ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Tuesday, August 31, 2010 8:27 AM
To: Tesfaye, Getachew
Cc: KOWALSKI David (AREVA); Hearn, Peter
Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Attachments: Blank Bkgrd.gif; DRAFT RESPONSE RAI 351 Q.09.02.05-22.pdf; DRAFT FSAR Changes RAI 351 Q.09.02.05-22 REV.pdf

Importance: High

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Sent: Tuesday, August 31, 2010 7:10 AM
To: BRYAN Martin (External RS/NB)
Cc: BALLARD Bob (EP/PE); CONNELL Kevin (EP/PP); HUDDLESTON Stephen (EP/PE); EDWARDS Harold (EP/PE); GARDNER Darrell (RS/NB); MCINTYRE Brian (RS/NB); SLOAN Sandra (RS/NB)
Subject: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Importance: High

Marty:

Please transmit to Getachew Tesfaye the attached partial set of DRAFT responses to RAI 351 questions. This response will be discussed at today's (8/31/10) FSAR Chapter 9 Weekly Telecon/GoToMeeting with the NRC.

Attached are the following DRAFT response(s):

- Response to RAI 351 - Question 09.02.05-22.

NOTE: The FSAR changes associated with this response include a revision to U.S. EPR FSAR Tier 2, Figure 3.8-101-Essential Service Water Building Section A-A. This figure reflects Security Sensitive Information and is not part of the attached FSAR changes. This figure can be discussed during the telecon.

Note that this DRAFT response has not been through the final Licensing review/approval process; nor does it reflect technical editing.

Please call me if you have any questions. Thanks.

David J. Kowalski, P.E.
Principal Engineer
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Response to

Request for Additional Information No. 351, Supplement 2

01/15/2010

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.05 - Ultimate Heat Sink
SRP Section: 09.05.01 - Fire Protection Program

Application Section: FSAR Chapter 9

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

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Question 09.02.05-22:

Follow-up to RAI 175, Question 9.2.5-04:

The ultimate heat sink (UHS) must be able to withstand natural phenomena without the loss of function in accordance with General Design Criteria (GDC) 2 requirements. The system description does not explain the functioning and maximum allowed combined seat leakage of safety-related boundary isolation valves at the UHS basin to ensure UHS integrity and operability during seismic events and other natural phenomena. Consequently, additional information needs to be included in Tier 2 Section 9.2.5 of the Final Safety Analysis Report (FSAR) to fully describe: (a) the assurance of UHS integrity and operability by the safety-related boundary isolation valves so that common-cause simultaneous failure of all non-safety-related UHS piping will not compromise the UHS safety functions during seismic events, (b) provide the maximum allowed combined seat leakage that assures that the safety-related UHS boundary isolation valves and periodic testing that will be performed to ensure that the specified limit will not be exceeded, and (c) a description of any other performance assumptions that pertain to the boundary isolation valves or other parts of the system including blowdown that are necessary to assure the capability of the UHS to perform its safety functions during natural phenomena. In addition, under FSAR, Section 9.2.5.5, "Safety Evaluation," it states that "The UHS pump buildings and cooling towers are designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles and other natural phenomena." However, there is no mention of the piping system being designed to meeting these conditions.

Based on the staff's review of the applicant's response to RAI 9.2.5-04 (ID1817/6797) AREVA #175, Supplement 1, the following were determined as unresolved and needed further clarification/resolution by the applicant.

The applicant response indicates that non-safety-related system piping is seismically analyzed for adverse interaction with safety-related structures, systems, and components and refers to FSAR Tier 2, Section 3.7.3.8, for additional information. However, the response did not address the effects of flooding due to failure of non-safety-related piping associated with the essential service water system and the ultimate heat sink, and additional information is needed to assure that the consequences of flooding in this regard will not pose a threat to safety-related equipment. Additionally, since the blowdown piping for the cooling tower basins is non-safety-related, the effects of cooling tower basin overflow due to torrential rains and hurricanes need to be addressed. The FSAR should be revised to include this information as appropriate.

Response to Question 09.02.05-22:

In accordance with Section 3.4.3.9 of the U.S. EPR FSAR, as modified by response to RAI 218 Question 03.04.01-12, the Essential Service Water Pump Buildings (ESWPB) are physically separated by division and connected to their respective cooling tower. The flooding analysis considers a postulated pipe failure in the Essential Service Water System (ESWS) piping to be the bounding internal flooding source. In the event of an ESWS piping failure in the building, the affected division of the ESWS is considered lost. As indicated in Section 3.4.1 of the U.S. EPR FSAR, if there is a failure of one division of ESWS and one division is out for maintenance, there are two remaining divisions of ESWS to perform the system safety function.

The non-safety-related dedicated ESW system would not be operating during a DBA; therefore, it is not a source of flooding.

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As indicated in U.S. EPR FSAR Tier 2, Section 9.2.5.3, the UHS blowdown is automatically secured by safety-related valves during the initial 72-hour post accident period. The non-safety-related ESW blowdown piping and debris removal piping inside Essential Service Water Pump Buildings (UQB) and downstream of isolation valves 30PEB 10/20/30/40 AA015, AA016 are shut-off from the ESW pump discharge which is the pressure source that could cause flooding. Therefore, the non-safety-related ESW blowdown piping and debris removal piping inside Essential Service Water Pump Buildings (UQB) is not a source of flooding.

As indicated in U.S. EPR FSAR Tier 2, Section 9.2.5.5, “the cooling towers must operate for a nominal 30 days following a LOCA without requiring any makeup water to the source or it must be demonstrated that replenishment or use of an alternate or additional water supply can provide continuous capability of the heat sink to perform its safety-related functions. The tower basin contains a minimum 72-hour supply of water.” The normal makeup water system would not be operating during a DBA. Any required make-up would be provided by the safety-related emergency makeup system. Also the water from a break of normal makeup water system would overflow into the UHS basin where it would be maintained by UHS water level control features so as not to render the associated train of UHS inoperable. Therefore, the non-safety-related ESW normal makeup water piping upstream of isolation valves 30PED10/20/30/40 AA019 and the chemical treatment piping are not a flooding concern.

In the event of torrential rains and hurricanes, water can enter the UHS tower basin only through the air inlet opening (air intake) and air outlet opening (fans) area of the cooling tower portions of the ESW buildings. Refer to Figure 3.8-95 through Figure 3.8-102 of the U.S. EPR FSAR for details of the ESW building layout.

The makeup water flow to the cooling tower basin automatically stops once the water level in the cooling tower basin rises to the pre-set high limit in either an operating or standby division. If the water level in the cooling tower basin continues to rise, an alarm will alert the operator at the high level. Operator action will be performed to remove water from the cooling tower basin through the use of the safety related emergency blowdown to maintain normal water level. Additionally based on Figure 3.8-101, there is approximately four feet of height available from the high water level alarm setpoint to the bottom of door that forms the first point of entry into the ESW pump room.

As shown in the revised FSAR Figure 9.2.1-1 the complete emergency blowdown flow path is classified as safety related to assure its functional availability during any design basis event. The emergency blowdown discharges outside of the building and is located above the flood level. The emergency blowdown pipe exiting the building is protected from tornado generated missiles by the building structure. .

Based on the above, no adverse effects on the safety related equipment is anticipated within the ESW pump room if the water level rises due to torrential rains and hurricanes.

To ensure the function of the safety related filter, an alternate filter blowdown is provided as shown in the FSAR Figure 9.2.1-1 being revised. The new line includes valve 30PEB10/20/30/40AA004, Filter Emergency Blowdown Isolation Valve.

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FSAR Impact:

The following parts of the U.S. EPR FSAR will be revised as described in the response and indicated in the attached markup.

Tier 1, Table 2.7.11-1

Tier 1, Table 2.7.11-2

Tier 1, Figure 2.7.11-1, Sheets 1-4

Tier 2, Table 3.2.2-1

Tier 2, Table 3.9.6-2

Tier 2, Figure 3.8-101

Tier 2, Table 3.10-1

Tier 2, Table 3.11-1

Tier 2, Section 9.2.1.3.3

Tier 2, Section 9.2.1.7

Tier 2, Figure 9.2.1-1, Sheet 1

Tier 2, Section 9.2.5.3.1

Tier 2, Section 9.2.5.5

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Table 2.7.11-1—Essential Service Water System Equipment Mechanical Design (8 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME Code Section III	Function	Seismic Category
ESWS Pump Division 1	30PEB10AP001	ESW Pump Structure Division 1	Yes	Run	I
Recirc Isolation Valve Division 1	30PEB10AA002	ESW Pump Structure Division 1	Yes	Close	I
Emer. Blowdown Isolation Valve Division 1	30PEB10AA003	ESW Pump Structure Division 1	Yes	Close	I INSERT /
Pump Discharge Isolation Valve Division 1	30PEB10AA005	ESW Pump Structure Division 1	Yes	Open	I
Filter Blowdown Isolation Valve Division 1	30PEB10AA015	ESW Pump Structure Division 1	Yes	Close	I
Blowdown Isolation Valve Division 1	30PEB10AA016	ESW Pump Structure Division 1	Yes	Close	I
Pump Discharge Check Valve Division 1	30PEB10AA204	ESW Pump Structure Division 1	Yes	Open	I
Tower Isolation Valve Division 1	30PED10AA010	ESW Pump Structure Division 1	Yes	Open	I
Tower Bypass Isolation Valve Division 1	30PED10AA011	ESW Pump Structure Division 1	Yes	Close	I
Makeup Water Isolation Valve Division 1	30PED10AA019	ESW Pump Structure Division 1	Yes	Close	I

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INSERT for RAI 351 Q 09.02.05-22

INSERT 1 -- Table 2.7.11-1

Description	Tag Number	Location	ASME Code Section III	Function	Seismic Category
Filter Emergency Blowdown Isolation Valve Division 1	30 PEB10 AA004	ESW Pump Structure Division 1	Yes	Open	I
Filter Emergency Blowdown Isolation Valve Division 2	30 PEB20 AA004	ESW Pump Structure Division 2	Yes	Open	I
Filter Emergency Blowdown Isolation Valve Division 3	30 PEB30 AA004	ESW Pump Structure Division 3	Yes	Open	I
Filter Emergency Blowdown Isolation Valve Division 4	30 PEB40 AA004	ESW Pump Structure Division 4	Yes	Open	I

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Table 2.7.11-2—Essential Service Water System Equipment I&C and Electrical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	IEEE Class 1E (2)	PACS	MCR/RSS Displays	MCR/RSS Controls
ESWS Pump Division 1	30PEB10AP001	ESW Pump Structure Division 1	Division 1	Yes	On-Off/ On-Off	Start-Stop/ Start-Stop
Recirc Isolation Valve Division 1	30PEB10AA002	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A
Emer. Blowdown Isolation Valve Division 1	30PEB10AA003	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A INSERT 2
Pump Discharge Isolation Valve Division 1	30PEB10AA005	ESW Pump Structure Division 1	Division 1	Yes	Pos/Pos	Open-Close/Open-Close
Filter Blowdown Isolation Valve Division 1	30PEB10AA015	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A
Blowdown Isolation Valve Division 1	30PEB10AA016	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A
Tower Isolation Valve Division 1	30PED10AA010	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A
Tower Bypass Isolation Valve Division 1	30PED10AA011	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A
Makeup Water Isolation Valve Division 1	30PED10AA019	ESW Pump Structure Division 1	Division 1	Yes~~No~~	Pos/N/A	Open-Close/N/A

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INSERT 2 -- Table 2.7.11-2

Description	Tag Number	Location	IEEE Class 1E	PACS	MCR/RSS Displays	MCR/RSS Controls
Filter Emergency Blowdown Isolation Valve Division 1	30 PEB10 AA004	ESW Pump Structure Division 1	Division 1	Yes	Pos/NA	Open-Close/N/A
Filter Emergency Blowdown Isolation Valve Division 2	30 PEB20 AA004	ESW Pump Structure Division 2	Division 2	Yes	Pos/NA	Open-Close/N/A
Filter Emergency Blowdown Isolation Valve Division 3	30 PEB30 AA004	ESW Pump Structure Division 3	Division 3	Yes	Pos/NA	Open-Close/N/A
Filter Emergency Blowdown Isolation Valve Division 4	30 PEB40 AA004	ESW Pump Structure Division 4	Division 4	Yes	Pos/NA	Open-Close/N/A

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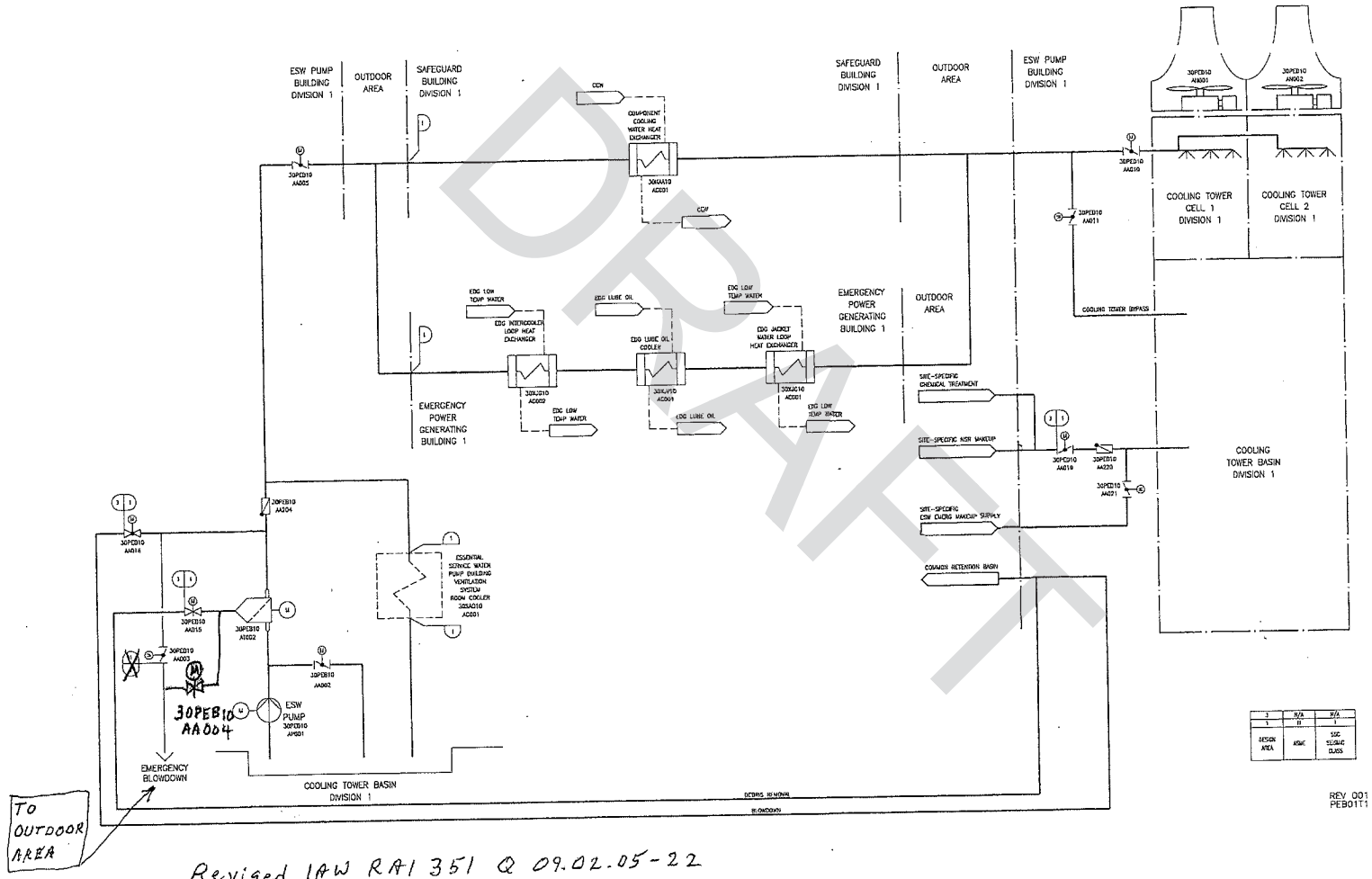
Figure 2.7.11-1—Essential Service Water System Functional Arrangement
Sheet 1 of 9



TO OUTDOOR AREA

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Figure 2.7.11-1—Essential Service Water System Functional Arrangement
Sheet 2 of 9

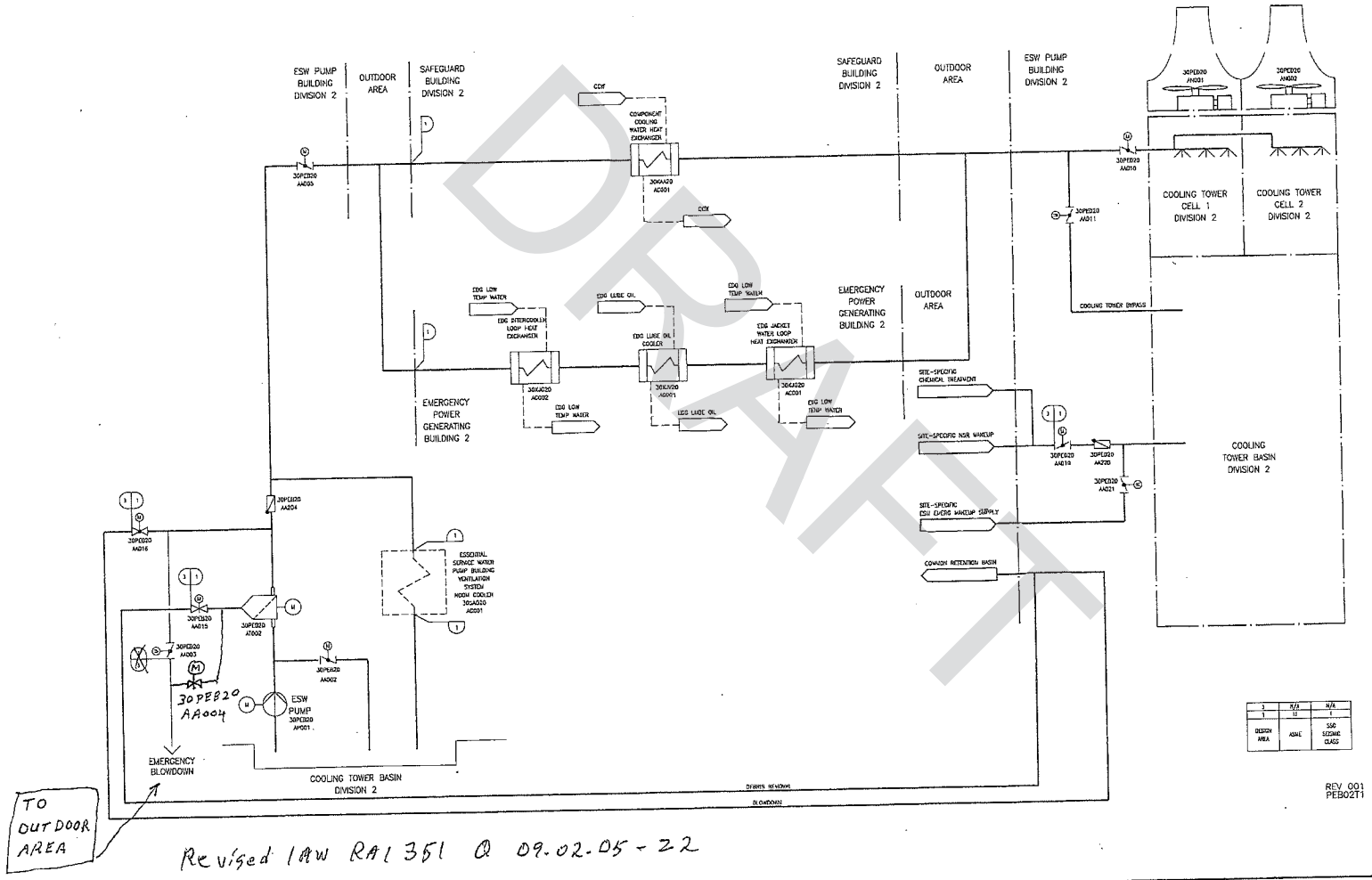

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Figure 2.7.11-1—Essential Service Water System Functional Arrangement
Sheet 3 of 9

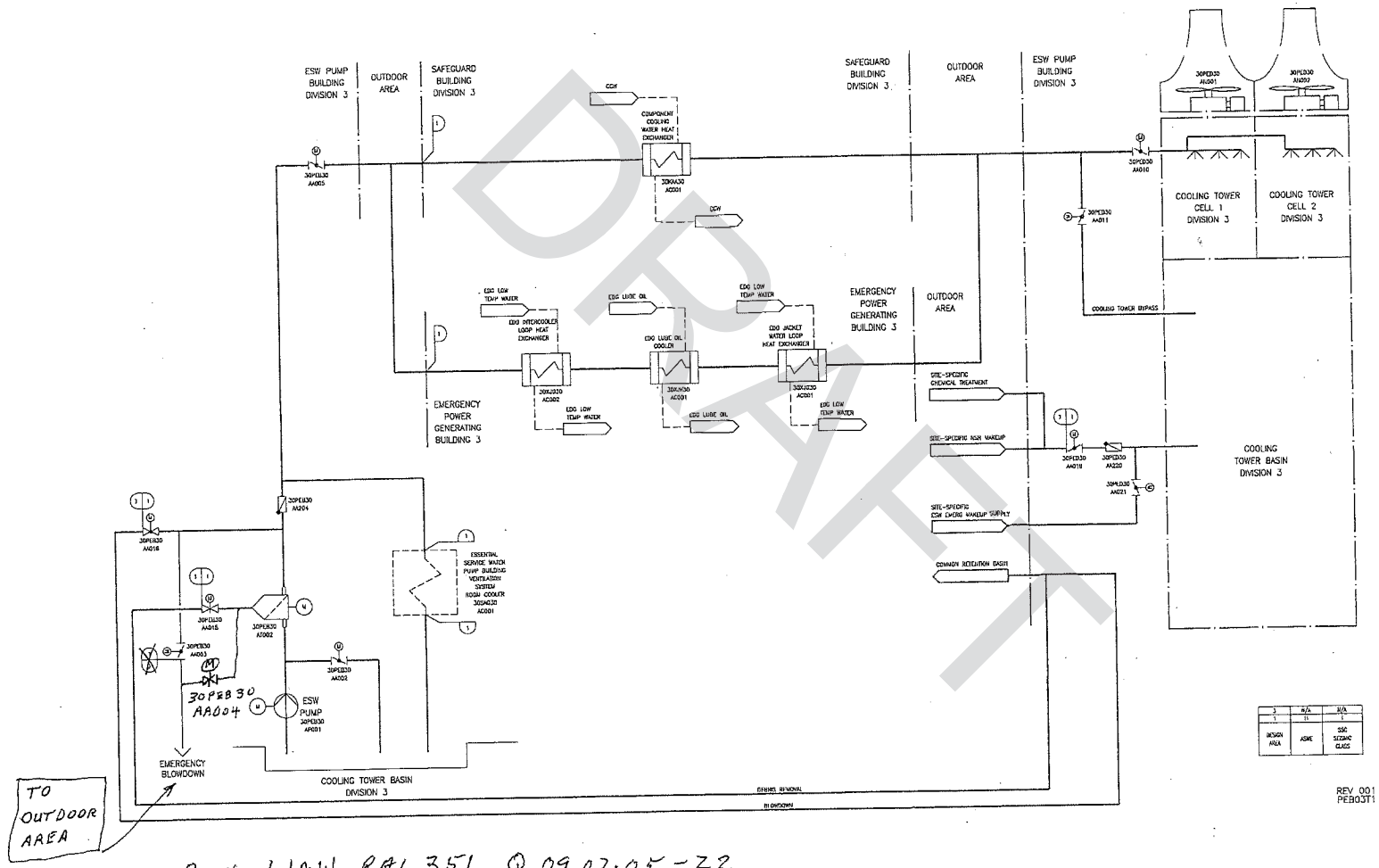

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Figure 2.7.11-1—Essential Service Water System Functional Arrangement
Sheet 4 of 9

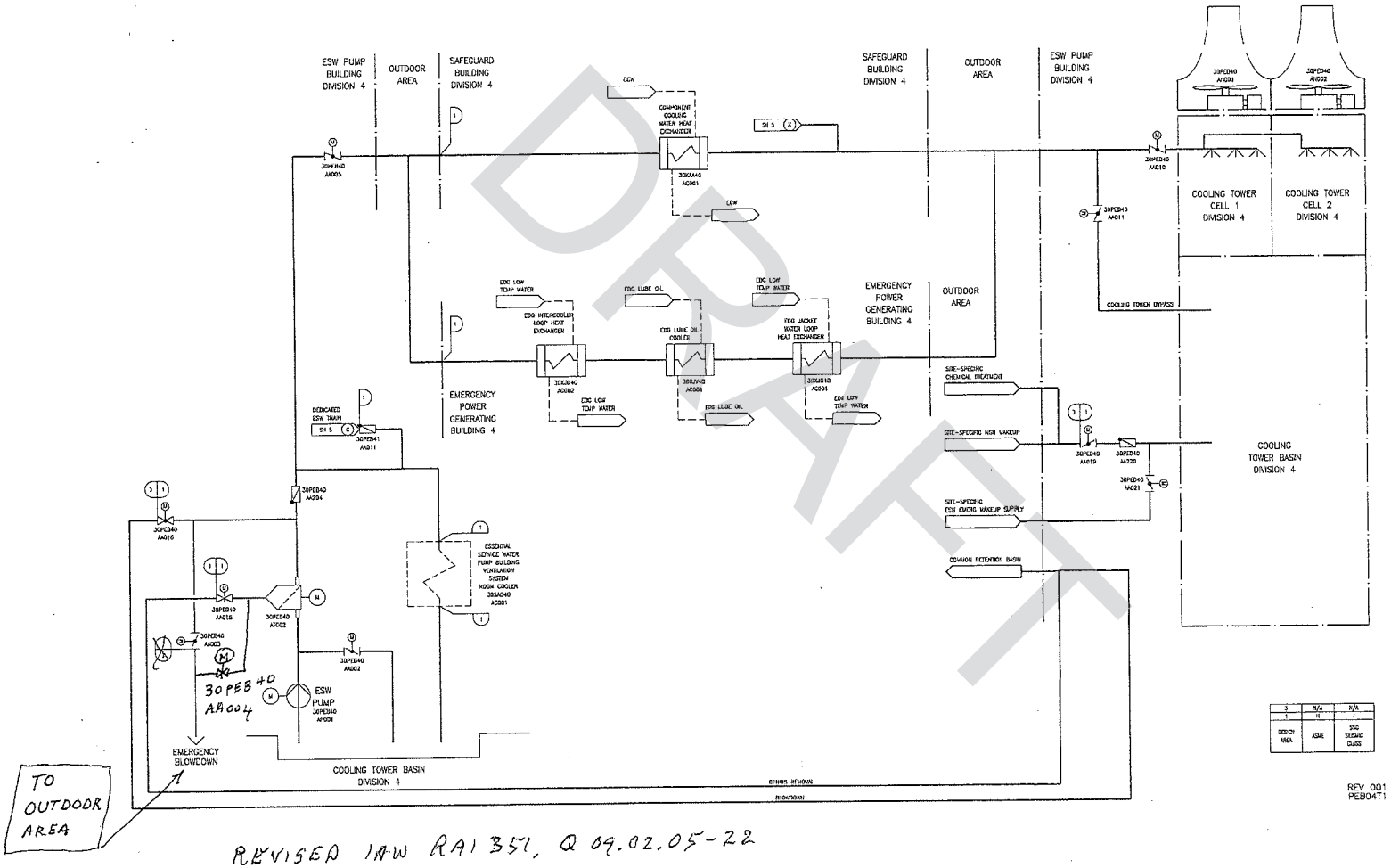

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Table 3.2.2-1—Classification Summary
Sheet 94 of 182

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
PEB80	Dedicated ESW Valves	NS	E	NSC	No	4UQB, UJH	ANSI/ASME B31.1[6]
PEB10/20/30/40	ESW Blowdown Piping Outside UQB	NS	E	NSC	No	UZT	ANSI/ASME B31.1[6]
30PEB10/20/30/40 AA003	ESW Blowdown Isolation Valve	S	C	I	Yes	UQB	ASME Class 3[3]
30PEB10/20/30/40 AA015/016	ESW Blowdown Isolation Valve	S	C	I	Yes	UQB	ASME Class 3[3]
PEB10/20/30/40	ESW Blowdown Piping inside UQBs and downstream of Isolation Valves 30PEB 10/20/30/40 ~~AA003~~, AA015, AA016	NS	E	NSC	No	UQB	ANSI/ASME B31.1[6]
PEB10/20/30/40	ESW Blowdown Piping upstream of Isolation Valves 30PEB 10/20/30/40 ~~AA003~~, AA015, AA016	S	C	I	Yes	UQB	ASME Class 3[3]
30PED10/20/30/40 AA022	ESW Chemical Treatment System Isolation Valves	NS	E	NSC	No	UQB	ANSI/ASME B31.1[6]

INSERT 3

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Table 3.9.6-2—Inservice Valve Testing Program Requirements
Sheet 78 of 102

Valve Identification Number[1]	Description/ Valve Function	Valve Type[2]	Valve Actuator[3]	ASME Code Class[4]	ASME OM Code Category[5]	Active / Passive[6]	Safety Position[7]	Test Required[8,10]	Test Frequency[9]	Comments
30LBA43AA101	Main Steam Relief Control Valve	GB	MO	2	A	A	O/C	ET ST LT PI	Q Q 2Y 2Y	
30LBA11AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA21AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA31AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA41AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA12AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA22AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA32AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30LBA42AA191	Main Steam Safety Valve	RV	SA	2	A/C	A	O/C	ET LT	5Y 5Y	
30PEB10AA002	Recirc Isolation PEB10 AP001	BF	MO	3	B	A	C	ET PI	Q 2Y	
30PEB10AA003	Emergency Blowdown Isolation PEB10	BF	MO	3	~~B~~A	A	C	ET PI LT	Q 2Y 2Y	

INSERT 4

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INSERT 3 -- Table 3.2.2-1

30PEB10/20/30/40AA004	ESW Filter Emergency Blowdown Isolation Valve	S	C	I	Yes	UQB	ASME Class 3[3]
PEB10/20/30/40	Emergency Blowdown and Emergency Debris Filter Blowdown Piping to its terminal end outside of wall of UQB.	S	C	I	Yes	UQB	ASME Class 3[3]

INSERT 4 -- Table 3.9.6-2

30PEB10AA004	Filter Emergency Blowdown Isolation Valve	GT	MO	3	A	C	ET PI LT	Q 2Y 2Y	
30PEB20AA004	Filter Emergency Blowdown Isolation Valve	GT	MO	3	A	C	ET PI LT	Q 2Y 2Y	
30PEB30AA004	Filter Emergency Blowdown Isolation Valve	GT	MO	3	A	C	ET PI LT	Q 2Y 2Y	
30PEB40AA004	Filter Emergency Blowdown Isolation Valve	GT	MO	3	A	C	ET PI LT	Q 2Y 2Y	

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Table 3.10-1—List of Seismically and Dynamically Qualified Mechanical and Electrical Equipment
Sheet 88 of 204

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)		Safety Class (Note 4)		EQ Program Designation (Note 5)	
T Dnstr CVCS HP Cl2	30KAB70CT082	30UJA11016	H	H		SI	S	C/NM	Y (4)	Y (5)
V 1 Upstr *QN* Users	30KAB80AA015	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V 2 Upstr *QN* Users	30KAB80AA016	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V Dnstr *QN* Users	30KAB80AA019	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
CK-V Rten Com 1B NC	30KAB80AA020	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V F KAB80 CF060	30KAB80AA314	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V F KAB80 CF060	30KAB80AA315	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V F KAB80 CF061	30KAB80AA316	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V F KAB80 CF061	30KAB80AA317	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
D-V Sup Com1B NC	30KAB80AA403	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
D-V Retn Com1B NC	30KAB80AA406	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
D-V Retn Com1B NC	30KAB80AA407	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V-V Sup Com1B NC	30KAB80AA501	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
V-V Retn Com1B NC	30KAB80AA504	31UJH10004	M	H	ES	SI	S	C/NM	Y (3)	Y (5)
F Upstr QNA21 AC002	30KAB80CF060	31UJH10004	M	H		SI	S	C/NM	Y (3)	Y (5)
F Dnstr KAB80 Chil	30KAB80CF061	31UJH10004	M	H		SI	S	C/NM	Y (3)	Y (5)
Essential Service Water System (ESWS)										
CCW HX Inlet Isolation Vlv	30PEB10AA007	31UJH05026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX Outlet Isolation Vlv	30PEB10AA009	31UJH05026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX Tube Side Thermal Relief Vlv	30PEB10AA192	31UJH05026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX Inlet Side DP Root Vlv	30PEB10AA306	31UJH10026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX Outlet Side DP Root Vlv	30PEB10AA307	31UJH10026	M	H		SI	S	C/NM	Y (3)	Y (5)
ESW Drain Isolation Vlv	30PEB10AA401	31UJH01026	M	H		SI	S	C/NM	Y (3)	Y (5)
ESW Drain Isolation Vlv	30PEB10AA402	31UJH10026	M	H		SI	S	C/NM	Y (3)	Y (5)
ESW Drain Isolation Vlv	30PEB10AA403	31UJH01026	M	H		SI	S	C/NM	Y (3)	Y (5)
ESW Drain Isolation Vlv	30PEB10AA405	31UJH01026	M	H		SI	S	C/NM	Y (3)	Y (5)
ESW Drain Isolation Vlv	30PEB10AA407	31UJH01026	M	H		SI	S	C/NM	Y (3)	Y (5)
ESW Drain Isolation Vlv	30PEB10AA408	31UJH01026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX Tube Side Vent Vlv	30PEB10AA508	31UJH10026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX Tube Side Vent Vlv	30PEB10AA509	31UJH10026	M	H		SI	S	C/NM	Y (3)	Y (5)
Orifice Plate	30PEB10BP002	31UJH05026	M	H		SI	S	C/NM	Y (3)	Y (5)
CCW HX DP Measurement	30PEB10CP004	31UJH05026	M	H		SI	S			Y (5)
CCW HX Outlet Temp Measurement	30PEB10CT002	31UJH05026	M	H		SI	S			Y (5)

INSERT 5

Revised IAW RAI 351 Q 09.02-05-22

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Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment
Sheet 54 of 150

Name Tag (Equipment Description)	Tag Number	Local Area KKS ID (Room Location)	EQ Environment (Note 1)	Radiation Environment Zone (Note 2)	EQ Designated Function (Note 3)	Safety Class (Note 4)	EQ Program Designation (Note 5)
SW Pump Bldg Cooler Pressure Indicator	30PEB31CP501	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SAQ HX Outlet Temp Measurement	30PEB31CT001	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA002 Valve Motor Actuator	30PEB40AA002	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA003 Valve Motor Actuator	30PEB40AA003	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA005 Valve Motor Actuator	30PEB40AA005	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA015 Valve Motor Actuator	30PEB40AA015	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AA016 Valve Motor Actuator	30PEB40AA016	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor Heater, Train 4	30PEB40AH500	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Motor, Train 4	30PEB40AP001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PEB40 AT002 Filter Motor Actuator	30PEB40AT002	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Flow Indicator	30PEB40CF001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
CCW HX Outlet Flow Measurement	30PEB40CF002	34UJH05026	M	H	ES ~~PAM~~ SI	S 1E	Y (2) Y (5)
UHS Tower Basin Level Indicator	30PEB40CL001	34URB01003	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Pressure Indicator	30PEB40CP002	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Filter Diff Pressure Indicator	30PEB40CP003	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
ESW Pump Discharge Thermocouple	30PEB40CT001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SAQ HX DP Measurement	30PEB41CP001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SW Pump Bldg Cooler Pressure Indicator	30PEB41CP501	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
SAQ HX Outlet Temp Measurement	30PEB41CT001	34UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
~~ESW Pump Motor, Dedicated Train~~	~~30PEB80AP001~~	~~34UQB02001~~	~~M~~	~~M~~	~~SII~~	~~NS AQ~~ ~~EMC~~	~~Y (5) Y (6)~~
30PED10 AA010 Valve Motor Actuator	30PED10AA010	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AA011 Valve Motor Actuator	30PED10AA011	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AA019 Valve Motor Actuator	30PED10AA019	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AA021 Valve Motor Actuator	30PED10AA021	31UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AN001 Fan Motor	30PED10AN001	31URB03001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED10 AN002 Fan Motor	30PED10AN002	31URB03002	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AA010 Valve Motor Actuator	30PED20AA010	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AA011 Valve Motor Actuator	30PED20AA011	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AA019 Valve Motor Actuator	30PED20AA019	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AA021 Valve Motor Actuator	30PED20AA021	32UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AN001 Fan Motor	30PED20AN001	32URB03001	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED20 AN002 Fan Motor	30PED20AN002	32URB03002	M	M	ES SI	S 1E EMC	Y (5) Y (6)
30PED30 AA010 Valve Motor Actuator	30PED30AA010	33UQB02001	M	M	ES SI	S 1E EMC	Y (5) Y (6)

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RAI 351, Q 09.02.05-22, Insert 5, FSAR Table 3.10-1

Filter Emergency Blowdown Isolation Valve	30PEB10AA004	31UQB2001	M	M	ES	SI	S	SI	C/NM			Y(5)
Filter Emergency Blowdown Isolation Valve	30PEB20AA004	32UQB2001	M	M	ES	SI	S	SI	C/NM			Y(5)
Filter Emergency Blowdown Isolation Valve	30PEB30AA004	33UQB2001	M	M	ES	SI	S	SI	C/NM			Y(5)
Filter Emergency Blowdown Isolation Valve	30PEB40AA004	34UQB2001	M	M	ES	SI	S	SI	C/NM			Y(5)

RAI 351, Q 09.02.05-22, Insert 6, FSAR Table 3.11-1

30PEB10AA004 Valve Motor Actuator	30PEB10AA004	31UQB2001	M	M	ES	SI	S	1E	EMC			Y(5) Y(6)
30PEB20AA004 Valve Motor Actuator	30PEB20AA004	32UQB2001	M	M	ES	SI	S	1E	EMC			Y(5) Y(6)
30PEB30AA004 Valve Motor Actuator	30PEB30AA004	33UQB2001	M	M	ES	SI	S	1E	EMC			Y(5) Y(6)
30PEB40AA004 Valve Motor Actuator	30PEB40AA004	34UQB2001	M	M	ES	SI	S	1E	EMC			Y(5) Y(6)

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The pump motors are air cooled. To remove heat losses, an air recirculation system is installed for each division. In addition, anti-condensation heaters on the motors are switched on as soon as the pumps cease operation.

9.2.1.3.2 Dedicated Essential Service Water Pump

The 100 percent capacity dedicated ESW pump is normally in standby mode.

This non-safety-related pump is manually started only in response to certain postulated SA conditions; it is not credited for response to any DBA.

The required flow rate of the dedicated ESWS pump is defined by the heat to be removed from the dedicated CCWS HX. Design parameters are listed in Table 9.2.1-2. The pump is designed to fulfill the corresponding minimal required design mass flow rate under the following conditions:

- Minimal water level.
- Fluctuations in the supplied electrical frequency.
- Increased pipe roughness due to aging and fouling.
- Fouled debris filter.
- Minimum water level in cooling tower basin considers minimum submergence requirements to prevent vortex effects, and net positive suction head to prevent cavitation of the dedicated ESWS pump.

The pump motor is air cooled. In addition, an anti-condensation heater on the motor is switched on as soon as the pump ceases operation.

9.2.1.3.3 Debris Filters -Safety Divisions

The debris filters remove all debris particles from the cooling water that would obstruct the system user HXs.

The debris filters are designed as an automatic backwash type. With increasing fouling, the differential pressure across the filter segments increases until reaching a preset operational point. The pressure relief backwash process of the filter is initiated by either the signal of the differential pressure measuring system, a timer after the start of the ESW pump or via a manual operator initiation.

The discharge and disposal of the collected debris must be treated in accordance with federal and state regulations relevant to site location.

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INSERT 7 -- U.S. EPR FSAR 9.2.1.3.3:

To ensure the function of the safety related filter, an alternate filter blowdown is provided. The line includes valve 30PEB10/20/30/40AA004, Filter Emergency Blowdown Isolation Valve.

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U.S. EPR FSAR Tier 2, Section 3.9 and Section 6.6 outline the inservice testing and inspection requirements. Refer to U.S. EPR FSAR Tier 2, Section 16.0, Surveillance Requirement (SR) 3.7.8 for surveillance requirements that verify continued operability of the ESWS.

Pursuant to the recommendations included in Generic Letter 89-13 (Reference 2), the design of safety-related portions of the ESWS considers the potential for capability and performance degradation and subsequent system failure due to siltation, erosion, corrosion, protective coating failure, and the presence of organisms that subject the system to microbiological influenced corrosion, as well as macro-fouling. A combination of design means, such as chemical treatment to reduce biological challenges; provisions to permit regular, periodic inspections, preventative maintenance, testing and performance trending; the use of best design practices for piping material selection and layout to minimize erosion and corrosion; and administrative controls in the form of operating, maintenance and emergency procedures, provide a level of assurance that the ESWS is able to perform its safety function when required.

Consistent with GL 89-13, design provisions of the ESWS accommodate performing the following:

- Identify and reduce the incidence of flow blockage problems caused from biofouling.
- Verify the heat transfer capability of safety-related heat exchangers connected to or cooled by the ESWS.
- Conduct routine inspection and maintenance activities of ESWS piping and components to provide assurance that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of safety-related systems supplied by ESW.

9.2.1.7 Instrumentation Requirements

Instrumentation is provided in order to control, monitor and maintain the safety-related and non-safety-related functions of the ESWS.

Upon receipt of a safety injection signal, the following valves will receive a signal to automatically align to their post accident position as indicated:

- ESWS normal blowdown isolation valves 30PEB10/20130/40 AA016 (closed).
- Cooling tower emergency blowdown system isolation valves 30PEB10/20/30/40 AA003 (closed).
- Debris filter blowdown isolation valves 30PEB10/20130/40 AA015 (closed).
- ESWS debris filter emergency blowdown isolation valve, 30PEB10/20/30/40 AA004 (closed)

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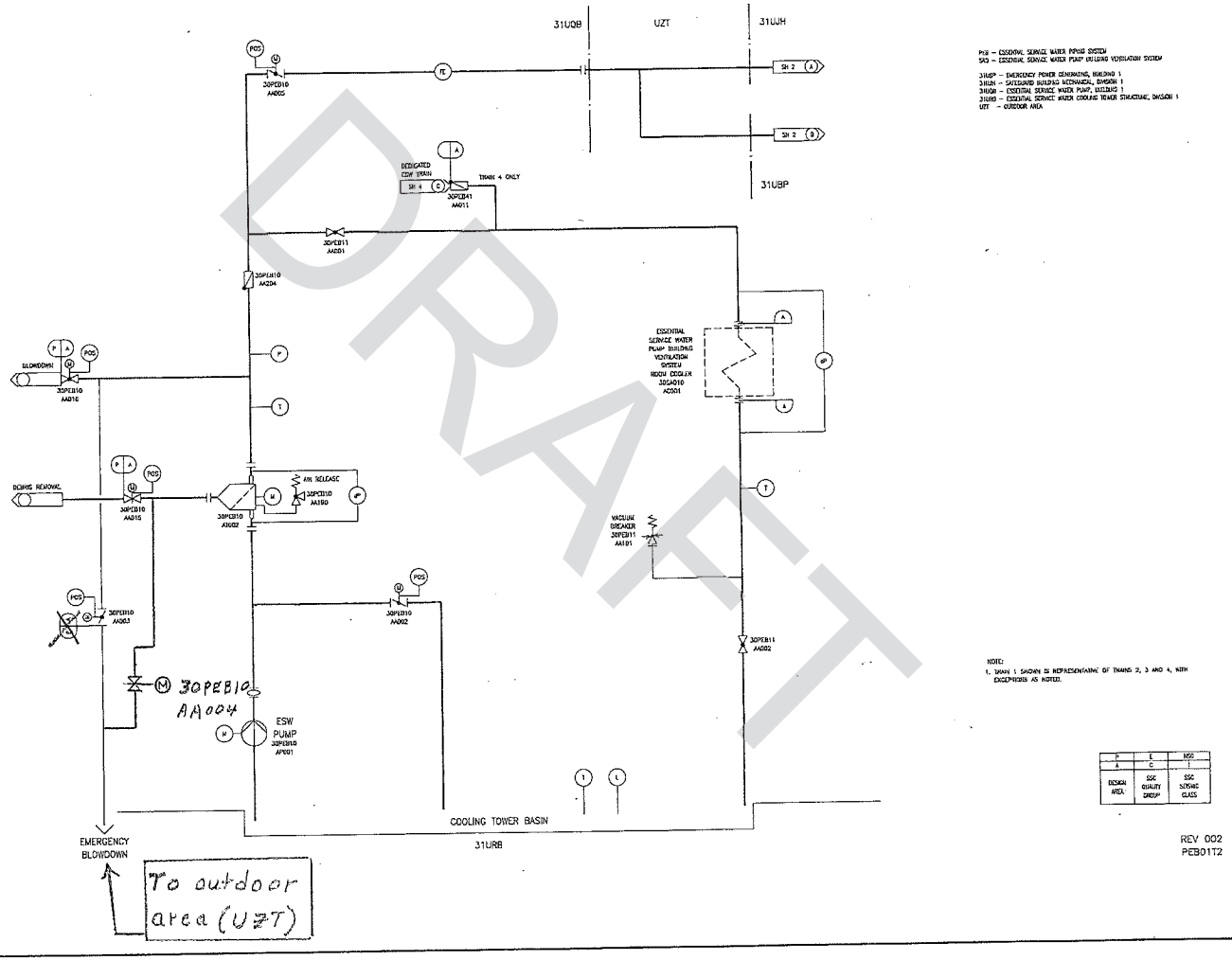
Figure 9.2.1-1—Essential Service Water System Piping & Instrumentation Diagram
Sheet 1 of 4



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(9.2.5.3.1 contin)

UHS cooling tower fill is constructed of ceramic tile, supported on reinforced concrete beams. Spray piping and nozzles are fabricated of corrosion resistant materials (e.g., stainless steel, bronze). UHS cooling tower internals are seismically designed and supported to withstand a safe shutdown earthquake (SSE). Passive failures of the cooling tower spray or fill systems are considered extremely unlikely due to their materials of construction, supporting systems and Seismic Category I design.

To prevent the entrainment of debris from the UHS cooling tower, each cell of the UHS cooling tower includes a debris screen located between the cooling tower internals and the ESW pump.

To account for potential interference effects of the cooling towers, an inlet wet bulb correction factor is used. As part of addressing Item 2.0-1 of Table 1.8-2, the COL applicant that references the U.S. EPR design certification will evaluate their site-specific conditions of orientation (with respect to wind direction), location, wind velocity, and direction to determine a wet bulb correction factor to account for interference effects.

To account for potential recirculation effects of the cooling towers, an inlet wet bulb correction factor is used. As part of addressing Item 2.0-1 of Table 1.8-2, the COL applicant that references the U.S. EPR design certification will evaluate their site-specific location to determine a wet bulb correlation factor to account for recirculation effects.

Each cooling tower basin is sized to provide for a minimum 72-hour supply of cooling water to the associated ESW division under design basis accident (DBA) conditions assuming loss of normal makeup water capability.

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9.2.5.3.2 Piping, Valves, and Fittings

System materials are selected that are suitable to the site location, UHS fluid properties and site installation. System materials that come into contact with one another are chosen to minimize galvanic corrosion. All safety-related piping, valves, and fittings are in accordance with ASME Code Section III, Class 3 (Reference 1).

Inservice testing of valves will be performed as described in Section 3.9.6.3. Leakage rates for boundary isolation valves that require testing are based on ASME OM Code, Subsection ISTC (Reference 2).

9.2.5.3.3 Cooling Tower Basin

The 72-hour basin water volume is the minimum water volume that must be present in a basin to accommodate system water inventory losses experienced in the basin due to ultimate heat sink (UHS) tower operation under the worst case environmental

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Based on the increase in heat removal during a DBA, a temperature of less than or equal to 90°F is maintained in the UHS basin during normal operation, so that the cooling tower basin temperature does not exceed 95°F.

9.2.5.5 Safety Evaluation

The UHS pump buildings and cooling towers are designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles and other natural phenomena. Section 3.3, Section 3.4, Section 3.5, Section 3.7 and Section 3.8 provide the basis for the adequacy of the structural design of these structures. The aboveground piping and components are protected by the structures.

The UHS is designed to remain functional after a safe shutdown earthquake (SSE). Section 3.7 and Section 3.9 provide the design loading conditions that are considered. Section 3.5, Section 3.6 and Section 9.5.1 provide the hazards analyses to verify that a safe shutdown, as outlined in Section 7.4, can be achieved and maintained.

The four division design of the UHS provides complete redundancy; therefore a single failure will not compromise the UHS system safety-related functions. Each division of UHS is independent of any other division and does not share components with other divisions or with other nuclear power plant units.

Considering preventative maintenance and a single failure, two UHS divisions may be lost, but the ability to achieve the safe shutdown state under DBA conditions can be reached by the remaining two UHS divisions. In case of LOOP the four UHS cooling towers have power supplied by their respective division EDGs. Isolation valves can isolate non-safety-related portions of the system if necessary without compromising the safety-related function of the system.

The cooling towers must operate for a nominal 30 days following a LOCA without requiring any makeup water to the source or it must be demonstrated that replenishment or use of an alternate or additional water supply can provide continuous capability of the heat sink to perform its safety-related functions. The tower basin contains a minimum 72-hour supply of water. After the initial 72 hours, the site specific makeup water system will provide sufficient flow rates of makeup water to compensate for system volume losses for the remaining 27 days. ~~The normal and emergency blowdown isolation valves provide automatic isolation of the ESWS from downstream non-safety-related blowdown piping under DBA conditions to prevent loss of ESW inventory~~. The ESW emergency makeup water system also provides isolation of the normal makeup water system from the tower basins under DBA conditions to prevent loss of ESW inventory.

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The heat load after 72 hours post-DBA is lower than the peak heat load due to a reduction in the decay heat from the reactor. Consequently, the makeup flow rate required after 72 hours is lower than the peak condition. Since the UHS basin contains

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(9.2.5.5 CONTIN)

at least 72 hours of water inventory for the DBA, in combination with the worst ambient evaporation conditions, the UHS emergency makeup is not required to start until after 72 hours. At that point, the makeup requirements are diminished. The minimum makeup supply rate is based on the maximum evaporation rate over a 72 hour period post-DBA and considers such losses as drift, seepage and valve seat leakage.

COL applicants that reference the U.S. EPR will verify that the makeup water supply is sufficient for the ambient conditions corresponding to their plant location. Refer to Table 1.8-2, Item number 2.3-10.

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9.2.5.6 Inspection and Testing Requirements

Prior to initial plant startup, a comprehensive preoperational test is performed to demonstrate the ability of the ESWS and UHS to supply cooling water as designed under normal and emergency conditions. The UHS is tested as described in Chapter 14.2, Test # 49.

~~After the plant is brought into operation, periodic inspections and tests of the ESWS and UHS components and subsystems are performed to verify proper operation. Scheduled inspections and tests are necessary to verify system operability.~~

The installation and design of the UHS provides accessibility for the performance of periodic inservice inspection and testing. Periodic inspection and testing of safety-related equipment verifies its structural and leaktight integrity and its availability and ability to fulfill its functions. Inservice inspection and testing requirements are in accordance with Section XI of the ASME BPV Code and the ASME OM Code.

Section 3.9 and Section 6.6 outline the inservice testing and inspection requirements. Refer to Section 16.0, Surveillance Requirements (SR) 3.7.19 for surveillance requirements that verify continued operability of the UHS.

9.2.5.7 Instrumentation Applications

Instrumentation is provided in order to control, monitor and maintain the safety-related functions of the UHS. Indications of the process variables measured by the instrumentation are provided to the operator in the main control room.

9.2.5.7.1 System Monitoring

- Cooling tower basin water level.
- Cooling tower water temperature.

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INSERT 8 FOR U.S. EPR FSAR 9.2.5.3.1:

In the event of torrential rains and hurricanes, water would enter through the air inlet and air outlet area of the cooling tower portion of the Essential Service Water Buildings. Refer to Figure 3.8-95 through Figure 3.8-102 of the U.S. EPR FSAR for details of the Essential Service Water Building. As the water level reaches the high level, an alarm in the control room will alert the operator. Operator action is performed to remove water from the cooling tower basin through the use of the safety related emergency blowdown to maintain normal water level. Therefore, no adverse effects on the safety related equipment is anticipated within the ESW pump room if the water level rises due to torrential rains and hurricanes.

INSERT 9 FOR U.S. EPR FSAR 9.2.5.5:

In accordance with Section 3.4.3.9, ESWPBs are physically separated by division and connected to their respective ESW cooling tower. The flooding analysis considers a postulated pipe failure in the ESWS piping to be the bounding internal flooding source. In the event of an ESWS piping failure in the building, the affected division of the ESWS is considered lost. As indicated in Section 3.4.1, if there is a failure of one division of ESWS and one division is out for maintenance, there are two remaining divisions of ESWS to perform the system safety function.

INSERT 10 FOR U.S. EPR FSAR 9.2.5.5:

The normal blowdown isolation valves and the normal filter blowdown isolation valves provide automatic isolation of the ESWS from downstream non-safety-related blowdown piping under DBA conditions to prevent loss of ESW inventory. The emergency blowdown isolation valves and the emergency filter blowdown isolation valves provide automatic isolation of the ESWS under DBA conditions to prevent loss of ESW inventory. The emergency blowdown discharges outside of the ESW Pump Building at an elevation above the flood level. The emergency blowdown pipe exiting the building is protected from tornado generated missiles by the building structure.

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