AREVA

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NRC:14:041

U.S. Nuclear Regulatory Commission
Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

U.S. EPR Design Certification Application - Closure of FSAR Chapter 10

Ref. 1: Letter, Pedro Salas (AREVA NP Inc.) to Document Control Desk (NRC), "Closure Plan for U.S. EPR Design Certification Application FSAR Group A Chapters," NRC:13:092, December 20, 2013.

Ref. 2: Letter, Pedro Salas (AREVA Inc.) to Document Control Desk (NRC), "U.S. EPR Design Certification Application Closure of FSAR Group A Chapters 2, 13, 17 and AIA," NRC:14:010, March 24, 2014.

Ref. 3: Letter, Pedro Salas (AREVA Inc.) to Document Control Desk (NRC), "U.S. EPR Design Certification Application - Closure of FSAR Chapter 5," NRC:14:031, June 23, 2014.

Ref. 4: Letter, Pedro Salas (AREVA Inc.) to Document Control Desk (NRC), "U.S. EPR Design Certification Application - Closure of FSAR Chapter 8," NRC:14:040, June 24, 2014.

In Reference 1, AREVA Inc. (AREVA) documented a process for segmented closure of individual Final Safety Analysis Report (FSAR) chapters of the U.S. EPR Design Certification Application. Pursuant to this process, on March 24, 2014 (Reference 2), June 23, 2014 (Reference 3), and June 24, 2014 (Reference 4) AREVA provided, for NRC Staff review, the final markups of U.S. EPR FSAR Tier 2, Chapters 2, 5, 8, 13, 17, and Section 19.2.7, which are all but one of the U.S. EPR FSAR chapters designated for closure in fiscal year (FY) 2014. By this letter, AREVA provides for Staff review the final markups of U.S. EPR FSAR Tier 2, Chapter 10, "Steam Power Conversion Systems," and associated conforming changes to other chapters. This letter will be followed by the issuance of U.S. EPR FSAR Revision 7 containing all closed Group A chapters.

Most of the enclosed changes to U.S. EPR FSAR Tier 2, Chapter 10 are the result of conforming changes from other U.S. EPR FSAR chapters and closure of Open Items raised in AREVA reviews. In addressing these items, AREVA and the NRC Staff have participated in a number of public meetings and conference calls where these changes were fully discussed. Based on AREVA's FSAR chapter closure process, including extensive Staff interactions, AREVA has reasonable assurance that U.S. EPR FSAR Tier 2, Chapter 10 is complete and accurate in all material respects, and that no further changes are anticipated. This letter constitutes closure of the last U.S. EPR FSAR Group A chapter for FY 2014.

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NRO

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Sincerely,

Pedro Salas, Director
Regulatory Affairs
AREVA Inc.

cc: G. F. Wunder
J. P. Segala
Docket 52-020

ENCLOSURE 1
FINAL MARK-UPS FOR CHAPTER 10 AND CONFORMING CHANGES FOR FSAR REVISION

Description of Change	Pages Affected	
Editorial/typographical changes identified as part of the Chapter 10 freeze process.	Page 10.3-2	
	Page 10.3-26	Table 10.3-4
	Page 10.4-53	Table 10.4.7-2
Conforming changes consistent with discussion during Chapter 11 Public Meeting held on March 5, 2014, related to design information for radiation monitors.	Page 10.4-3	
	Page 10.4-6	
	Page 10.4-9	
	Page 10.4-15	
	Page 10.4-29	
Conforming changes to safety classification, quality group, seismic category and/or EQ designation based on updated source documentation (e.g., system description, design requirements). Source documents have been revised through the implementation of the following DCRs: • DCR 113-7015514-000, "Edits to Main Steam System Source Documents for FSAR Chapter 10 Closeout." • DCR 113-7015515-000, "Change of Water Supply to Condenser Evacuation System Separator / Silencer and Edits to Condenser Evacuation Source Documents for FSAR Chapter 10 Closeout." • DCR 113-7015517-000, "Edits to Circulating Water System Source Documents for FSAR Chapter 10 Closeout." • DCR 113-7015518-000, "Changes to Rated Condensate Flow and Edits to Condensate Polishing System Source Documents for FSAR Chapter 10 Closeout." • DCR 113-7015519-000, "Design Area Changes for Feedwater Pumps." • DCR 113-7015520-000, "Edits to Central Gas Supply System Source Documents for Steam Generator Blowdown System FSAR Chapter 10 Closeout." • DCR 113-7015521-000, "Changes to Main Steam and Reheat Steam Systems for FSAR Chapter 10 Closeout."	Page 10.2-12	
	Page 10.3-11	
	Page 10.3-25	Table 10.3-4
	Pages 10.3-36, 10.3-37	Figure 10.3-1
	Pages 10.4-19, 10.4-35, 10.4-39, 10.4-44, 10.4-82	
	Page 10.4-11	Figure 10.4.2-1
	Page 10.4-12	Figure 10.4.2-2
	Page 10.4-16	Figure 10.4.3-1
	Page 10.4-26	Figure 10.4.5-1 (Sheet 1)
	Page 10.4-50	Table 10.4.7-1
	Page 10.4-54	Figure 10.4.7-1 (Sheet 1)
	Page 10.4-69	Figure 10.4.8-1 (Sheet 2)
	Page 10.4-100	Table 10.4.9-4
	Page 10.4-101	Table 10.4.9-5
	Page 10.4-102	Figure 10.4.9-1 (Sheet 1)
	Tier 1:	
	Page 2.8-26	Figure 2.8.2-1 (Sheet 1)
Conforming changes based on previous RAI responses.	Page 10.2-23	
	Page 10.3-11	

Description of Change	Pages Affected
Response to RAI 610	Pages 10.4-57, 10.4-58, 10.4-60, 10.4-64, 10.4-66
Response to RAI 605	Page 10.4-77
Changes associated with corrective action to ensure SSC information provided in Tier 1 and Tier 2 is technically consistent.	<u>Tier 1</u>: Page 2.8-9 Pages 2.8-14 to 2.8-18 — Table 2.8.2-2 Page 2.8-19 — Table 2.8.2-3 Page 2.8-31 Pages 2.8-36 to 2.8-37 — Table 2.8.6-2 Page 2.8-38 — Table 2.8.6-3
Conforming changes to other FSAR chapters.	<u>Table 3.2.2-1:</u> Pages 3.2-127, 3.2-154, 3.2-155, 3.2-157, 3.2-160, 3.2-161, 3.2-162, 3.2-164, 3.2-165, 3.2-166, 3.2-168, 3.2-169 <u>Table 3.10-1:</u> Pages 3.10-134, 3.10-135, 3.10-136, 3.10-210, 3.10-211

The reheat stop and intercept valves, located in the hot reheat lines at the inlet of the IP turbines, control steam flow to the IP turbines. During normal operation of the turbine, the reheat stop and intercept valves are fully open. The intercept valve flow control unit positions the valve during startup and normal operation and closes the valve rapidly on loss of turbine load. The reheat stop valves close completely on turbine overspeed and turbine trip.

10.2.2.9 Overspeed Protection

Overspeed protection for the turbine is provided by:

- Electro-hydraulic governor system.
- Primary electrical overspeed trip system.
- Backup electrical overspeed trip system.
- Manual trip button located in the main control room and manual trip button local to the turbine.

A protective trip system is provided to quickly close the main steam stop and control valves, the reheat stop and intercept valves, and the extraction steam non-return valves in the event of an unsafe condition or to provide overspeed protection. The system is designed to minimize false and spurious trips during normal operation and allow testing of the trip system during operation. A power load imbalance function is provided, which compares turbine and generator load and initiates an appropriate momentary ~~control~~ intercept valve closure when the turbine load exceeds the generator load by a specified amount.

Following a loss-of-load event, the governor system is designed to limit the turbine speed to 108 percent of nominal speed. The maximum expected overspeed following a full-load rejection at valves wide open, assuming a governor system failure and an overspeed protection system trip is approximately 117 percent.

The steam turbine has two redundant and diverse electrical overspeed systems that meet the single failure criterion. The two overspeed protection systems are redundant from the speed probes to the turbine trip relays. Both overspeed protection systems have three independent speed probes and signal conversion modules acting on one of three electronic tripping channels. Each independent electrical overspeed trip system is designed and manufactured by a different vendor. Each vendor directly manufactures their system components (e.g., motherboards, sensors) and develops diverse software to transform the analog speed sensor signal into a digital signal. Software between the two overspeed protection systems will be different in parameters, dynamics, or logic. There are no components, process inputs, or process outputs shared between the two systems. Each system will be installed in a separate cabinet with separate power sources. Figure 10.2-2—Overspeed Protection System

- Visual inspection and magnetic particle examination of the external faces of the discs in the area of blade attachments. If surface indications are detected, ultrasonic inspections will be performed.

- Dismantle last stage blades of the LP rotor. Magnetic particle examination of rotor fir-tree roots.

- Penetrant examination of welded plugs.

A COL applicant that references the U.S. EPR design certification will include ultrasonic examination of the turbine rotor welds or provide an analysis which demonstrates that defects in the root of the rotor welds will not grow to critical size for the life of the rotor.

10.2.4 Safety Evaluation

The TG is not safety-related and does not perform any safety-related functions.

The TG design satisfies general design criteria (GDC 4) relating to the protection of structures, systems and components (SSC) important to safety, except for two of the four ESWBs, from turbine missiles. Refer to Section 3.5.1.3. A failure in the TG package ~~does not affect any structures, systems and components (SSC) important to safety and~~ does not preclude safe shutdown of the reactor.

- The orientation of the U.S. EPR TG is considered to be unfavorably oriented as defined by RG 1.115 because not all essential SSC are located outside the low-trajectory hazard zone. Turbine missiles are addressed in Section 3.5.1.3.

- The TG design includes a redundant overspeed protection system, which terminates an overspeed event prior to reaching design overspeed.

- The TG package and associated piping, valves and controls are located completely within the Turbine Building. There are no safety-related systems or components located in the Turbine Building.

- Turbine speed is continuously monitored. Alarms are issued if specified limits are exceeded.

- The turbine and its auxiliaries are manufactured, erected, tested and operated in accordance with manufacturers standard practices and applicable U.S. codes to engender high reliability of systems and the mechanical integrity of the TG package.

Normally there is no radioactivity in this system. Radioactivity is only present as a result of primary to secondary leakage in the steam generators. If steam generator tube leakage occurs, the small amount of radioactivity which may be present in the secondary system is monitored and detected by the steam generator blowdown system (refer to Section 10.4.8) and in the exhaust air system from the main condenser

- Provide backup supply to the auxiliary steam system.
- Supply deaerator pegging steam during startup and shutdown.

10.3.2 System Description

10.3.2.1 General Description

A flow diagram of the MSSS is provided in Figure 10.3-1—Main Steam Supply System. The system conveys steam from the SGs to the TG. The system consists of main steam piping, MSRTs, MSSVs and main steam isolation valves (MSIV). Table 10.3-1—Main Steam Supply System Design Data, provides design data for the MSSS.

Safety-related portions of the MSSS include piping between each SG outlet nozzle and its respective main steam isolation valve, inclusive of the following components and associated branch piping:

- MSIVs.
- Main steam warming control valves (MSWCV).
- Main steam warming isolation valves (MSWIV).
- Main steam relief isolation valves (MSRIV).
- Main steam relief control valves (MSRCV).
- MSSVs.

Each of the four SGs has its own main steam line. Each main steam line connects to its SG outlet nozzle, exits the Reactor Building (RB) through penetrations and enters a valve room related to each division. The divisionally separated main steam lines are located in a two-by-two arrangement in valve rooms on top of Safeguard Buildings 1 and 4 and on opposite sides of the RB.

Outside the valve rooms, the main steam lines are routed across a pipe bridge to the Turbine Building (TB) and connect to the four turbine stop valves. Drain pots are provided at the turbine inlet for condensate removal. Branch piping inside the TB supplies second stage reheater steam, deaerator pegging steam, backup auxiliary steam and turbine bypass to the main condenser.

Auxiliary steam from the MSSS is used to supply turbine gland steam during startup and shutdown, and heating steam for the feedwater storage tank during startup. Pressure reducing valves are provided as needed to reduce the header pressure to the pressure required for proper operation of the equipment. The normal supply of auxiliary steam is from the extraction ~~of~~ to the moisture separator reheaters (MSR). Backup auxiliary steam is supplied via the MSSS upstream of the HP turbine stop

- ~~Consistent with the guidance in RG 1.115, Position C.1, the TG location and axis is favorably oriented with respect to the containment such that turbine missile impacts on safety-related portions of the MSSS from a single U.S. EPR plant are precluded. Refer to Section 3.5.1.3 for the evaluation of turbine missiles.~~

- Consistent with the guidance in RG 1.115, the TG is considered unfavorably oriented because all essential SSC are not located outside the low-trajectory hazard zone; however, the safety-related portions of the MSSS are located outside of the low-trajectory hazard zone for a single U.S. EPR plant. Refer to Section 3.5.1.3 for the evaluation of turbine missiles.

- Consistent with RG 1.117, Appendix Positions 2 and 4, the safety-related portions of the MSSS are protected against the effects of tornado and hurricane missiles by the external walls and roofs of the structures containing these portions of the system, as described in Section 3.5.

- Load drops on safety-related portions of the MSSS are precluded during operations, requiring the MSSS to be operable by administrative controls implemented in plant procedures as indicated in Sections 9.1.5.2.5 and 9.1.5.3. The controls include the use of handling devices suitable for the load being lifted and limitations on lift heights and lift paths over safety-related components as indicated in Section 9.1.5.1.

- ~~Load drops on safety-related portions of the MSSS are precluded during operations, requiring the MSSS to be operable by administrative controls implemented in plant procedures. The controls include the use of handling devices suitable for the load being lifted and limitations on lift heights and lift paths over safety-related components.~~

- The MSSS design considers steam hammer and relief valve discharge loads to make sure system safety functions can be performed. Refer to Section 3.12 for a description of piping design and piping supports design. Loads from relief valve thrusts and sudden closure of valves (hammer) is included in the piping analyses. Operating and maintenance procedures will include precautions to prevent steam hammer and relief valve discharge loads. Piping in the MSSS is required to be properly warmed and drained of condensate during startup. System maintenance and operating procedures will include guidance and precautions to be exercised during system and component testing and changing valve alignments to confirm that valves in the MSSS operate properly.

- The MSSS design includes protection against water entrainment by sloping the main steam piping to drained low points.

The design of the safety-related portions of the MSSS satisfies GDC 5 regarding sharing of systems. Safety-related portions of the MSSS are not shared among nuclear power units.

The design of the safety-related portions of the MSSS satisfies GDC 34 regarding residual heat removal from the reactor coolant system.

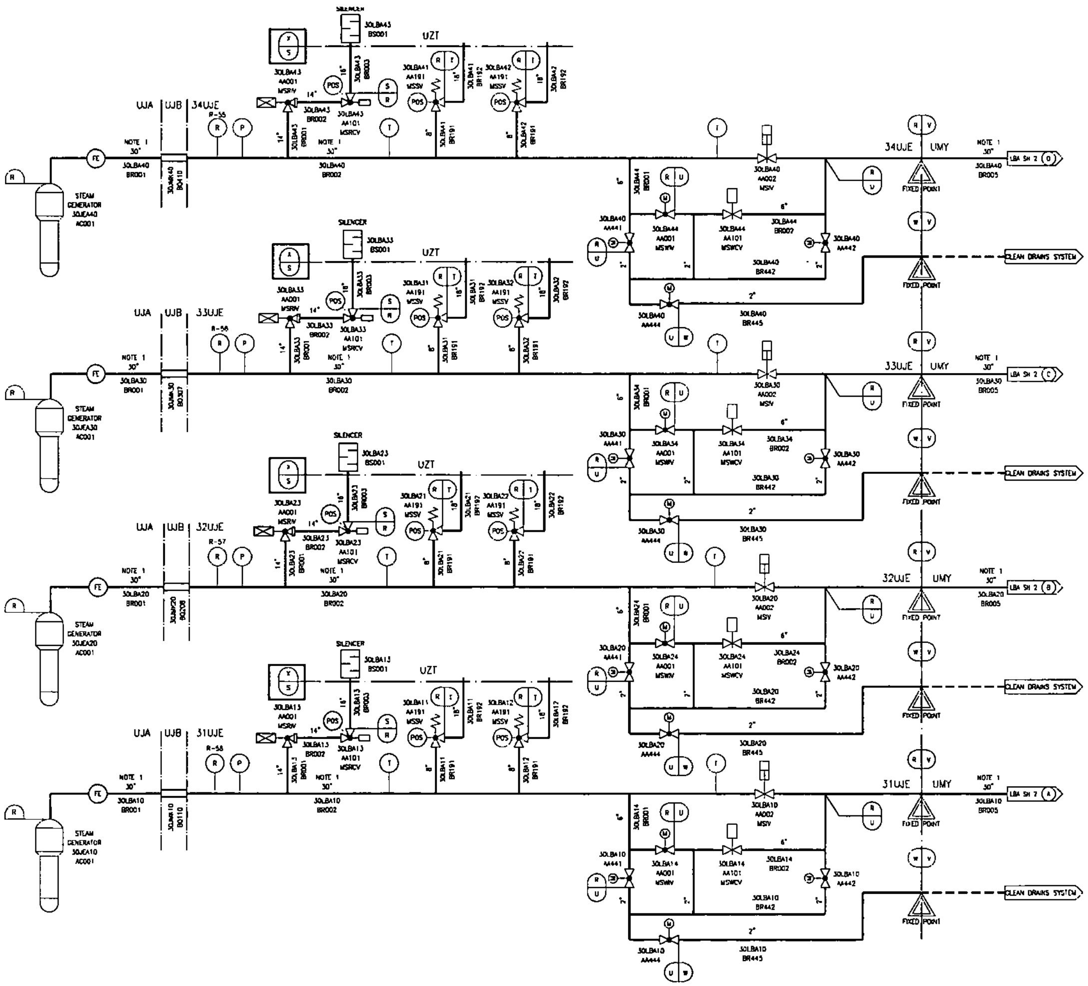
Table 10.3-4—Main Steam Supply System Single Active Failure Analysis
Sheet 1 of 2

	Component	Failure	Comments
1	Main steam isolation valves (MSIV)	Loss of power from one power supply	Loss of one power supply has no effect on ability of valve to close. Valve fails closed on loss of electrical signals or loss of hydraulic pressure. Valve actuator has 2 redundant closure systems. Valve closure is controlled by 4 cross-division power supplies provided to the actuator closing systems.
		Valve fails to close upon receipt of automatic signal	Closure of three of four MSIVs adequate to meet safety requirements.
2	Main steam relief isolation valves (MSRIV)	Loss of power from one power supply	Loss of one power supply has no effect on ability of valve to open or close. Valve fails closed upon loss of electrical signals. Valve actuator system has 2 redundant opening / closing systems. Valve closure is controlled by 4 cross-division power supplies provided to the actuator opening/closing systems.
		Valve fails to close upon receipt of automatic signal	Each valve has 2 redundant opening/ closing systems. A single failure in the opening/closing system will not cause failure of valve to close. Backup isolation valve MSRCV provided in each main steam relief train.
		Valve fails to open upon receipt of automatic signal	Each valve has 2 redundant opening/ closing systems. A single failure in the opening/closing system will not cause failure of valve to open. If MSRT is not available, 2 MSSVs on each main steam line provide adequate overpressure protection and provide adequate initial residual heat removal by venting steam to the atmosphere. Cooldown can then be accomplished by venting steam to the atmosphere with the remaining 3 MSRTs.

Table 10.3-4—Main Steam Supply System Single Active Failure Analysis
Sheet 2 of 2

	Component	Failure	Comments
3	Main steam relief control valves (MSRCV)	Loss of power from one power supply	Valve is fully open during power operation for thermal power greater than 50% and remains fully open upon loss of power supply. Valve is 40% open from 0% to 20% thermal power. Valve is between 40% to 100% open from 20% to 50% thermal power. Valve fails as-is upon loss of power. Redundant power supply provided.
		Valve fails to close upon receipt of automatic signal	Second isolation valve MSRIV provided in each main steam relief train.
4	Main steam warming isolation valves (MS~~R~~WIV)	Loss of power from one power supply	Valve remains closed. Valve is closed during power operation. Valve fails as-is upon loss of power. Redundant power supply provided.
		Valve fails to close upon receipt of automatic signal	See above. Second isolation valve MS~~R~~WCV provided in each main steam warming line.
5	Main steam warming ~~isolation~~ control valves (MS~~R~~WCV)	Loss of power from one power supply	Valve remains closed. Valve is closed during power operation. Valve fails as-is upon loss of power. Redundant power supply provided.
		Valve fails to close upon receipt of automatic signal	See above. Second isolation valve MS~~R~~WIV provided in each main steam warming line.
6	Main steam line pressure sensors	No signal generated for protection logic	Refer to Chapter 7, Section 7.3.
7	Main steam line activity sensors	No signal generated for protection logic	Refer to Chapter 7, Section 11.5.4.1, and Chapter 11, Section 11.5.4.1 and Table 11.5-1.

Figure 10.3-1—Main Steam Supply System
Sheet 1 of 2



JEA - STEAM GENERATOR
JMK - PIPING PENETRATIONS
LBA - MAIN STEAM PIPING SYSTEM

UJA - REACTOR BUILDING
UJB - REACTOR BUILDING ANNULUS
31UJE - MAIN STEAM AND FEEDWATER VALVE ROOM, DIVISION 1
32UJE - MAIN STEAM AND FEEDWATER VALVE ROOM, DIVISION 2
33UJE - MAIN STEAM AND FEEDWATER VALVE ROOM, DIVISION 3
34UJE - MAIN STEAM AND FEEDWATER VALVE ROOM, DIVISION 4
UMY - PIPE BRIDGE
UZT - OUTDOOR AREA

MSIV - MAIN STEAM ISOLATION VALVE
MSRCV - MAIN STEAM RELIEF CONTROL VALVE
MSRIV - MAIN STEAM RELIEF ISOLATION VALVE
MSSV - MAIN STEAM SAFETY VALVE
MSWCV - MAIN STEAM WARMING CONTROL VALVE
MSWIV - MAIN STEAM WARMING ISOLATION VALVE

NOTE:
1. MAIN STEAM HEADER PIPING IS SPECIAL WALL PIPE, NOMINAL 30" NPS WITH A PIPE ID OF 27.5".

DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS
X	D	1095	600	II
W	D	1435	592	II
V	E	1435	592	NSC
U	C	1435	592	I
T	C	250	420	I
S	C	1095	600	I
R	B	1435	592	I

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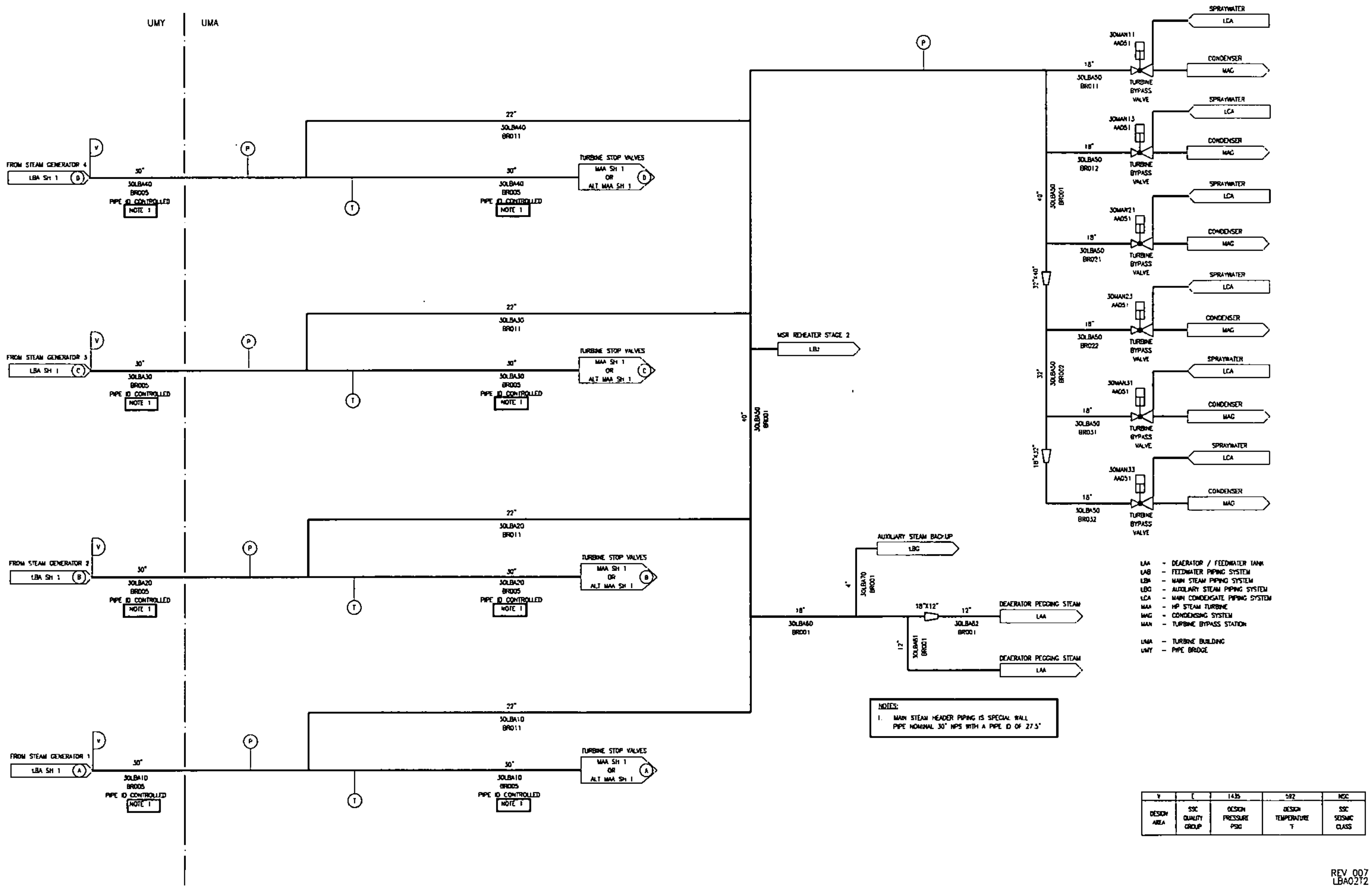
Figure 10.3-1—Main Steam Supply System
Sheet 2 of 2



Butterfly valves are provided in the circulating water system (CWS) to permit half of the condenser tube bundles to be isolated and removed from service for maintenance.

During anticipated operational occurrences, the main condenser is capable of accepting steam from the TBS while maintaining condenser vacuum, provided the CWS remains in operation and spray water pressure is available if operating conditions require spray water (refer to Section 10.4.4 for a description of the TBS).

The operation of the main condenser supports other system operations within the steam and power conversion system.

10.4.1.3 Safety Evaluation

The main condenser has no nuclear safety-related function.

The design of the main condenser satisfies general design criterion (GDC 60), as it relates to the control of radioactive material releases to the environment. During normal operation and shutdown, the main condenser contains negligible quantities of radioactive contaminants. However, it is possible for the main condenser to become contaminated in the event of primary-to-secondary system leakage.

- Air and non-condensable gases are discharged from the main condenser by the MCES. Radiological activity of the MCES exhaust is monitored (refer to Section 10.4.2). The radiological aspects of primary-to-secondary leakage, which includes anticipated operating concentrations of radioactive contaminants, are addressed in Section 11.5 and Table 11.5-1~~, Monitor R-3~~.
- For the U.S. EPR, no hydrogen buildup is anticipated in the main condenser. Dissolved oxygen is present in the condensate and condenser hotwell inventory, but only trace amounts of this oxygen are released in the condenser, and the amounts are negligible compared to the amount of gas and vapor being evacuated by the MCES. There is no potential for explosive mixtures within the main condenser which would result in excessive releases of radioactivity; therefore, the main condenser design satisfies GDC 60 and is not required to be designed to withstand the effects of an explosion.

Failure of the main condenser and the resulting flooding does not prevent the operation of any essential system because no safety-related equipment is located in the Turbine Building.

Main condenser operation does not directly affect the reactor coolant system. If the main condenser performance is degraded, the turbine backpressure increases. This increase in backpressure causes a lowering of turbine cycle efficiency, which requires an increase in reactor power to maintain the demanded electrical power generation level. The reactor power increase is limited by the reactor control system, as described in Section 7.7. The reactor protection system, described in Section 7.2, maintains the plant within safe operation limits. If main condenser performance is sufficiently

10.4.2 Main Condenser Evacuation System

The main condenser evacuation system (MCES) removes air and non-condensable gases from the main condenser and connected steam side systems during plant startup, cooldown and normal operation.

10.4.2.1 Design Basis

The MCES performs no safety-related function and therefore has no nuclear safety-related design basis.

The MCES is designed to meet the following functional criteria:

- Air and non-condensable gases are removed from the condenser and connected steam side systems during plant startup, cooldown and normal operation.
- Vacuum is established and maintained in the condenser and connected steam side systems during plant startup and normal operation by using mechanical vacuum pumps.

10.4.2.2 System Description

10.4.2.2.1 General Description

The MCES is non-safety related and is located in the Turbine Building. The MCES is used to evacuate air rapidly from the main condenser and connected steam side systems during plant startup, and to continuously remove non-condensable gases during normal operation to maintain optimum condenser performance.

The MCES and air vent system are shown in Figure 10.4.2-1—Main Condenser Evacuation System and Figure 10.4.2-2—Vent System for Air Removal.

The steam and air mixture extracted from each condenser shell is routed to one of two 100 percent capacity holding vacuum pumps. Discharge from the vacuum pumps is routed by a header to the air vent system, where the radiological activity of the exhausted air is monitored (refer to Section 11.5.4 and Table 11.5-1~~, Monitor R-3~~).

Isolation valves serve to stop air removal from the air cooler tube bundle when the circulating water side of the associated condenser shell is shut off.

The connection of the condensers to the vacuum pumps is controlled by air-operated control valves at the inlet of each vacuum pump. These valves are normally open. The vacuum pumps are connected to the air removal header by air intake isolation valves. The vacuum pumps pass the steam and air mixture to the moisture separators–silencers. As a result of compression, the steam component condenses while the exhausted air is vented through the air vent system into the nuclear auxiliary building ventilation system.

- Dissolved oxygen is present in the condensate and condenser hotwell inventory but only trace amounts of this oxygen is released into the main condenser, and the amounts are negligible compared to the amount of gas and vapor being evacuated by the system.

- There is no potential for explosive mixtures within the MCES, which would result in excessive releases of radioactivity; therefore, the MCES design satisfies GDC 60 and is not required to be designed to withstand the effects of an explosion. The design capacity of the holding (continuously operating) vacuum pumps in the MCES is such that the water vapor content is above 58% by volume of the total mixture. There is no buildup of non-condensable gas in the main condenser because the MCES operates continuously whenever the main condenser is in operation. The vacuum pumps in the MCES are liquid ring vacuum pumps. Cooling water is used to seal the vacuum pumps. The mixture passing through the MCES is at low temperature and high humidity due to contact with the water ring in the vacuum pumps. As indicated in Table 10.1-1—Design Heat Balance for Steam and Power Conversion System Cycle, the average design backpressure is 2.5 inches HgA. Based upon standard steam tables the corresponding saturation temperature is approximately 109° F. The MCES operates at a lower pressure and temperature than the backpressure in the condenser.

- The exhaust from the MCES is discharged to the air vent system. The exhaust flow is monitored for radioactivity as described in Section 11.5.4 and discharged to the nuclear auxiliary building ventilation system. The radiological aspects of primary-to-secondary leakage, including anticipated releases from the system, are described in Section 11.5.4 (refer to Table 11.5-1~~, Monitor R-3~~).

Malfunction of MCES components does not affect the safe operation of the plant or any safety related system.

- MCES operation does not directly affect the reactor coolant system. If the air removal system fails completely, a gradual reduction in condenser vacuum results from the buildup of non-condensable gases. This reduction in vacuum causes a lowering of turbine cycle efficiency, which requires an increase in reactor power to maintain the demanded electrical power generation level. The reactor power increase is limited by the reactor control system, as described in Section 7.7. The reactor protection system, described in Section 7.2, maintains the plant within safe operation limits. If the MCES remains inoperable, condenser vacuum increases to the turbine trip setpoint and a turbine trip is initiated. A loss of condenser vacuum is addressed in Section 15.2.

10.4.2.5 Inspection and Testing Requirements

Inspection and testing of the system is performed prior to plant operation. Refer to Section 14.2 (test abstract #065) for initial plant startup test program.

Components of the system are monitored during operation to confirm proper operation. Periodic inspections of the evacuation system are performed in conjunction with the scheduled maintenance outages. The vacuum pumps are initially tested for

Figure 10.4.2-1—Main Condenser Evacuation System

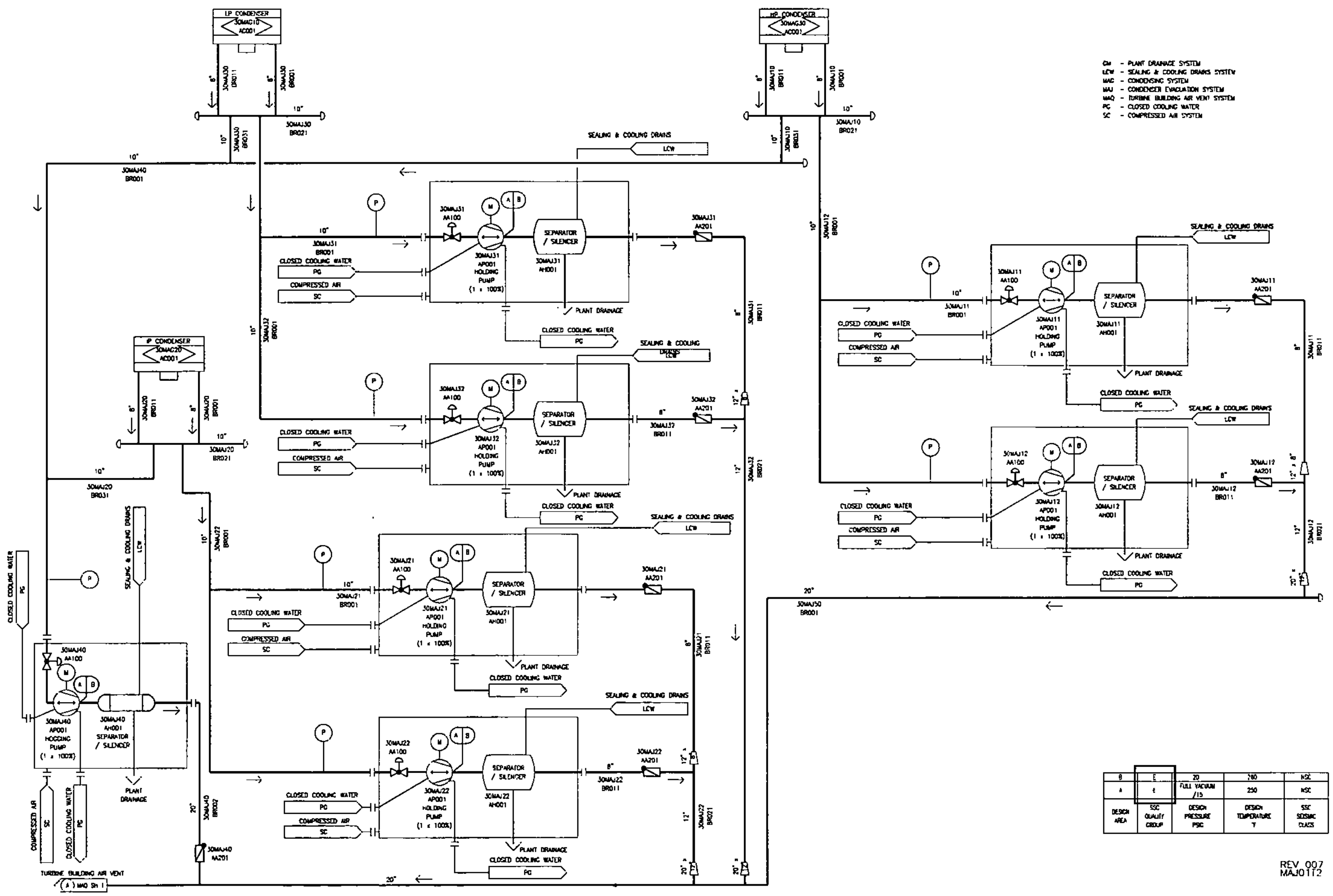
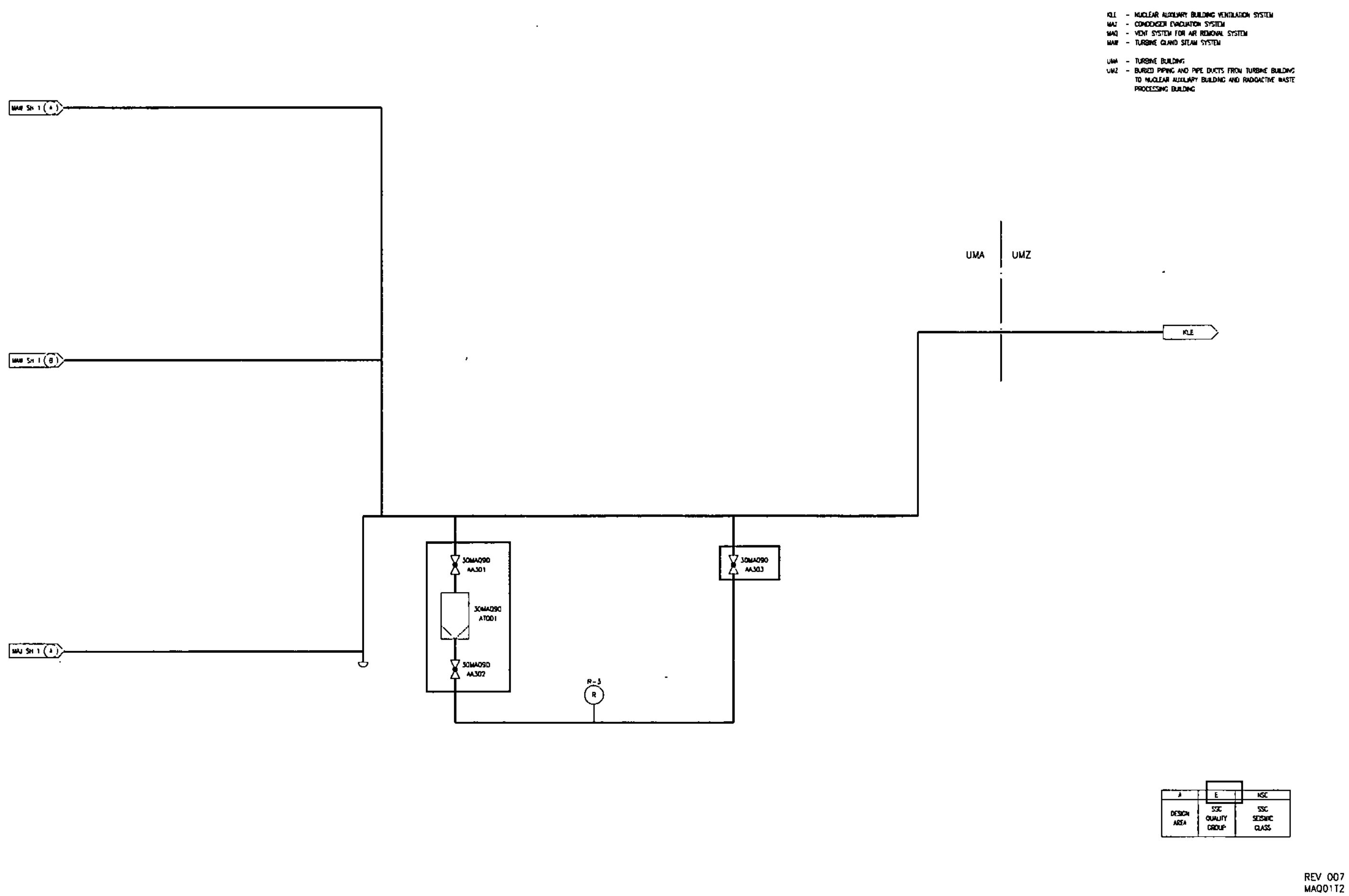


Figure 10.4.2-2—Vent System for Air Removal



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excess steam escaping at higher loads is dumped to the main condenser through the seal steam leak-off valve. Leak-off steam from the seals of the main stop and control valves is also discharged into the TGSS header. The steam seal leak-off valve is a pneumatically actuated pressure control valve, which fails to the position designated by the turbine supplier.

10.4.3.3 Safety Evaluation

The TGSS performs no safety-related functions and is not required to operate during or after an accident. The design of the TGSS satisfies general design criteria GDC 60 and GDC 64, related to the TGSS design for control and monitoring of release of radioactive materials.

The air and noncondensable gases discharged from the gland steam exhausters are not normally radioactive during plant operation. However, in the event of significant primary-to-secondary system leakage due to a steam generator tube rupture, it is possible for the seal steam to become contaminated resulting in the potential to discharge a radioactively contaminated mixture.

The gland steam condenser receives steam and noncondensable gases from the TGSS and condenses the steam. Air and non-condensable gases are evacuated from the gland steam condenser and discharged into the air vent system by exhaust fans. The exhaust flow is monitored for radioactivity as described in Section 11.5.4 (refer to Table 11.5-1, ~~Monitor R-3~~) and discharged to the Nuclear Auxiliary Building ventilation system.

10.4.3.4 Inspection and Testing Requirements

The TGSS components are inspected during construction and functionally tested during plant startup. Refer to Section 14.2 (test abstract #064) for initial plant startup test program. Components of the TGSS are designed to permit periodic inspection and testing during plant operation. Components of the system are monitored during operation to demonstrate satisfactory functioning of TGSS equipment.

10.4.3.5 Instrumentation Requirements

The following TGSS parameters are monitored during plant operation:

- Steam seal header temperature.
- Steam seal header pressure.
- Gland steam exhauster vacuum.
- Gland condenser outlet temperature.
- Gland condenser pressure.

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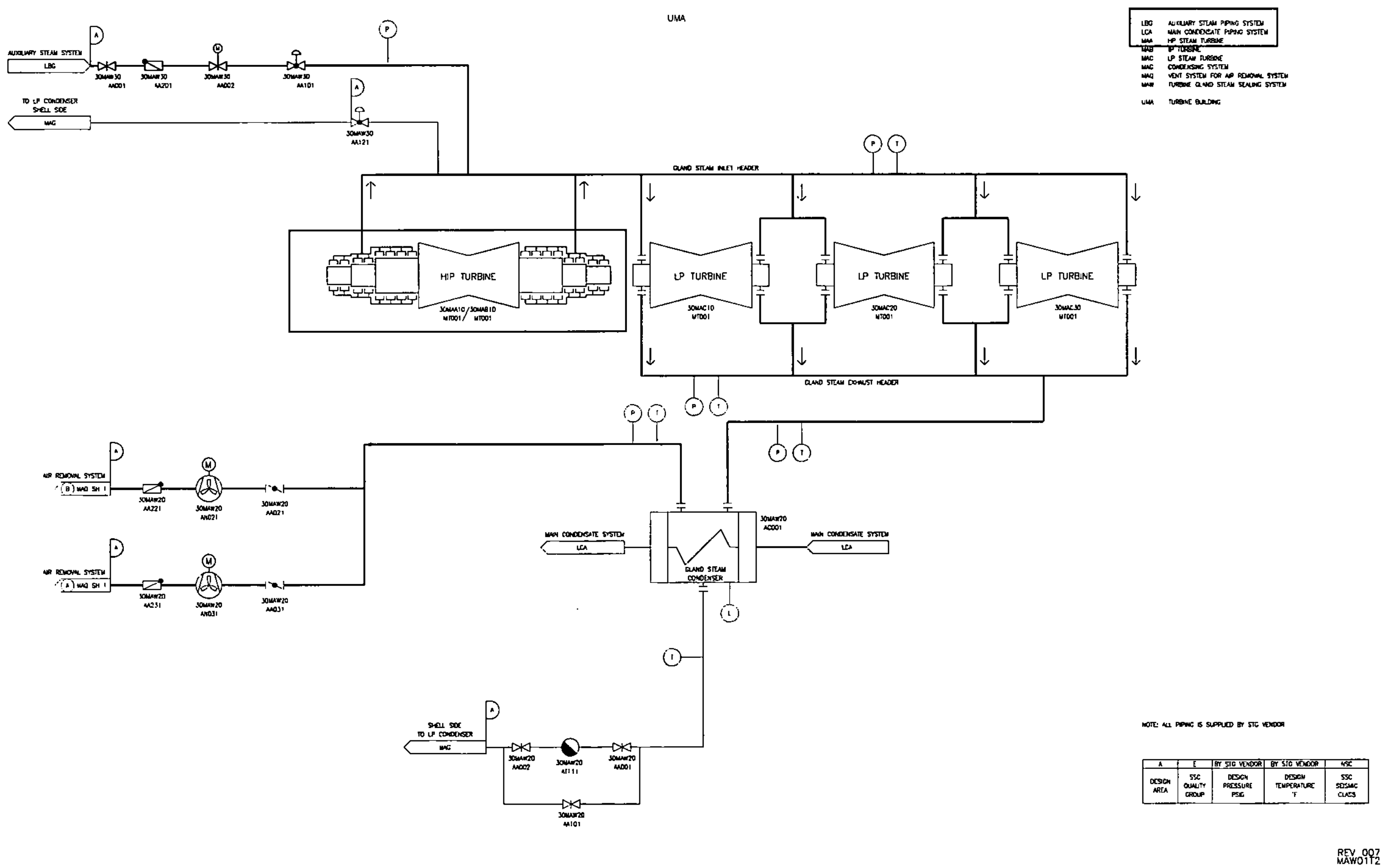
Figure 10.4.3-1—Turbine Gland Sealing System



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If the TBS is unavailable, the cooldown is accomplished with ~~either~~ the MSRTs~~, or MSSVs~~.

Abnormal Operation

Loss of External Load

Subsequent to a loss of external load, the turbine trips and is followed by reactor shutdown. Steam is automatically dumped to the main condenser through the TBS, or if TBS is unavailable to the atmosphere via the MSRTs. Once conditions have stabilized, the unit is maintained in hot shutdown conditions or cooled down using the TBS or MSRTs.

Loss of Condenser Vacuum

Loss of condenser vacuum causes the TBS to become unavailable for service. Chapter 15 describes the evaluation of anticipated operational occurrences.

Increased Steam Flow with MSIV Failure to Close

This event is initiated by a failure or function error of the turbine or turbine bypass controls, resulting in a sudden increase in steam flow. Also, one MSIV is postulated not to close upon receiving a main steam isolation signal. This event is enveloped by the main steam line break (MSLB) event. Once conditions have stabilized, heat removal takes place via the MSRTs.

Accident Conditions

A failure of the TBS piping is within the main steam line break outside containment event. Refer to Chapter 15 for a description of accident analyses. This includes an evaluation of a MSLB and steam generator tube rupture.

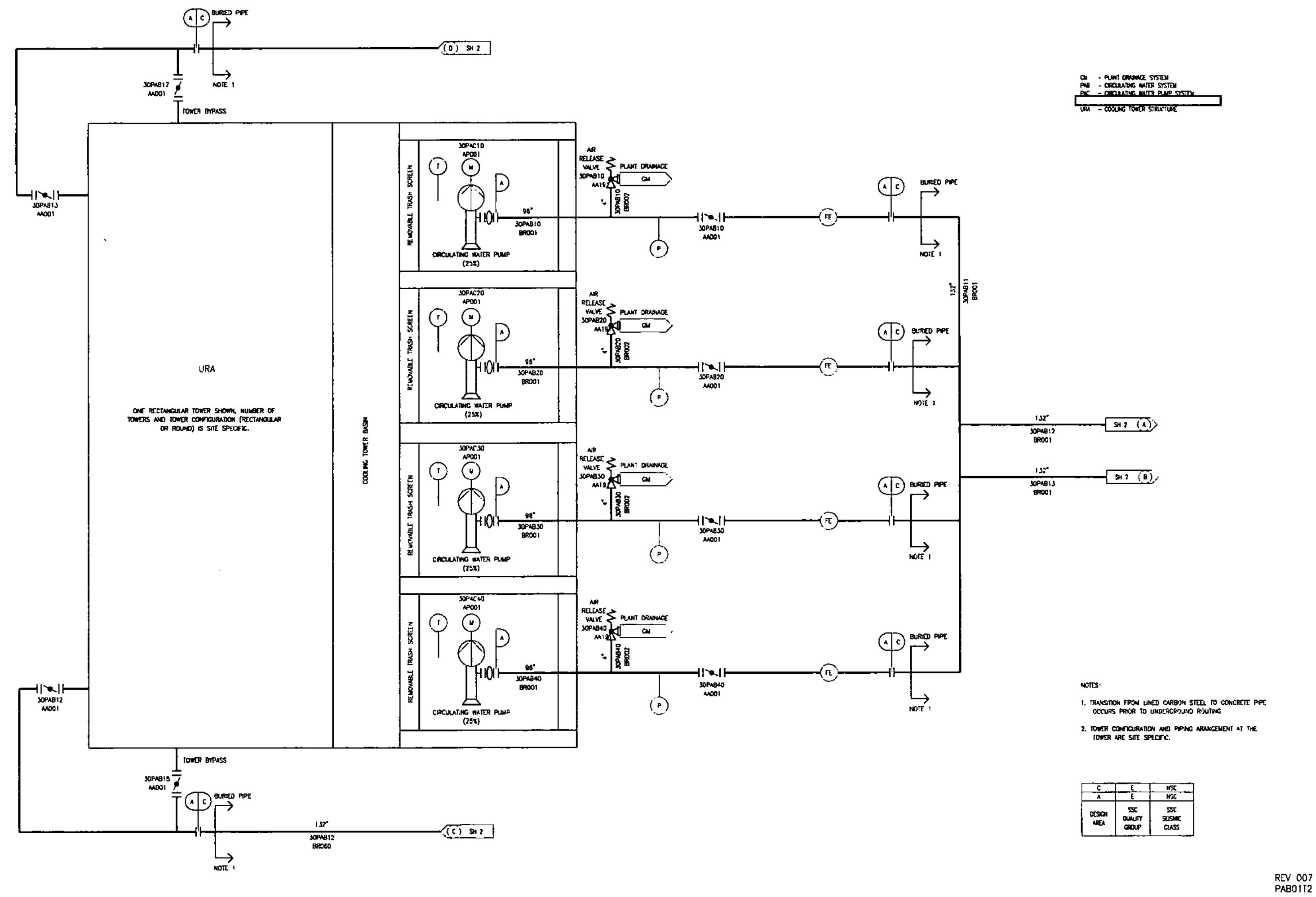
10.4.4.3 Safety Evaluation

The TBS performs no safety-related functions and is not required to operate during or after an accident.

The design of the TBS satisfies general design criteria (GDC 4), regarding the environmental effects of a TBS failure on essential equipment.

- There is no safety-related equipment in the vicinity of the TBS. All high energy lines of the TBS are located in the Turbine Building. Therefore, TBS piping failures would not affect any safety-related equipment. Since there are no safety-related systems to be effected by a TBS pipe-break, NUREG-0800 BTP 3-3 (Reference 1) and BTP 3-4 (Reference 2) are not applicable to the TBS. The general subject of pipe failures is discussed in Section 3.6.1 and Section 3.6.2.

**Figure 10.4.5-1—Circulating Water System Flow Diagram
Sheet 1 of 2**



Condensate Polisher

The condensate polisher consists of at least four trains of deep mixed bed demineralizers with downstream resin traps. Spent polisher resin is replaced or regenerated offsite. The number and size of the ion exchangers allow functional requirements to be met while permitting replacement of resin in one ion exchanger at a time.

Resin Trap

Resin traps are installed downstream of each ion exchanger to remove resin fines.

Spent Resin Tank

The spent resin tank is used for storage of exhausted or spent resin prior to shipping offsite for regeneration or disposal.

Resin Addition Equipment

Equipment is provided to replace the ion exchange resin.

10.4.6.3 System Operation

The CPS cleans up the condensate during startup to meet condensate and feedwater system water chemistry specifications as described in Section 10.3.5. The condensate is recirculated to the hotwell during startup until the desired water quality is attained. Condensate and feedwater system operation is described in Section 10.4.7.

During power operation, the condensate polishers are used only when abnormal secondary cycle conditions exist. This allows continuous operation of the plant with condenser tube leakage until repairs can be made. Flow through the condensate polisher is controlled by the condensate polisher bypass valve.

Exhausted or spent resin is removed from the polisher vessel and replaced with new or regenerated resin. Resin replacement requires the polisher vessel to be out of service. The standby vessel is placed in service when another vessel needs to be removed from service. Spent resin may be transferred directly to a truck or the spent resin storage tank until it can be removed offsite. Spent resin will normally be nonradioactive and not require any special packaging prior to disposal. In the event the resin becomes contaminated with radioactive material, shielding is provided, if required. Spent resins are shipped offsite per the Process Control Program (PCP). Information about the PCP can be found in Section 11.4.3. Radiation monitors associated with the steam generator blowdown system, main steam system and Vent System for Air Removal System vent are used to detect secondary side radioactive contamination (refer to Section 11.5,~~-~~Table 11.5-1~~, Monitors R-46 through R-49 (Steam Generator BLowdown System), and R-3 (Vent System for Air Removal)~~).

makeup valves are split-range. The valve station controls deaerator–feedwater storage tank level by controlling condensate flow.

Following the deaerator makeup valve station, condensate flows to the four stages of LP FWHs, three strings for stage 1 and 2 and two strings for stages 3 and 4. Each string of LP FWHs can be isolated and bypassed via manual component level controls from PICS. No automatic functions or manual group commands exist for these valves. Condensate combines with the return line from the blowdown coolers and flows to the deaerator–feedwater storage tank. Deaerator–feedwater storage tank inventory is maintained by demineralized water supply from the DWDS.

The main feedwater and startup and shutdown motor-driven feedwater pumps are located in the TB below the deaerator–feedwater storage tank. Feedwater is pumped by four 33 percent capacity MFW pumps and a single five percent capacity startup and shutdown feedwater pump. Normally three MFW pumps are in operation with the fourth main pump and the startup and shutdown pump on automatic standby. A separate line from the deaerator–feedwater storage tank supplies each feedwater pump.

Downstream of the feedwater pumps the piping combines into a common header, which supplies the two strings of HP FWHs and reheater stage 2 drain coolers. Each string can be isolated and bypassed via manual component level controls from PICS. No automatic functions or manual group commands exist for these valves.

Downstream of the HP FWH trains, the MFW line splits into individual feed lines to each of the four SGs. The feedwater system is designed to limit total system delivery rate to the Steam Generators to 115%~~, assuming inadvertent operation of the standby main feedwater pump and that four MFW pumps are operating~~ of flow at 100% load in the event that all four full load control valves are opened due to a PAS/PICS failure. The feed lines are routed outdoors along a pipe bridge, through the SB and into the RB via the four containment penetrations. The feedwater valve stations are located inside compartments within valve rooms inside the SBs, and are split-range to improve controllability over the entire operating range. Each valve station contains a full load control valve with an upstream hydraulic-pneumatic feedwater full load isolation valve and a low load and very low load control valve with a common upstream motor-operated low load feedwater isolation valve (MFWLLIV).

A motor-operated main feedwater isolation valve (MFWIV) is provided just outside the RB. Additionally, a damped check valve inside the RB provides additional containment isolation. Piping from the valve stations to the SG is routed upward without loops to preclude steam plugging during transients. Refer to Section 5.4.2 for a description of the feedwater connection to each SG.

condenser circulating water pumps, part of the circulating water system (CWS), are operating to remove heat loads from the condenser.

Using one condensate pump during recirculation, the system is vented and pressurized in stages. Turbine sealing may begin once condensate flow is established through the gland steam condenser. Similarly, SG blowdown begins once condensate flow is established through the blowdown cooler. Once water is admitted to the deaerator–feedwater storage tank, the low range makeup valve automatically maintains deaerator–feedwater storage tank level.

At approximately 50 percent load, a second condensate pump is started to maintain flow. The condensate pump recirculation valve gradually modulates closed as the unit load is increased.

Using the startup and shutdown feedwater pump, its recirculation valve automatically modulates to maintain pump minimum flow and the main feedwater very low load control valves (MFWVLLCV) automatically modulate to maintain SG water level. At approximately five percent load, one of the MFW pumps is started, as required to maintain SG water level. Subsequently, the second and third MFW pumps are started. The feedwater pumps are started in a staged manner to reduce the possibility of overfeed in the event of controls malfunctioning.

As load is increased, flow control is transferred from the MFWVLLCVs, to the MFWLLCVs and eventually to the MFWFLCVs.

Normal Operation

During normal plant operation, two condensate pumps are in service with flow from the hotwell, through the gland steam condenser LP FWHs, and blowdown cooler into the deaerator–feedwater storage tank. Normally, there is no flow to the turbine bypass or exhaust hood sprays. The standby condensate pump is normally set to automatically start on failure of an operating pump.

During normal operation, three MFW pumps are in service with flow from the deaerator–feedwater storage tank, through the HP FWHs and second stage reheater drain coolers, and into the SG. The standby MFW pump is normally set to automatically start on failure of an operating pump. The startup and shutdown feedwater pump is normally set to start on failure of all main pumps. The feedwater system is designed to limit total system delivery rate to the Steam Generators to 115%~~, assuming inadvertent operation of the standby main feedwater pump and that four MFW pumps are operating~~ of flow at 100% load in the event that all four full load control valves are opened due to a PAS/PICS failure.

ATWS – Loss of Normal Feedwater

The secondary side response is the same as for ATWS – Loss of Offsite Power.

Refer to Chapter 15 for a description of accident analyses.

10.4.7.3 Safety Evaluation

The design of the safety-related portions of the CFS satisfies GDC 2 regarding the effects of natural phenomena.

- Safety-related portions of the CFS are located inside containment and valve rooms, which are part of the SBs. Safeguard Buildings 1 and 4 each contain two valve rooms. These buildings are designed to withstand the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, tsunami and seiches. Section 3.3, Section 3.4, Section 3.5, Section 3.7 and Section 3.8 provide the bases for the adequacy of the structural design of these buildings.

- Safety-related portions of the CFS are designed to remain functional during and after a safe shutdown earthquake (SSE). Section 3.7 provides the design loading conditions that are considered.

- Consistent with the guidance in RG 1.29, the condensate system piping penetrating the containment and the associated CIVs are designed to Seismic Category I requirements. The condensate system piping inside containment or valve rooms that is not Seismic Category I, is designed to Seismic Category II requirements. Also consistent with the guidance in RG 1.29, feedwater system piping that is part of the primary and secondary reactor containment, is designed to Seismic Category I requirements; these design requirements extend to the first seismic restraint beyond the defined boundary.

- Portions of the condensate system penetrating the containment and the associated CIVs are designated Quality Group B and designed as ASME Boiler and Pressure Vessel Code, Section III, Class 2 (Reference 2) components. The cooling water supply and return piping inside containment is designated Quality Group ~~D~~B and Seismic Category ~~II~~I.

- Feedwater system CIVs and adjacent piping up to the SGs are designated Quality Group B and designed as ASME Code, Section III, Class 2 components subject to the requirements of Subsection NC. Feedwater system piping upstream of the CIVs up to the fixed restraint, is designated Quality Group C and designed as ASME Boiler and Pressure Vessel Code, Section III, Class 3 (Reference 4) components subject to the requirements of Subsection ND.

- Inside the four valve rooms, the feedwater piping is routed in four individual and separate trains so that internal flooding does not prevent the main feedwater system (MFWS) from performing its safety-related functions. Refer to Section 3.4.3.4 for a discussion of flooding in the valve compartments. Critical components in the MFWS are located inside the feedwater valve rooms.

Table 10.4.7-1—Main Feedwater Safety-Related Piping and Valves
Sheet 1 of 3

Main Feedwater Piping (Safety-Related Portion)	
Design (VWO) flow rate	21,479,950 lb/hr ~~21,492,900 lb/hr~~
Number of lines	4
Main line nominal size	20 in.
Piping MFWCKV Outlet to SG	
Schedule	120
Design pressure	1435 psig
Design temperature	600°F
Design code	ASME Section III, Class 2
Seismic design	Category I
Piping MFWIV to MFWCKV	
Schedule	160
Design pressure	2050 psig
Design temperature	600°F
Design code	ASME Section III, Class 2
Seismic design	Category I
Piping Main 20 Inch Line Fixed Point Restraint to MFWIV	
Schedule	140
Design pressure	2050 psig
Design temperature	600°F
Design code	ASME Section III, Class 3
Seismic design	Category I
Piping 10 Inch Line Low Load	
Schedule	140
Design pressure	2050 psig
Design temperature	600°F
Design code	ASME Section III, Class 3
Seismic design	Category I

Table 10.4.7-2—Condensate and Feedwater System Single Active Failure Analysis

	Component	Failure	Comments
1	Main feedwater full load isolation valves (MFWFLIV)	Loss of power from one power supply	Loss of one power supply has no effect on ability of valve to close. Valve actuator has 2 redundant closure systems. Valve closure is controlled by 2 cross-division power supplies provided to the actuator closing systems.
		Valve fails to close upon receipt of automatic signal	Redundant isolation valves MFWFLCV and MFWIV provided in each main feedwater line.
2	Main feedwater low load isolation valves (MFWLLIV)	Loss of power from one power supply	Redundant, cross-division power supply provided.
		Valve fails to close upon receipt of automatic signal	Redundant isolation valve MFWLLCV and MFWIV provided.
3	Main feedwater full load control valves (MFWFLCV)	Loss of power from one power supply	Redundant, cross-division power supply provided.
		Valve fails to close upon receipt of automatic signal	Redundant isolation valves MFWFLIV and MFWIV provided in each main feedwater line.
4	Main feedwater low load control valves (MFWLLCV)	Loss of power from one power supply	Redundant, cross-division power supply provided.
		Valve fails to close upon receipt of automatic signal	Redundant isolation valves MFWLLIV and MFWIV are provided.
5	Main feedwater very low load control valves (MFWVLLCV)	Loss of power from one power supply	Redundant, cross-division power supply provided.
		Valve fails to close upon receipt of automatic signal	Redundant isolation valves MFW~~FL~~IV and MFWLLIV are provided.
6	Main feedwater isolation valves (MFWIV)	Loss of power from one power supply	Redundant, cross-division power supply provided.
		Valve fails to close upon receipt of automatic signal	Redundant isolation valves MFWFLIV and MFWLLIV are provided.

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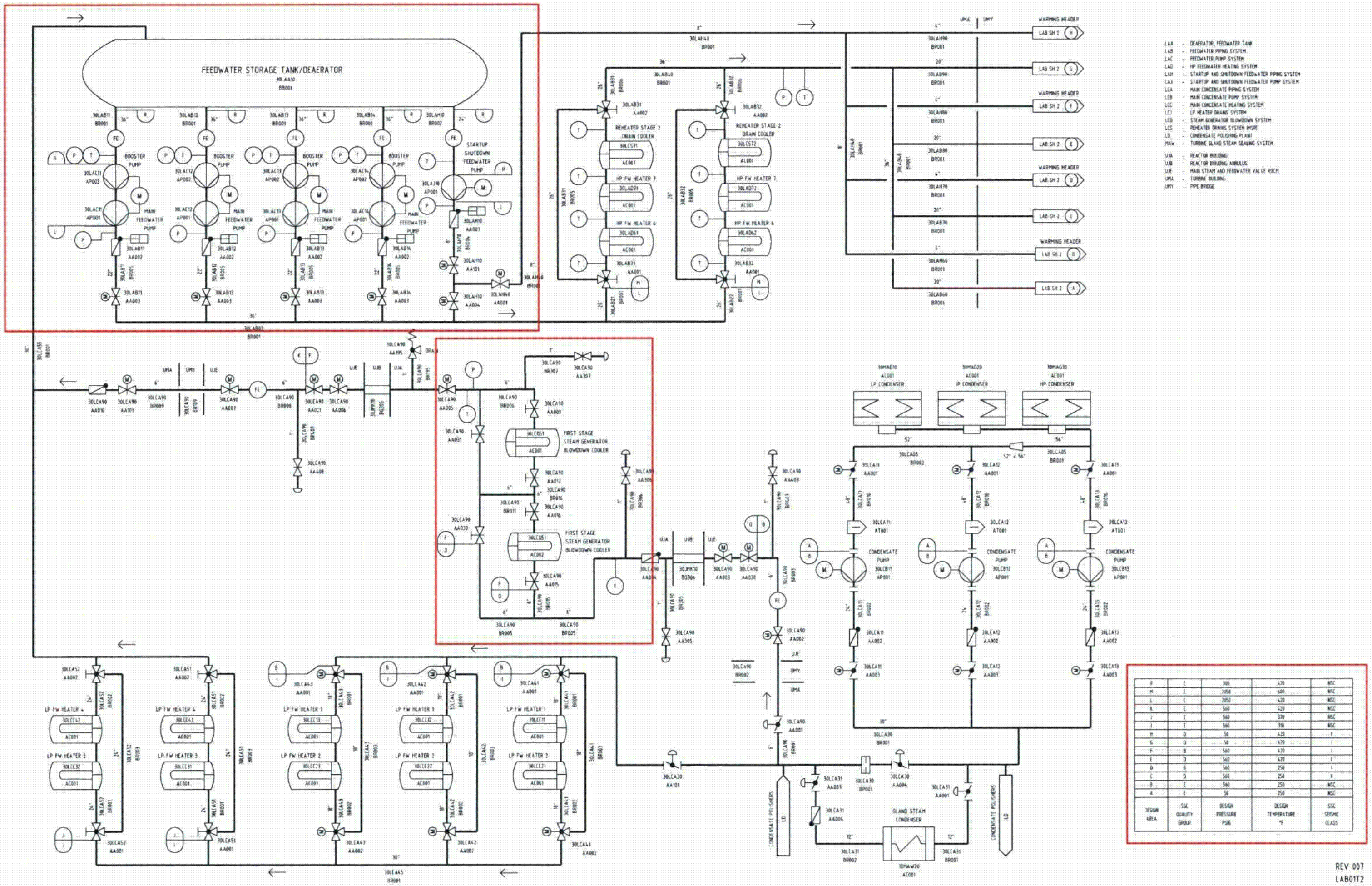
Figure 10.4.7-1—Condensate and Feedwater System Sheet 1 of 2



10.4.8 Steam Generator Blowdown System (PWR)

The Steam Generator Blowdown System (SGBS) assists in maintaining the chemical characteristics of the secondary water within permissible limits. The SGBS provides the capability for continuous hot blowdown of the secondary side of the steam generators (SG). The SGBS includes equipment for heat recovery, purification and reuse of SG blowdown.

10.4.8.1 Design Bases

The following safety-related functions are performed by the SGBS and are required to function following a design basis accident (DBA):

- Provide blowdown system isolation.
- Provide containment isolation.
- Provide capability for interconnection of SGs.

The SGBS has the following design basis requirements and criteria:

- The safety-related portion of the SGBS is designed and fabricated to codes consistent with the quality group classification in accordance with RG 1.26 and the seismic category in accordance with RG 1.29. The design of the SGBS is Seismic Category I and Quality Group B from its connection to the SG inside primary containment up to and including the isolation valves outside containment (GDC 1).
- The non-safety related portions of the SGBS in the Safeguard Buildings Mechanical Division 4 have a seismic category in accordance with RG 1.29 position C.2 for those non-safety related portions of which failure could reduce the functioning of any safety related or Seismic Category I system components to an unacceptable safety level (GDC 1).
- The non-safety-related portion of the SGBS, downstream of the outer containment isolation valves (CIV), meets the quality standards of RG 1.143, regulatory position C.1.1 (GDC 1).
- The non-safety-related portions of the SGBS downstream of the outer containment isolation valves (CIVs), meets the radwaste classifications defined in RG 1.143, regulatory position C.5. This portion of the system shall be classified as RW-IIa or RW-IIc using the guidance provided in RG 1.143.
- The safety-related portion of the SGBS is designed to function and is protected from the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods and external missiles (GDC 2).
- The blowdown system is sampled continuously to monitor its demineralization and clean up performance (GDC 13).

- The SGBS is designed to blow down up to one percent of the main steam flow rate of all four SGs or up to two percent of a single SG main steam flow rate to maintain water chemistry (GDC 14).

- Consistent with the requirements of 10 CFR 20.1406, the SGBS is designed to minimize, to the extent practicable, contamination of the facility and the environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste (See Section 12.3.6.5). To meet this requirement, radiation monitors are designed to isolate SGBS on high blowdown activity coupled with a partial cooldown signal (See Section 11.5.4.3 and Table 11.5-1). ~~For steam generator tube rupture, radiation monitors are designed to isolate SGBS on main steam high activity coupled with a partial cooldown signal or high steam generator water level above the narrow range; only the SGBS of the affected steam generator will be automatically isolated (See Section 11.5.4.1 and Table 11.5-1).~~

10.4.8.2 System Description

10.4.8.2.1 General Description

Figure 10.4.8-1—Steam Generator Blowdown System Discharge and Cooling and Figure 10.4.8-2—Steam Generator Blowdown Demineralizing System Flow Diagram provide schematic diagrams of the SGBS. Each SG is equipped with its own blowdown line with the capability of blowing down the hot leg and cold leg of the SG shell side. (The hot and cold legs are blown down at low plant loads; otherwise, only the hot leg is blown down.) The blowdown is directed into a flash tank where the flashed steam is returned to the cycle via the deaerator/feedwater storage tank. The liquid portion flows to heat exchangers cooled in two stages by the main condensate system in the first stage and the component cooling system in the second stage before going to the SG blowdown demineralizer. The SGBS also conveys the water from the exit of the SG blowdown demineralizer to the main condenser. The interfaces with the main condensate system, main condenser and feedwater storage tank are addressed in Section 10.4.7.

Each SG is fitted with two nozzles on the hot leg and one nozzle on the cold leg. Piping connects the three nozzles to one blowdown line per SG.

Two secondary sampling system branches are connected to the blowdown collecting lines, one to the cold leg blowdown line and one to the common hot leg blowdown line.

Each of the four blowdown lines is routed through blowdown flow rate adjusting valves to the blowdown flash tank, located in the Reactor Building. The blowdown flow rate adjusting valves control the blowdown flow rate from each SG. The flashed steam is conveyed from the flash tank through containment penetration to the deaerator/feedwater storage tank. The blowdown liquid is transferred from the flash tank, through the first stage blowdown cooler, through the containment penetration,

10.4.8.2.2 Component Description

Table 3.2.2-1 provides the seismic design and other design classifications for components in the SGBS. Section 3.2 describes how the guidance of RG 1.26 and RG 1.29 is implemented for the U.S. EPR.

SG Blowdown Isolation Valves

There are safety-related, electric motor operated, blowdown isolation valves on the hot and cold leg blowdown lines of each SG and a safety-related, electric motor operated, redundant valve on the common blowdown line from each SG. The common blowdown line isolation valves have a diverse power supply from the upstream hot and cold leg blowdown isolation valves. ~~Closing the blowdown isolation valves prevents loss of SG secondary inventory.~~

Process controls are provided to automatically isolate if the flash tank water level or pressure exceeds allowable limits, if the flash tank safety relief valve opens, or if the blowdown flow rate from a SG exceeds allowable limits.

SG Transfer Lines

The SG transfer lines are used to depressurize a stagnant SG during an SGTR plus LOOP event. These transfer lines are intended to transfer the content of the affected (i.e., stagnant) SG to the unaffected SG. These transfer lines link SGs 1 to 2 and SGs 3 to 4. For redundancy, each transfer line is equipped with two isolation valves, which are in parallel with each other.

Blowdown Flow Rate Adjusting Valves

The blowdown flow rate adjusting valves are designed to discharge the required SG blowdown flow to the flash tank.

Blowdown Flash Tank

Internal volume is sufficient to control the flash tank pressure and level within a narrow range. Nozzles are welded into the vertical shell, top and bottom. Four of the nozzles on top of the tank are for the SG blowdown inlet. The flashed steam is removed from a separate nozzle on the top head. The liquid drains from a nozzle on the lower head. There is an impurity pipe trap on the bottom of the flash tank. The tank is protected against overpressure by the flash tank safety relief valve, in conformance with the ASME Boiler and Pressure Vessel (BPV) Code, Section III-NC (Reference 1).

blowdown is reduced or stopped by closing the SG blowdown flow rate adjusting valves and/or SG blowdown isolation valves. Valves are closed automatically upon reaching a setpoint water level to prevent the water hammer that could occur inside the flash tank if the water level were to reach the flash tank inlet nozzles.

The isolation valve downstream of the demineralizer is automatically closed to protect the SG blowdown demineralizer resin if the temperature of the blowdown water downstream of the second stage blowdown coolers reaches 131°F. The temperature limit could be exceeded if the main condensate flow or component cooling water flow (or both) is too low; or if the main condensate temperature or component cooling water temperature (or both) is too high; or if the flash tank pressure is too high. When the blowdown demineralizer isolation valve closes, the flash tank water level increases and the blowdown operation is stopped by the automatic closure of the SG blowdown adjusting valves or SG blowdown isolation valves.

In special cases, the entire SG blowdown demineralizing system can be bypassed around to the main condenser, or the blowdown can also be bypassed to the liquid waste storage system instead of to the main condenser. The blowdown can be manually discharged to the liquid waste management system if radioactivity is detected in the blowdown. Radiation monitors are designed to isolate SGBS on high blowdown activity coupled with a partial cooldown signal; only the SGBS of the affected steam generator will be automatically isolated (See Section 11.5.4.3 and Table 11.5-1).

10.4.8.3.3 Accident Conditions

The blowdown isolation valves isolate on a containment isolation signal or emergency feedwater (EFW) actuation signal, or main steam isolation signal with low SG pressure or high SG pressure drop. Closing the SGBS isolation valves prevents loss of SG secondary inventory. For steam generator tube rupture, radiation monitors are designed to isolate SGBS on main steam high activity coupled with a partial cooldown signal or high steam generator water level above the narrow range with a partial cooldown; only the SGBS of the affected steam generator will be automatically isolated (See Section 11.5.4.1 and Table 11.5-1). In the event of a steam generator tube rupture and loss of offsite power, the SGBS transfer lines are manually operated to transfer SG inventory from the affected SG to another SG to achieve cold shutdown.

10.4.8.4 Safety Evaluation

The design of the SGBS satisfies GDC 1 as it relates to system components being designed, fabricated, erected, and tested for quality standards.

- The safety-related portion of the SGBS is designed and fabricated to codes consistent with the quality group classification in accordance with RG 1.26 and the seismic category in accordance with RG 1.29. The design of the SGBS is

- Controls are provided to protect the SGBS demineralizers from high temperatures.

The single failure criterion is applied to the CIVs, SGBS isolation valves, SGBS 1&2 transfer valves, and SGBS 3&4 transfer valves. Section 6.2.4 and Section 6.2.6 discuss the system containment isolation arrangement and containment leakage testing.

For the SGBS transfer valves, redundant parallel paths in each SGBS transfer line provide protection against a single failure of a transfer valve preventing the transfer function in the event of a steam generator tube rupture and loss of offsite power. Section 8.3.1.2.11 discusses the application of Branch Technical Position (BTP) 8-4 to the SGBS 1&2 and 3&4 transfer valves as a means of designing against a single failure of a transfer valve defeating the separation of the steam generators as assumed in the accident analyses.

10.4.8.5 Inspection and Testing Requirements

The SGBS components are inspected and tested during plant startup. Refer to Section 14.2 (test abstracts #067, #072, #185 and #204) for initial plant startup test program.

The design of the SGBS includes the capability for inservice testing. This includes operation of applicable portions of the protection system. Refer to Section 3.9.6 for a description of the inservice testing program.

The SGBS components are designed and located to permit preservice and inservice inspections to the extent practical. The SGBS lines within the containment and Safeguard Buildings up to and including the isolation valves outside containment are inspected at installation as required by ASME Code, Section XI (Reference 2) preservice inspection requirements. Refer to Section 6.6 for a description of the inservice inspection program.

10.4.8.6 Instrumentation Requirements

The SGBS instrumentation is provided to facilitate automatic operation, remote control and continuous indication of system parameters.

Process radiation monitors are provided in the SG blowdown sampling system. These monitors are discussed in Section 11.5.4.3.

Safety-related isolation functions of the SGBS are performed by the protection system as described above in Section 10.4.8.3.3.

Non-safety related instrumentation and control (I&C) functions are performed by the process automation system.

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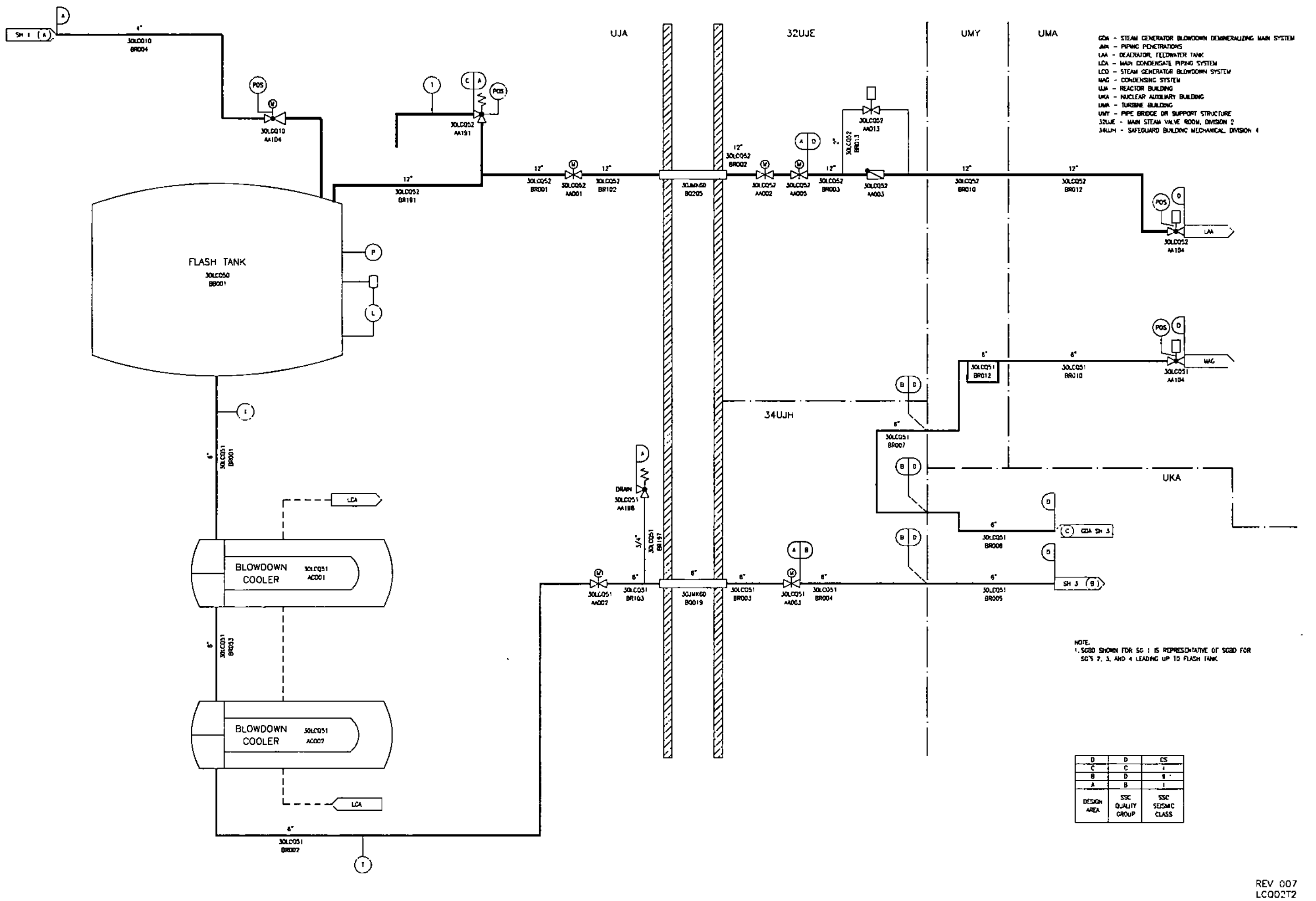
Figure 10.4.8-1—Steam Generator Blowdown System Discharge and Cooling
Sheet 2 of 3



Makeup to the storage pools can also be provided by hose from the fire water system or other available water sources.

The EFWS has the capability to perform its required safety-related functions following design basis transients or accidents assuming a single active failure in one EFW train and with a pump out of service for preventive maintenance in a second train. The system capacity is sufficient to remove decay heat and provide feedwater for cooldown of the RCS following a reactor trip from full power.

The EFWS design flow requirement provides 400 gpm (at 122°F) to a minimum of two SGs following a main feedwater line break when pumping against the main steam relief train (MSRT) setpoint pressure. This requirement is met assuming a single active failure and an EFW pump out for maintenance.

All four EFWS trains are powered from separate emergency buses, each backed by an emergency diesel generator (EDG), with trains 1 and 4 also capable of being powered from the diverse station blackout diesel generators (SBODG).

In the event of an extended loss of alternating current (AC) power (ELAP), the connection to the fire water distribution system on the EFWS discharge cross-connect header provides the capability to supply to the SGs from the fire water storage tanks using the diesel-driven fire pumps.

Design features and system operation considerations provide reasonable assurance that connection and operation of the fire water distribution system in the above manner will not result in water hammer destructive to the safety-related portions of the EFWS. The piping in the cross connect and the piping in the fire protection system are designed so that they can be properly filled, vented, and maintained sufficiently full of water prior to placing the system in service for this function. System maintenance and operating procedures will also include guidance and precautions to be exercised during system and component testing when changing valve alignments or when starting or stopping the fire pumps.

10.4.9.2.2 Component Description

The EFWS safety-related piping and components are designed and constructed in accordance with Quality Group C and Seismic Class I requirements, except for the containment isolation boundary piping and valves that are Quality Group B. Table 3.2.2-1 provides the seismic design and other design classifications for components in the EFWS. The EFWS piping and component pressure retaining parts are constructed of austenitic stainless steel. The EFWS materials conform to the requirements and regulatory guidance in Section 6.1.1. EFWS component data information is provided in Table 10.4.9-1—Emergency Feedwater System Component Data and material specifications are provided in Table 10.4.9-2—Emergency Feedwater Material Specifications.

resulting high-temperature condition and provides an alarm in the MCR to alert the operators to close the EFWS isolation valve and to promptly perform any other required actions to return the affected pump train to service.

10.4.9.2.3.3 Accident Conditions

The operator action times described in this section support the assumptions used in the Chapter 15 analyses.

Small Break Loss of Coolant Accident (SBLOCA)

A small break loss of coolant accident (SBLOCA) results in a loss of reactor coolant inventory which cannot be compensated for by the chemical and volume control system (CVCS). The loss of primary coolant results in a decrease in reactor coolant pressure and pressurizer level. The EFWS is automatically started if SG low level is reached. On safety injection signal, partial cool down is initiated to enable medium head safety injection (MHSI) flow.

A minimum of two EFWS trains are available to restore and maintain SG water inventory during RCS cooldown to RHR system entry conditions.

Steam Generator Tube Rupture (SGTR)

An SGTR results in a leak of primary coolant into the affected SG. The EFWS is utilized to assist in RCS cooldown, as necessary. In addition, EFWS flow to the affected SG can be isolated manually ~~after~~ within 30 minutes or by the automatic closure of the SG isolation valve and the level control valve upon SG high level. The associated EFWS pump is shut down manually. A minimum of two EFWS trains are normally available to restore and maintain SG water inventory during RCS cool down to RHR system entry conditions.

In the unlikely event of an SGTR in one SG coincident with a single failure of another EFWS train and a third EFWS pump out for maintenance, only one intact SG is fed initially by the EFWS. Within 30 minutes, the operator opens the required discharge header isolation MOVs to align the EFWS pump feeding the affected SG to feed an intact SG.

The EFWS maintains SG water inventory during RCS cooldown to RHR system entry conditions.

Main Steam Line Break (MSLB)

A MSLB results in a significant reduction of RCS pressure and temperature and associated positive reactivity. At break initiation the secondary side pressure falls, a reactor trip occurs and the main steam isolation valves (MSIV) close. The EFWS pump aligned to the affected SG automatically starts upon SG low level. The EFWS pump

Table 10.4.9-4—Emergency Feedwater System Indicating, Alarm, and Actuation Control Devices

Device	Indication (CR)	Indication (Local)	Alarm (CR)	Actuation
EFW pool level wide range	X	X	X	
EFW pool level narrow range	X		X	(H) Isolate DI Water
EFW pool temperature	X		X	
EFW pump suction temperature	X			
EFW pump discharge pipe temperature	X		X	
EFW pump suction pressure	X			(L) Pump trip[1]
EFW pump head	X			
EFW pump discharge pressure	X	~~X~~		(L) Pump trip[1]
EFW LCV pressure drop	X			
EFW pump flow	X			FCV Control
EFW flow to SG	X			
EFW FCV valve position	X			FCV Control
EFW LCV valve position	X			SG Level Control
EFW pump discharge manual valve position switches	X			
EFW supply header valve position switches	X			
EFW discharge header valve position switches	X			
EFW pump bearing temperature	X		X	(H) Pump trip[1]
EFW pump motor winding temperature	X		X	(H) Pump trip[1]
EFW pump motor current	X			
EFW pump vibration	X			

Note:

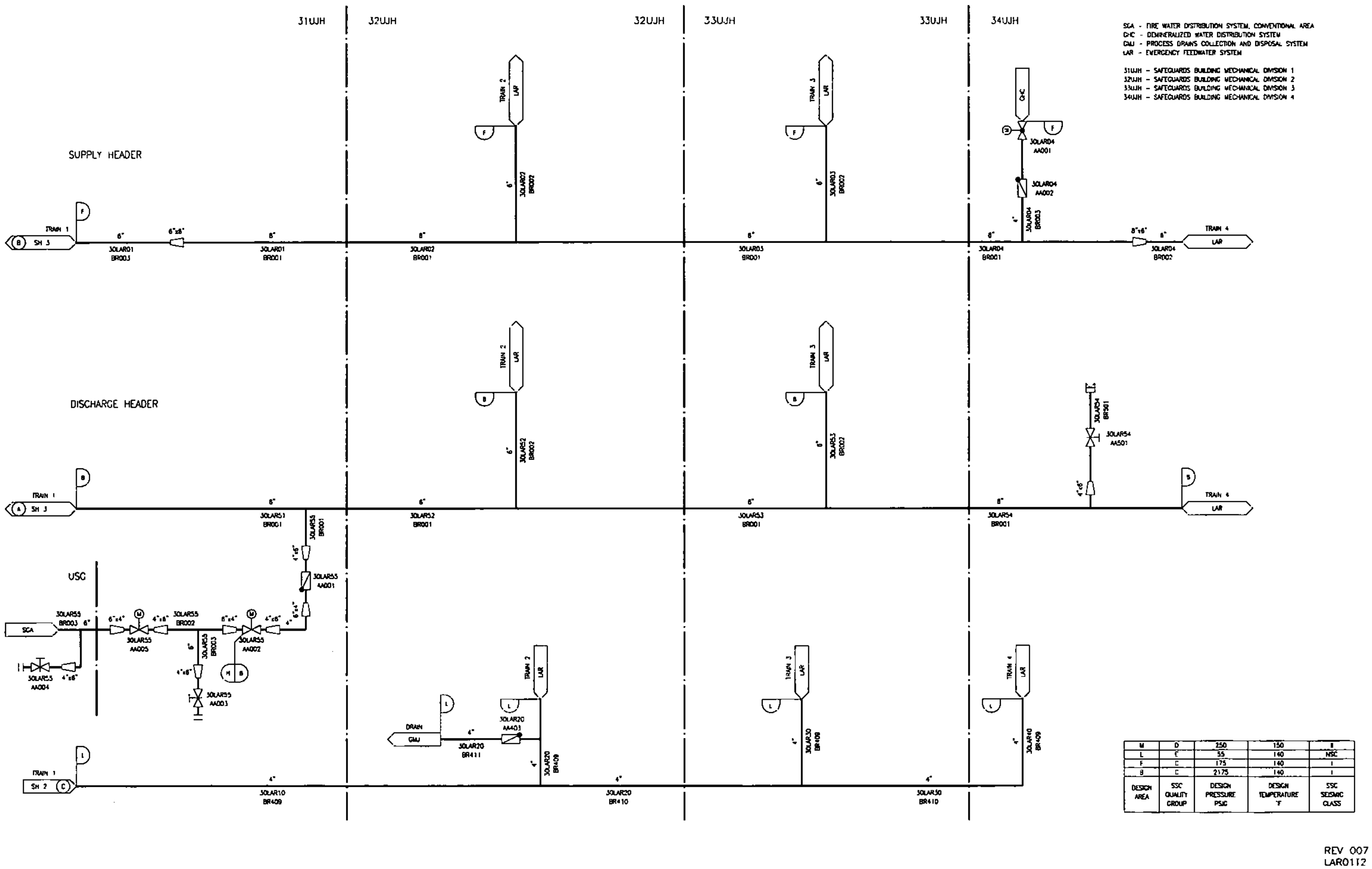
1. Pump will not trip following a safety actuation signal.

Table 10.4.9-5—EFWS Unreliability Results

Initiating Event	Secondary Cooling Systems Credited	Probability that the Credited Systems Fail to Provide Adequate Steam Generator Flow
General Transient	MFW, SSS, and EFWS	5.40E-07 3.55E-07
Loss of Main Feedwater	EFWS	3.41E-05 3.89E-05
Loss of Main Feedwater	EFWS and SSS	1.14E-05
Loss of Offsite Power	EFWS (without no power recovery)	1.38E-04 1.01E-04
Loss of Offsite Power	EFWS (offsite power recovery considered)	8.83E-05 7.15E-05
Loss of Offsite Power	EFWS and SSS (offsite power recovery considered)	7.61E-05 5.68E-05

Next File

Figure 10.4.9-1—Emergency Feedwater System Flow Diagram
Sheet 1 of 3



M	D	250	150	II
L	E	55	140	NSC
F	C	175	140	I
B	C	2175	140	I
DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS

Conforming Changes

2.8.2 Main Steam System

Design Description

1.0 System Description

The main steam system (MSS) is a non-safety-related system with portions that are safety-related. It transports steam from the steam generators to the turbine generator during normal operations. The MSS also isolates the steam generators and the safety-related portion of MSS from the non-safety-related portion during design basis accidents. The main steam pipe lines from the steam generators to and including the fixed seismic restraints downstream of the main steam isolation valves (MSIVs) are safety related. The main steam lines downstream of the fixed seismic restraints to the turbine generator are non-safety-related.

The MSS provides the following safety-related functions:

- The MSS isolates the steam generators and associated portion of main steam lines.
- The MSS provides residual heat removal by venting steam to the atmosphere via the main steam relief trains (MSRTs) and the main steam safety valves (MSSVs).

The MSS provides the following non-safety-related functions:

- The MSS and the turbine bypass system provide the capability to dump steam to the main condenser.

2.0 Arrangement

2.1 The functional arrangement of the MSS is as described in the Design Description of Section 2.8.2, Tables 2.8.2-1—MSS Equipment Mechanical Design and 2.8.2-2—MSS Equipment I&C and Electrical Design, and as shown on Figure 2.8.2-1—MSS Functional Arrangement.

2.2 Deleted.

2.3 Physical separation exists between divisions of the safety-related portions of the MSS ~~as shown on Figures 2.1.1-23, 2.1.1-24, 2.1.1-36, and 2.1.1-37~~equipment as listed in Table 2.8.2-2.

3.0 Mechanical Design Features

3.1 Valves listed in Table 2.8.2-1 will be functionally designed and qualified such that each valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.

3.2 Deleted.

Table 2.8.2-2—MSS Equipment I&C and Electrical Design
Sheet 1 of 5

Description	Tag Number(1)	Location(3)	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Main Steam Relief Isolation Valve	30LBA13AA001	Safeguard Building 1	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Open-Close/ Open-Close
Main Steam Relief Isolation Valve	30LBA23AA001	Safeguard Building 1	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Open-Close/ Open-Close
Main Steam Relief Isolation Valve	30LBA33AA001	Safeguard Building 4	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Open-Close/ Open-Close
Main Steam Relief Isolation Valve	30LBA43AA001	Safeguard Building 4	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Open-Close/ Open-Close
Main Steam Relief Control Valve	30LBA13AA101	Safeguard Building 1	1^N 2^A	Yes	Yes	Position / Position	Open-Throttle-Close/ Open-Throttle-Close
Main Steam Relief Control Valve	30LBA23AA101	Safeguard Building 1	2^N 1^A	Yes	Yes	Position / Position	Open-Throttle-Close/ Open-Throttle-Close
Main Steam Relief Control Valve	30LBA33AA101	Safeguard Building 4	3^N 4^A	Yes	Yes	Position / Position	Open-Throttle-Close/ Open-Throttle-Close
Main Steam Relief Control Valve	30LBA43AA101	Safeguard Building 4	4^N 3^A	Yes	Yes	Position / Position	Open-Throttle-Close/ Open-Throttle-Close
MSIV	30LBA10AA002	Safeguard Building 1	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Close / Close
MSIV	30LBA20AA002	Safeguard Building 1	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Close / Close

Table 2.8.2-2—MSS Equipment I&C and Electrical Design
Sheet 2 of 5

Description	Tag Number(1)	Location(3)	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
MSIV	30LBA30AA002	Safeguard Building 4	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Close / Close
MSIV	30LBA40AA002	Safeguard Building 4	$1^N, 2^N, 3^N, 4^N$ $2^A, 1^A, 4^A, 3^A$	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Isolation Valve	30LBA14AA001	Safeguard Building 1	1^N 2^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Isolation Valve	30LBA24AA001	Safeguard Building 1	2^N 1^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Isolation Valve	30LBA34AA001	Safeguard Building 4	3^N 4^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Isolation Valve	30LBA44AA001	Safeguard Building 4	4^N 3^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Control Valve	30LBA14AA101	Safeguard Building 1	3^N 4^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Control Valve	30LBA24AA101	Safeguard Building 1	4^N 3^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Control Valve	30LBA34AA101	Safeguard Building 4	1^N 2^A	Yes	Yes	Position / Position	Close / Close
Main Steam Warming Control Valve	30LBA44AA101	Safeguard Building 4	2^N 1^A	Yes	Yes	Position / Position	Close / Close

Table 2.8.2-2—MSS Equipment I&C and Electrical Design
Sheet 3 of 5

Description	Tag Number(1)	Location(3)	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Main Steam Drain Isolation Valves	30LBA10AA441	Safeguard Building 1	1^N 2^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA10AA442	Safeguard Building 1	4^N 3^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA10AA444	Safeguard Building 1	3^N 4^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA20AA441	Safeguard Building 1	2^N 1^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA20AA442	Safeguard Building 1	3^N 4^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA20AA444	Safeguard Building 1	4^N 3^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA30AA441	Safeguard Building 4	3^N 4^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA30AA442	Safeguard Building 4	2^N 1^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA30AA444	Safeguard Building 4	1^N 2^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA40AA441	Safeguard Building 4	4^N 3^A	Yes	Yes	Position / Position	Close / Close

Table 2.8.2-2—MSS Equipment I&C and Electrical Design
Sheet 4 of 5

Description	Tag Number(1)	Location(3)	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Main Steam Drain Isolation Valves	30LBA40AA442	Safeguard Building 4	1^N 2^A	Yes	Yes	Position / Position	Close / Close
Main Steam Drain Isolation Valves	30LBA40AA444	Safeguard Building 4	2^N 1^A	Yes	Yes	Position / Position	Close / Close
Instruments							
Main Steam Line Pressure Transmitter	30LBA10CP811	Safeguard Building 1	1^N 2^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA10CP821	Safeguard Building 1	2^N 1^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA10CP831	Safeguard Building 1	3^N 4^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA10CP841	Safeguard Building 1	4^N 3^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA20CP811	Safeguard Building 1	1^N 2^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA20CP821	Safeguard Building 1	2^N 1^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA20CP831	Safeguard Building 1	3^N 4^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA20CP841	Safeguard Building 1	4^N 3^A	Yes	N/A	Pressure/ Pressure	N/A / N/A

Table 2.8.2-2—MSS Equipment I&C and Electrical Design
Sheet 5 of 5

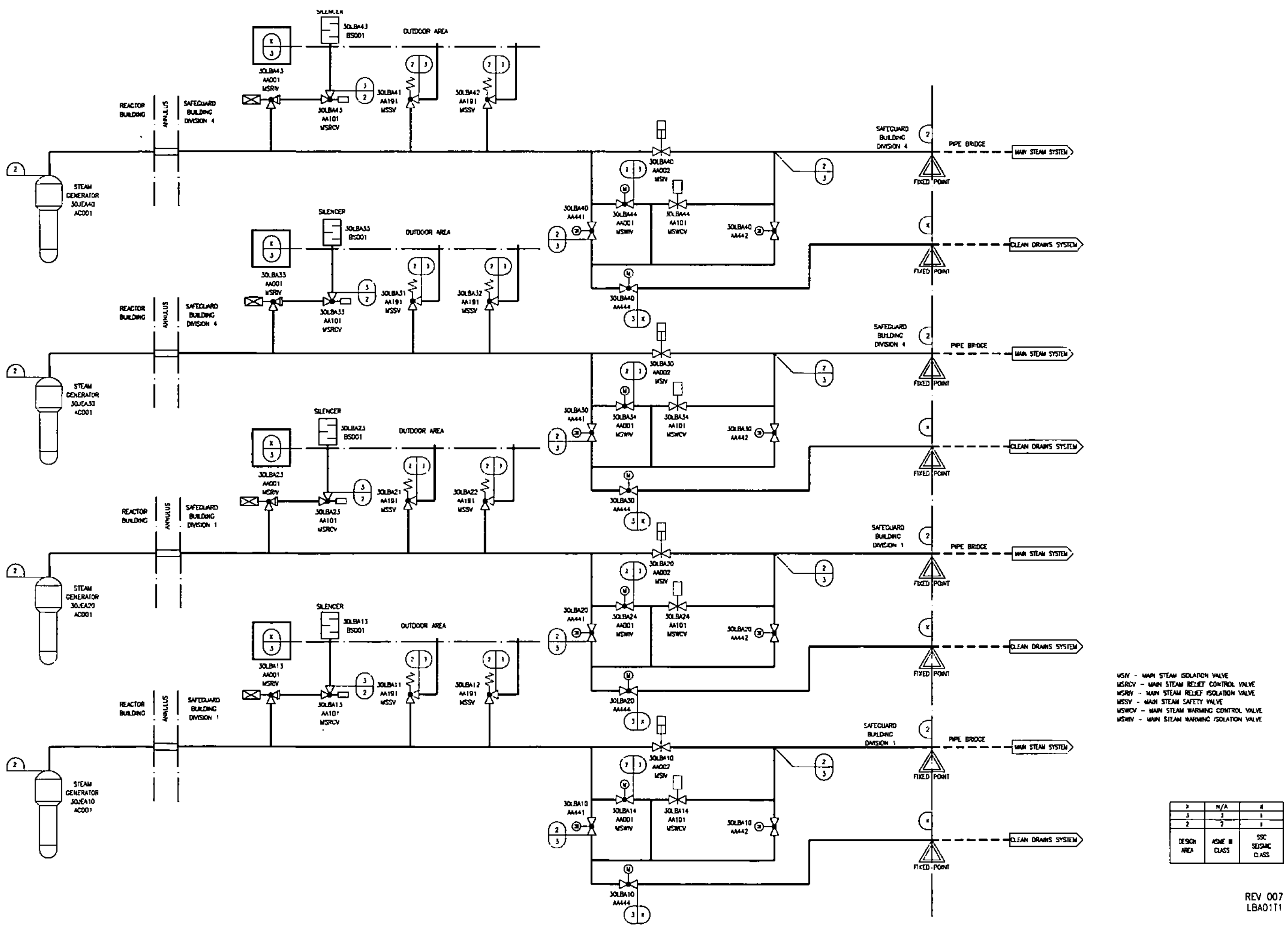
Description	Tag Number[1]	Location[3]	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Main Steam Line Pressure Transmitter	30LBA30CP811	Safeguard Building 4	1^N 2^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA30CP821	Safeguard Building 4	2^N 1^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA30CP831	Safeguard Building 4	3^N 4^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA30CP841	Safeguard Building 4	4^N 3^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA40CP811	Safeguard Building 4	1^N 2^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA40CP821	Safeguard Building 4	2^N 1^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA40CP831	Safeguard Building 4	3^N 4^A	Yes	N/A	Pressure/ Pressure	N/A / N/A
Main Steam Line Pressure Transmitter	30LBA40CP841	Safeguard Building 4	4^N 3^A	Yes	N/A	Pressure/ Pressure	N/A / N/A

1. Equipment tag numbers are provided for information only and are not part of the certified design.
2. ^{N} denotes the division equipment is normally powered from; ^{A} denotes the division equipment is powered from when alternate feed is implemented.
3. The functional description of Safeguard Buildings is described in Section 2.1.1.2.

Table 2.8.2-3—Main Steam System ITAAC
Sheet 1 of 7

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the MSS is as described in the Design Description of Section 2.8.2, Tables 2.8.2-1 and 2.8.2-2, and as shown on Figure 2.8.2-1.	An inspection of the as-built MSS functional arrangement will be performed.	The MSS conforms to the functional arrangement as described in the Design Description of Section 2.8.2, Tables 2.8.2-1 and 2.8.2-2, and as shown on Figure 2.8.2-1.
2.2	Deleted.	Deleted.	Deleted.
2.3	Physical separation exists between divisions of the safety-related portions of the MSS equipment as ~~shown on Figures 2.1.1-23, 2.1.1-24, 2.1.1-36, and 2.1.1-37.~~listed in Table 2.8.2-2.	An inspection will be performed to verify that the as-built safety-related portions of the MSS are located in separate valve rooms in Safeguard Buildings 1 and 4.	The divisions of the safety-related portions of the MSS are located in separate valve rooms in Safeguard Buildings 1 and 4 as listed in Table 2.8.2-2.~~shown on Figures 2.1.1-23, 2.1.1-24, 2.1.1-36, and 2.1.1-37.~~
3.1	Valves listed in Table 2.8.2-1 will be functionally designed and qualified such that each valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.	Tests or type tests of valves will be performed to demonstrate that the valves function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.	A report concludes that the valves listed in Table 2.8.2-1 are capable of performing their intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.
3.2	Deleted.	Deleted.	Deleted.

Figure 2.8.2-1—Main Steam Supply System Functional Arrangement
Sheet 1 of 2



2.8.6 Main Feedwater System

Design Description

1.0 System Description

The main feedwater system (MFWS) is a non-safety-related system with portions that are safety related. It transports and controls feedwater from the deaerator/feedwater storage tank to the steam generators (SG). It includes the startup/shutdown feedwater supply. The MFWS is safety related from the connections to the SGs to the fixed seismic restraint in each main feedwater line and to the fixed seismic restraint in each startup/shutdown feedwater line.

The MFWS provides the following safety-related function:

- Shut off main feedwater supply and startup/shutdown feedwater supply.

The MFWS provides the following non-safety-related functions:

- The MFWS supplies feedwater to the SGs for power operation.
- A startup/shutdown system supplies feedwater to the SGs for low-power operation.

2.0 Arrangement

2.1 The functional arrangement of the MFWS is as described in the Design Description of Section 2.8.6, Tables 2.8.6-1—MFWS Equipment Mechanical Design and 2.8.6-2—MFWS Equipment I&C and Electrical Design, and as shown on Figure 2.8.6-1—MFWS Functional Arrangement.

2.2 Deleted.

2.3 Physical separation exists between divisions of the safety-related portions of the MFWS equipment as ~~shown on Figures 2.1.1-23 and 2.1.1-36~~listed in Table 2.8.6-2.

3.0 Mechanical Design Features

3.1 Valves listed in Table 2.8.6-1 will be functionally designed and qualified such that each valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.

3.2 Check valves listed in Table 2.8.6-1 will function to change position as listed in Table 2.8.6-1 under normal operating conditions.

3.3 Deleted.

3.4 Equipment identified as Seismic Category I in Table 2.8.6-1 can withstand seismic design basis loads without a loss of safety function(s).

Table 2.8.6-2—MFWS Equipment I&C and Electrical Design
Sheet 1 of 2

Description	Tag Number(1)	Location(3)	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Main Feedwater Full Load Isolation Valves (MFWFLIV)	30LAB60AA001	SB 1	3^N, 1^N 4^A, 2^A	Yes	Yes	Position / Position	Close / Close
	30LAB70AA001	SB 1	4^N, 2^N 3^A, 1^A				
	30LAB80AA001	SB 4	1^N, 3^N 2^A, 4^A				
	30LAB90AA001	SB 4	2^N, 4^N 1^A, 3^A				
Main Feedwater Full Load Control Valves (MFWFLCV)	30LAB60AA101	SB 1	1^N, 2^A	Yes	Yes	Position / Position	Close / Close
	30LAB70AA101	SB 1	2^N, 1^A				
	30LAB80AA101	SB 4	3^N, 4^A				
	30LAB90AA101	SB 4	4^N, 3^A				
Main Feedwater Isolation Valves (MFWIV)	30LAB60AA002	SB 1	1^N, 2^A	Yes	Yes	Position / Position	Close / Close
	30LAB70AA002	SB 1	2^N, 1^A				
	30LAB80AA002	SB 4	3^N, 4^A				
	30LAB90AA002	SB 4	4^N, 3^A				

Table 2.8.6-2—MFWS Equipment I&C and Electrical Design
Sheet 2 of 2

Description	Tag Number(1)	Location(3)	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Main Feedwater Low Load Isolation Valves (MFWLLIV)	30LAB64AA001	SB 1	3^N, 4^A	Yes	Yes	Position / Position	Close / Close
	30LAB74AA001	SB 1	4^N, 3^A				
	30LAB84AA001	SB 4	1^N, 2^A				
	30LAB94AA001	SB 4	2^N, 1^A				
Main Feedwater Low Load Control Valves (MFWLLCV)	30LAB64AA101	SB 1	1^N, 2^A	Yes	Yes	Position / Position	Close / Close
	30LAB74AA101	SB 1	2^N, 1^A				
	30LAB84AA101	SB 4	3^N, 4^A				
	30LAB94AA101	SB 4	4^N, 3^A				
Main Feedwater Very Low Load Control Valves (MFWVLLCV)	30LAB64AA102	SB 1	1^N, 2^A	Yes	Yes	Position / Position	Close / Close
	30LAB74AA102	SB 1	2^N, 1^A				
	30LAB84AA102	SB 4	3^N, 4^A				
	30LAB94AA102	SB 4	4^N, 3^A				

1. Equipment tag numbers are provided for information only and are not part of the certified design.
2. ^{N} denotes the division equipment is normally powered from; ^{A} denotes the division equipment is powered from when alternate feed is implemented.
3. The functional description of Safeguard Buildings is described in Section 2.1.1.2.

Table 2.8.6-3—Main Feedwater System ITAAC
Sheet 1 of 6

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the MFWS is as described in the Design Description of Section 2.8.6, Tables 2.8.6-1 and 2.8.6-2, and as shown on Figure 2.8.6-1.	An inspection of the as-built MFWS functional arrangement will be performed.	The MFWS conforms to the functional arrangement as described in the Design Description of Section 2.8.6, Tables 2.8.6-1 and 2.8.6-2, and as shown on Figure 2.8.6-1.
2.2	Deleted.	Deleted.	Deleted.
2.3	Physical separation exists between divisions of the safety-related portions of the MFWS equipment as ~~shown on Figures 2.1.1-23 and 2.1.1-36~~listed in Table 2.8.6-2.	An inspection will be performed to verify that the as-built safety-related portions of the MFWS are located in separate valve rooms in Safeguard Buildings 1 and 4.	The divisions of the safety-related portions of the MFWS are located in separate valve rooms in Safeguard Buildings 1 and 4 as ~~shown on Figures 2.1.1-23 and 2.1.1-36~~listed in Table 2.8.6-2.
3.1	Valves listed in Table 2.8.6-1 will be functionally designed and qualified such that each valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.	Tests or type tests of valves will be performed to demonstrate that the valves function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.	A report concludes that the valves listed in Table 2.8.6-1 are capable of performing their intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions up to and including design basis accident conditions.
3.2	Check valves listed in Table 2.8.6-1 will function to change position as listed in Table 2.8.6-1 under normal operating conditions.	Tests will be performed to verify the ability of check valves to change position under normal operating conditions.	The check valves change position as listed in Table 2.8.6-1 under normal operating conditions.
3.3	Deleted.	Deleted.	Deleted.

Table 3.2.2-1—Classification Summary
Sheet 118 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
QJB	Piping and Valves Inside Containment from Containment Isolation Valve to LCQ	S	B	I	Yes	UJA	ASME Class 2[2]
AUXILIARY SYSTEMS							
JMM	**Leak-off System**						
JMM30	Containment Inflating/ Deflating Subsystem - Air Intake and Discharge Piping	NS	E	NSC	No	UFA	ANSI/ASME B31.1[6]
JMM10	Containment Leaktightness Test Subsystem - Contaminant Isolation Valves and Related Piping	S	B	I	Yes	UJA, UJB, UJH	ASME Class 2[2]
JMM10	Containment Leaktightness Test Subsystem - Remaining Piping	NS	E	NSC	No	UJA, UJB, UJH, UZT	ANSI/ASME B31.1[6]
KT	**Nuclear Island Drain & Vent Systems**						
30KTC10 AP004	Annular Sump Pump - UJB	NS	D	NSC	No	UJB	Manufacturer Standards
30KTA10 AA017	Containment Isolation Valve	S	B	I	Yes	UJA	ASME Class 2[2]

Table 3.2.2-1—Classification Summary
Sheet 145 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30LBA10/20/30/40 CP811/821/831/841	Pressure Transmitters - Reactor Safety	S	N/A	I	Yes	UJE	
30LBA10/20/30/40 CR811/821/831/841	Radiation Monitors - Reactor Safety	S	N/A	I	Yes	UJE	
30LBA13/23/33/43 BS001	Silencers - Including Break-Away Point	NS-AQ ~~S~~	D ~~C~~	II	Yes	UZT (Roof of 1UJE, 4UJE)	ANSI/ASME B31.1[6] RG 1.29[25] ~~ASME Class 3[3]~~
30LBA10/20/30/40 CT401	Temperature Sensors - Acceptance Testing - Thermowell Only	S	B	I	Yes	UJE	ASME Class 2[2]
30LBA10/20/30/40 CT002	Temperature Sensors - Binary Measurement - Thermowell Only	S	B	I	Yes	UJE	ASME Class 2[2]
30LBA10/20/30/40 AA501/502	Vent Isolation Valves	S	B	I	Yes	UJA	ASME Class 2[2]
30MAN11/13/21/23/ 31/33 AA051	Turbine Bypass Valves	NS	E	NSC	No	UMA	ANSI/ASME B31.1[6]
LBA	Main Steam Piping 30LBA/10/20/30/40 BR001/002 and Other Piping Directly Connected within UJA, UJE, and UJH	S	B	I	Yes	UJA, UJE, UJH	ASME Class 2 [2]

Table 3.2.2-1—Classification Summary
Sheet 146 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
LBA	Balance of LBA Piping within UJA, UJE, and UJH (Miscellaneous Vents and Drains, etc.)	NS-AQ	D	II	Yes	UJA, UJE, UJH	ANSI/ASME B31.1[6] RG 1.29[25]
LB	Balance of LB System Piping and Components	NS	E N/A	NSC	No	UMA, UMY	ANSI/ASME B31.1[6]
MAA, MAB, MAC	**Main Turbine Generator**	NS	N/A	NSC	No	UMA	
LCQ	**Steam Generator Blowdown System**						
LCQ	All LCQ Piping and Valves in 2UJE Downstream of Outer Containment Isolation Valve	NS-AQ	D	CS	No	2UJE	ANSI/ASME B31.3[9], ANSI/ASME B16.34[7], RG 1.143[25], RW-IIc
LCQ	All LCQ Piping and Valves in 4UJH Downstream of Outer Containment Isolation Valve	NS-AQ	D	II	Yes	4UJH	ANSI/ASME B31.1[6], ANSI/ASME B16.34[7], Safety-Related piping in close proximity RG 1.29[25]
30LCQ51 AC001/ 002	First Stage Blowdown Coolers	S	B	I	Yes	UJA	ASME Class 2[2]
30LCQ51 AA002	Inner Containment Isolation Valve	S	B	I	Yes	UJA	ASME Class 2[2]
30LCQ52 AA001	Inner Containment Isolation Valve	S	B	I	Yes	UJA	ASME Class 2[2]

Table 3.2.2-1—Classification Summary
Sheet 148 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30LCQ10/20/30/40 AA003	Steam Generator Common Leg Blowdown Isolation Valves	S	B	I	Yes	UJA	ASME Class 2[2]
30LCQ10/20/30/40 AA001	Steam Generator Hot Leg Blowdown Isolation Valves	S	B	I	Yes	UJA	ASME Class 2[2]
LCQ	UMY, UKA and UMA Piping and Valves	NS-AQ	D	CS	No	UMY, UMA, UKA	ANSI/ASME B31.3[9], ANSI/ASME B16.34[7], RG 1.143[25], RW-IIc
LCQ	All LCQ Piping Upstream of Outer Containment Isolation Valves	S	B	I	YES	UJA, 2UJE, 4UJH	ASME Class 2[2]
LA	**Feedwater System**						
LA	Balance of Feedwater System Piping and Components	NS	E ~~N/A~~	NSC	No	UMY, UMA	ANSI/ASME B31.1[6], ANSI/ASME B16.34[7], ASME VIII[8]
30LAB60/70/80/90 AA003	Check Valves Upstream of Steam Generators	S	B	I	Yes	UJA	ASME Class 2[2]
30LAB64/74/84/94 AA301/302	Differential Pressure Transmitter Isolation Valves	S	C	I	Yes	UJE	ASME Class 3[3]

Table 3.2.2-1—Classification Summary
Sheet 151 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30LAB60/70/80/90 AA307	Pressure Transmitter Isolation Valves	S	C	I	Yes	UJE	ASME Class 3[3]
30LAB60/70/80/90 CT708	Temperature Sensor Downstream of Flow Meters	S	N/A	I	Yes	UJE	
30LAB60/70/80/90 CT762	Temperature Sensors Downstream of FL/LL Junctions	S	N/A	I	Yes	UJE	
30LAB60/70/80/90 CT763	Temperature Sensors Downstream of FL/LL Junctions	S	N/A	I	Yes	UJE	
30LAB60/70/80/90 AA501	Vent Valves Downstream of FLCVs	S	C	I	Yes	UJE	ASME Class 3[3]
30LAB64/74/84/94 CG704-706	Very Low Load Control Valve Position Sensors	NS-AQ	N/A	II	Yes	UJE	RG 1.29[25]
30LAB64/74/84/94 AA102	Very Low Load Control Valves	S	C	I	Yes	UJE	ASME Class 3[3]
MAG	**Main Condenser**	NS	N/A	NSC	No	UMA	
LC, LD	**Condensate System**						
LC	Balance of Condensate Piping Inside Containment	~~NS-AQ~~S	~~D~~B	~~II~~I	Yes	UJA	ASME Class 2[2] ~~ANSI/ ASME B31.1[6] RG 1.29[25]~~

Table 3.2.2-1—Classification Summary
Sheet 152 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
LC	Balance of Condensate Piping, Excluding Condensate Polishing	NS	E	NSC	No	UMY, UMA	ANSI/ASME B31.1[6], ANSI/ASME B16.34[7]
30LCA90 AA403/ 408	Condensate Drain Second Isolation Valves	NS	E	NSC	No	2UJE	ANSI/ASME B31.1[6]
30LCA90 AA406/ 410	Condensate Drain Second Isolation Valves	~~NS-AQ~~S	~~D~~B	~~II~~I	Yes	UJA	ASME Class 2[2] ~~ANSI/ ASME B31.1[6] RG 1.29[25]~~
30JMK10 BQ304/305	Condensate Line Containment Penetrations	S	B	I	Yes	UJB	ASME Class 2[2]
LC	Condensate Piping Associated With Containment Penetrations	S	B	I	Yes	UJA	ASME Class 2[2]
LC	Condensate Piping From 2UJE to Deaerator	NS	E	NSC	No	UMY, UMA	ANSI/ASME B31.1[6], ANSI/ASME B16.34[7]
LD	Condensate Polishing	NS	E	NSC	No	UMA	ANSI/ASME B31.1[6], ANSI/ASME B16.34[7], ASME VIII[8]
30LCA90 AA511	Condensate Vent Isolation Valve	~~NS-AQ~~S	~~D~~B	~~II~~I	Yes	UJA	ASME Class 2[2] ~~ANSI/ ASME B31.1[6] RG 1.29[25]~~

Table 3.2.2-1—Classification Summary
Sheet 153 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30LCA90 AA503/ 508	Condensate Vent Isolation Valves	NS	E	NSC	No	2UJE	ANSI/ASME B31.1[6]
30LCA90 AA009	First Stage Blowdown Cooler Bypass Valve	NS AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA015-017	First Stage Blowdown Cooler Bypass Valves	NS AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA030/ 031	First Stage Blowdown Cooler Bypass Valves	NS AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA401/ 402	First Stage Blowdown Cooler Drain Isolation Valves	NS AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA501/ 502	First Stage Blowdown Cooler Vent Isolation Valves	NS AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA301-304	Flow Transmitter Isolation Valves	NS	E	NSC	No	2UJE	ANSI/ASME B31.1[6]
30LCA90 AA311-314	Flow Transmitter Isolation Valves	NS	E	NSC	No	2UJE	ANSI/ASME B31.1[6]

Table 3.2.2-1—Classification Summary
Sheet 155 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30LCA90 AA306/ 307	Leak Test Valves	NS AQS	DB	II I	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA010	Outbound Condensate Check Valve	NS	E	NSC	No	UMA	ANSI/ASME B31.1[6]
30LCA90 AA007	Outbound Condensate Isolation Valve	NS	E	NSC	No	2UJE	ANSI/ASME B31.1[6]
LC	Outbound Condensate Piping in 2UJE	NS	E	NSC	No	2UJE	ANSI/ASME B31.1[6]
30LCA90 AA101	Outbound Condensate Temperature Control Valve	NS	E	NSC	No	UMA	ANSI/ASME B31.1[6]
30LCA90 AA005	Outbound Containment Isolation Valve - Inside Containment	S	B	I	Yes	UJA	ASME Class 2[2]
30LCA90 AA006	Outbound Containment Isolation Valve - 1st Outside Containment	S	B	I	Yes	2UJE	ASME Class 2[2]
30LCA90 AA021	Outbound Containment Isolation Valve - 2nd Outside Containment	S	B	I	Yes	2UJE	ASME Class 2[2]
30LCA90 AA195	Pressure Relief Valve	S	B	I	Yes	UJA	ASME Class 2[2]

Table 3.2.2-1—Classification Summary
Sheet 156 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30LCA90 AA182/ 184/186/188/191	Pressure Relief Valves	NS-AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA310	Pressure Transmitter Isolation Valve	NS-AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 AA320/ 330	Pressure Transmitter Isolation Valve	NS-AQS	DB	HI	Yes	UJA	ASME Class 2[2] ANSI/ ASME B31.1[6] RG 1.29[25]
30LCA90 CP002/ 402/501	Pressure Transmitters	NS-AQ	N/A	II	Yes	UJA	RG 1.29[25]
30LCA90 CT001/002	Temperature Transmitters	NS-AQ	N/A	II	Yes	UJA	RG 1.29[25]
30LCA90 CT401-403	Temperature Transmitters	NS-AQ	N/A	II	Yes	UJA	RG 1.29[25]
QU	**Secondary Sampling System**						
QUA, QUB, QUD, QUE, QUG, QUP, QUS	Secondary Sampling System Piping and Valves in UMA, UBA, UQA	NS	E	NSC	No	UMA, UBA, UQA	ANSI/ASME B31.1[6]
QUC	Balance of QUC System Components	NS	E N/A	NSC	No	UFA, UKA	ANSI/ASME B31.1[6]

Table 3.2.2-1—Classification Summary
Sheet 157 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
~~QUS~~	~~Circulating Water Sampling System~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UQA~~	~~ANSI/ASME B31.1~~[6]
~~QUE~~	~~Condensate Sampling Systems~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UMA~~	~~ANSI/ASME B31.1~~[6]
~~QUP~~	~~Cooling System for Secondary Samples~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UMA~~	~~ANSI/ASME B31.1~~[6]
~~QUG~~	~~Demineralized Water Supply Sampling System~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UBA~~	~~ANSI/ASME B31.1~~[6]
~~QUA~~	~~Feedwater Sampling System~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UMA~~	~~ANSI/ASME B31.1~~[6]
~~QUB~~	~~Main Steam Sampling System~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UMA~~	~~ANSI/ASME B31.1~~[6]
~~QUD~~	~~Sampling System for Auxiliary Steam and Feedwater~~	~~NS~~	~~N/A~~	~~NSC~~	~~No~~	~~UMA~~	~~ANSI/ASME B31.1~~[6]
QUC	Sampling System for Steam Generator Blowdown System - Containment Penetrations, including Containment Isolation Valves	S	B	I	Yes	UJA, UFA	ASME Class 2[2]

Table 3.2.2-1—Classification Summary
Sheet 159 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
QUC14	SECSS (SG) sample cooler supply and return piping to the nearest valves	NS-AQ	D	II	Yes	UFA	ASME B31.1
MAJ	**Condenser Evacuation System Components**	NS	E N/A	NSC	No	UMA	ANSI/ASME B31.1[6], ASME VIII[8], HEI[21], Manufacturer Standards
MAW	**Turbine Gland Steam Sealing System Components**	NS	E N/A	NSC	No	UMA	ANSI/ASME B31.1[6], ASME VIII[8]
GD	**Steam Generator Blowdown Demineralizing System**						
GDA	Air Lines Connected to Backwash Air Vessel and Buffer Tank for Pneumatic Valves	NS	E	NSC	No	UKA	ANSI/ASME B31.1[6]
30GDA14 AT010	Backwash Air Vessel	NS	E	NSC	No	UKA	ASME VIII[8]
GDA	Balance of GDA Piping and Valves	NS-AQ	D	RS	No	UKA	ANSI/ASME B31.3[9], RG 1.143[25], RW-IIa
30GDA20 AT010	Buffer Tank for Pneumatic Valves	NS	E	NSC	No	UKA	ASME VIII[8]
30GDA10 AT010	Cartridge Filter	NS-AQ	D	RS	No	UKA	ASME VIII[8], RG 1.143[25], RW-IIa

Table 3.2.2-1—Classification Summary
Sheet 160 of 198

KKS System or Component Code	SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program (Note 5)	Location (Note 17)	Comments/ Commercial Code
30GDA10 AT001	Cation Exchanger	NS-AQ	D	RS	No	UKA	ASME VIII[8], RG 1.143[25], RW-IIa
30GDA13 AT012	Drain Buffer Tank	NS-AQ	D	RS	No	UKA	ASME VIII[8], RG 1.143[25], RW-IIa
30GDA10 AT002	Mixed Bed Exchanger	NS-AQ	D	RS	No	UKA	ASME VIII[8], RG 1.143[25], RW-IIa
30GDA10 AT011	Resin Trap	NS-AQ	D	RS	No	UKA	ASME VIII[8], RG 1.143[25], RW-IIa
30GDA13 AP001	Waste Water Pump	NS-AQ	D	RS	No	UKA	ASME VIII[8], RG 1.143[25], RW-IIa
PA	**Circulating Water Supply System Components**	NS	E ~~N/A~~	NSC	No	UMA, UZT	
PG	**Turbine Building Closed Cooling Water System Components**	NS	E ~~N/A~~	NSC	No	UMA, UZT	ASME B31.1[6], ASME VIII[8]

Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment
Sheet 121 of 200

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)			Safety Class (Note 4)		EQ Program Designation (Note 5)		
SIS TRN 4 Dbl. Gd. Pipe Press. Sensor	30JNK11CP005	34UJH	M	H	ES		SI	S	C/NM	Y (3)		Y (5)
SAHRS Suct. Ln. Dbl. Gd. Pipe Press. Ssr	30JNK11CP006	34UJH	M	H	ES		SI	S	C/NM	Y (3)		Y (5)
SIS TRN 3 Dbl. Gd. Pipe Press. Sensor, loc.	30JNK11CP504	33UJH	M	H	ES		SI	S	C/NM	Y (3)		Y (5)
SIS TRN 4 Dbl. Gd. Pipe Press. Sensor, loc.	30JNK11CP505	34UJH	M	H	ES		SI	S	C/NM	Y (3)		Y (5)
SAHRS Suct. Ln. Dbl. Gd. Pipe Pres. Ssr, loc.	30JNK11CP506	34UJH	M	H	ES		SI	S	C/NM	Y (3)		Y (5)
IRWST Temperature Sensor	30JNK11CT054	30UJA	H	H	ES		SI	S	C/NM		Y (4)	Y (5)
IRWST Temperature Sensor	30JNK11CT056	30UJA	H	H	ES		SI	S	C/NM		Y (4)	Y (5)
IRWST 3-Way Isolation Valve	30JNK20AA001	32UJH	M	H	ES	PAM	SI	S	C/NM	Y (3)		Y (5)
IRWST 3-Way Isolation Valve	30JNK30AA001	33UJH	M	H	ES	PAM	SI	S	C/NM	Y (3)		Y (5)
IRWST 3-Way Isolation Valve	30JNK40AA001	34UJH	M	H	ES	PAM	SI	S	C/NM	Y (3)		Y (5)
Main Steam System (MSS)												
MSIV Trn1	30LBA10AA002	31UJE	H	H	ES	PAM	SI	S	C/NM		Y (4)	Y (5)
LBA10CP811 I-V	30LBA10AA311	31UJE	H	M			SI	S				Y (5)
LBA10CP821 I-V	30LBA10AA321	31UJE	H	M			SI	S				Y (5)
LBA10CP831 I-V	30LBA10AA331	31UJE	H	M			SI	S				Y (5)
LBA10CP841 I-V	30LBA10AA341	31UJE	H	M			SI	S				Y (5)
MS Trn1 F-Meas I-V 1	30LBA10AA342	30UJA	H	H			SI	S				Y (5)
MS Trn1 F-Meas I-V 2	30LBA10AA343	30UJA	H	H			SI	S				Y (5)
MS Trn1 F-Meas I-V 3	30LBA10AA344	30UJA	H	H			SI	S				Y (5)
MSIV Trn1 Upstr D-V	30LBA10AA441	31UJE	H	M		PAM	SI	S	C/NM		Y (4)	Y (5)
MSIV Trn1 Dnstr D-V	30LBA10AA442	31UJE	H	M			SI	S	C/NM		Y (4)	Y (5)
MSIV Trn1 2nd D-V	30LBA10AA444	31UJE	H	M			SI	S	C/NM		Y (4)	Y (5)
MS Trn1 V-LN 1st I-V	30LBA10AA501	30UJA	H	H			SI	S				Y (5)
MS Trn1 V-LN 2nd I-V	30LBA10AA502	30UJA	H	H			SI	S				Y (5)
1st MSSV Trn1	30LBA11AA191	31UJE	H	M	ES		SI	S				Y (5)
2nd MSSV TRN1	30LBA12AA191	31UJE	H	M	ES		SI	S				Y (5)
MSRIV Trn 1	30LBA13AA001	31UJE	H	H	ES	PAM	SI	S	C/NM		Y (4)	Y (5)
MSRCV Trn 1	30LBA13AA101	31UJE	H	M	ES	PAM	SI	S	C/NM		Y (4)	Y (5)
LBA13CP401 I-V	30LBA13AA301	31UJE	H	M			SII	NS-AQ				Y (5)
MSRT1 Drn Flowrest	30LBA13BP701	31UJE	H	M			SII	NS-AQ				Y (5)
Silencer	30LBA13BS001	31UJE	M	M			SII	NS-AQ				Y (5)
MSIV Byp Ln I-V Trn1	30LBA14AA001	31UJE	H	M		PAM	SI	S	C/NM		Y (4)	Y (5)
MSIV Byp Ln C-V Trn1	30LBA14AA101	31UJE	H	M			SI	S	C/NM		Y (4)	Y (5)
MSIV Trn2	30LBA20AA002	32UJE	H	H	ES	PAM	SI	S	C/NM		Y (4)	Y (5)

Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment
Sheet 122 of 200

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)			Safety Class (Note 4)		EQ Program Designation (Note 5)	
LBA20CP811 I-V	30LBA20AA311	32UJE	H	M			SI	S			Y (5)
LBA20CP821 I-V	30LBA20AA321	32UJE	H	M			SI	S			Y (5)
LBA20CP831 I-V	30LBA20AA331	32UJE	H	M			SI	S			Y (5)
LBA20CP841 I-V	30LBA20AA341	32UJE	H	M			SI	S			Y (5)
MS Trn2 F-Meas I-V 1	30LBA20AA342	30UJA	H	H			SI	S			Y (5)
MS Trn2 F-Meas I-V 2	30LBA20AA343	30UJA	H	H			SI	S			Y (5)
MS Trn2 F-Meas I-V 3	30LBA20AA344	30UJA	H	H			SI	S			Y (5)
MSIV Trn2 Upstr D-V	30LBA20AA441	32UJE	H	M		PAM	SI	S	C/NM	Y (4)	Y (5)
MSIV Trn2 Dnstr D-V	30LBA20AA442	32UJE	H	M			SI	S	C/NM	Y (4)	Y (5)
MSIV Trn2 2nd D-V	30LBA20AA444	32UJE	H	M			SI	S	C/NM	Y (4)	Y (5)
MS Trn2 V-Ln 1st I-V	30LBA20AA501	30UJA	H	H			SI	S			Y (5)
MS Trn2 V-Ln 2nd I-V	30LBA20AA502	30UJA	H	H			SI	S			Y (5)
1st MSSV Trn2	30LBA21AA191	32UJE	H	M	ES		SI	S			Y (5)
2nd MSSV Trn2	30LBA22AA191	32UJE	H	M	ES		SI	S			Y (5)
MSRIV Trn 2	30LBA23AA001	32UJE	H	H	ES	PAM	SI	S	C/NM	Y (4)	Y (5)
MSRV Trn 2	30LBA23AA101	32UJE	H	M	ES	PAM	SI	S	C/NM	Y (4)	Y (5)
LBA23CP401 I-V	30LBA23AA301	32UJE	H	M			SII	NS-AQ			Y (5)
MSRT2 Drn Flowrest	30LBA23BP701	32UJE	H	M			SII	NS-AQ			Y (5)
Silencer	30LBA23BS001	30UJE	M	M			SII	NS-AQ			Y (5)
MSIV Byp Ln I-V Trn2	30LBA24AA001	32UJE	H	M		PAM	SI	S	C/NM	Y (4)	Y (5)
MSIV Byp Ln C-V Trn2	30LBA24AA101	32UJE	H	M			SI	S	C/NM	Y (4)	Y (5)
MSIV Trn3	30LBA30AA002	33UJE	H	H	ES	PAM	SI	S	C/NM	Y (4)	Y (5)
LBA30CP811 I-V	30LBA30AA311	33UJE	H	M			SI	S			Y (5)
LBA30CP821 I-V	30LBA30AA321	33UJE	H	M			SI	S			Y (5)
LBA30CP831 I-V	30LBA30AA331	33UJE	H	M			SI	S			Y (5)
LBA30CP841 I-V	30LBA30AA341	33UJE	H	M			SI	S			Y (5)
MS Trn3 F-Meas I-V 1	30LBA30AA342	30UJA	H	H			SI	S			Y (5)
MS Trn3 F-Meas I-V 2	30LBA30AA343	30UJA	H	H			SI	S			Y (5)
MS Trn3 F-Meas I-V 3	30LBA30AA344	30UJA	H	H			SI	S			Y (5)
MSIV Trn3 Upstr D-V	30LBA30AA441	33UJE	H	M		PAM	SI	S	C/NM	Y (4)	Y (5)
MSIV Trn3 Dnstr D-V	30LBA30AA442	33UJE	H	M			SI	S	C/NM	Y (4)	Y (5)
MSIV Trn3 2nd D-V	30LBA30AA444	33UJE	H	M			SI	S	C/NM	Y (4)	Y (5)
MS Trn3 V-Ln 1st I-V	30LBA30AA501	30UJA	H	H			SI	S			Y (5)
MS Trn3 V-Ln 2nd I-V	30LBA30AA502	30UJA	H	H			SI	S			Y (5)

Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment
Sheet 123 of 200

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
1st MSSV Trn3	30LBA31AA191	33UJE	H	M	ES SI	S	Y (5)
2nd MSSV Trn3	30LBA32AA191	33UJE	H	M	ES SI	S	Y (5)
MSRIV Trn 3	30LBA33AA001	33UJE	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
MSRV Trn 3	30LBA33AA101	33UJE	H	M	ES PAM SI	S C/NM	Y (4) Y (5)
LBA33CP401 I-V	30LBA33AA301	33UJE	H	M	SII	NS-AQ	Y (5)
MSRT3 Drn Flowrest	30LBA33BP701	33UJE	H	M	SII	NS-AQ	Y (5)
Silencer	30LBA33BS001	34UJE	M	M	SII	NS-AQ	Y (5)
MSIV Byp LN I-V Trn3	30LBA34AA001	33UJE	H	M	PAM SI	S C/NM	Y (4) Y (5)
MSIV Byp LN C-V Trn3	30LBA34AA101	33UJE	H	M	SI	S C/NM	Y (4) Y (5)
MSIV Trn4	30LBA40AA002	34UJE	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
LBA40CP811 I-V	30LBA40AA311	34UJE	H	M	SI	S	Y (5)
LBA40CP821 I-V	30LBA40AA321	34UJE	H	M	SI	S	Y (5)
LBA40CP831 I-V	30LBA40AA331	34UJE	H	M	SI	S	Y (5)
LBA40CP841 I-V	30LBA40AA341	34UJE	H	M	SI	S	Y (5)
MS Tr43 F-Meas I-V 1	30LBA40AA342	30UJA	H	H	SI	S	Y (5)
MS Tr43 F-Meas I-V 2	30LBA40AA343	30UJA	H	H	SI	S	Y (5)
MS Tr43 F-Meas I-V 3	30LBA40AA344	30UJA	H	H	SI	S	Y (5)
MSIV Trn4 Upstr D-V	30LBA40AA441	34UJE	H	M	PAM SI	S C/NM	Y (4) Y (5)
MSIV Trn4 Dnstr D-V	30LBA40AA442	34UJE	H	M	SI	S C/NM	Y (4) Y (5)
MSIV Trn4 2nd D-V	30LBA40AA444	34UJE	H	M	SI	S C/NM	Y (4) Y (5)
MS Trn4 V-Ln 1st I-V	30LBA40AA501	30UJA	H	H	SI	S	Y (5)
MS Trn4 V-Ln 2nd I-V	30LBA40AA502	30UJA	H	H	SI	S	Y (5)
1st MSSV Trn4	30LBA41AA191	34UJE	H	M	ES SI	S	Y (5)
2nd MSSV Trn4	30LBA42AA191	34UJE	H	M	ES SI	S	Y (5)
MSRIV Trn 4	30LBA43AA001	34UJE	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
MSRV Trn 4	30LBA43AA101	34UJE	H	M	ES PAM SI	S C/NM	Y (4) Y (5)
LBA43CP401 I-V	30LBA43AA301	34UJE	H	M	SII	NS-AQ	Y (5)
MSRT4 Drn Flowrest	30LBA43BP701	34UJE	H	M	SII	NS-AQ	Y (5)
Silencer	30LBA43BS001	34UJE	M	M	SII	NS-AQ	Y (5)
MSIV Byp Ln I-V Trn4	30LBA44AA001	34UJE	H	M	PAM SI	S C/NM	Y (4) Y (5)
MSIV Byp Ln C-V Trn4	30LBA44AA101	34UJE	H	M	SI	S C/NM	Y (4) Y (5)
Steam Generator Blowdown System (SGBS)							
SG1 Hot Leg BD Isolation Gate Valve	30LCQ10AA001	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)
SG1 Cold Leg BD Isolation Gate Valve	30LCQ10AA002	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)

Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment Sheet 197 of 200

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
FWDS Isolation Valve	30JMQ45AA001	34UJH	M	H	SII	NS-AQ SII	Y(5)
Gaseous Waste Processing System (GWPS)							
Containment Isolation Valve (UFA Side)	30KPL84AA002	30UFA	M	H	ES PAM SI	S C/NM	Y (3) Y (5)
Containment Isolation Valve (UJA side)	30KPL84AA003	30UJA	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
Containment Isolation Valve (UJA side)	30KPL85AA003	30UJA	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
Containment Isolation Valve (UFA side)	30KPL85AA004	30UFA	M	H	ES PAM SI	S C/NM	Y (3) Y (5)
Test Connection Isolation Valve	30KPL85AA202	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)
Condensate (Inside Containment) System (CS)							
Condensate to BD Coolers 1st Outside C I-V	30LCA90AA003	32UJE	M	M	ES PAM SI	S C/NM	Y (5)
Condensate Containment I-V	30LCA90AA004	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)
Condensate C I-V	30LCA90AA005	30UJA	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
Condensate from BD Coolers 1st Outside C I-V	30LCA90AA006	32UJE	M	M	ES PAM SI	S C/NM	Y (5)
Condensate BD Cooler I-V	30LCA90AA009	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate BD Cooler I-V	30LCA90AA015	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate BD Cooler I-V	30LCA90AA016	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate BD Cooler I-V	30LCA90AA017	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate to BD Coolers 2nd Outside C I-V	30LCA90AA020	32UJE	M	M	ES PAM SI	S C/NM	Y (5)
Condensate from BD Coolers 2nd Outside C I-V	30LCA90AA021	32UJE	M	M	ES PAM SI	S C/NM	Y (5)
Condensate BD Cooler Bypass I-V	30LCA90AA030	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate BD Cooler Bypass I-V	30LCA90AA031	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Shell Relief Valve	30LCA90AA182	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Shell Relief Valve	30LCA90AA184	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Bypass Relief Valve	30LCA90AA186	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate Relief Valve by BD Cooler	30LCA90AA188	30UJA	H	H	~~SII~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)

Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment Sheet 198 of 200

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
Condensate Relief Valve by BD Cooler	30LCA90AA191	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
CondensateContainmentPenetration Relief	30LCA90AA195	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)
Condensate BD Cooler Press Instr I-V	30LCA90AA310	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate BD Cooler Press Instr I-V	30LCA90AA320	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate BD Cooler Press Instr I-V	30LCA90AA330	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate Drain I-V	30LCA90AA401	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate Drain I-V	30LCA90AA402	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Drain Valve	30LCA90AA406	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Condensate Drain Valve	30LCA90AA410	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Vent Valve	30LCA90AA501	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Vent Valve	30LCA90AA502	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
BD Cooler Vent Valve	30LCA90AA511	30UJA	H	H	~~SI~~SI	~~NS-AQ~~S C/NM	Y (4) Y (5)
Central Gas Distribution (Nitrogen) System (CGDS)							
QJB Outside Containment Isolation Valve	30QJB40AA001	30UFA	M	H	ES PAM SI	S C/NM	Y (3) Y (5)
QJB INside Containment Isolation Valve	30QJB40AA002	30UJA	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
QJB Outside Containment Isolation Valve	30QJB40AA003	30UFA	M	H	ES PAM SI	S C/NM	Y (3) Y (5)
QJB Inside Containment Isolation Valve #	30QJB40AA004	30UJA	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
Operational Chilled Water System - Nuclear Island (OCWS)							
Outside Containment Isolation Valve #1	30QNJ41AA002	30UFA	M	H	ES PAM SI	S C/NM	Y (3) Y (5)
Inside Containment Isolation Valve #1	30QNJ41AA003	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)
Inside Containment Isolation Valve #2	30QNJ41AA027	30UJA	H	H	ES PAM SI	S C/NM	Y (4) Y (5)
Outside Containment Isolation Valve #2	30QNJ41AA028	30UFA	M	H	ES PAM SI	S C/NM	Y (3) Y (5)
OCWS Thermal Relief	30QNJ41AA192	30UJA	H	H	ES SI	S C/NM	Y (4) Y (5)