Cooling Return	Yellow	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV67A	RHR A Shutdown Cooling CV Bypass	Green	Yes	Note 6
RHS(3)	2RHS*MOV67B	RHR B Shutdown Cooling CV Bypass	Yellow	Yes	Note 6
RHS(3)	2RHS*MOV112	RHR Shutdown Cooling Suction Isolation	Yellow	Yes	Second Fuse at MCC, Note 6
RHS(3)	2RHS*MOV113	RHR Shutdown Cooling Suction Isolation	Green	Yes	Note 6
RHS(3)	2RHS*FV38A	RHR Loop A Test Return	Green	Yes	Disconnect Switch/Second Fuse at MCC
RHS(3)	2RHS*FV38B	RHR Loop B Test Return	Yellow	Yes	Disconnect Switch/Second Fuse at MCC
RHS(3)	2RHS*MOV104	RHR Head Spray Isolation	Green	Yes	Second Fuse to MCC, Note 6
RHS(3)	2RHS*MOV142	RHR Discharge to Radwaste	Green	Yes	Second Fuse at MCC, Note 6
RHS(3)	2RHS*MOV1A	RHR Pump P1A Suction	Green	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV1B	RHR Pump P1B Suction	Yellow	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV2A	RHR A Shutdown Cooling Suction	Green	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV2B	RHR B Shutdown Cooling Suction	Yellow	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV8A	RHR H. E. E1A Bypass	Green	Yes	Disconnect Switch/Second Fuse at MCC
RHS(3)	2RHS*MOV8B	RHR H. E. E1B Bypass	Yellow	Yes	Disconnect Switch/Second Fuse at MCC
RHS(3)	2RHS*MOV149	RHR Discharge to Radwaste	Yellow	Yes	Second Fuse at MCC, Note 6
RHS(3)	2RHS*MOV30A	RHR A Return to Suppression Pool Isolation	Green	Yes	Second Fuse at MCC
RHS(3)	2RHS*MOV30B	RHR B Return to Suppression Pool Isolation	Yellow	Yes	Second Fuse at MCC
RHS(7)	2RHS*MOV24A	RHR LPCI Injection	Green	No	Not Required
RHS(7)	2RHS*MOV24B	RHR LPCI Injection	Yellow	No	Not Required
RHS(7)	2RHS*MOV4A	RHR Min. Flow	Green	No	Not Required
RHS(7)	2RHS*MOV4B	RHR Min. Flow	Yellow	No	Not Required
RTX	2RTX-XSR1A	115/13.8-kV Reserve Transformer A	Black	No	No Fix Required; In Case of Loss of This, Emergency Diesel Will Start
RTX	2RTX-XSR1B	115/13.8-kV Reserve Transformer B	Black	No	No Fix Required; In Case of Loss of This, Emergency Diesel Will Start

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
SCM	2SCM*XD102A	Dist Transformer 600-V - 120/240	Green	No	Not Required for Safe Shutdown
SCM	2SCM*XD104A	Dist Transformer 600-V - 120/240	Green	No	Not Required for Safe Shutdown
SCM	2SCM*XD302B	Dist Transformer 600-V - 120/240	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*XD304B	Dist Transformer 600-V - 120/240	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*XD103A	Dist Transformer 600-V - 120/240	Green	No	Not Required for Safe Shutdown
SCM	2SCM*XD101A	Dist Transformer 600-V - 120/240	Green	No	Not Required for Safe Shutdown
SCM	2SCM*XD105A	Dist Transformer 600-V - 120/240	Green	No	Not Required for Safe Shutdown
SCM	2SCM*XD303B	Dist Transformer 600-V - 120/240	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*XD301B	Dist Transformer 600-V - 120/240	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*XD305B	Dist Transformer 600-V - 120/240	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*PNL102A	120-V Dist Panel	Green	No	Not Required for Safe Shutdown
SCM	2SCM*PNL104A	120-V Dist Panel	Green	No	Not Required for Safe Shutdown
SCM	2SCM*PNL103A	120-V Dist Panel	Green	No	Not Required for Safe Shutdown

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
SCM	2SCM*PNL101A	120-V Dist Panel	Green	No	Not Required for Safe Shutdown
SCM	2SCM*PNL105A	120-V Dist Panel	Green	No	Not Required for Safe Shutdown
SCM	2SCM*PNL302B	120-V Dist Panel	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*PNL304B	120-V Dist Panel	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*PNL301B	120-V Dist Panel	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*PNL303B	120-V Dist Panel	Yellow	No	Not Required for Safe Shutdown
SCM	2SCM*PNL305B	120-V Dist Panel	Yellow	No	Not Required for Safe Shutdown
SCV	2SCV*PNL101A	GTS Miscellaneous 120/240-V Panel	Green	No	Not Required for Safe Shutdown
SCV	2SCV*PNL301B	GTS Miscellaneous 120/240-V Panel	Yellow	No	Not Required for Safe Shutdown
SFC[1,2]	2SFC*HV35A	2SFC*TK1A Inlet Valve	Green	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV35B	2SFC*TK1B Inlet Valve	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV54A	Skimmer Surge Tank Outlet	Green	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV54B	Skimmer Surge Tank Outlet	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV6A	Spent Fuel Pool Cooling Water Cross Connect	Green	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV6B	Spent Fuel Pool Cooling Water Cross Connect	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*LS33A	Skimmer Surge Tank Level	Green	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*LS33C	Skimmer Surge Tank Level	Green	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*AOV33A	Skimmer Surge Tank Level Control	Green	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*LS33B	Skimmer Surge Tank Level	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*LS33D	Skimmer Surge Tank Level	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*AOV33B	Skimmer Surge Tank Level	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*LT32A	Spent Fuel Pool Surge Tank Water Level	Green	No	N/R, PGCC Indication Only
SFC[2]	2SFC*LT32B	Spent Fuel Pool Surge Tank Water Level	Yellow	No	N/R, PGCC Indication Only
SFC[2]	2SFC*LS34A	SFC Skimmer Surge Tank High Level	Green	No	N/R
SFC[2]	2SFC*LS34B	SFC Skimmer Surge Tank High Level	Yellow	No	N/R
SFC[2]	2SFC*TE31A	Spent Fuel Pool Surge Tank Outlet Temperature	Green	No	N/R
SFC[2]	2SFC*TE31B	Spent Fuel Pool Surge Tank Outlet Temperature	Yellow	No	N/R
SFC[2]	2SFC*PT3A	Spent Fuel Pool Circulating Pump A Suction Pressure	Green	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*PT3B	Spent Fuel Pool Circulating Pump B Suction Pressure	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*PT30A	Spent Fuel Pool Circulating Pump A Discharge Pressure	Green	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*PT30B	Spent Fuel Pool Circulating Pump B Discharge Pressure	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*FT36A	Spent Fuel Pool Cooling System Flow	Green	No	N/R
SFC[2]	2SFC*FT36B	Spent Fuel Pool Cooling System Flow	Yellow	No	N/R
SFC[2]	2SFC*FT58A	SFC Pump Discharge Flow	Green	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*FT58B	SFC Pump Discharge Flow	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[2]	2SFC*P1A	SFC Water Circulating Pump A	Green	No	Disconnect Switch to Disconnect PGCC Control
SFC[2]	2SFC*P1B	SFC Water Circulating Pump B	Yellow	No	Disconnect Switch to Disconnect PGCC Control
SFC[1,2]	2SFC*AOV154	SFC Filter Header Inlet Isolation Valve	Yellow	No	N/R, Manual Closer of Valve Long Term
SFC[1,2]	2SFC*AOV153	SFC Filter Header Inlet Isolation Valve	Green	No	N/R, Manual Closer of Valve Long Term
SFC[1,2]	2SFC*HV18A	2SFC-FLT1A Inlet	Green	No	N/R, Manual Closer of Valve Long Term
SFC[1,2]	2SFC*HV18B	2SFC-FLT1B Inlet	Yellow	No	N/R, Manual Closer of Valve Long Term

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
SFC[1,2]	2SFC*HV17A	2SFC-FLT1A Bypass	Green	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV17B	2SFC-FLT1B Bypass	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV37A	2SFC*E1A Heat Exchanger	Green	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*HV37B	2SFC*E1B Heat Exchanger	Yellow	No	N/R, Manual Alignment of System Long Term
SFC[1,2]	2SFC*AOV19A	2SFC-FLT1A Outlet	Green	No	N/R
SFC[1,2]	2SFC*AOV19B	2SFC-FLT1B Outlet	Yellow	No	N/R
SFC[2]	2SFC*TE8A	Spent Fuel Pool Heat Exchanger Outlet Temperature	Green	No	N/R
SFC[2]	2SFC*TE8B	Spent Fuel Pool Heat Exchanger Outlet Temperature	Yellow	No	N/R
SWP[3]	2SWP*P1A	SWP Pumps *P1A	Green	Yes	Dedicated SWP Disconnect Switch/Second Fuse
SWP[3]	2SWP*P1C	SWP Pumps *P1C	Green	Yes	Dedicated SWP Disconnect Switch/Second Fuse
SWP[3]	2SWP*P1E	SWP Pumps *P1E[9]	Green	Yes	Dedicated SWP Disconnect Switch
SWP[3]	2SWP*P1B	SWP Pumps *P1B	Yellow	Yes	Dedicated SWP Disconnect Switch/Second Fuse
SWP[3]	2SWP*P1D	SWP Pumps *P1D	Yellow	Yes	Dedicated SWP Disconnect Switch/Second Fuse
SWP[3]	2SWP*P1F	SWP Pumps *P1F[9]	Yellow	Yes	Dedicated SWP Disconnect Switch
SWP[3]	2SWP*MOV74A	SWP Pump 2SWP*P1A Discharge Valve	Green	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP[3]	2SWP*MOV74C	SWP Pump 2SWP*P1C Discharge Valve	Green	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP[3]	2SWP*MOV74E	SWP Pump 2SWP*P1E Discharge Valve	Green	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP[3]	2SWP*MOV74B	SWP Pump 2SWP*P1B Discharge Valve	Yellow	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP[3]	2SWP*MOV74D	SWP Pump 2SWP*P1D Discharge Valve	Yellow	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP[3]	2SWP*MOV74F	SWP Pump 2SWP*P1F Discharge Valve	Yellow	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP[3]	2SWP*STR4A and MOV1A	SWP Str (Motor-Operated) and Backwash Valve (Motor-Operated)	Green	No	Dedicated SWP Disconnect Switch to Start and Run Equipment/Open Valve
SWP[3]	2SWP*STR4C and MOV1C	SWP Str (Motor-Operated) and Backwash Valve (Motor-Operated)	Green	No	Dedicated SWP Disconnect Switch to Start and Run Equipment/Open Valve
SWP[3]	2SWP*STR4E and MOV1E	SWP Str (Motor-Operated) and Backwash Valve (Motor-Operated)	Green	No	Dedicated SWP Disconnect Switch to Start and Run Equipment/Open Valve
SWP[3]	2SWP*STR4B and MOV1B	SWP Str (Motor-Operated) and Backwash Valve (Motor-Operated)	Yellow	No	Dedicated SWP Disconnect Switch to Start and Run Equipment/Open Valve
SWP[3]	2SWP*STR4D and MOV1D	SWP Str (Motor-Operated) and Backwash Valve (Motor-Operated)	Yellow	No	Dedicated SWP Disconnect Switch to Start and Run Equipment/Open Valve
SWP[3]	2SWP*STR4F and MOV1F	SWP Str (Motor-Operated) and Backwash Valve (Motor-Operated)	Yellow	No	Dedicated SWP Disconnect Switch to Start and Run Equipment/Open Valve
SWP[3]	2SWP*MOV3A	SWP to TBCLCW Isolation Valve	Green	No	Dedicated SWP Disconnect Switch to Close Valve/Second Fuse at MCC
SWP[3]	2SWP*MOV3B	SWP to TBCLCW Isolation Valve	Yellow	No	N/R
SWP[2]	2SWP*MOV19A	SWP to CCP Heat Exchanger Isolation Valve	Green	No	Dedicated SWP Disconnect Switch to Close Valve/Second Fuse at MCC
SWP[2]	2SWP*MOV19B	SWP to CCP Heat Exchanger Isolation Valve	Yellow	No	N/R
SWP[2]	2SWP*FV47A	SWP to Circulating Water Isolation Valve	Green	No	Dedicated SWP Disconnect Switch
SWP[2]	2SWP*FV54A	SWP to Circulating Water Isolation Valve	Green	No	N/R
SWP[2]	2SWP*FV47B	SWP to Circulating Water Isolation Valve	Yellow	No	Dedicated SWP Disconnect Switch
SWP[2]	2SWP*FV54B	SWP to Circulating Water Isolation Valve	Yellow	No	N/R
SWP[2]	2SWP*MOV599	Turbine Building Discharge Isolation Valve	Green	No	N/R
SWP[2]	2SWP*MOV93A	Reactor Building Discharge Isolation Valve	Green	No	Dedicated SWP Disconnect Switch to Close Valve/Second Fuse at MCC
SWP[2]	2SWP*MOV93B	Reactor Building Discharge Isolation Valve	Yellow	No	N/R

TABLE 9B.8-3 (Cont'd.)

System	Equipment	Description	Electrical Division	Controlled From RSS Panel	Control Circuit Arrangement
SWP(2)	2SWP*MOV50A	Service Water Cross Header Isolation Valve	Green	No	N/R
SWP(2)	2SWP*MOV50B	Service Water Cross Header Isolation Valve	Yellow	No	N/R
SWP(2)	2SWP*MOV21A	SWP to SFC Isolation Valve	Green	No	N/R
SWP(2)	2SWP*MOV21B	SWP to SFC Isolation Valve	Yellow	No	N/R
SWP(3)	2SWP*MOV66A	SWP to 2EGS*EG1 Cooler	Green	Yes	RMS/Transfer to RSS Panel/Second Fuse at MCC
SWP(3)	2SWP*MOV66B	SWP to 2EGS*EG3 Cooler	Yellow	Yes	RMS/Transfer to RSS Panel/Second Fuse to MCC
SWP(3)	2SWP*MOV33A	Service Water FR 2RHS*E1A	Green	Yes	Fuse at MCC
SWP(3)	2SWP*MOV33B	Service Water FR 2RHS*E1B	Yellow	Yes	Fuse at MCC
SWP(3)	2SWP*MOV90A	Service Water to Heat Exchanger 2RHS*E1A	Green	Yes	Second Fuse at MCC
SWP(3)	2SWP*MOV90B	Service Water to Heat Exchanger 2RHS*E1B	Yellow	Yes	Second Fuse at MCC
SWP(3)	2SWP*SSR1A, 2A, 3A	SWP Bar Rack Heater Intake Structure #1	Green	No	--
SWP(3)	2SWP*SSR4A, 5A, 6A	SWP Bar Rack Heater Intake Structure #2	Green	No	Add Dedicated SWP Disconnect Switch to
SWP(3)	2SWP*SSR1B, 2B, 3B	SWP Bar Rack Heater Intake Structure #1	Yellow	No	Activate Heaters - Second Fuse to MCC
SWP(3)	2SWP*SSR4B, 5B, 6B	SWP Bar Rack Heater Intake Structure #2	Yellow	No	--
SWP(3)	2SWP*SOV20A	RHS Pump P1A Seal	Green	No	N/R
SWP(3)	2SWP*SOV20B	RHS Pumps P1B&C Seal	Yellow	No	N/R
SWP(3)	2SWP*SOV22A	RHS Pump P1A Seal	Green	No	N/R
SWP(3)	2SWP*SOV22B	RHS Pumps P1B&C Seal	Yellow	No	N/R
VBA	2VBA*UPS2A	Division I Control UPS	Green	No	Disconnect Switch to Disconnect PGCC Metering
VBA	2VBA*UPS2C	Division I Control UPS	Green	No	Disconnect Switch to Disconnect PGCC Metering
VBA	2VBA*UPS2B	Division II Control UPS	Yellow	No	Disconnect Switch to Disconnect PGCC Metering
VBA	2VBA*UPS2D	Division II Control UPS	Yellow	No	Disconnect Switch to Disconnect PGCC Metering
VBS	2VBS*PNL101A	120-V UPS Distribution Panel	Green	No	N/R
VBS	2VBS*PNL301B	120-V UPS Distribution Panel	Yellow	No	N/R
VBS	2VBS*PNL102A	120-V UPS Distribution Panel	Green	No	N/R, Not Used for REM Shutdown
VBS	2VBS*PNL302B	120-V UPS Distribution Panel	Yellow	No	N/R, Not Used for REM Shutdown
WCS(2)	2WCS-MOV106	RWCU Drain to Waste Collector Tank	Black	No	Note 6
WCS(2)	2WCS-MOV107	RWCU Drain to Main Condenser	Black	No	Note 6

TABLE 9B.8-3 (Cont'd.)

(1) Time to reach 150°F is 4.8 hr following the loss of cooling during normal operation.
(2) Denotes evaluated for spurious action.
(3) Denotes required for safe shutdown.
(4) Deleted.
(5) Deleted.
(6) Operating procedures to require valve to be maintained in the closed/de-energized state, de-energized from the power sources.
(7) Valves need to be manually manipulated to initiate alternate shutdown cooling.
(8) Capability to monitor SRV tail piece thermocouple for temperature is provided at junction box 2-JB5511. This can be used for verification of cold shutdown.
(9) Operation from remote shutdown requires control fuse replacement.

SECTION 9B.9

ALTERNATE SHUTDOWN ANALYSIS

9B.9.1 Introduction

The results of the Appendix R SSA (Section 9B.8) show that, at minimum, one of the four trains of SSDSs will remain free of damage due to a fire in any fire area except for the power generation control complex (PGCC), which includes the main control room and relay room. A remote shutdown system (RSS) is provided to achieve and maintain hot and cold shutdown in case of a fire in the PGCC. The design of the RSS meets the requirements of Section III.L of Appendix R.

9B.9.2 Description

The RSPs are located in separate fire areas in the control building, el 261 ft, in an area enclosed by 3-hr fire-rated barriers (Fire Areas [FA]19 and FA17, Figure 9A.3-5).

The RSS design is described in detail in Section 7.4.1.4. Manual keylock transfer switches are provided in the RSPs. These transfer switches isolate controls from the main control room and transfer controls to the remote shutdown room. Control power supplies and control logics are also transferred.

Control switches are provided on the RSP for manual control of the systems required for hot and cold shutdown.

Instrumentation is provided in the RSP to indicate necessary plant parameters.

The remote shutdown room is divided into two separate rooms, each enclosed by 3-hr rated barriers. FA19 (zone 338NZ) contains Division II components which constitute safe shutdown trains 2 and 4, while FA17 (zone 343NZ) contains Division I components which constitute safe shutdown trains 1 and 3.

Access to the remote shutdown room is administratively controlled.

SECTION 9B.10

LIGHTING

NRC Branch Technical Position CMEB 9.5-1, Guidelines for Fire Protection for Nuclear Plants, Revision 2, July 1981, has recognized that lighting is vital to the plant safe shutdown and the emergency response to a fire. As such, the following requirements are included in Section c.5.g.

"1) Fixed, self contained lighting units with individual 8 hour minimum battery power supplies should be provided in areas that must be manned for safe shutdown and for access and egress routes to and from all areas. Safe shutdown areas include those areas required to be manned if the Control Room must be evacuated.

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

The NMP2 SSA requires that proper lighting systems be provided at all times for all areas required for safe shutdown. The safe shutdown lighting system must assure that sufficient illumination is provided for all work stations necessary for safe shutdown in case of a fire in any fire area, and in access and egress routes thereto.

The lighting systems necessary for safe shutdown are powered by one or a combination of the following methods:

1. <u>Normal lighting system</u> usually receives power from the normal Station 600-V load centers.

2. <u>Emergency lighting system</u> normally receives power from the offsite power sources via Class 1E load centers where, in the case of a LOOP, power is provided from the emergency diesel generators. The emergency lighting system provides lighting required for operating safety-related equipment during the emergency conditions. The emergency lighting system is divided into three separate divisions corresponding to Divisions I, II and III of the plant emergency ac distribution system.

3. <u>Essential lighting system</u> is powered from the uninterruptible power supply (UPS) power system when no normal ac power, including onsite and offsite power sources, is available (for maximum duration of 2 hr). The essential lighting system provides partial lighting for certain critical areas of the Station requiring continuous lighting, such as the control room, relay

room, standby diesel generator rooms, emergency switchgear rooms, service water pump rooms, and for access and egress routes where 8-hr battery-pack emergency lighting is not required.

4. <u>Eight-hr battery-pack lighting system</u> powered from its own battery packs.

The lighting system as described meets the requirements of BTP CMEB 9.5-1, Section c.5.g.1, and applies to locations required for remote safe shutdown in the event of a control room fire and LOOP.

A fire in some areas may cause a reactor trip. It is postulated that a fire in the control room, relay room or switchgear room may also cause a LOOP. Although plant normal lighting may be available for a fire in all other areas, the Appendix R SSA does not credit the availability of the normal lighting system. Therefore, an alternatively powered lighting system must be provided for a fire in any fire areas of the plant where safe shutdown equipment is located and Operator manual actions are required. In addition to the emergency powered lighting system, the essential powered lighting system and 8-hr battery-powered emergency lighting are provided at all work stations necessary for safe shutdown where Operator manual actions are required. Table 9B.8-1 provides a list of safe shutdown equipment and any Operator manual action that may be required.

The illumination levels are at a minimum one foot-candle average maintained at the work stations (within a vertical viewing area for a vertical work station, and a horizontal viewing area for a horizontal work station). A one foot-candle average is maintained horizontal on the centerline of the access and egress routes.

All of the lighting systems, including the battery packs, are seismically supported. Details of Station lighting systems are provided in Section 9.5.3.

SECTION 9B.11

CONCLUSIONS

From the results of the analysis in Section 9B.8, it can be concluded that Unit 2 maintains safe shutdown capability in the event of a fire in any one fire area at a time, not coincident with any other design basis accident (DBA), except LOOP.

SECTION 9B.12

SAFE SHUTDOWN CONCERNS

The following are responses to NRC concerns given to Niagara Mohawk Power Corporation (NMPC) during a meeting held June 19, 1985, regarding safe shutdown capability.

1. The design basis event for considering the need for alternative shutdown is a postulated fire and a specific fire containing redundant safe shutdown cables and equipment in close proximity where it has been determined that the fire protection means cannot assure that safe shutdown capability will be preserved. Two cases should be considered: offsite power is available and offsite power is not available.

   <u>Response</u>

   We have evaluated the safe shutdown capability for Unit 2 and considered the need for alternative shutdown capability for each specific fire area in the plant. Safe shutdown can either be performed from the control room for a fire in any plant fire area except for the control room or relay room, or from the RSP in the case of a fire in the relay room or control room. For either of these conditions, we have determined that safe shutdown can be achieved with or without offsite power available. Additionally, we have evaluated the effects of spurious operation, and no single spurious operation will adversely affect safe shutdown.

2. No fission product monitoring integrity shall be affected, including fuel clad damage, rupture of the primary coolant or rupture of the containment boundary. The RCS process variables shall be within those values predicted for a LOOP, and the alternate shutdown capability shall be able to achieve and maintain subcritical conditions in the reactor, maintain reactor coolant inventory, maintain shutdown for extended periods of time, achieve cold shutdown within 72 hr, and maintain cold shutdown conditions thereafter.

   <u>Response</u>

   Our evaluation of safe shutdown capability used the following as the acceptance criteria, that there be: no fuel damage, no rupture of the primary coolant boundary, and no rupture of the containment boundary. The RCS process variables are within those predicted for the LOOP and shutdown from the control room or locally using the RSPs (if the control room is not available) is able to achieve and maintain subcritical conditions, maintain sufficient reactor coolant inventory, achieve and maintain hot shutdown conditions for extended periods of time, and attain cold shutdown conditions within 72 hr and maintain cold shutdown conditions thereafter.

3. The reactivity control functions shall be capable of achieving and maintaining cold shutdown reactivity conditions.

   <u>Response</u>

   The redundant capability provided by the alternate rod insertion (ARI) recirculation pump trip (RPT), cessation of feedwater flow and capability to inject the standby liquid control system (SLCS) assures an insertion of negative reactivity sufficient to achieve and maintain cold shutdown conditions.

4. Reactor coolant makeup functions shall be capable of maintaining the reactor coolant level above the top of the core for boiling water reactors (BWR).

   <u>Response</u>

   Our evaluation ensures that reactor coolant makeup function is capable of maintaining reactor coolant above the top of the core and is the same as those predicted for the case of LOOP.

5. Reactor heat removal function shall be capable of achieving and maintaining decay heat removal.

   <u>Response</u>

   The reactor heat removal function has been determined to achieve and maintain decay heat removal. See Section 4.

6. The process monitoring function shall be capable of providing direct readings or process variables necessary to perform and control the above functions.

   <u>Response</u>

   The process monitoring functions are capable of providing direct readings of the process variables necessary to perform and control safe shutdown functions. These are available either from the main control room or the RSP (see FSAR Section 7.4).

7. The supporting functions shall be capable of providing the process cooling, lubrication, etc., necessary to permit the operation of equipment used for safe shutdown by the systems identified in 3 through 5 above.

   <u>Response</u>

The supporting functions were analyzed and are capable of providing their necessary function to permit operation of safe shutdown equipment. See Sections 9B.4 and 9B.8.

8. The equipment and systems used to achieve and maintain hot shutdown should be: 1) free of fire damage, 2) capable of maintaining such conditions for longer than 72 hr if the equipment required to achieve and maintain cold shutdown is not available due to fire damage, and 3) capable of being powered by onsite emergency power systems.

   <u>Response</u>

   Equipment and systems required to achieve and maintain hot shutdown will remain free from fire damage due to their separate locations within the plant, or are protected by a combination of fire barriers, sprinklers, and detectors. Identified safe shutdown equipment can achieve and maintain hot shutdown conditions for periods longer than 72 hr if cold shutdown systems are not available due to fire damages, and are capable of being powered by onsite emergency power systems. Additionally, the alternate shutdown capability can achieve and maintain cold shutdown within 72 hr, and is capable of being powered by onsite emergency power systems.

9. The equipment and systems used to achieve and maintain cold shutdown conditions should either be free of fire damage or the fire damage to such systems should be limited such that repairs can be made and cold shutdown conditions achieved within 72 hr. Equipment and systems used prior to 72 hr after the fire should be capable of being powered by an onsite emergency power system. Those used after 72 hr may be powered from an offsite power system.

   <u>Response</u>

   The equipment and systems used to achieve and maintain cold shutdown conditions will remain either free from fire damage due to their location or will be protected by a combination of fire barriers, fire suppression systems, and fire detectors.

   Should the equipment be damaged by fire, sufficient capability will be provided onsite to ensure that cold shutdown systems are restored within 72 hr using repair procedures. Repair procedures are not necessary to restore cold shutdown systems. Sufficient systems are available either from the control room or the RSPs to achieve and maintain hot and cold shutdown conditions without the need for repairs.

10. Systems need not be designed to seismic Category 1 criteria, single-failure criteria, or cope with other plant accidents such as pipe breaks or stuck valves except those portions of

those systems that interfere with or impact the existing safety systems.

Response

Many of the systems used for safe shutdown and cold shutdown during fires are seismic Category 1, must meet single-failure criteria, and can cope with other in-plant accidents such as pipe breaks or stuck relief valves. However, those conditions are not necessary to be applied in the case of fire.

11. The following equipment is used for hot shutdown: 1) Reactor trip capability either by automatic or manual scram; 2) RCIC RHR including the SWP system and appropriate process monitoring capabilities such as reactor vessel level, pressure, suppression pool temperature, onsite emergency power, and dc power and distribution systems. Systems used for cold shutdown include RHR system, SWP system, onsite dc and ac or offsite power systems.

Response

As shown on Figure 9B.4-2, the approach used for Unit 2 is similar to that described above. The reactor is either manually or automatically scrammed. Then one of four trains are used to provide makeup water and decay heat removal. Either HPCS or RCIC is used for high pressure makeup. If a blowdown were to occur either through the ADS or relief valves, makeup would be provided using the low pressure systems (LPCS or LPCI). Additionally, decay heat removal is provided by the RHR system.

In the event of a fire in the control room or relay room which forces evacuation of the control room, sufficient equipment to enable hot and cold shutdown is provided at the RSPs (FSAR Section 7.4) and through the use of local control. Viability of these circuits is assured by the use of transfer switches which electrically isolate the control room and transfer control to the local panels and the RSPs. Redundant and isolated fuses are provided (in the emergency switchgear rooms) to maintain the power source to these circuits.

12. The description of the systems or portions thereof used to provide the shutdown capability and modifications required to achieve alternate shutdown capability if required.

Response

Appendix 9B and Section 7.4 of the FSAR provide descriptions of the shutdown systems and modifications and alternate shutdown capability from the remote shutdown room.

13. System design drawings which show normal and alternate shutdown control and power circuits, location of components and that wiring which is in an area and wiring which is out of the area required alternate system.

    Response

    System design drawings are available onsite as required to show normal and alternate shutdown control and power circuits, location of components and wiring in various fire areas. Cable routing in the plant is shown in Table 9B.8-1.

14. Demonstrate that changes to safety systems will not degrade safety systems. For example, new isolation switches and control switches should meet design criterion standards in the FSAR for electrical equipment in the system in which the switch is to be installed. Cabinets that switches are to be mounted in should also meet the same criteria as other safety-related cabinets and panels and, to avoid inadvertent isolation from the control room, isolation switches should be keylocked or alarmed in the control room if in the local or isolated position. Periodic checks should be made to verify that the switch is in the proper position for normal operation, and single transfer switch or other new device should not be a source for single failure to cause loss of redundant safety systems.

    Response

    Equipment which is being provided for safe shutdown will meet the criteria for the system in which it is installed. Keylocks are provided on the transfer and disconnect switches to assure against inadvertent operation. Separate transfer switches are used for redundant divisions to ensure that both the divisions are not affected by any single failure. Actuation of the transfer switches is alarmed in the control room.

15. Demonstrate that wiring, including power sources for the control circuits and equipment, operations for the alternate shutdown method, is independent of equipment wiring in the area to be avoided.

    Response

    Table 9B.8-1 shows the circuits and equipment that are located in each fire area. Information is provided showing the location of the equipment that would be available for a fire in the area to be utilized for safe shutdown. A computer program was utilized to verify that cables were routed appropriately to maintain divisional separation and ensure safe shutdown capability in the event of a fire.

16. Demonstrate that alternative shutdown power sources, including all breakers, have isolation devices on control circuits that are routed through the area to be avoided even if the breaker is to be operated manually.

    Response

    Alternate shutdown power sources, including all breakers, are routed such that safe shutdown can be achieved independently of where the fire occurs. Alternative systems are available for safe shutdown. We have shown which components and electrical cabling are in each area and which can be used for safe shutdown when a fire is in any given area. Appropriate isolation devices (e.g., fuses, breakers, transfer switch contacts, etc.) have been used to mitigate the effects of fire damage to maintain independent power supply and availability.

17. Demonstrate that licensee procedures have been developed and describe the tasks to be performed to effect the shutdown methods.

    Response

    Procedures are presently being developed to enable safe shutdown in the event of a fire within the plant. These are available and personnel training will be completed prior to fuel load.

18. Demonstrate that spare fuses are available for control circuits where these fuses may be required in supplying power to control circuits used for the shutdown method and may be blown by the effects of a cable spreading room fire. Spare fuses should be located conveniently to the existing fuses, and the shutdown procedures should inform the Operator to check these fuses.

    Response

    The controls for the safe shutdown equipment, in the event of fire in the control room (or relay room), are provided on the RSPs or locally (FSAR Section 7.4). All control circuits required for safe shutdown from the remote shutdown room that are subject to control room fire effects are provided with redundant fuses which are put into the circuit by the operation of a transfer or disconnect switch.

19. Demonstrate that the manpower required to perform the shutdown functions using the procedures of Item 18, as well as to provide Fire Brigade members to fight the fire, is available as required by the Fire Brigade Technical Specifications.

    Response

A demonstration will be conducted during initial testing to verify the capability to perform the safe shutdown functions considering a fire in any area of the plant, including the control room area.

20. Demonstrate that adequate acceptance tests are performed. These should verify that equipment operates from the local control station when the transfer or isolation switch is placed in a location position, and that the equipment cannot be operated from the control room, and that equipment operates from the control room but cannot be operated in the local control station when the transfer or isolation switch is in the remote position.

    Response

    The preoperational test program will incorporate the requirements of the above testing.

21. Technical Specification of the surveillance requirements and limited conditions of operation for that equipment not already covered by existing Technical Specifications. For example, if new isolation and control switches are added for the SWP system, the existing Technical Specifications surveillance requirements for the SWP system should add a statement similar to the following. "Every third pump test should also verify that the pump starts from an alternative shutdown station after moving all service water system isolation switches to the local control position."

    Response

    Technical Specifications have been submitted which demonstrate operability of control circuits every 18 months.

22. Demonstrate that the systems available are adequate to perform the necessary shutdown functions. The functions required should be based on previous analysis if possible, such as loss of offsite ac power or shutdown on A Group 1 (RPV) isolation. Equipment required for the alternate capability should be the same or equivalent to that relied on in the above analysis.

    Response

    An analysis was performed to ensure that appropriate capability exists to shut down the plant on loss of offsite ac power. The results of this analysis are provided in Table 9B.8-2.

23. Demonstrate that repair procedures for cold shutdown systems are developed and materials for repairs are maintained onsite.

Response

Because of the separation, isolation, and redundancy provided, repairs have not been required to achieve safe shutdown and cold shutdown. Procedures are therefore not provided.

24. Provide a table that lists all equipment including instrumentation and support systems, equipment that is required by the alternate or dedicated method of achieving and maintaining shutdown.

Response

Equipment used to maintain or achieve hot shutdown from the remote shutdown room in the event of fire in the control room or relay room is shown on Table 9B.8-3. The systems required for safe shutdown from the remote shutdown room are described in Section 9B.8.2.

25. For each alternative shutdown equipment listed in Item 24 above, provide a table that lists essential cables that are located in the fire area.

Response

All equipment, instrumentation and control and power cables that are located in various fire areas are listed in Table 9B.8-1.

26. Provide a table that lists safety-related and nonsafety-related cables associated with equipment and cables constituting the alternate or dedicated method of shutdown that are located in the fire area.

Response

See Item 24 and 25 above.

27. Show that fire-induced failures of cables listed in Item 25 and 26 above will not prevent operation or cause maloperation of alternative or dedicated shutdown method.

Response

Spurious operation or maloperation of alternative or dedicated shutdown equipment was evaluated and is described in Section 9B.8.1.

28. For each cable listed in Item 26 above, provide detailed electrical schematic drawings that show on each cable is isolated from the fire area.

Response

Schematic drawings are available for onsite review during the Appendix R audit.

29. The RHR system is generally low pressure system that interfaces with high-pressure primary coolant system. To preclude a LOCA through this interface, we require compliance with the recommendation of BTP 9.5-1. Thus, this interface most likely consists of two redundant and independent MOVs. These two MOVs and their associated cable may be subject to a single fire hazard. It is our concern that this single fire could cause the two valves to open resulting in a fire-initiated LOCA through the subject high-/low-pressure system interface. To assure that this interface and other high-/low-pressure interfaces are adequately protected from the effects of a single fire, we required the following information.

    A. Identify each high-/low-pressure interface that uses redundant, electrically controlled devices such as two series MOVs to isolate or preclude rupture of any primary coolant boundary.

Response

Each high-pressure and low-pressure interface point is described in Table 9B.5-1.

APPENDIX 9C

THE CONTROL OF HEAVY LOADS AT NINE MILE POINT UNIT 2

APPENDIX 9C

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SECTION 1

INTRODUCTION

Nuclear Regulatory Commission (NRC) letter dated December 22, 1980, to Niagara Mohawk Power Corporation (NMPC) contained NUREG-0612, Control of Heavy Loads at Nuclear Power Plants. This letter requested a review of the controls for handling heavy loads to determine the extent to which general guidelines were addressed, and to identify changes and modifications that would be required to satisfy these guidelines.

The information presented in this report is a summary of the heavy loads analysis of Nine Mile Point Nuclear Station - Unit 2 (Unit 2). The concerns of the NRC staff as defined in NUREG-0612 have been specifically addressed in Section 3. The objective of NUREG-0612 to provide a maximum practical "defense-in-depth" approach to reduce risk involved in load-handling failures remains an ongoing objective.

Section 8.2 of this report provides a comparison and evaluation of the differences between the Unit 2 polar crane and NUREG-0554.

SECTION 2

BASIS OF REVIEW

A heavy load has been defined by NUREG-0612 as any weight greater than the combined weight of a single spent fuel assembly and its associated handling tool.

This report uses "greater than 1,000 pounds" as a basis for determining "heavy load." The actual weight for the spent fuel assembly and its associated handling tool is 1,129 lb. In the area of the reactor and spent fuel pool, all loads which are hoisted and handled were investigated. This report does not address temporary rigging/load handling systems which are erected as needed during the course of normal plant maintenance; these are controlled by administrative procedures in accordance with NUREG-0612.

The general guidelines identified in NUREG-0612 were used as a basis for this review.

SECTION 3

RESULTS OF REVIEW

The results of the review are listed as direct responses to Enclosure 3 of the NRC's December 22, 1980, letter. For convenience, the NRC requested information is repeated, followed by the Unit 2 response.

The following format corresponds point by point to Enclosure 3 of the NRC's letter:

2. INFORMATION REQUESTED FROM LICENSEE

2.1 General Requirements for Overhead Handling Systems

NUREG-0612, Section 5.1.1, identifies several general guidelines related to the design and operation of overhead load-handling systems in the areas where spent fuel is stored, in the vicinity of the reactor core, and in other areas of the plant where a load drop could result in damage to equipment required for safe shutdown or decay heat removal. Information provided in response to this section should identify the extent of potentially hazardous load-handling operations at a site, and the extent of conformance to appropriate load-handling guidance.

2.1-1 Requested Information

Report the results of your review of plant arrangements to identify all overhead handling systems from which a load drop may result in damage to any system required for plant shutdown or decay heat removal (taking no credit for any interlocks, Technical Specifications, operating procedures, or detailed structural analysis).

Response

This study included a systematic review of all permanent cranes, monorails, and hoists intended for use at Unit 2. The overhead handling systems, from which load drops may result in damage to a system required for plant shutdown or decay heat removal, are listed in Table 3-1.

2.1-2 Requested Information

Justify the exclusion of any overhead handling system from the above category by verifying that there is sufficient physical separation from any load-impact point and any safety-related component to permit a determination by inspection that no heavy load drop can result in damage to any system or component required for plant shutdown or decay heat removal.

Response

The overhead handling systems, which have been excluded from this study, are listed in Table 3-2. The specific justification for excluding each system is noted.

2.1-3 Requested Information

With respect to the design and operation of heavy-load handling systems in the reactor building and those load-handling systems identified in Item 2.1-1, provide your evaluation concerning compliance with the guidelines of NUREG-0612, Section 5.1.1. The following specific information should be included in your reply:

a. Drawings or sketches sufficient to clearly identify the location of safe load paths, spent fuel, and safety-related equipment.

Response

See Section 5 for drawings which define safe load paths and show safety-related equipment.

b. A discussion of measures taken to ensure that load-handling operations remain within safe load paths, including procedures, if any, for deviation from these paths.

Response

Safe load paths will be referenced in procedures and shown on equipment layout drawings. Load paths will not be marked on the floor in the area where the load is to be handled. There are 10 to 15 load paths for the reactor building operating floor. Load paths would be confusing and overlapped by other load paths. There are limit switches on the reactor building polar crane (RBPC) to limit movement of heavy loads over the spent fuel pool. Most of the other cranes discussed in Item 2.1-1 are monorail which inherently define the load path.

c. The tabulation of heavy loads to be handled by each crane which includes the load identification, load weight, its designated lifting device, and verification that the handling of such load is governed by a written procedure containing, as a minimum, the information identified in NUREG-0612, Section 5.1.1(2).

Response

See Tables 3-3, 3-4, and 3-5 for tabulation of heavy loads handled by cranes, hoists, and monorails. The procedures will comply with NUREG-0612, Section 5.1.1(2), except that the safe load paths are not marked on the floors. These procedures will be available for onsite review.

d. Verification that lifting devices identified in Item 2.1-3c comply with the requirements of ANSI N14.6-1978 or ANSI B30.9-1971 as appropriate. For lifting devices where these standards, as supplemented by NUREG-0612, Section 5.1.1(4) or 5.1.1(5), are not met, describe any proposed alternatives and demonstrate their equivalency in terms of load-handling reliability.

Response

See Section 6 for a discussion on lifting devices.

e. Verification that ANSI B30.2-1976, Chapter 2-2, has been invoked with respect to crane inspection, testing, and maintenance. Where any exception is taken to this standard, sufficient information should be provided to demonstrate the equivalency of proposed alternatives.

Response

See Section 7 for compliance with guidelines of ANSI B30.2-1976.

f. Verification that crane design complies with the guidelines of CMAA Specification No. 70 and Chapter 2-1 of ANSI B30.2-1976, including the demonstration of equivalency of actual design requirements for instances where specific compliance with these standards is not provided.

Response

See Section 8 for verification of crane design.

g. Exceptions, if any, taken to ANSI B30.2-1976 with respect to Operator training, qualification, and conduct.

Response

See Section 9 for Operator training, qualification, and conduct.

2.2 Specific Requirements for Overhead Handling Systems Operating in the Reactor Building

NUREG-0612, Section 5.1.4, provides guidelines concerning the design and operation of load-handling systems in the vicinity of spent fuel in the reactor vessel or in storage. Information provided in response to this section should demonstrate that adequate measures have been taken to ensure that, in this area, either the likelihood of a load drop which might damage spent fuel is extremely small, or that the estimated consequences of such a drop will not exceed the limits set by the evaluation criteria of NUREG-0612, Section 5.1, Criteria I through III.

2.2-1 Requested Information

Identify by name, type, capacity, and equipment designator, any cranes physically capable (i.e., ignoring interlocks, moveable mechanic stops, or operating procedures) of carrying loads over spent fuel in the storage pool or in the reactor vessel.

Response

Name		Type	Capacity	Equipment Designator
a.	Reactor Building Crane	Polar	132/25/0.5 ton	2MHR-CRN1
b.	Fuel-Handling	Jib	0.5 ton	2MHF-CRN-1
c.	Fuel-Handling	Jib	0.5 ton	2MHF-CRN-2
d.	Channel-Handling	Jib	200 lb	2MHF-CRN-3
e.	Fuel Grapple	Tele-scoping		NA
f.	Service Pole Caddy	Hoist	0.25 ton	NA

2.2-2 Requested Information

Justify the exclusion of any crane in this area from the above category by verifying that they are incapable of carrying heavy loads or are permanently prevented from movement of heavy load over stored fuel or into any location where, following any failure, such load may drop into the reactor vessel or spent fuel storage pool.

Response

The fuel-handling jib cranes, service pole caddy hoist, and the channel-handling jib crane can be excluded since loads handled are less than 1,000 lb. The fuel grapple handles only the fuel assembly and, therefore, is also excluded since previous analyses postulated worst-case accident for spent fuel assembly drop over the reactor core. The calculated exposures (design base accident [DBA]) were a small fraction of the allowable guidelines of 10CFR100 as discussed in Section 15.7.4 of the Unit 2 Final Safety Analysis Report (FSAR).

2.2-3 Requested Information

Identify any cranes listed in Item 2.2-1 which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling system (i.e., crane-load-combination) information specified in Attachment 1.*

Response

The main hook (132 ton) of the RBPC is a single-failure proof design which complies with the criteria of NUREG-0612, Section 5.1.6. See Section 8 for a more detailed summary of the RBPC design. See Table 3-3 for the crane loads.

* All attachments are those accompanying Enclosure 3 of the NRC's December 22, 1980, letter.

2.2-4 Requested Information

For cranes identified in Item 2.2-1 not categorized according to Item 2.2-3, demonstrate that the criteria of NUREG-0612, Section 5.1, are satisfied. Compliance with Criterion IV will be demonstrated in response to Section 2.3 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the reactor building and your determination of compliance. This response should include the following information for each crane.

a. Where reliance is placed on the installation and use of electrical interlocks or mechanical stops, indicate the circumstances under which these protective devices can be removed or bypassed and the administrative procedures invoked to ensure proper authorization of such action. Discuss any related or proposed Technical Specifications concerning the bypass of such interlocks.

Response

In regards to the RBPC: electrical interlocks may be temporarily removed or bypassed with written approval of the Shift Manager (SM) and/or Plant General Manager. The reasons for removal or bypassing will be included with the written approval. A site procedure which explains the conditions and requirements for temporary removal or bypassing will be developed.

b. Where reliance is placed on the operation of the standby gas treatment system (SGTS), discuss present and/or proposed Technical Specifications and administrative or physical controls provided to ensure that these assumptions remain valid.

Response

Technical Specifications will address required operability of SGTS during fuel handling operations.

c. Where reliance is placed on other site-specific considerations (e.g., refueling sequencing), provide present or proposed Technical Specifications, and discuss administrative or physical controls provided to ensure the validity of such considerations.

Response

The fuel-handling procedures now being formulated will follow the guidelines of NUREG-0612.

d. Analyses performed to demonstrate compliance with Criteria I through III should conform to the guidelines of NUREG-0612 Appendix A. Justify any exception taken to these guidelines and provide the specific information requested in Attachments 2, 3, or 4, as appropriate, for each analysis performed.

Response

No such analyses were required for this study.

2.3 Specific Requirements for Overhead Handling Systems Operating in Plant Areas Containing Equipment Required for Reactor Shutdown, Decay Heat Removal, or Spent Fuel Pool Cooling

NUREG-0612, Section 5.1.5, provides guidelines concerning the design and operation of load-handling systems in the vicinity of equipment or components required for safe reactor shutdown and decay heat removal. Information provided in response to this section should be sufficient to demonstrate that adequate measures have been taken to ensure that in these areas, either the likelihood of a load drop which might prevent safe reactor shutdown or prohibit continued decay heat removal is extremely small, or that damage to such equipment from load drops will be limited in order not to result in the loss of these safety-related functions. Cranes which must be evaluated in this section have been previously identified in your response to Item 2.1-1, and their loads in your response to Item 2.1-3c.

2.3-1 Requested Information

Identify any cranes listed in Item 2.1-1 which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling system (i.e., crane-load-combination) information specified in Attachment 1.

Response

See Section 8, Verification of Crane Design.

2.3-2 Requested Information

For any cranes identified in Item 2.1-1 not designated as single-failure proof in Item 2.3-1, a comprehensive hazard evaluation should be provided, including the following information:

a. The presentation in a matrix format of all heavy loads and potential impact areas where damage might occur to safety-related equipment. Heavy loads identification should include designation and weight or cross-reference to information provided in Item 2.1-3c. Impact areas should be identified by construction zones and elevations or by some other method such that the impact area can be located on the plant general arrangement drawings.

   Response

   See hazard elimination tables in Section 4.

b. For each interaction identified, indicate which of the load and impact area combinations can be eliminated because of separation and redundancy of safety-related equipment, mechanical stops and/or electrical interlocks, or other site-specific considerations. Elimination on the basis of the aforementioned consideration should be supplemented by the following specific information:

   (1) For load/target combinations eliminated because of separation and redundancy of safety-related equipment, discuss the basis for determining that load drops will not affect continued system operation (i.e., the ability of the system to perform its safety-related function).

   Response

   See comment section of the hazard elimination tables in Section 4.

(2) Where mechanical stops or electrical interlocks are to be provided, present details showing the areas where crane travel will be prohibited. Additionally, provide a discussion concerning the procedures that are to be used for authorizing the bypassing of interlocks or removable stops, for verifying that interlocks are functional prior to crane use, and for verifying that interlocks are restored to operability after operations which require bypassing have been completed.

Response

See the drawings listed in Section 5 for areas where crane travel is prohibited due to mechanical stops or interlocks. Bypassing of interlocks or mechanical stops will be covered in the load-handling procedures.

(3) Where load/target combinations are eliminated on the basis of other site-specific considerations (e.g., maintenance sequencing), provide present and/or proposed Technical Specifications and discuss administrative procedures or physical constraints invoked to ensure the validity of such considerations.

Response

See comment section of the hazard elimination tables in Section 4.

c. For interactions not eliminated by the analysis of Item 2.3-2b, identify any handling systems for specific loads which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each so evaluated, provide the load-handling system (i.e., crane-load-combination) information specified in Attachment 1.

Response

All interactions were eliminated by analysis of Item 2.3-2b.

d. For interactions not eliminated in Items 2.3-2b or 2.3-2c, demonstrate using appropriate analysis that damage would not preclude operation of sufficient equipment to allow the system to perform its safety function following a load drop (NUREG-0612, Section 5.1, Criterion IV).

For each analysis so conducted, the following information should be provided:

(1) An indication of whether or not, for the specific load being investigated, the overhead crane-handling system is designed and constructed such that the hoisting system will retain its load in the event of seismic accelerations equivalent to those of a safe shutdown earthquake (SSE).

(2) The basis for any exceptions taken to the analytical guidelines for NUREG-0612, Appendix A.

(3) The information requested in Attachment 4.

Response

All interactions were eliminated by analysis of Item 2.3-2b.

TABLE 3-1

OVERHEAD HANDLING SYSTEMS WHICH CARRY HEAVY LOADS OVER SAFE SHUTDOWN OR DECAY HEAT REMOVAL EQUIPMENT

Mark No.	Identification	Location	Function
2MHR-CRN1	132/25/0.5-Ton Reactor Building Polar Crane	Reactor Building at El 387'-4" and Azimuth 0°-359°	Refueling and maintenance
2MHR-CRN3,4	34-Ton Recirc Motor Handling Cranes	Primary Containment at El 284'-11" and Azimuth 135° and 315°	Removal and replacement of pump motors
2MHS-CRN6	10-Ton Stop Log Area Crane	Screenwell Building Intake and Discharge Shaft Area El 307'-9"	Removal and replacement of SWP MOVs and stop logs
2MHS-CRN7	8-Ton Single Girder Crane	Reactor Building at El 261'-0" and Azimuth 0°	Removal and replacement of outboard main steam and feedwater valves
2MHR-CRN65[(1)]	2-Ton Monorail System	Primary Containment at El 305'-9" and Azimuth 240° to 115°	Removal and replacement of safety relief valves
2MHR-CRN65X[(1)]	2-Ton Monorail System	Primary Containment at El 305'-9" and Azimuth 240° to 115°	Removal and replacement of safety relief valves (installed during cold shutdown or refueling mode)
2MHR-CRN66X	2-Ton Transfer Monorail System	Primary Containment at El 261'-0" and Azimuth 165° to 235°	Transfer safety relief valves and CRD cart
2MHR-CRN67	8-Ton Monorail System	Primary Containment at El 261'-0" and Azimuth 315° to 45°	Removal and replacement of main steam isolation valves
2MHS-CRN2, 3, and 4	5-Ton Emergency Diesel Generator Cranes	Emergency Diesel Generator Building El 261'-0"	Maintenance of emergency generators
2MHW-CRN1	75/40-Ton Screenwell Room Crane	Screenwell Building Above Service Water Pump Bays	Maintenance of service water pumps, circulating water pumps, feedwater heater tube bundles, and miscellaneous equipment

(1) 2MHR-CRN65 and 2MHR-CRN65X cannot be used or installed on the monorail concurrently.

TABLE 3-2

OVERHEAD HANDLING SYSTEMS WHICH ARE EXCLUDED FROM FURTHER CONSIDERATION

Mark No.	Identification and Justification
2MHN-CRN1	30-Ton Radwaste Building Crane - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN56	Radwaste Building Monorail (10-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN70	Grating and Miscellaneous Equipment Hoist (2-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN71	Concrete Slab Hoist (3-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN72	Heat Exchanger Hoist (2-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN73	Concrete Slab Hoist (4-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN74	Concrete Slab Hoist (4-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN75	Concrete Slab Hoist (4-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN76	(LLW) Storage container/SRV test and storage facility hoist (4-ton capacity). This crane is located inside radwaste at el 265'-0" which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHF-CRN1 and -CRN2	Refueling Area Jib Cranes - The capacities of these cranes are all 1/2 ton. Therefore, these cranes are excluded from the Heavy Loads study.
2MHF-CRN3	Channel Handling Boom with Counterbalance - The capacity is 200 lb; therefore, this crane is excluded from the Heavy Loads study.
2MHT-CRN1	250/40-Ton Turbine Room Crane - This crane is located inside the turbine building, which does not contain any safety-related mechanical equipment. A load drop from this crane will not preclude plant shutdown.

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TABLE 3-2 (Cont'd.)

Mark No.	Identification and Justification
2MHS-CRN1	RDS Cart Crane (1.5-Ton Capacity) - This crane is located in that area of the reactor building at el 289'-0" and azimuth 221°F which does not contain safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHS-CRN5	Workshop Crane (10-Ton Capacity) - This crane is located in the turbine building dirty workshop and large tool area at el 261'-0". A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHS-CRN9	Discharge Flume and Screenhouse Crane (10-Ton Capacity) - This crane is located in the screenhouse. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHS-CRN20	Lube Oil Tank Equipment Crane (1.5-Ton Capacity) - This jib crane is located over the turbine oil reservoir at el 277'-6". A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN31	3-Ton Monorail Hoist System - This is located inside the control building at el 261'-0" and is used for the removal of the hatch cover slabs and equipment. A load drop from this hoist would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN32	3-Ton Monorail Hoist System - This hoist is located inside the auxiliary boiler room at el 261'-0". A load drop from this hoist would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN33 and -CRN34	10-Ton Monorail Hoist Systems - These hoists are located in the turbine building for the handling of the condenser waterboxes during a plant shutdown. A load drop from these hoists would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN45 and -CRN46	5-Ton Monorail Hoist Systems - These hoists are located inside the normal switchgear building at el 293'-0" and 261'-0", respectively, and are used for the handling of hatch cover slabs and equipment. Load drops from these hoists would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN48	10-Ton Monorail Hoist System - This system is located in the decontamination area at el 261'-0". A load drop from this hoist system would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN55	4-Ton Monorail Hoist System - This hoist is located in the control building above floor el 306'-0". A load drop from this hoist would not result in damage to any system required for shutdown or decay heat removal.
2MHR-CRN50	Pipe Chase Hatch Cover Hoist (5-Ton Capacity) - This hoist is located in the reactor building at el 353'-0" and azimuth 50°. A load drop from this hoist would not result in damage to any system required for plant shutdown.
2MHR-CRN51	Pipe Chase Hatch Cover Hoist (10-Ton Capacity) - This hoist is located in the reactor building at el 328'-10" and azimuth 320°. A load drop from this hoist would not result in damage to any system required for plant shutdown.

TABLE 3-2 (Cont'd.)

Mark No.	Identification and Justification
2MHR-CRN52	8-Ton Monorail Hoist System - This hoist is located in the reactor building at el 328'-10" and azimuth 125°. It is used for removing a hatch cover. A load drop from this hoist will not result in damage to any system required for plant shutdown.
2MHR-CRN61	8-Ton Monorail Hoist System - This hoist is used for the removal and replacement of the equipment hatch cover at el 261'-0" and azimuth 315°. A load drop from this hoist would not result in damage to any system required for plant shutdown.
2MHK-CRN78	2-Ton Hatch and Equipment Hoist - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHR-CRN100	4-Ton Hatch and Equipment Hoist - This crane is located in the reactor building at el 261'-0" and azimuth 193°. A load drop from this hoist would not result in damage to any system required for plant shutdown.
2MHR-CRN200	4-Ton Monorail Hoist System - This hoist is located inside the secondary containment at el 261'-0" and extends from azimuth 135° to 35 line. A load drop from this hoist would not result in damage to any system required for plant shutdown. (Interchangeable with hoists 2MHR-CRN200A and 2MHR-CRN200B.)
2MHR-CRN200A	One of the 2-Ton Hoists - This hoist is interchangeable with 2MHR-CRN200 for the removal and replacement of SRVs and is located inside the secondary containment at el 261'-0" and extends from azimuth 135° to 35 line. A load drop from this hoist would not result in damage to any system required for plant shutdown. (Work in conjunction with 2MHR-CRN200B.)
2MHR-CRN200B	One of the 2-Ton Hoists - This hoist is interchangeable with 2MHR-CRN200 for the removal and replacement of SRVs and is located inside the secondary containment at el 261'-0" and extends from azimuth 135° to 35 line. A load drop from this hoist would not result in damage to any system required for plant shutdown. (Work in conjunction with 2MHR-CRN200A.)

TABLE 3-3

2MHR-CRN1/POLAR CRANE LOADS

Crane Load	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Fuel Transfer Shielding Bridge	34	Main Strongbacks and Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug A	90	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug B	102	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug C (with rigging)	119	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug D	90	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling
Drywell Shield Plug E	82	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug F	93	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug G	93	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug H	82	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Drywell Head	55	Main Strongbacks and Sling Assemblies or Kevlar Sling Assemblies with Redundant Strongback Only	*	Twice each refueling operation
Reactor Vessel Head	132**	Main Strongbacks and Sling Assemblies or Carousel Strongback	*	Twice each refueling operation

TABLE 3-3 (Cont'd.)

Crane Load	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Steam Dryer	50	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Steam Separator	80	Main Strongbacks with Solid Bar Sling Assemblies or Wire Rope Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Reactor Vessel Head Insulation and Support Frame	40	Main Strongbacks and Sling Assemblies or Kevlar Sling with Redundant Strongback Only	*	Twice each refueling operation
Spent Fuel Shipping Cask	100	Cask Lifting Yoke	*	As needed over the life of plant
Reactor Head Stud Rack	2.1	Sling Assemblies	*	Twice each refueling operation
Reactor Stud Tensioner	5	Sling Assemblies	*	Twice each refueling operation
Refueling Canal Plugs	16 (max)	Main Strongbacks and Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
WCS Filter Demineralizer Removal Plugs	15	Main Strongbacks and Sling Assemblies or Kevlar Sling Assemblies	*	As needed over the life of plant
SFC Filter Removal Plugs	10	Main Strongbacks and Sling Assemblies or Sling Assemblies Only	*	As needed over the life of plant
SFC Filter Demineralizer Removal Plugs	4	Sling Assemblies	*	As needed over the life of plant
Reactor Service Platform	5	Main Strongbacks and Sling Assemblies or Sling Assemblies Only	*	Twice each refueling operation
Storage Pool Gate	50	Main Strongbacks and Sling Assemblies or Kevlar Sling Assemblies	*	Twice each refueling operation
Recirculation Pump Motor	33.5	Main Strongbacks and Sling Assemblies	*	As needed over the life of plant
Storage Pool Plug	82	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation

TABLE 3-3 (Cont'd.)

Crane Load	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Fuel Pool Gate	1.45	Main Strongbacks and Sling Assemblies or Sling Assemblies Only	*	Twice each refueling operation
Jib Cranes	3.3	Main Strongbacks and Sling Assemblies or Sling Assemblies Only		As needed over the life of plant
Removal Hoist Plate	0.6	N/A	*	As needed over the life of plant
Control Blade Storage Frame	6.5	Chain Hoist and Sling Assemblies	*	As needed over the life of plant
Fuel Inspection Stand	1.5	Sling Assemblies		As needed over the life of plant
Refuel Bridge Hoist Test Weight	0.5	Refuel Bridge Auxiliary Hoist		Once each refueling operation
Refuel Bridge Hoist Test Weight	0.74	Refuel Bridge (Round Mast) Main Hoist		Once each refueling operation
Refuel Bridge Hoist Test Weight	0.2	Refuel Bridge (Round Mast) Main Hoist		Once each refueling operation

* Load-handling procedures will be developed to cover load-handling operations for heavy loads that are handled over or in proximity to spent fuel or safe shutdown equipment.
** Maximum load.

TABLE 3-4

REACTOR BUILDING CRANES - LOADS HANDLED

Crane Load	Crane Mark No.	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Main Outboard Steam Valve(s) 2MSS*AOV7A, B, C, and D	2MHS-CRN7	7	Sling Assembly	*	*
MSS Valve Operators	2MHS-CRN7	2.4	Sling Assembly	*	*
Feedwater Valves	2MHS-CRN7	8	Sling Assembly	*	*
PSV Valves (PSV-120 to 137)	2MHR-CRN65 2MHR-CRN65X	1.8 1.8	Sling Assembly Sling Assembly	* *	* *
PSV Valves and CRD Cart (PSV-120 to 137)	2MHR-CRN66X	1.5	Sling Assembly	*	*
Recirculation Pump Motors	2MHR-CRN3&4	33.5	Spreader Beam	*	*
Cooling Coil Cart	2MHR-CRN3&4	5	Sling Assembly	*	*
Inboard Steam Valves 2MSS*AOV6A, B, C, and D	2MHR-CRN67	7.0	Sling Assembly	*	*

* Load-handling procedures will be developed to cover load-handling operations for heavy loads that are handled over or in proximity to spent fuel or safe shutdown equipment. Frequency will depend on maintenance guidelines.

TABLE 3-5

SCREENWELL AREA TRAVELING CRANES - LOADS HANDLED

Crane Load	Crane Mark No.	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Service Water Pumps	2MHW-CRN1	4	Sling Assembly	*	*
Service Water Pump Motors	2MHW-CRN1	2.5	Sling Assembly	*	*
Circulation Water Pumps	2MHW-CRN1	30	Sling Assembly	*	*
Circulation Water Pump Motors	2MHW-CRN1	20	Sling Assembly	*	*
Stop Log No. 6	2MHS-CRN6	1	Sling Assembly	*	*
Stop Log No. 9	2MHS-CRN6	2.5	Sling Assembly	*	*
6th Pt Heater	2MHW-CRN1	56	Sling Assembly	*	*
5th Pt Heater	2MHW-CRN1	34	Sling Assembly	*	*
4th Pt Heater	2MHW-CRN1	38	Sling Assembly	*	*
3rd Pt Heater	2MHW-CRN1	28	Sling Assembly	*	*
Concrete Floor Plugs	2MHW-CRN1	18	Sling Assembly	*	*

* Load-handling procedures will be developed to cover load-handling operations for heavy loads that are handled over or in proximity to safe shutdown equipment. Frequency will depend on maintenance guidelines.

SECTION 4

HAZARD ELIMINATION TABLE

Table 4-1 lists the potential impact where damage might occur to safety-related equipment upon a heavy load drop.

1. Hazard Elimination Categories

    a. Crane travel for this area/load combination is prohibited by electrical interlocks or mechanical stops.

    b. System redundancy and separation precludes loss of capability of system to perform its safety-related function following this load drop in this area.

    c. Site-specific considerations eliminate the need to consider load/equipment combination. (See comment at bottom of Table 4-1 for detailed explanation of the use of this category.)

    d. Likelihood of handling system failure for this load is extremely small (i.e., Section 5.1.6, NUREG-0612 satisfied).

    e. Analysis demonstrates that crane failure and load drop will not damage safety-related equipment.

    f. Load is handled only in shutdown condition. Safety-related components under the load paths are already inoperative due to plant conditions and/or maintenance requirements. Their failure does not prevent safe shutdown conditions from being maintained.

TABLE 4-1

HAZARD ELIMINATION

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
MARK NO. 2MHR-CRN1 (25-Ton Auxiliary Hoist)			
When handling loads with the 25-ton auxiliary hoist, slings specified for use on safety-related equipment must be used. Loads greater than 12.5 tons shall not be permitted over safety-related equipment. When handling loads greater than 1/2 ton, lifts must be done in accordance with NUREG-0612, Control of Heavy Loads at Nuclear Power Plants.			
MARK NO. 2MHR-CRN3 (Recirc Motor Handling) Impact Area: Reactor Building - Drywell Location: At El 284 ft 11 in, Azimuth 135°			
Recirculation Pump (2RC-P1A) Motor	261 ft, 0 in	The recirculation pump and associated piping and electrical conduit not removed for the lift operation	C[1]
MARK NO. 2MHR-CRN4 (Recirc Motor Handling) Impact Area: Reactor Building - Drywell Location: At El 284 ft 11 in, Azimuth 315°			
Recirculation Pump (2RC-P1B) Motor	261 ft, 0 in	The recirculation pump and associated piping and electrical conduit not removed for the lift operation	C[2]

(1) This crane's sole purpose is for maintenance/removal of the pump motor and motor cooling coils. This crane will be utilized only during cold shutdown conditions; however, failure of these components does not result in a loss of safe shutdown capability. The potential exists for damage to the pump or its associated piping.

(2) This crane's sole purpose is for maintenance/removal of the pump motor and motor cooling coils. When this motor is replaced, it will be hoisted up the equipment hatch at Azimuth 315° and carried over the reactor operating floor with the main hook of the RBPC (single-failure proof). This crane will be utilized only during cold shutdown conditions. The potential exists for damage to the pump or its associated piping; however, failure of these components does not result in a loss of safe shutdown capability.

TABLE 4-1 (Cont'd.)

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
MARK NO. 2MHS-CRN7 (Outboard MSS and FWS Valves) Impact Area: Reactor Building - Main Steam Tunnel Location: At El 261 ft 0 in, Azimuth 0°			
2MSS*HYV7A, 7B, 7C and 7D	261 ft, 0 in	2 1/2-in Ø electrical conduit MSS-750-170-2	F
2FWS*AOV23A and 23B	261 ft, 0 in	MSS lines for valves	F
2FWS*MOV21A and 21B	261 ft, 0 in	WCS-008-89-1	F
MARK NO. 2MHR-CRN65 AND 65X (Main Steam Safety Relief Valve Removal) Impact Area: Reactor Building - Primary Containment Location: At El 305 ft 9 in, Azimuth 240° to 115°			
PSV Valves (PSV-120 to PSV-137)	296 ft, 6 in	2-ISC-750-107-2 2-IAS-150-727-3 2RHS-012-125-1 2-MSS-026-43-1 2-MSS-026-44-1 2-MSS-026-45-1 2-MSS-026-46-1	F F B F F F F
MARK NO. 2MHR-CRN66X (PSV Valves and CRD Cart Removal) Impact Area: Reactor Building - Primary Containment Location: At El 261 ft 9 in, Azimuth 135° to 231°			
PSV Valves and CRD Cart	261 ft, 0 in	2-ICS-010-70-1 2ICS*MOV128 2-CCP-003-343-3 2-CCP-003-344-3 2MSS-026-43-1 2MSS-026-44-1 2CX999GF1-1 1/2" 2CK993NA-3"	F F B F F F F

TABLE 4-1 (Cont'd.)

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
MARK NO. 2MHR-CRN67 (MSS Isolation Valves) Impact Area: Reactor Building - Primary Containment Location: At El 261 ft 0 in, Azimuth 315°			
2MSS*AOV6A, 6B, 6C and 6D	261 ft, 0 in	2-FWS-024-031-1 2-FWS-024-032-2 2MSS-026-43-1 2MSS-026-44-1 2MSS-026-45-1 2MSS-026-46-1 2RMS*RE1C and D 2SVV-025-128-3 2SVV-025-129-3 2SVV-025-132-3 2SVV-025-133-3 2MSS-750-260-2 2MSS-750-263-2 2MSS-750-264-2 2MSS-750-267-2 2MSS-750-268-2 2MSS-750-271-2 2MSS-750-272-2 2MSS-750-275-2 2CMS*TE105 2CX995YF 2CC995YU3 2CC999DA 2CC985YZ 2CC985YZ1 2CC9970X 2CX995YT 2CC991 2CC995 2CC9980M	F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F

TABLE 4-1 (Cont'd.)

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
MARK NO. 2MHS-CRN2, 3 AND 4 (Emergency Diesel Generator) Impact Area: Emergency Diesel Generator Building Location: El 261 ft 0 in			
Any Diesel Component, Maintenance Tool, or Auxiliary Equipment	261 ft, 0 in	2EGS*EG1 2EGS*EG2 2EGS*EG3	F[3] F[3] F[3]
MARK NO. 2MHW-CRN1 Impact Area: Screenwell Building Location: Above Service Water Pump Bays			
Service Water Pump Motors	224 ft, 0 in	Service water pumps and piping	B
Circulation Water Pumps	231 ft, 9 in	Service water pumps and piping	C[4]
Circulation Water Pump Motors	239 ft, 4 in	Service water pumps and piping	C[4]
Feedwater Heater Tube Bundles	280 ft, 0 in	Service water pumps and piping	C[4]
Stop Logs	261 ft, 0 in	Service water pumps and piping	C[4]
Concrete Floor Plugs	280 ft, 0 in	Service water pumps and piping	B
MARK NO. 2MHS-CRN6 Impact Area: Screenwell Building Location: Intake and Discharge Shaft Area			
Stop Log(s)	261 ft, 0 in and 285 ft, 0 in	2SWP*MOV30A 2SWP*MOV30B 2SWP*MOV77A 2SWP*MOV77B SWP Piping	C[5] C[5] C[5]

[3] The only time when the load will be over safety-related equipment would be when the diesel generator is down and being serviced. The overhead crane structure is seismically qualified only when the crane is in the stored position. Procedure controls will be utilized to assure the crane is not moved over safety-related equipment when diesel generators are operable.
[4] Administrative procedures will prevent crane travel over safety-related equipment. See Safe Load Path Drawing (Figure 5-3).
[5] Operating procedures will restrict crane travel over safety-related equipment. See Safe Load Path Drawing (Figure 5-3).

SECTION 5

LIST OF FIGURES

The following figures are included as part of this report:

SECTION 6

LIFTING DEVICES

The following specially-designed lifting devices consist of primary and redundant strongbacks or spreader seams and sling assemblies or specially-designed sling assemblies. They are single-failure proof in accordance with NUREG-0554. The design approach for these devices is consistent with the design criteria contained in ANSI N14.6. Quality Assurance (QA) Program requirements in compliance with the provisions of 10CFR50 Appendix B and supplementary QA requirements were mandatory in the purchase specification. Critical items are identified as QA Category I components.

1. Lifting Rig Arrangements for Drywell and Vessel Heads
2. Lifting Rig Arrangements for Insulation Support Frame
3. Lifting Rig Arrangements for Steam Dryer
4. Lifting Rig Arrangements for Steam Separator
5. Lifting Rig Arrangements for Transfer Bridge
6. Lifting Rig Arrangements for Service Platform
7. Lifting Rig Arrangements for Shield Plugs
8. Lifting Rig Arrangement for Recirc Motor

8\. Lifting Rig Arrangements for the Transfer Cask used during Dry Cask Storage Operations

Other lifting arrangements, not listed above, consisting of sling assemblies are supplied in accordance with design criteria contained in Section 3.2.5 of ANSI N14.6. ASME B30.9-2010 is used for the selection, use and maintenance of synthetic round slings.

SECTION 7

VERIFICATION OF TESTING, INSPECTION, AND MAINTENANCE

Procedures will be written and approved for inspection, testing, and maintenance of the RBPC and those cranes, monorails, and hoists identified in Item 2.1-1. Cranes will be inspected, tested, and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976, and monorails and hoists will be inspected, tested, and maintained in accordance with Chapter 16-2 of ANSI B30.16-1981, which is technically equivalent to Chapter 2-2 of ANSI B30.2-1976, with the exception that tests and inspection will be performed prior to use where it is not practical to meet the frequency of ANSI B30.2 or ANSI B30.16, or where frequency of crane, monorail, or hoist use is less than the specified inspection and test frequency.

SECTION 8

VERIFICATION OF CRANE DESIGN

8.1 INTRODUCTION

The RBPC has been designed for Class A1 standby service in accordance with Crane Manufacturers' Association of America (CMAA) Specification No. 70 and the mandatory requirements of ANSI B30.20, in addition to the technical requirements of Stone & Webster Engineering Corporation (SWEC) Specification No. NMP2-251P. The RBPC is seismic Category I. The crane is designed for the following rated loads:

- No. 1 Auxiliary Hoist 1/2-ton
- No. 2 Auxiliary Hoist 25-ton
- No. 3 Main Hoist 132-ton
- Crane Trolley 132-ton
- Crane Bridge 132-ton

The main hoist is designed to provide a dual loading path so that the single failure of any component shall not result in loss of the lifted load. The single-failure system criteria also applies to the hoist electrical system. The Hoist Motor is an inverter duty AC motor that is controlled by a VFD. The main hoist controls include phase loss and phase reversal protection.

The redundant main hoist system consists of a dual path through the hoist gear train, the reeving system, and the hoist load block, along with restraints at critical points to provide load retention and to minimize uncontrolled motions of the load upon failure of any single hoist component. The system includes the complete gear trains connecting the hoist motor to the hoist drum, while the main hook is used for handling the spent fuel cask; positive interlocks are provided which prevent the transfer path of the cask to be over the spent fuel storage pool but still allow the hook to lower the cask into its proper position in the spent fuel loading pool. Bypass keylock switch is provided to override these interlocks. This allows the use of RBPC main hoist over the spent fuel pool to support refueling operations. Operation is accomplished by following written load handling procedures in accordance with NUREG-0612, Control of Heavy Loads at Nuclear Power Plants. Specific criteria regarding heavy load handling over fuel assemblies in the storage pool are described in TRM Section 3.9.5.
The auxiliary hoists also have positive interlocks which prevent their transfer paths to be over the spent fuel storage pool. Overrides of these interlocks will be covered by special administrative procedures. The auxiliary hoists can also be placed in operable modes by use of key-operated selector positions. The operating modes of these hoists will also be controlled by administrative procedures.

8.2 DIFFERENCES BETWEEN UNIT 2 DESIGN AND NUREG-0554

A thorough evaluation was made between the RBPC design features and those recommended in NUREG-0554. The RBPC main hoist as designed contains all the major safety features recommended by NUREG-0554 to quality as single-failure proof. The following section provides a detailed summary of the differences between the RBPC design and NUREG-0554 recommendations.

The significant differences between the Unit 2 design and NUREG-0554 are as follows:

a. NUREG Section 2.4 specifies impact tests for materials over 1/2 in. The specification requires impact tests for materials over 5/8-in thick.

   Evaluation

   ASME Section III, NC-2300, requires impact tests for materials greater than 5/8-in thick; the Unit 2 specification is consistent with this requirement.

b. NUREG Section 4.1 specifies a cable safety factor of 10 to 1 dynamic. The specification requires a cable safety factor of 10 to 1 static.

   Evaluation

   The dynamic safety factor of the crane when considering the MCL to be 132 tons is slightly under 11.0 to 1. This conservative design more than surpasses requirements to sustain the dynamic effects of load transfer due to the loss of one of the two independent rope systems. An ample design margin will still exist in the remaining rope system of eight parts supporting the load.

c. NUREG Section 4.3 specifies load attachment points to be designed for three times the load to be handled, static plus dynamic. The specification requires the load attachment points to be designed for three times the static load to be handled.

   Evaluation

   A design factor margin study and a main hoist load block design study were made to verify the safety of the RBPC design. For the main hoist load blocks study the structural components were reviewed for a 152-ton load (MCL plus 15 percent). The resulting stresses were less than 1/3 the minimum yield strength of the respective materials.

d. NUREG Section 4.6 specifies that lift beams and lifting devices be designed for three times the load, static plus dynamic. The specification requires three times the static load.

Evaluation

The lifting rigs and sling assemblies were designed for three times the static load times 1.05. The calculated stresses were less than the minimum yield strength of the respective materials. See Section 6 for further details on the design of these devices.

e. NUREG Section 5.1 specifies the bridge speed not to exceed the slow recommendation of CMAA, which is 50 ft/min. The Unit 2 crane's bridge span is designed to be 75 ft/min.

Evaluation

The RBPC design includes a VFD that provides up to 2ft/min stepless inch speeds. The 75 ft/min normal operating speed satisfies the moderate speed recommendation of CMAA-70. With these features the intent of NUREG-0554 is met.

f. NUREG Section 8.5 specifies that the MCL be marked on the crane. The specification uses maximum working load (MWL).

Evaluation

The MCL will be identified on the RBPC.

g. NUREG Section 9.0 specifies that the operating manual give the margin for degradation of wear-susceptible components.

Evaluation

This is an administrative requirement which will be covered in the Inspection Procedures detailed in Section 7. These procedures will be in compliance with ANSI B30.2.0.

h. NUREG Section 10.0 specifies that Crane Operator qualification be addressed.

Evaluation

Section 9 covers Crane Operator qualifications.

8.3 RBPC LOSS OF POWER AND FAILURE MODES AND EFFECTS ANALYSIS

With regard to the NRC's December 19, 1983, Clarification to Generic Letter 81-07, concerning electrical circuitry and phase loss of a single-failure proof crane, the dc hoist controls of the Unit 2 RBPC, Mark No. 2MHR-CRN1, are specifically provided with phase loss protection as well as phase reversal protection.

Inherently, the crane's dc hoist controls are provided with a fail-safe design such that power is removed from the hoist motor and the holding brakes applied upon any of the following contingencies:

- Opening of an ac phase
- Loss of ac fuses
- Loss of voltage
- Loss of regenerative power capability
- Loss of motor field
- Loss of dc fuse

Additionally, the crane's dc hoist controls are provided with a torque check, which prevents the hoist holding brakes from being released until the motor field is energized and armature current is flowing.

8.4 CRANES OTHER THAN RBPC

a. Cranes 2MHR-CRN3, 2MHR-CRN4, and 2MHS-CRN7 were designed so that the trolleys and crane bridges cannot be dislodged during an earthquake, in combination with SRV and LOCA phenomena. The design of the single-girder, underhung motor-operated bridge crane includes the requirements of CMAA Specification No. 74 and all the mandatory requirements of ANSI B30.11. The design of the wire rope hoists and trolleys includes the requirements of HMI-100 and the mandatory requirements of ANSI B30.16, in addition to the technical requirements of SWEC Specification No. NMP2-P251W.

b. The 75-ton screenwell area crane, 2MHW-CRN1, is designed in accordance with the requirements of CMAA Specification No. 70 and ANSI B30.2.0, in addition to the technical requirements of SWEC Specification No. NMP2-P251C.

c. 2MHR-CRN61, -CRN65, and -CRN67 monorail hoist systems have been designed in accordance with the mandatory requirements of HMI-100 and ANSI B30.16, in addition to the technical and seismic requirements of SWEC Specification No. NMP2-P251R.

d. 2MHS-CRN2, -CRN3, -CRN4, and -CRN6 have been designed in accordance with the requirements of CMAA Specification No. 74 and ANSI B30.16*, and all the mandatory requirements of SWEC Specification No. NMP2-P251H.

e. The auxiliary electrical chain hoist 2MHR-CRN65X is designed in accordance with mandatory requirements of HMI-400 and ANSI B30.16, in addition to the technical requirements established in Specification No. NMP2-P251K.

* ANSI B30.16 is technically equivalent to ANSI B30.2, and CMAA Specification No. 74 is technically equivalent to CMAA Specification No. 70.

f. Electric chain hoist 2MHR-CRN66X is designed in accordance with mandatory requirements of HMI-400 and ANSI B30.16 in addition to the technical requirements established in specification NMP2-P251K.

SECTION 9

OPERATOR TRAINING, QUALIFICATION, AND CONDUCT

Unit 2 uses lesson guides to train Crane Operators. These lesson guides ensure proper and safe operation of floor-operated overhead cranes in accordance with ANSI B30.2-1976. The Crane Operator program ensures that the recommendations of ANSI B30.2-1976, Chapter 2-3, are adequately included. The current Crane Operator training program includes the requirements for a practical operating examination. This practical examination is given after the Operator undergoes detailed classroom instruction. In addition, the Operator is required to meet certain physical qualifications before qualifying to train as a Crane Operator. These physical qualifications are consistent with ANSI B30.2-1976.

SECTION 10

NRC REQUESTS FOR ADDITIONAL INFORMATION

NRC Position 1

Information on the selection of lifting devices not specifically designed which provides stress allowance based on maximum static plus dynamic loads, and special identification labeling of any sling committed to a dedicated crane load service.

Response

Table 3-1 in the report (submitted July 10, 1984) represents overhead handling systems which carry heavy loads over safe shutdown equipment. All lifting devices for these cranes will be designed for the static load and additional impact loading as specified in CMAA Specification No. 70. These lifting devices will be tested and properly identified.

NRC Position 2

The application of special lifting device design stresses that provides for the maximum static plus dynamic loading.

Response

The specially-designed lifting devices used for handling heavy loads contain dual-load paths consisting of primary and redundant strongbacks and sling assemblies. Each load path is designed to support three times the weight of the load being handled without exceeding the yield strength of any component. This provides a 200-percent margin to account for dynamic effects. The design of these devices is consistent with the guidelines of ANSI N14.6.

NRC Position 3

Development of procedures incorporating safe load path identification system used for the facility.

Response

Unit 2 will incorporate the requirement of a signalman in the load handling party. The duties of the signalman and the Crane Operator will be clearly defined in the load handling procedures.

NRC Position 4

Adapt a system or method of marking safe load paths that is consistent with NUREG-0612.

Response

Unit 2 has reviewed "Synopsis of Issues Associated with NUREG-0612 - Guide Line 1 - Safe Load Paths." Unit 2 will designate a second party member (signalman) to be responsible to ensure that designated safe load paths are followed. Safe load paths will be marked on drawings and included in load handling procedures. These procedures will clearly define the duties and responsibilities of each member of the load handling party.

NRC Question F410.52

As a result of recently identified ACRS concerns, provide a response to the following request for information regarding the handling of heavy loads:

a. Describe the means provided to assure the integrity of the concrete shield plugs lifting eye, and any other heavy loads so that they will not fall apart while being handled during refueling should the lifting eye fail or the plug impact other structures.

b. Alternatively, describe the consequences of failure of the concrete shield plug or other heavy loads during handling. This evaluation should confirm that unacceptable fuel damage or damage to safety-related equipment will not occur.

Response

A dual-load-path hoisting system is used for handling all heavy loads. This system includes primary and redundant crane hooks, strongbacks, slings, and lifting lugs on the load. Each part of the hoisting system has been designed to support a load of at least three times the weight of the item being handled without permanent deformation. In addition, the special lifting device (strongbacks and slings) has been static load-tested to 150 percent of rated load, and the lifting lugs on the concrete shield plugs and fuel transfer bridge have been static load-tested to 125 percent of rated load.

The integrity of the concrete shield plugs, lifting lugs, and lifting assemblies is assured by the integral design of the plug liners, lifting structures, rebar, and concrete. The concrete is completely encased in a reinforced carbon steel liner to which the lifting lugs are welded. The concrete rebar are welded to the lifting lugs by cadweld sleeves. This design and the aforementioned design requirements of the plug eliminate any possibility of the plug falling apart should the lifting lug fail or the plug impact other structures.