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TOKYO, JAPAN

July 25, 2012

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-12203

Subject: MHI's Response to US-APWR DCD RAI No. 919-6392 Revision 0 (SRP 09.02.02)

Reference: [1] "REQUEST FOR ADDITIONAL INFORMATION 919-6392 REVISION 0, SRP Section: 09.02.02 – Reactor Auxiliary Cooling Water Systems, Application Section: 9.2.2," dated April 10, 2012.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Response to Request for Additional Information No. 919-6392 Revision 0".

Enclosed is the response to one RAI contained within Reference 1. This transmittal completes the response to this RAI.

Please contact Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. His contact information is provided below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
Director- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosure:

1. Response to Request for Additional Information No. 919-6392 Revision 0

D081
NRO

CC: J. A. Ciocco
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Contact Information

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Enclosure 1

UAP-HF-12203
Docket No. 52-021

Response to Request for Additional Information No. 919-6392
Revision 0

July 2012

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

7/25/2012

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 919-6392 REVISION 0**

SRP SECTION: **09.02.02 – Reactor Auxiliary Cooling Water Systems**

APPLICATION SECTION: **09.02.02**

DATE OF RAI ISSUE: **4/10/2012**

QUESTION NO.: 09.02.02-86

Follow-up to RAI 362-2278, question 09.02.02-34 and RAI 571-4365 question 09.02.02-58. A design change was proposed in response to question 09-.02.02-48 to maintain CCWS flow to the reactor cooling pump (RCP) thermal barrier.

As discussed in the applicant's response to RAI 571-4365, question 09.02.02-58,

> Removal of automatic closure of the header tie line isolation valves (NCS-MOV-020A/B and 007A/B) during an accident condition introduces the potential for additional loading on one train of a subsystem if a single failure is postulated in the other train. (Note, the response to Question 09.02.02-48 describes the design change to the automatic isolation of the A2 header heat loads.) The potential exists only for the period in which the header tie line valves are open. For example, if the B-CCW pump fails to actuate upon the receipt of an ECCS actuation signal, the heat load on the A-CCW heat exchanger will be increased as follows:
>
> Additional load from B header
>
> B-CCW pump: Pump fails to start: 0.0 Btu/hr
>
> B-SI pump: Pump actuated by ECCS signal: 0.84 x 10^6 BTU/hr
>
> B-CS/RHR pump: Pump actuated by containment spray signal: 0.48 x 10^6 BTU/hr
>
> B-CS/RHR heat exchanger: CCW will not be provided to the heat exchanger because the outlet isolation valve (NCS-MOV-145B) opens only on receipt of both B-CCW pump actuation and ECCS actuation signal: 0.0 Btu/hr
>
> Thus, the total additional A-CCW heat exchanger heat load is 1.32 x 10^6 BTU/hr.

Based on the Advisory Committee on Reactor Safeguards (ACRS) meetings on March 22-23, 2012, it was discussed there could be more challenging single active failure scenarios then what was described in the RAI 571-4365 response that would result in two trains of CCWS (both shared from a single CCWS surge tank) becoming inoperable and unable to perform their intended function.

One example that was described at ACRS:

Since the containment spray/residual heat removal (CS/RHR) downstream automatic opening of MOV-145 A, B, C, D take >120 seconds to open (based on a automatic start signal of ECCS with CCWS pump start), a single active failure which occurs after these valves goes fully open may results in >4000 gpm through the 14" piping system of added flow to the running CCWS pump. This added flow may result in the running operable CCWS pump going to pump run-out conditions, thus tripping on over-current.

1. The applicant should revise its application and RAI response to address all potential scenarios due to the MOVs train cross tie valves (MOV-007s and 020s) being open. This one example above may not be limiting.
2. The Tier 2 Failure Modes and Effects Analysis (FMEA) should be revised to address various and most limiting single active failures, as described in item 1.

ANSWER:

A design change was proposed in the response to RAI 571-4365, Question 09.02.02-58 (provided in UAP-HF-11237, dated July 29, 2011) to remove automatic closure of the header tie line isolation valves (NCS-MOV-007A, B, C, D and NCS-MOV-020A, B, C, D). As a result, additional heat loads on the heat exchanger in one CCW train can be postulated if a single active failure on the other subsystem train occurs, which results in loss of that heat exchanger. The response to Question 9.02.02-58 addressed the maximum heat load that could be provided to a single CCW heat exchanger. Similarly, flow rates will differ if a single failure in one train of a subsystem results in the pump of the other train providing flow to both trains. The most limiting potential accident scenario from a flow perspective is the following:

During the performance of on-line maintenance (OLM) on one train, an accident occurs and results in three CCW pumps normally starting. The header tie line isolation valves are closed in the subsystem undergoing OLM and open in the other subsystem. The CS/RHR heat exchanger outlet valves (NCS-MOV-145A, B, C and D) open on receipt of a CCW pump start signal, and cooling starts on the three available trains. The response to Question 09.02.02-58 assumed that the operator will close the header tie line isolation valves within 24 hours to configure the CCWS for long-term operation after a design basis accident. If a single power train failure occurred prior to closing the header tie line isolation valves in the subsystem not undergoing OLM, the CCW pump and CS/RHR pump on the associated train would stop. Because the header tie line is not isolated, only one CCW pump would supply cooling water to two CS/RHR heat exchangers. However, only one CS/RHR heat exchanger would remove heat because the CS/RHR pump on the same train as the CCW pump also stops.

Under the condition that one CCW pump provides flow to two CS/RHR heat exchangers, the CCW pump flow rate increases to account for the additional CS/RHR Hx flow path (from approximately 9300 gpm to 14000 gpm). As a result, the flow rate to each heat exchanger is less than with two pumps running or one pump in a separate train. Therefore, while the available CS/RHR HX in the OLM subsystem has the full CCW flow rate, in the other subsystem, the CS/RHR HX that is removing heat has a reduced CCW flow rate. This means that the accident heat removal requirement (two 100% capacity CS/RHR heat exchangers) is not ensured. (After the header tie line valves are closed to provide train separation, a postulated failure in the other train would not result in this flow redistribution.)

To prevent the potential CCW flow reduction to the operable CS/RHR heat exchanger, the design has been changed to close the CS/RHR heat exchanger CCW outlet valves (NCS-MOV-145A, B, C and D) on receipt of both a low CCW pump discharge pressure signal and a low header pressure signal. If a power supply train failure occurs, the pumps on the associated train would stop. However, the CS/RHR heat exchanger outlet valve (NCS-MOV-145A, B, C or D) on the associated train could not be closed because its supply power would also be lost. Therefore, a 2^{nd} motor operated outlet valve, NCS-MOV-146A, B, C and D, in series with the 1^{st} outlet valve (NCS-MOV-145A, B, C and D), and CCW pump discharge pressure instruments (PT-035, 036, 037 and 038) are provided. The 1^{st} and 2^{nd} outlet valves and pressure instruments are powered from different trains.

The normal position of the new valves NCS-MOV-146A, B, C and D is open. (If two valves with a different power supply train are normally closed and in series, a single power supply train failure could disable two CCW trains.) These valves are provided with an interlock to close on receipt of both a low pump discharge pressure signal from the associated CCW pump and the low header pressure signal; thus, each valve will remain open during normal operation when only one CCW pump operates in each subsystem. (The low discharge pressure signal is reached only if the header pressure is reduced to a level corresponding to a single CCW pump supplying flow to both CS/RHR heat exchangers)

The CCW pumps are designed with maximum flow rate of 17000 gpm and do not reach runout condition in the limiting scenario.

Item 1
The DCD will be revised to describe the additional motor operated valves and pump discharge instruments.

The response to the RAI 571-4365, Question 09.02.02-58 will be revised to refer to the response to this RAI.

Item 2
The DCD Tier 2, Table 9.2.2-3, FMEA will be revised to add the design change and reflect the most limiting single active failure.

Impact on DCD

DCD Tier 1 will be revised as follows (See Attachment.):

- Table 2.7.3.3-2: Add "CS/RHR heat exchanger CCW outlet 2nd valves", isolation valves MOV-146A, B, C and D.
- Table 2.7.3.3-2: Change the name of MOV-145A, B, C and D from "CS/RHR heat exchanger CCW outlet valves" to "CS/RHR heat exchanger CCW outlet 1st valves."
- Table 2.7.3.3-2: Add "Low CCWP discharge pressure" and "Transfer Closed" to "PSMS Control" and "Active Safety Function," respectively of MOV-145A, B, C and D.
- Table 2.7.3.3-2: Add pressure instruments PT-025, 026, 027,028, 035, 036, 037 and 038.
- Table 2.7.3.3-4: Add the isolation valves MOV-146A, B, C and D.
- Table 2.7.3.3-4: Change the name of MOV-145A, B, C and D from "CS/RHR heat exchanger CCW outlet valves" to "CS/RHR heat exchanger CCW outlet 1st valves."
- Table 2.7.3.3-4: Add pressure instruments (PT-025, 026, 027, 028, 035, 036, 037 and 038.
- Figure 2.7.3.3-1: Add isolation valves (MOV-146A, B, C and D).

DCD Tier 2 Chapter 3 will be revised as follows:

- Table 3.9-14: Add the isolation valves MOV-146A, B, C and D.
- Table 3D-2: Add the isolation valves MOV-146A, B, C and D.
- Table 3D-2: Add the pressure instruments PT-025, 026, 027, 028, 035, 036, 037 and 038.
- Table 3K-2: Add the isolation valves MOV-146A, B, C and D.
- Table 3K-3: Add the pressure instruments PT-025, 026, 027, 028, 035, 036, 037 and 038.

DCD Tier 2 Chapter 7 will be revised as follows:

- Table 7.4-1: Change the name of MOV-145A, B, C and D from "CS/RHR heat exchanger CCW outlet valves" to "CS/RHR heat exchanger CCW outlet 1st valves."
- Table 7.4-1: Add isolation valves MOV-146A, B, C and D.
- Table 7.4-2: Add pressure instruments PT-025, 026, 027, 028, 035, 036, 037 and 038.

DCD Tier 2 Chapter 9 will be revised as follows:

- Subsection 9.2.2.2.1.5: Add isolation valves MOV-146A, B, C and D.
- Subsection 9.2.2.2.1.5: Change the name of MOV-145A, B, C and D from "CS/RHR heat exchanger CCW outlet valves" to "CS/RHR heat exchanger CCW outlet 1st valves." Add the description of the interlock with respect to pump stop.
- Subsection 9.2.2.5.1: Add the description of the interlock for closing MOV-146A, B, C and D.
- Subsection 9.2.2.5.7: Remove the description of CCWP discharge pressure instruments and add it to new Subsection 9.2.2.5.8. Renumber subsequent subsections.
- Table 9.2.2-3: Add the FMEA to MOV-145A, B, C and D regarding the respective train CCW pump stop within 24 hours after the pump start.
- Table 9.2.2-3: Add the FMEA for MOV-146A, B, C and D.
- Table 9.2.2-7: Add isolation valves MOV-146A, B, C and D.
- Figure 9.2.2-1: Add isolation valves MOV-146A, B, C and D and pump discharge pressure instruments PT-025, 026, 027, 028, 035, 036, 037 and 038 and valve closure interlock.
- Figure 9.2.2-2: Add the isolation valves MOV-146A, B, C and D.

Impact on R-COLA

There is no impact on the COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

Small change resulting in slight improvement in core damage frequency.

Impact on Technical / Topical Reports

There is no impact on the Technical / Topical Reports.

Attachment

Table 2.7.3.3-2 Component Cooling Water System Equipment Characteristics (Sheet 2 of 10)

Equipment Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/ Qual. For Harsh Envir	PSMS Control	Active Safety Function	Loss of Motive Power Position
CCW return header tie line isolation valves	NCS-MOV-007 A, B, C, D	3	Yes	Yes	Yes/No	~~ECCS Actuation and undervoltage signal~~	~~Transfer Closed~~	As Is
						~~Containment Spray~~	~~Transfer Closed~~	
						~~Low low CCW surge tank water level~~	~~Transfer Closed~~	
						Remote Manual	Transfer Open/ Transfer Closed	
CS/RHR heat exchanger CCW outlet 1st valves	NCS-MOV-145 A, B, C, D	3	Yes	Yes	Yes/No	ECCS Actuation and CCW pump start	Transfer Open	As Is
						Low CCWP discharge pressure and Low CCW header Pressure	Transfer Closed	
						Remote Manual	Transfer Open/ Transfer Closed	

DCD_09.02.02-48

DCD_09.02.02-86

Table 2.7.3.3-2 Component Cooling Water System Equipment Characteristics (Sheet 3 of 10)

Equipment Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/ Qual. For Harsh Envir	PSMS Control	Active Safety Function	Loss of Motive Power Position	
CS/RHR heat exchanger CCW outlet 2nd valves	NCS-MOV-146 A, B, C, D	3	Yes	Yes	Yes/No	Low CCWP discharge pressure and Low CCW header Pressure	Transfer Closed	As Is	DCD_09.02.02-86
						Remote Manual	Transfer Open/ Transfer Closed		
RCP CCW supply line outside containment isolation valves	NCS-MOV-402 A, B	2	Yes	Yes	Yes/No	~~Containment Isolation Phase B~~	~~Transfer Closed~~	As Is	DCD_09.02.02-58
						Remote Manual	Transfer Open/ Transfer Closed		

Table 2.7.3.3-2 Component Cooling Water System Equipment Characteristics (Sheet 9 of 10)

Equipment Name	Tag No.	ASME Code Section III Class	Seismic Category I	Remotely Operated Valve	Class 1E/ Qual. For Harsh Envir.	PSMS Control	Active Safety Function	Loss of Motive Power Position
Charging pump non-essential chilled water return isolation valve	NCS-MOV-326 A, B	3	Yes	Yes	Yes/ No	-	-	As Is
Component cooling water Header Flow	NCS-FT-034, 035, 037, 038	-	Yes	-	Yes/ No	-	-	-
Component cooling water Surge Tank Water Level	NCS-LT-~~010, 011, 020, 021~~010A,B,C,D, 011A,B,C,D	-	Yes	-	Yes/ No	-	-	-
Component cooling water pump discharge pressure 1	NCS-PT-025, 026, 027, 028	-	Yes	-	Yes/No	-	-	-
Component cooling water pump discharge pressure 2	NCS-PT-035, 036, 037, 038	-	Yes	-	Yes/No	-	-	-
Component cooling water Header Pressure	NCS-PT-030, 031, 032, 033	-	Yes	-	Yes/ No	-	-	-
Component cooling water Supply Temperature	NCS-TE-025, 026, 027, 028,	-	Yes	-	Yes/ No	-	-	-
RCP thermal barrier component cooling water flow 1	NCS-FT-129 A 130 A 131 A 132 A	-	Yes	-	Yes/No	-	-	-
RCP thermal barrier component cooling water flow 2	NCS-FT-129 B 130 B 131 B 132 B	-	Yes	-	Yes/No	-	-	-

DCD_09.02.02-68

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Table 2.7.3.3-4 Component Cooling Water System Equipment Alarms, Displays, and Control Functions (Sheet 1 of 3)

Equipment/Instrument Name	MCR/RSC Alarm	MCR Display	MCR/RSC Control Function	RSC Display	
Component cooling water pumps (NCS-MPP-001 A,B,C,D)	No	Yes	Yes	Yes	
CCW supply header tie line isolation valves (NCS-MOV-020A,B)	No	Yes	Yes	Yes	
CCW return header tie line isolation valves (NCS-MOV-007A,B)	No	Yes	Yes	Yes	
CS/RHR heat exchanger CCW outlet 1st valves (NCS-MOV-145A,B,C,D)	No	Yes	Yes	Yes	DCD_09.02.02-86
CS/RHR heat exchanger CCW outlet 2nd valves (NCS-MOV-146A, B, C, D)	No	Yes	Yes	Yes	DCD_09.02.02-86
RCP CCW supply line outside containment isolation valves (NCS-MOV-402A,B)	No	Yes	Yes	Yes	
~~RCP CCW supply line outside containment isolation valve bypass valves (NCS-MOV-445A,B)~~	~~No~~	~~Yes~~	~~Yes~~	~~Yes~~	DCD_09.02.02-58
RCP CCW return line inside containment isolation valves (NCS-MOV-436A,B)	No	Yes	Yes	Yes	
~~RCP CCW return line inside containment isolation valve bypass valves (NCS-MOV-447A,B)~~	~~No~~	~~Yes~~	~~Yes~~	~~Yes~~	DCD_09.02.02-58
RCP CCW return line outside containment isolation valves (NCS-MOV-438A,B)	No	Yes	Yes	Yes	
~~RCP CCW return line outside containment isolation valve bypass valves (NCS-MOV-448A,B)~~	~~No~~	~~Yes~~	~~Yes~~	~~Yes~~	DCD_09.02.02-58
RCP motor CCW supply line isolation valves (NCS-MOV-446A,B,C,D)	No	Yes	Yes	Yes	
RCP CCW supply line tie line isolation valves (NCS-MOV-232A,B)	No	Yes	Yes	Yes	
RCP CCW return line tie line isolation valves (NCS-MOV-233A,B)	No	Yes	Yes	Yes	
RCP CCW return line isolation valve (NCS-MOV-234A,B)	No	Yes	Yes	Yes	
RCP CCW supply line isolation valves (NCS-MOV-401A,B)	No	Yes	Yes	Yes	
Charging pump CCW return isolation valve (NCS-MOV-316A,B)	No	Yes	Yes	Yes	
Charging pump fire fighting water supply isolation valve (NCS-MOV-321A, B)	No	Yes	Yes	Yes	
Charging pump alternative cooling water supply isolation valve (NCS-MOV-322A,B)	No	Yes	Yes	Yes	
Charging pump non-essential chilled water supply isolation valve (NCS-MOV-323A,B)	No	Yes	Yes	Yes	

Table 2.7.3.3-4 Component Cooling Water System Equipment Alarms, Displays, and Control Functions(Sheet 3 of 3)

Equipment/Instrument Name	MCR/RSC Alarm	MCR Display	MCR/RSC Control Function	RSC Display	
Component cooling water pump discharge 1st pressure (NCS-PT-025, 026, 027, 028)	Yes	Yes	No	Yes	DCD_09.02.02-86
Component cooling water pump discharge 2nd pressure (NCS-PT-035, 036, 037, 038)	Yes	No	No	No	
CCW surge tank water level (NCS-LT-~~010,011,020,021~~010A,B,C,D, 011A,B,C,D)	Yes	Yes	No	Yes	DCD_09.02.02-68
RCP thermal barrier component cooling water flow (NCS-FT-129A,B, 130A,B, 131A,B, 132A,B)	Yes	Yes	No	Yes	
Containment fan cooler alternative cooling water supply isolation valve (NCS-MOV-241)	No	Yes	Yes	Yes	DCD_09.02.02-80
Containment fan cooler alternative cooling water return isolation valve (NCS-MOV-242)	No	Yes	Yes	Yes	

DCD_09.02.02-49
DCD_09.02.02-51
DCD_09.02.02-86

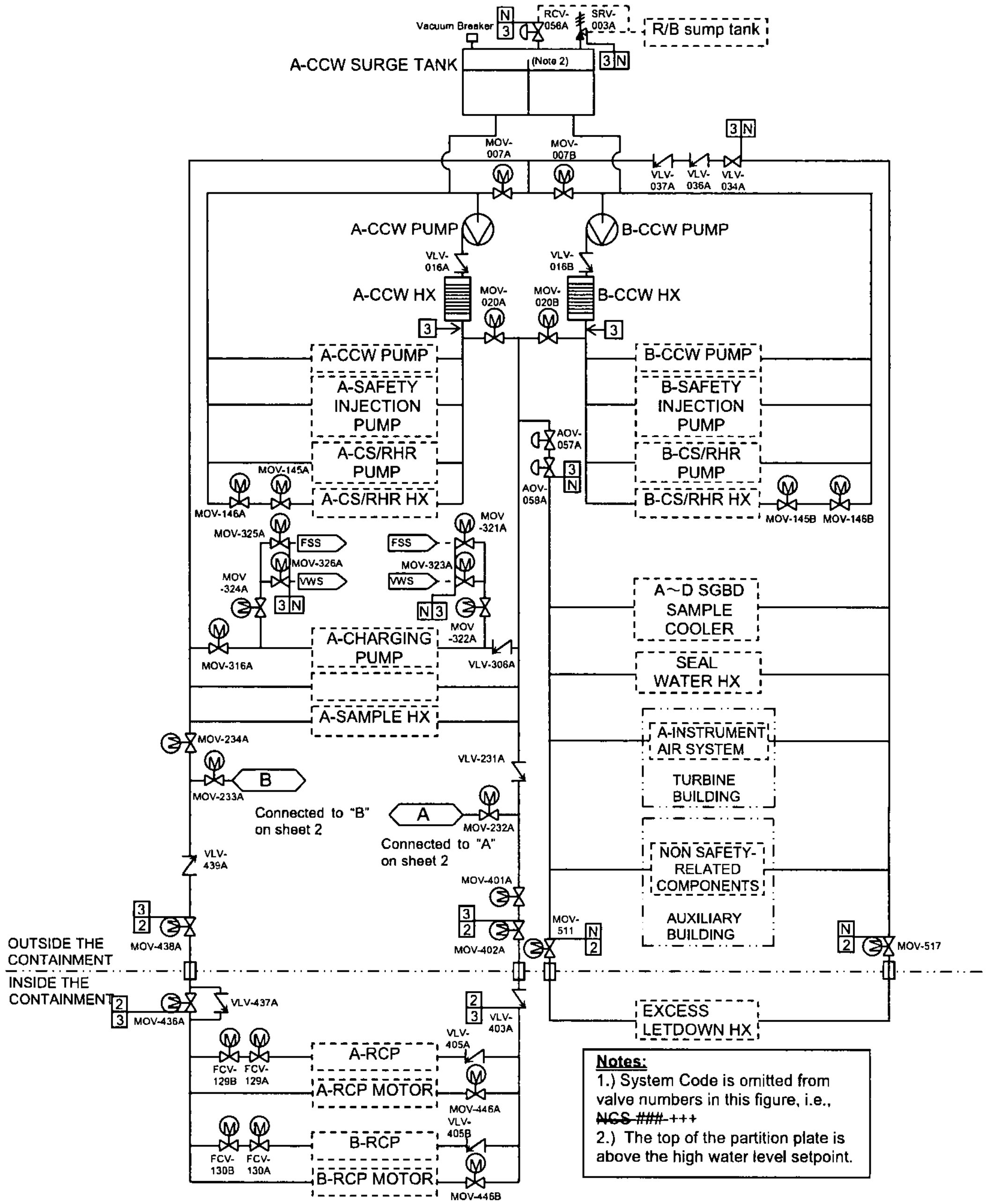

Figure 2.7.3.3-1 Component Cooling Water System (Sheet 1 of 2)

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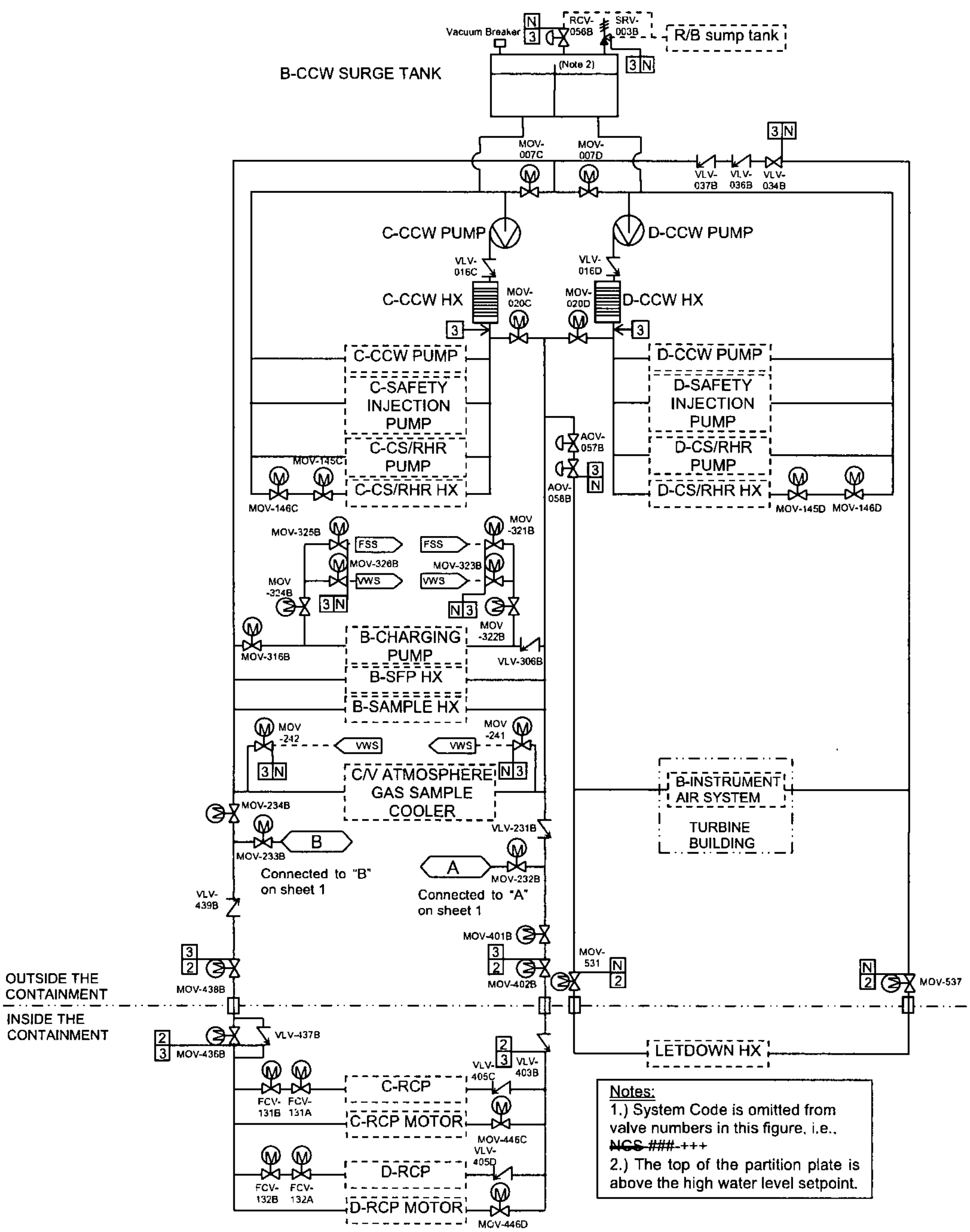

Figure 2.7.3.3-1 Component Cooling Water System (Sheet 2 of 2)

Table 3.9-14 Valve Inservice Test Requirements (Sheet 63 of 121)

Valve Tag Number	Description	Valve/ Actuator Type	Safety-Related Missions	Safety Functions(2)	ASME IST Category	Inservice Testing Type and Frequency	IST Notes
NCS-MOV-145C	Containment spray/residual heat exchanger component cooling water isolation	Remote MO Gate	Maintain Close Transfer Open Transfer Close	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-145D	Containment spray/residual heat exchanger component cooling water isolation	Remote MO Gate	Maintain Close Transfer Open Transfer Close	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-146A	Containment spray/residual heat exchanger component cooling water isolation	Remote MO Gate	Maintain Open Transfer Close Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-146B	Containment spray/residual heat exchanger component cooling water isolation	Remote MO Gate	Maintain Open Transfer Close Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-146C	Containment spray/residual heat exchanger component cooling water isolation	Remote MO Gate	Maintain Open Transfer Close Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	

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Table 3.9-14 Valve Inservice Test Requirements (Sheet 64 of 121)

Valve Tag Number	Description	Valve/ Actuator Type	Safety-Related Missions	Safety Functions(2)	ASME IST Category	Inservice Testing Type and Frequency	IST Notes
NCS-MOV-146D	Containment spray/residual heat exchanger component cooling water isolation	Remote MO Gate	Maintain Open Transfer Close Transfer Open	Active Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-316A	Charger Pump component cooling water return	Remote MO Gate	Maintain Open	Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-316B	Charger Pump component cooling water return	Remote MO Gate	Maintain Open	Remote Position	B	Remote Position Indication, Exercise/2 Years Exercise Full Stroke/ Quarterly Operability Test	
NCS-MOV-511	Excess letdown heat exchanger component cooling water supply containment isolation	Remote MO Gate	Maintain Close Transfer Close	Active Containment Isolation Safety Seat Leakage Remote Position	A	Remote Position Indication, Exercise/2 Years Containment Isolation Leak Test Exercise Full Stroke/ Quarterly Operability Test	5

DCD_09.02.02-86

Table 3D-2 US-APWR Environmental Qualification Equipment List (Sheet 9 of 62)

Item Num	EquipmentTag	Description	Location		Purpose	Operational Durantion	Environmental Conditions	Radiation Condition	Influence of Submergence for Total Integrated Dose	Qualification Process	Seismic Category	Comments	
			Building	Zone	RT, ESF, PAM, Pressure Boundary (PB), Other(1)		Harsh or Mild	Harsh or Mild	Yes/No	E=Electrical M=Mechanical	I, II, Non		
1537	EWS-FT-036	C - Component Cooling Water Heat Exchanger Essential Service Water Flow	R/B	8	Other	36hr	Mild	Harsh	No (1)	E	I		DCD_09.01.03-8
1548	EWS-FT-037	D - Component Cooling Water Heat Exchanger Essential Service Water Flow	R/B	8	Other	36hr	Mild	Harsh	No (1)	E	I		DCD_09.01.03-8
1559	EWS-PT-015	A - Essential Service Water Header Pressure	UHSRS	-	PAM, Other	2wks, 36hr	Mild	-	-	E	I	(1)	DCD_09.01.03-8
15660	EWS-PT-016	B - Essential Service Water Header Pressure	UHSRS	-	PAM, Other	2wks, 36hr	Mild	-	-	E	I	(1)	DCD_09.01.03-8
15761	EWS-PT-017	C - Essential Service Water Header Pressure	UHSRS	-	PAM, Other	2wks, 36hr	Mild	-	-	E	I	(1)	DCD_09.01.03-8
15862	EWS-PT-018	D - Essential Service Water Header Pressure	UHSRS	-	PAM, Other	2wks, 36hr	Mild	-	-	E	I	(1)	DCD_09.01.03-8
15963	RWS-LT-010	Refueling Water Storage Pit Water Level (Narrow Range)	PCCV	1-5	PAM	4mos	Harsh	Harsh	No (1)	E	I		DCD_09.01.03-8
16064	RWS-LT-011	Refueling Water Storage Pit Water Level (Wide Range)	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I		DCD_09.01.03-8
1615	RWS-LT-012	Refueling Water Storage Pit Water Level (Narrow Range)	PCCV	1-5	PAM	4mos	Harsh	Harsh	No (1)	E	I		DCD_09.01.03-8
1626	RWS-LT-013	Refueling Water Storage Pit Water Level (Wide Range)	PCCV	1-5	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I		DCD_09.01.03-8
1637	LMS-LT-093A	Containment Sump Water Level A	PCCV	1-5	Other	36hr*	Harsh	Harsh	No (2)	E	I	*Not Required Post Accident	DCD_09.01.03-8
1648	LMS-LT-093B	Containment Sump Water Level B	PCCV	1-5	Other	36hr*	Harsh	Harsh	No (2)	E	I	*Not Required Post Accident	DCD_09.01.03-8
169	NCS-LT-011A	A - Component Cooling Water Surge Tank Water Level	R/B	8	Other	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02.02-68
170	NCS-LT-011B	A - Component Cooling Water Surge Tank Water Level	R/B	8	Other	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02.02-68
171	NCS-LT-011C	B - Component Cooling Water Surge Tank Water Level	R/B	8	Other	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02.02-68
172	NCS-LT-011D	B - Component Cooling Water Surge Tank Water Level	R/B	8	Other	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02.02-68
173	NCS-PT-025	A - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02.02-86

Table 3D-2 US-APWR Environmental Qualification Equipment List (Sheet 10 of 62)

Item Num	EquipmentTag	Description	Location		Purpose	Operational Durantion	Environmental Conditions	Radiation Condition	Influence of Submergence for Total Integrated Dose	Qualification Process	Seismic Category	Comments	
			Building	Zone	RT, ESF, PAM, Pressure Boundary (PB), Other(1)		Harsh or Mild	Harsh or Mild	Yes/No	E=Electrical M=Mechanical	I, II, Non		
174	NCS-PT-026	B - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
175	NCS-PT-027	C - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
176	NCS-PT-028	D - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
177	NCS-PT-035	A - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
178	NCS-PT-036	B - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
179	NCS-PT-037	C - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
180	NCS-PT-038	D - Component Cooling Water Pump discharge Pressure	R/B	8	ESF	36hr	Mild	Harsh	No (1)	E	I		DCD_09.02-86
Instruments (Resistance Temperature Detectors)													
1	RCS-TE-020	Loop A - Reactor Coolant Hot Leg Temperature (Wide Range)	PCCV	1-3	PAM, Other	4mos, 36hr	Harsh	Harsh	No (1)	E	I		
2	RCS-TE-021A	Loop A - Reactor Coolant Hot Leg Temperature (Narrow Range)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
3	RCS-TE-021B	Loop A - Reactor Coolant Hot Leg Temperature (Narrow Range)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
4	RCS-TE-021C	Loop A - Reactor Coolant Hot Leg Temperature (Narrow Range)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
5	RCS-TE-021D	Loop A - Reactor Coolant Cold Leg Temperature (Narrow Range)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
6	RCS-TE-023A	Loop A - Reactor Coolant Hot Leg Temperature (Narrow Range) (spare)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
7	RCS-TE-023B	Loop A - Reactor Coolant Hot Leg Temperature (Narrow Range) (spare)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
8	RCS-TE-023C	Loop A - Reactor Coolant Hot Leg Temperature (Narrow Range) (spare)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		
9	RCS-TE-023D	Loop A - Reactor Coolant Cold Leg Temperature (Narrow Range) (spare)	PCCV	1-3	RT	5min	Harsh	Harsh	No (1)	E	I		

Table 3D-2 US-APWR Environmental Qualification Equipment List (Sheet 42 of 62)

Item Num	EquipmentTag	Description	Location		Purpose	Operational Durantion	Environmental Conditions	Radiation Condition	Influence of Submergence for Total Integrated Dose	Qualification Process	Seismic Category	Comments	
			Building	Zone	RT, ESF, PAM, Pressure Boundary (PB), Other[1]		Harsh or Mild	Harsh or Mild	Yes/No	E=Electrical M=Mechanical	I, II, Non		
83	~~NCS-AOV-662B~~(Deleted)	~~Air Operated Valve~~	~~R/B~~	~~14~~	~~ESF~~	~~1yr~~	~~Mild~~	~~Mild~~	~~No (1)~~	~~M~~	~~I~~		DCD_09.02-49
84	NCS-PCV-012	Pressure Control Valve	R/B	8	PB	1yr	Mild	Harsh	No (1)	M	I		
86	NCS-MOV-321A	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
87	NCS-MOV-321B	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
88	NCS-MOV-322A	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
89	NCS-MOV-322B	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
90	NCS-MOV-323A	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
91	NCS-MOV-323B	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
92	NCS-MOV-324A	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
93	NCS-MOV-324B	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
94	NCS-MOV-325A	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
95	NCS-MOV-325B	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
96	NCS-MOV-326A	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
97	NCS-MOV-326B	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		
98	NCS-MOV-241	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		DCD_09.02-80
99	NCS-MOV-242	Motor Operated Valve	R/B	13-3	PB	1yr	Mild	Harsh	No (1)	M	I		DCD_09.02-80
100	NCS-AOV-057A	Air Operated Valve	R/B	13-3	ESF	1yr	Mild	Harsh	No (1)	M	I		DCD_09.02-49
101	NCS-AOV-057B	Air Operated Valve	R/B	13-3	ESF	1yr	Mild	Harsh	No (1)	M	I		
102	NCS-AOV-058A	Air Operated Valve	R/B	13-3	ESF	1yr	Mild	Harsh	No (1)	M	I		
103	NCS-AOV-058B	Air Operated Valve	R/B	13-3	ESF	1yr	Mild	Harsh	No (1)	M	I		
104	NCS-LCV-010B	Level Control Valve	R/B	8	PB	1yr	Mild	Harsh	No (1)	M	I		DCD_09.02-68
105	NCS-LCV-010D	Level Control Valve	R/B	8	PB	1yr	Mild	Harsh	No (1)	M	I		
106	NCS-MOV-146A	Motor Operated Valve	R/B	13-3	ESF	1yr	Mild	Mild	No (1)	M	I		DCD_09.02 02-86
107	NCS-MOV-146B	Motor Operated Valve	R/B	13-3	ESF	1yr	Mild	Mild	No (1)	M	I		

Table 3D-2 US-APWR Environmental Qualification Equipment List (Sheet 43 of 62)

Item Num	EquipmentTag	Description	Location		Purpose	Operational Durantion	Environmental Conditions	Radiation Condition	Influence of Submergence for Total Integrated Dose	Qualification Process	Seismic Category	Comments
			Building	Zone	RT, ESF, PAM, Pressure Boundary (PB), Other[1]		Harsh or Mild	Harsh or Mild	Yes/No	E=Electrical M=Mechanical	I, II, Non	
108	NCS-MOV-146C	Motor Operated Valve	R/B	13-3	ESF	1yr	Mild	Mild	No (1)	M	I	
109	NCS-MOV-146D	Motor Operated Valve	R/B	13-3	ESF	1yr	Mild	Mild	No (1)	M	I	
Equipment (Spent Fuel Pit Cooling and Purification System)												
1	SFP-MPP-001A	A-Spent Fuel Pit Pump	R/B	6	ESF	1yr	Mild	Harsh	No (1)	M	I	
2	SFP-MPP-001B	B-Spent Fuel Pit Pump	R/B	6	ESF	1yr	Mild	Harsh	No (1)	M	I	
3	SFP-MHX-001A	A-Spent Fuel Pit Heat Exchanger	R/B	6	ESF	1yr	Mild	Harsh	No (1)	M	I	
4	SFP-MHX-001B	B-Spent Fuel Pit Heat Exchanger	R/B	6	ESF	1yr	Mild	Harsh	No (1)	M	I	
Equipment (Essential Service Water System)												
1	EWS-MPP-001A	A-Essential Service Water Pump	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
2	EWS-MPP-001B	B-Essential Service Water Pump	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
3	EWS-MPP-001C	C-Essential Service Water Pump	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
4	EWS-MPP-001D	D-Essential Service Water Pump	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
5	EWS-SST-001A	A-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
6	EWS-SST-002A	A-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
7	EWS-SST-001B	B-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
8	EWS-SST-002B	B-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
9	EWS-SST-001C	C-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
10	EWS-SST-002C	C-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
11	EWS-SST-001D	D-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
12	EWS-SST-002D	D-Essential Service Water Pump Outlet Strainer	UHSRS	-	ESF	1yr	Mild	-	-	M	I	
13	EWS-SST-003A	A-Component Cooling Water Heat Exchanger Inlet Strainer	R/B	8	ESF	1yr	Mild	Harsh	No (1)	M	I	
14	EWS-SST-003B	B-Component Cooling Water Heat Exchanger Inlet Strainer	R/B	8	ESF	1yr	Mild	Harsh	No (1)	M	I	
15	EWS-SST-003C	C-Component Cooling Water Heat Exchanger Inlet Strainer	R/B	8	ESF	1yr	Mild	Harsh	No (1)	M	I	

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Table 3K-2 R/B RCA Components Protected From Internal Flooding (Sheet 21 of 22)

Item No.	Equipment Tag	Description	Location					Flood Elevation above Floor [ft]	Notes
			Building	Side	Floor Elevation	Fire Zone No.	Location Elevation above Floor		
262	VRS-TS-337	D - Safeguard Component Area Temperature	R/B RCA	W	3'-7"	FA2-153-03	N/A	-	1
263	VRS-TS-335	D - Safeguard Component Area Temperature	R/B RCA	W	3'-7"	FA2-153-03	N/A	-	1
264	VRS-TS-601	A - Annulus Emergency Exhaust Filtration Unit Area Temperature	R/B RCA	E	50'-2"	FA2-416-01	above flood elevation	0.58	
265	VRS-TS-604	A - Annulus Emergency Exhaust Filtration Unit Area Temperature	R/B RCA	E	50'-2"	FA2-416-01	above flood elevation	0.58	
266	VRS-TS-605	A - Annulus Emergency Exhaust Filtration Unit Area Temperature	R/B RCA	E	50'-2"	FA2-416-01	above flood elevation	0.58	
267	VRS-TS-611	B - Annulus Emergency Exhaust Filtration Unit Area Temperature	R/B RCA	W	50'-2"	FA2-417-01	above flood elevation	0.76	
268	VRS-TS-614	B - Annulus Emergency Exhaust Filtration Unit Area Temperature	R/B RCA	W	50'-2"	FA2-417-01	above flood elevation	0.76	
269	VRS-TS-615	B - Annulus Emergency Exhaust Filtration Unit Area Temperature	R/B RCA	W	50'-2"	FA2-417-01	above flood elevation	0.76	
270	NCS-MOV-146A	Motor Operated Valve	R/B RCA	E	3'-7"	FA2-209-03	above flood elevation	0.69	
271	NCS-MOV-146B	Motor Operated Valve	R/B RCA	E	3'-7"	FA2-151-04	above flood elevation	0.69	
272	NCS-MOV-146C	Motor Operated Valve	R/B RCA	W	3'-7"	FA2-152-04	above flood elevation	0.88	

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Table 3K-2 R/B RCA Components Protected From Internal Flooding (Sheet 22 of 22)

Item No.	Equipment Tag	Description	Location					Flood Elevation above Floor [ft]	Notes
			Building	Side	Floor Elevation	Fire Zone No.	Location Elevation above Floor		
273	NCS-MOV-146D	Motor Operated Valve	R/B RCA	W	3'-7"	FA2-128-02	above flood elevation	0.88	

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Note:

1. These components are protected by water-tight door and floor drain isolation valve against in-flow of flooding occurring outside of compartment. In addition, these components are not required to be protected against flooding occurring inside the compartment due to redundancy of other trains/components.

Table 3K-3 R/B NRCA Components Protected From Internal Flooding (Sheet 28 of 29)

Item No.	Equipment Tag	Description	Location					Flood Elevation above Floor [ft]	Notes
			Building	Side	Floor Elevation	Fire Zone No.	Location Elevation above Floor		
431	VRS-TS-146	Main Control Room Temperature	R/B NRCA	W	26'-11"	FA2-308-01	N/A	-	6
432	VRS-TS-156	Main Control Room Temperature	R/B NRCA	W	26'-11"	FA2-308-01	N/A	-	6
433	VRS-TS-166	Main Control Room Temperature	R/B NRCA	W	26'-11"	FA2-308-01	N/A	-	6
434	VRS-TS-176	Main Control Room Temperature	R/B NRCA	W	26'-11"	FA2-308-01	N/A	-	6
435	NCS-LCV-010B	Level Control Valve	R/B NRCA	E	101'-0"	FA2-106-01	above flood elevation	1.71	
436	NCS-LCV-010D	Level Control Valve	R/B NRCA	W	101'-0"	FA2-604-01	above flood elevation	1.71	7
437	NCS-LT-011A	A - Component Cooling Water Surge Tank Water Level	R/B NRCA	E	101'-0"	FA2-601-01	above flood elevation	1.71	
438	NCS-LT-011B	A - Component Cooling Water Surge Tank Water Level	R/B NRCA	E	101'-0"	FA2-601-01	above flood elevation	1.71	
439	NCS-LT-011C	B - Component Cooling Water Surge Tank Water Level	R/B NRCA	W	101'-0"	FA2-602-01	above flood elevation	3.08	
440	NCS-LT-011D	B - Component Cooling Water Surge Tank Water Level	R/B NRCA	W	101'-0"	FA2-602-01	above flood elevation	3.08	
441	NCS-PT-025	A - Component Cooling Water Pump discharge Pressure	R/B NRCA	E	-26'-4"	FA2-104-01	above flood elevation	0.45	
442	NCS-PT-026	B - Component Cooling Water Pump discharge Pressure	R/B NRCA	E	-26'-4"	FA2-105-01	above flood elevation	0.45	
443	NCS-PT-027	C - Component Cooling Water Pump discharge Pressure	R/B NRCA	W	-26'-4"	FA2-106-01	above flood elevation	0.60	
444	NCS-PT-028	D - Component Cooling Water Pump discharge Pressure	R/B NRCA	W	-26'-4"	FA2-107-01	above flood elevation	0.60	
445	NCS-PT-035	A - Component Cooling Water Pump discharge Pressure	R/B NRCA	E	-26'-4"	FA2-105-01	above flood elevation	0.45	
446	NCS-PT-036	B - Component Cooling Water Pump discharge Pressure	R/B NRCA	E	-26'-4"	FA2-104-01	above flood elevation	0.45	

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Table 3K-3 R/B NRCA Components Protected From Internal Flooding (Sheet 29 of 29)

Item No.	Equipment Tag	Description	Location					Flood Elevation above Floor [ft]	Notes
			Building	Side	Floor Elevation	Fire Zone No.	Location Elevation above Floor		
447	NCS-PT-037	C - Component Cooling Water Pump discharge Pressure	R/B NRCA	W	-26'-4"	FA2-106-01	above flood elevation	0.60	
448	NCS-PT-038	D - Component Cooling Water Pump discharge Pressure	R/B NRCA	W	-26'-4"	FA2-107-01	above flood elevation	0.60	

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Notes:

1. These components are protected by water-tight door and floor drain isolation valve against in-flow of flooding occurring outside of compartment. In addition, these components are not required to be protected against flooding occurring inside the compartment due to redundancy of other trains/components.
2. There is no impact to this component, even if outside of pit is flooded.
3. Main feed water valves are submerged in the event of main feed water pipe rupture. However, the function of these valves are not required for the mitigation of a main feed water rupture event. Main feed water valves are required for containment isolation function in the event of LOCA. In the event of LOCA, a huge volume of water is released. However, this flooding only occurs inside containment. Therefore, these valves are not submerged in the event of LOCA.
4. Support leg of A-CCW surge tank is flooded, but there is no impact to function of this component.
5. Lower portion of B-CCW surge tank is flooded, but there is no impact to function of this component.
6. These components are protected by water-tight door against in-flow of flooding occurring outside of compartment.
7. These valves are closed when in the normal condition. If this valve opens due to the event of flooding, the water is continuously supplied to CCW surge tank. Then, the surge tank may fail. However, the other valve "NCS-RCV-056B" will open on a high pressure alarm. Since the valve "NCS-RCV-056B" is not submerged in the event of flooding, the CCW surge tank maintains its function.

Table 7.4-1 Component Controls for Shutdown (Sheet 3 of 6)

Systems	Components	Normal Shutdown	Safe Shutdown	Train number for Safe Shutdown		Remarks
				Required Number	Actual Number	
RHRS (conti-nued	RHR Flow Control Valve	Yes	Yes	2	4	Table 5.4.7-1
	CS/RHR Pump Full-Flow Test Line Stop Valve	No	Yes	2	4	Table 5.4.7-1
EFWS	EFW Pump (Motor-Driven or Turbine Driven)	No	Yes	2	4	Table 5.4.7-1
	EFW Control Valve	No	Yes	2	4	Table 10.4.9-3
	EFW Isolation Valve	No	Yes	2	4	Table 10.4.9-3
	T/D-EFW Pump MS Line Steam Isolation Valve	No	Yes	1	4	Table 10.4.9-3
	T/D-EFW Pump Actuation Valve	No	Yes	1	4	Table 10.4.9-3
MSS	Main Steam Depressurization Valve	No	Yes	2	4	Table 10.3.3-1
	Main Steam Relief Valve	Yes	No	-	-	
	Main Steam Relief Valve Block Valve	No	Yes	2	4	Table 10.3.3-1
	Main Steam Isolation Valve	Yes	Yes	4	4	Table 10.3.3-1
	Main Steam Bypass Isolation Valve	Yes	Yes	4	4	Table 10.3.3-1
	Turbine Bypass Valve	Yes	No	-	-	
CFS	MFW Bypass Regulation valve	Yes	No	-	-	
	SG Water Filling Control Valve	Yes	No	-	-	
CCWS	CCW Pump	Yes	Yes	2	4	Automatic start in LOOP. Table 9.2.2-3
	CS/RHR Hx CCW Outlet 1st Valve	Yes	Yes	2	4	Table 9.2.2-3
	CS/RHR Hx CCW Outlet 2nd Valve	No	Yes	1	4	Table 9.2.2-3
ESWS	ESW Pump	Yes	Yes	2	4	Automatic start in LOOP. Table 9.2.2-3
	ESW Pump Discharge Valve	Yes	Yes	2	4	Table 9.2.2-3

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Table 7.4-2 Indication for Shutdown (Sheet 2 of 2)

Systems	Instruments	Number of Required Channels	Normal Shutdown	Safe Shutdown	Remarks
CCWS	CCW Surge Tank Water Level	2 per Tank	Yes	Yes	
	CCW Header Pressure	1 per Line	Yes	Yes	
	CCW Header Flow	1 per Line	Yes	Yes	
	CCW Supply Temperature	1 per Line	Yes	Yes	
	CCW Pump Discharge Pressure	2 per Line	No	Yes	
ESWS	CCW Hx ESW Flow	1 per Line	Yes	Yes	
	ESW Header Pressure	1 per Line	Yes	Yes	
RWS	RWSP Water Level (Wide Range)	2	No	Yes	
NIS	Source Range Neutron Flux	2	No	Yes	

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9.2.2.2.1.5 Valves

The following summarizes the major CCWS valves and their functions. Table 9.2.2-7 provides a listing of valves and the Class 1E power source. DCD_09.02.02-51

- **Header tie line isolation valve (Supply valves NCS-MOV-020A/B/C/D and Return valves NCS-MOV-007A/B/C/D)** DCD_09.02.02-48

Each safety train has both supply and return header tie line isolation valves so that a single failure of one of the safety trains will not impact the other safety trains.The function of this motor operated valve is to separate each subsystem into two independent trains during abnormal and accident conditions. This ensures each safety train is isolated from ~~any~~a potential passive failure in the non-safety portion or another safety train of the CCWS. ~~This valve automatically closes at once upon the following signals:~~This valve is operated from the MCR when an operator determines that train separation is required. DCD_09.02.02-48

  - ~~Low- low water level signal of a CCW surge tank~~
  - ~~ECCS actuation signal and under voltage signal~~
  - ~~Containment Spray signal~~

Header isolation meets the single failure criteria by incorporating two header tie line isolation valves. The ~~header isolation valves are designed to close within 30 seconds upon a S+UV signal, P signal, or surge tank water low low level. Then, in order to resume supply of the cooling water to the RCP thermal barrier heat exchanger and the spent fuel pit heat exchanger, the isolation signal can be bypassed and the isolation valves respond. In addition, the~~ header isolation valves are ~~opened in order~~open to supply cooling water to A, B, A1 and A2 trains (or C, D, C1 and C2 trains) by one CCW pump during normal operation. In the event of an accident, the header tie line valves are closed by operator action from the MCR to achieve independence between trains. MOV-007A and MOV-020A (or MOV-007B and MOV-020B) will be closed for Subsystem A. Conversely, MOV-007C and MOV-020C (or MOV-007D and MOV-020D) will be closed for Subsystem B. The header isolation valves are designed to close within 30 seconds, but shall not close so rapidly that water hammer would occur. DCD_09.02.02-48 DCD_09.02.02-48

- **Containment Spray/Residual Heat Removal Heat Exchanger (CS/RHRS HX) CCW Outlet 1st Valve (NCS-MOV-145A/B/C/D)** DCD_09.02.02-60

The CCW which is supplied to the CS/RHR heat exchanger is shutoff by the CCW outlet 1st isolation valves (NCS-MOV-145A, B, C and D) during standby. However, this normal closed motor operated valve automatically opens at once upon ~~ECCS actuation signal plus~~receipt of both an ECCS actuation signal and the respective train CCW pump start signal to establish cooling water flow to the CS/RHR heat exchanger. (These valves do not control the supply flow of each component.) These valves are fully open approximately 120 seconds after signal reception. This valve automatically closes if the respective train CCW pump stops resulting in a single pump supplying both CS/RHR heat exchangers. This condition is indicated by receipt of both a low pump discharge pressure signal from the respective train CCW pump and a low CCW header pressure signal. The open/close positions of the valves are displayed in the MCR. DCD_09.02.02-86 DCD_09.02.02-67 DCD_09.02.02-60 DCD_09.02.02-67 DCD_09.02.02-86 DCD_09.02.02-60

- **Containment Spray/Residual Heat Removal Heat Exchanger (CS/RHRS HX) CCW Outlet 2nd Valve (NCS-MOV-146A/B/C/D)** DCD_09.02.02-86

The normally opened motor operated valves (NCS-MOV-146A, B, C and D) are provided on the outlet lines of the respective CS/RHR heat exchangers and are used to isolate a CS/RHR heat exchanger, if necessitated by a train failure, to assure adequate CCW flow to the heat exchanger in the other train of the subsystem. This prevents a functioning CCW pump from supplying both CS/RHR heat exchangers and ensures that there is adequate flow to the heat exchanger in the operable train to satisfy heat removal requirements.

The valve actuates immediately on receipt of both a low pump discharge pressure signal from the respective train CCW pump and a low CCW header pressure signal. The low header pressure setpoint corresponds to a condition in which one CCW pump is supplying flow to both CS/RHR heat exchangers. (These valves do not control the supply flow of each component.) These valves are fully open approximately 120 seconds after signal reception. The open/close positions of the valves are displayed in the MCR.

- **RCP Thermal Barrier HX CCW Return Line Isolation valve (NCS-FCV-129A/B, 130A/B, 131A/B and 132A/B)** DCD_09.02.02-60

Two motor operated valves are located at the CCW outlet of the RCP thermal barrier Hx and close automatically upon a high flow rate signal at the outlet of this line in the event of in-leakage from the RCS through the thermal barrier Hx, and prevents this in-leakage from further contaminating the CCWS. The motor-operated valves receive a separate signal from each flow device. When the valves receive a high flow signal, the valves are closed. The high flow signal must occur for a duration that is sufficient to assure that a spurious signal does not unnecessarily close the valves. The open/close positions of the valves are displayed in the MCR. The valves are redundant to assure isolation in the event of a single failure. DCD_09.02.02-60

- **CCW Surge Tank Vent Valve and Relief Valve**

The surge tank vent valve opens upon CCW surge tank high pressure and this valve closes when the radiation monitor level exceeds its set point. The surge tank relief valve provides surge tank overpressure protection.

- **Other Relief Valve**

Other relief valves are provided to relieve the pressure buildup caused by potential thermal expansion when equipment is isolated.

- **Containment Isolation Valve**

Containment isolation valves are installed on CCW lines penetrating containment as described in Subsection 6.2.4. Containment isolation valves installed on the RCP coolant line that penetrates the containment are not automatically closed on a containment isolation signal in order to preserve flow to the RCP motor and seals. The open/close positions of the valves are displayed in the MCR where operators may control valve position as necessary. DCD_09.02.02-60

During normal operation, the standby pump and CCW HX are periodically tested for operability or, alternatively, placed in service in place of the train which has been operating. Routinely during plant shutdown, automatically operated pumps and valves are tested in accordance with surveillance requirements SR 3.7.7.2 and SR 3.7.7.3. Additionally periodic flow testing is performed to verify correct flow balancing among indi~~b~~vidual heat loads. DCD_09.02.02-65 DCD_09.02.02-67

Descriptions of the testing and inspection programs for pumps and valves are provided in the following subsections and sections:

- Subsection 3.9.6, Functional design, qualification & in-service testing programs for pumps, valves & dynamic restraints;
- Subsection 6.2.4, Containment Isolation System (applicable to CCWS containment isolation valves);
- Section 6.6, In-service inspection & testing of class 2 & 3 components.

9.2.2.5 Instrumentation Requirements

9.2.2.5.1 CCW supply header pressure

CCW header pressure is indicated in the MCR. When the pressure decreases due to the failure or inadvertent shutdown of the operating pump or valve misalignment, an alarm is transmitted to the MCR ~~and the standby pump is started~~based on a low pressure indication. The standby pump is automatically started based on this indication. DCD_09.02.02-60

In addition, the CS/RHR HX CCW Outlet 1st and 2nd valves automatically close on receipt of both the low pump discharge pressure signal from the respective train CCW pump and the low CCW header pressure signal. DCD_09.02.02-86

9.2.2.5.2 CCW radiation monitor

Radiation monitors are located downstream of the supply headers and the signal is ~~indicated~~displayed in the MCR. When the signal exceeds the setpoint, an alarm is transmitted and the CCW surge tank vent valve is closed. After header tie line isolation, the radiation monitor line root valves are operated in order to realign radiation monitoring. DCD_09.02.02-66

9.2.2.5.3 CCW supply header flow rate

The CCW supply header flow rates are indicated in the MCR.

9.2.2.5.4 CCW surge tank water level

~~The CCW surge tank water level is indicated in the MCR. If CCWS in-leakage or out-leakage occurs, a high or low water level alarm is transmitted to the MCR.~~The CCWS is designed with redundant MCR level indication for each surge tank compartment. The normal demineralized water makeup line for each CCWS surge tank compartment contains a flow indication device that can also be read in the MCR. The combination of continuously monitored compartment level and demineralized water makeup flow provides the ability to trend compartment level data and normal makeup flow. The DCD_09.02.02-57 capability to trend this data allows operators to ensure that the compartment water volume does not decrease below that necessary to ensure CCWS function for 7 days without makeup for post-seismic operation, if necessary. DCD_09.02.02-57

Surge tank water level considerations include:

- Potential inleakage from an RCP thermal barrier heat exchanger, as discussed in Subsection 9.2.2.2.1.3.
- Volume variations due to CCW temperature change, as discussed in Subsection 9.2.2.2.1.3.
- Adequate volume in each compartment to accommodate potential leakage for 7 days without makeup, as discussed in Subsection 9.2.2.3.2.

~~A low-low water level signal~~The normal water makeup valves (LCV-010A/B/C/D) are automatically closed when the surge tank reaches the normal level. A high water level signal provides an alarm in the MCR. A low water level signal provides an alarm in the MCR and opens the normal water makeup valves. Only one of the two instruments for each compartment is used to provide automatic control of the associated surge tank makeup valve. A low-low water level signal also provides a MCR alarm and isolates the components located in the non-seismic category I buildings. ~~In addition, the isolation valves on the header tie line are closed by a low-low water level signal and the subsystem, where the low-low water level signal is actuated, is divided into two independent trains for each train to supply the respective loop.~~ DCD_09.02.02-48 Level indication that is on-scale (i.e., at or above the 0% instrument level) is indicative of adequate CCWS pump net positive suction head. DCD_09.02.02-57

9.2.2.5.5 RCP thermal barrier HX and RCP motor cooling water flow rate

Reactor coolant pump thermal barrier HX and motor cooling water flow rate is indicated in the MCR. If the flow rate drops to its low flow setpoint, a low flow alarm is transmitted to the MCR. A high flow alarm, resulting from the in-leakage of reactor coolant to CCWS due to the reactor coolant pump thermal barrier HX tube leak, is transmitted to the MCR when the flow rate becomes about 1.5 times as large as the normal flow rate, and the isolation valves located at cooling water return line are closed.

9.2.2.5.6 CCW surge tank pressure

The CCW surge tank pressure is locally indicated. The surge tank nitrogen cover gas supply valve and tank vent valve are controlled with open-closed control so that the tank pressures are maintained within a pre-set range. High and low surge tank pressures are alarmed in the MCR.

9.2.2.5.7 CCWP ~~discharge and~~ suction pressure DCD_09.02.02-86

The CCW pump ~~discharge and~~ suction pressure~~s are~~ is locally indicated and ~~are~~is used for CCW pump performance testing.

9.2.2.5.8 CCWP discharge pressure

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Two pressure instruments are provided at the CCW pump outlet. When the pump discharge pressure decreases due to the failure or inadvertent shutdown of an operating pump, an alarm is transmitted to the MCR. In addition, the CS/RHR HX CCW Outlet 1st and 2nd valves automatically close on indications of this condition. One of two pressure indicators is indicated in the MCR; the other is a local indicator, which can be used for the CCW pump performance testing.

9.2.2.5.9 CCW supply temperature

The CCW HX outlet temperature is indicated in the MCR. When the temperature exceeds the setpoint, an alarm is transmitted to the MCR.

9.2.2.5.10 Other instrumentation

As shown in Figure 9.2.2-1, the other flow and temperature indicators are provided where required. These indicators are used for initial flow balancing, and flow and temperature verification during plant operation.

9.2.3 [Reserved]

Not applicable to the US-APWR.

9.2.4 Potable and Sanitary Water Systems

[[The objective of the potable and sanitary water system (PSWS) is to provide clean and potable water for domestic use and human consumption and to collect site sanitary waste for treatment, dilution and discharge during normal operation. The system serves all the areas in the T/B, R/B, A/B, access building, firehouse and future facilities.]]

9.2.4.1 Design Bases

[[There are no safety design bases for the potable and sanitary water system. The power generation design bases are as follows:]]

- [[The potable and sanitary water system is designed with no interconnection to systems that could potentially introduce contaminants including radiological contaminates into the system. This conforms to the requirement of GDC 60 (Ref. 9.2.11-1).]]
- [[The potable water is designed to be treated if necessary to prevent harmful physiological effects. Its bacteriological and chemical quality conforms to the requirements of the Environmental Protection Agency "National Primary Drinking Water Standards," 40 CFR 141 (Ref. 9.2.11-4). All state and local environmental protection standards will also be followed, as these may be more stringent than federal requirements.]] The COL Applicant is to confirm that all State and Local Department of Health and Environmental Protection Standards are applied and followed. The COL Applicant is to confirm the source of potable water to the site and the necessary required treatment.

Table 9.2.2-3 Component Cooling Water System Failure Modes and Effects Analysis (Sheet 2 of 5)

Item	Component	Safety Function	Failure Mode	Effect on System Safety Function	Failure Detection Method
4	CS/RHR HX cooling water outlet 1st valve (MOV-145A,B,C,D)	Opens to provide flow path to CS/RHR heat exchanger	Fails to open upon the demand signal	None Remaining three 50% capacity CS/RHR Heat Exchanger are available. Minimum two Heat Exchangers are required.	Valve position indication in MCR
		Isolates the supply line to CS/RHR heat exchanger (In case that CCW pump stops)	Fails to close on the demand signal	None Two isolation valves are provided in series (Closure of one valve provides isolation)	Valve position indication in MCR
5	Isolation valve for supply to non-seismic category I portion (AOV-601,602 AOV-661A,662A AOV-661B,662B)non-safety portion (AOV-057A,058A, AOV-057B,058B)	Isolates the supply line connected to non-seismic category Inon-safety portion	Fails to close on the demand signal	None Two isolation valves are provided in series. Close of one valve provides isolation. (Check valves are provided in return line.)	Valve position indication in MCR
6	RCP thermal barrier cooling water outlet valve (FCV-129A,B,130A,B, 131A,B,132A,B)	Isolates in-leak to CCWS	Fails to close on the demand signal	None Two isolation valves are provided in series. Close of one valve provides isolation.	Valve position indication in MCR

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Table 9.2.2-3 Component Cooling Water System Failure Modes and Effects Analysis (Sheet 5 of 5)

Item	Component	Safety Function	Failure Mode	Effect on System Safety Function	Failure Detection Method
14	CS/RHR HX cooling water outlet 2nd valve (MOV-146A,B,C,D)	Isolates the supply line to CS/RHR heat exchanger (In case that CCW pump stops)	Fails to close on the demand signal	None Two isolation valves are provided in series. Closure of one valve provides isolation.	Valve position indication in MCR

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Note 1: As discussed in Subsection 9.2.2.2.2.4, header tie line isolation valve closure is assumed within 24 hours, by manual operation from the MCR, after an ECCS signal to establish separation of the two trains within a subsystem. Prior to closure of the header tie line isolation valves, there is the potential for additional loading on one train of a subsystem if a single failure is postulated in the other train (e.g., Given a ECCS automatic initiation signal and a single failure of one CCWS pump to auto start, one CCWS may supply ECCS loads to two trains). The additional heat load on the available heat exchanger is small in comparison to the heat exchanger margins discussed in Subsection 9.2.2.2.1.1.

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Table 9.2.2-7 Electrical Power Division of Remotely Operated Valves (Sheet 1 of 3)

DCD_09.02.02-51

Valve Number	Operator Type	Electrical Power Division
MOV-007A-S	motor	A (Class 1E-station ac power source system)
MOV-007B-S	motor	B (Class 1E-station ac power source system)
MOV-007C-S	motor	C (Class 1E-station ac power source system)
MOV-007D-S	motor	D (Class 1E-station ac power source system)
MOV-020A-S	motor	A (Class 1E-station ac power source system)
MOV-020B-S	motor	B (Class 1E-station ac power source system)
MOV-020C-S	motor	C (Class 1E-station ac power source system)
MOV-020D-S	motor	D (Class 1E-station ac power source system)
MOV-145A-S	motor	A (Class 1E-station ac power source system)
MOV-145B-S	motor	B (Class 1E-station ac power source system)
MOV-145C-S	motor	C (Class 1E-station ac power source system)
MOV-145D-S	motor	D (Class 1E-station ac power source system)
MOV-146A-S	motor	B (Class 1E-station ac power source system)
MOV-146B-S	motor	A (Class 1E-station ac power source system)
MOV-146C-S	motor	D (Class 1E-station ac power source system)
MOV-146D-S	motor	C (Class 1E-station ac power source system)
MOV-232A-S	motor	B' (Class 1E-480V ac inverter supply system)
MOV-232B-S	motor	C' (Class 1E-480V ac inverter supply system)
MOV-233A-S	motor	B' (Class 1E-480V ac inverter supply system)
MOV-233B-S	motor	C' (Class 1E-480V ac inverter supply system)
MOV-234A-S	motor	B' (Class 1E-480V ac inverter supply system)
MOV-234B-S	motor	C' (Class 1E-480V ac inverter supply system)
MOV-316A-S	motor	A1 (Class 1E-station ac power source system (for 2 trains))
MOV-316B-S	motor	D1 (Class 1E-station ac power source system (for 2 trains))
MOV-321A-S	motor	A1 (Class 1E-station ac power source system (for 2 trains))
MOV-321B-S	motor	D1 (Class 1E-station ac power source system (for 2 trains))
MOV-322A-S	motor	A1 (Class 1E-station ac power source system (for 2 trains))
MOV-322B-S	motor	D1 (Class 1E-station ac power source system (for 2 trains))
MOV-323A-S	motor	A1 (Class 1E-station ac power source system (for 2 trains))
MOV-323B-S	motor	D1 (Class 1E-station ac power source system (for 2 trains))

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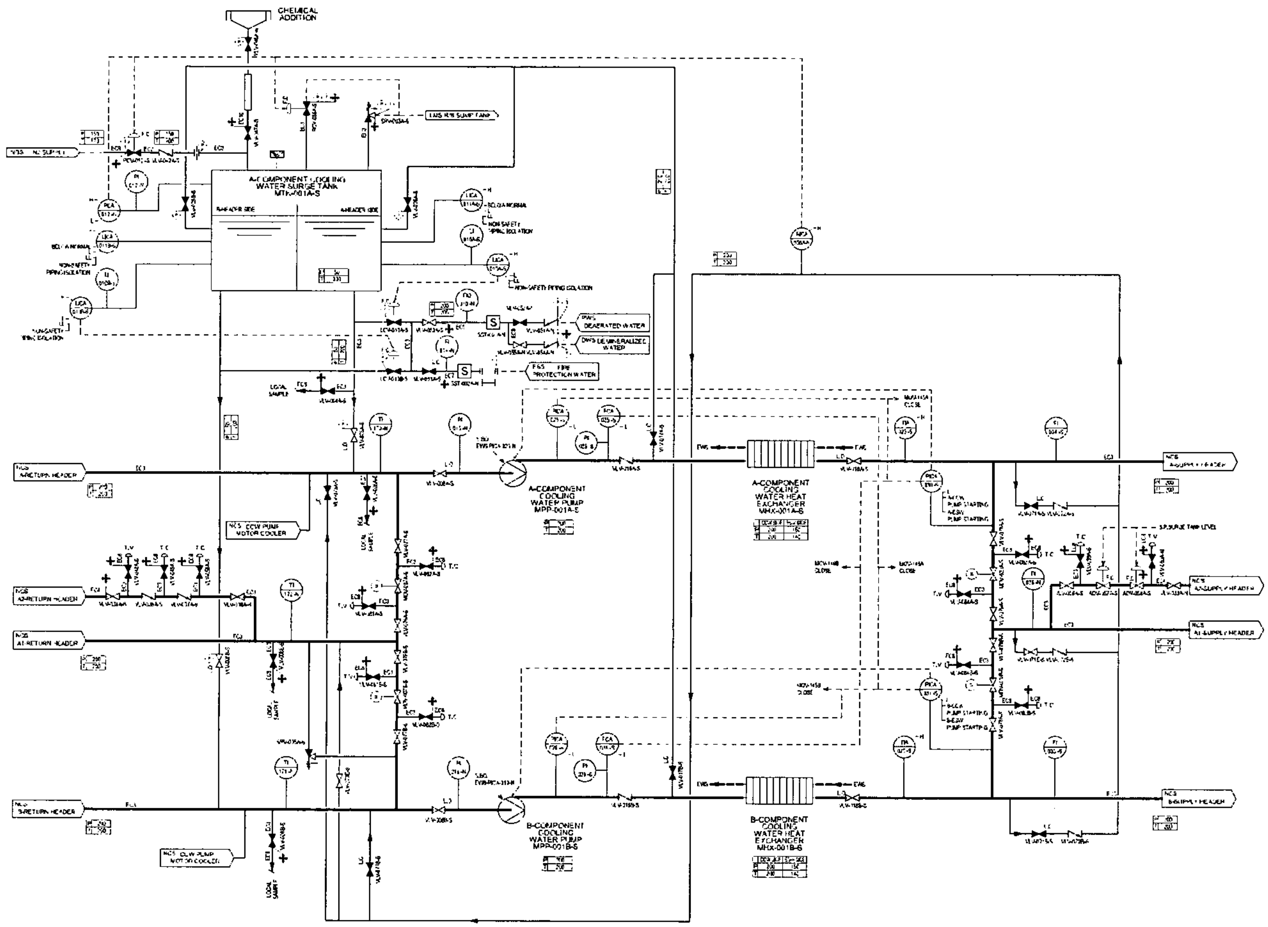

Figure 9.2.2-1 Component Cooling Water System Piping and Instrumentation Diagram (Sheet 1 of 9)

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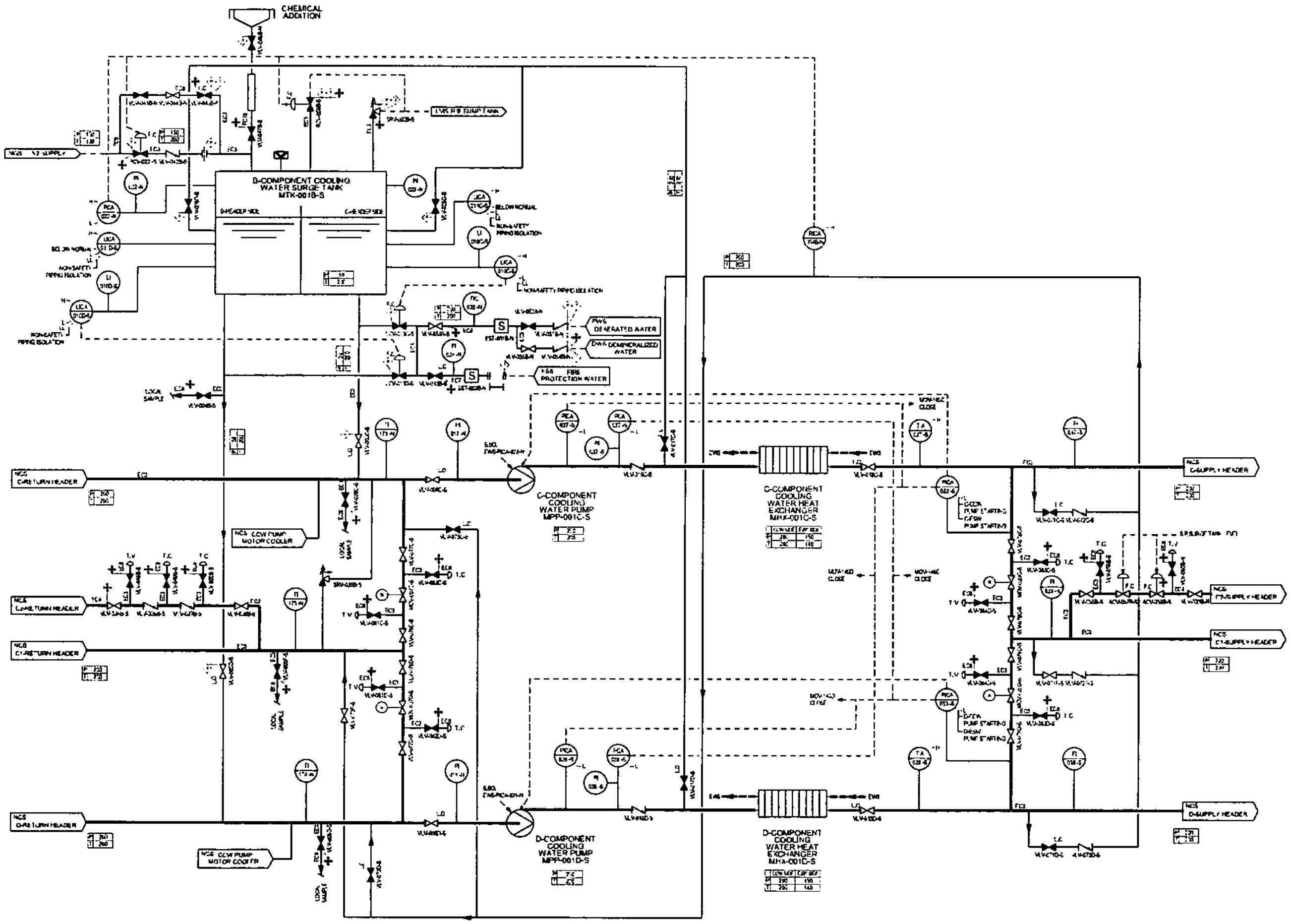

Figure 9.2.2-1 Component Cooling Water System Piping and Instrumentation Diagram (Sheet 2 of 9)

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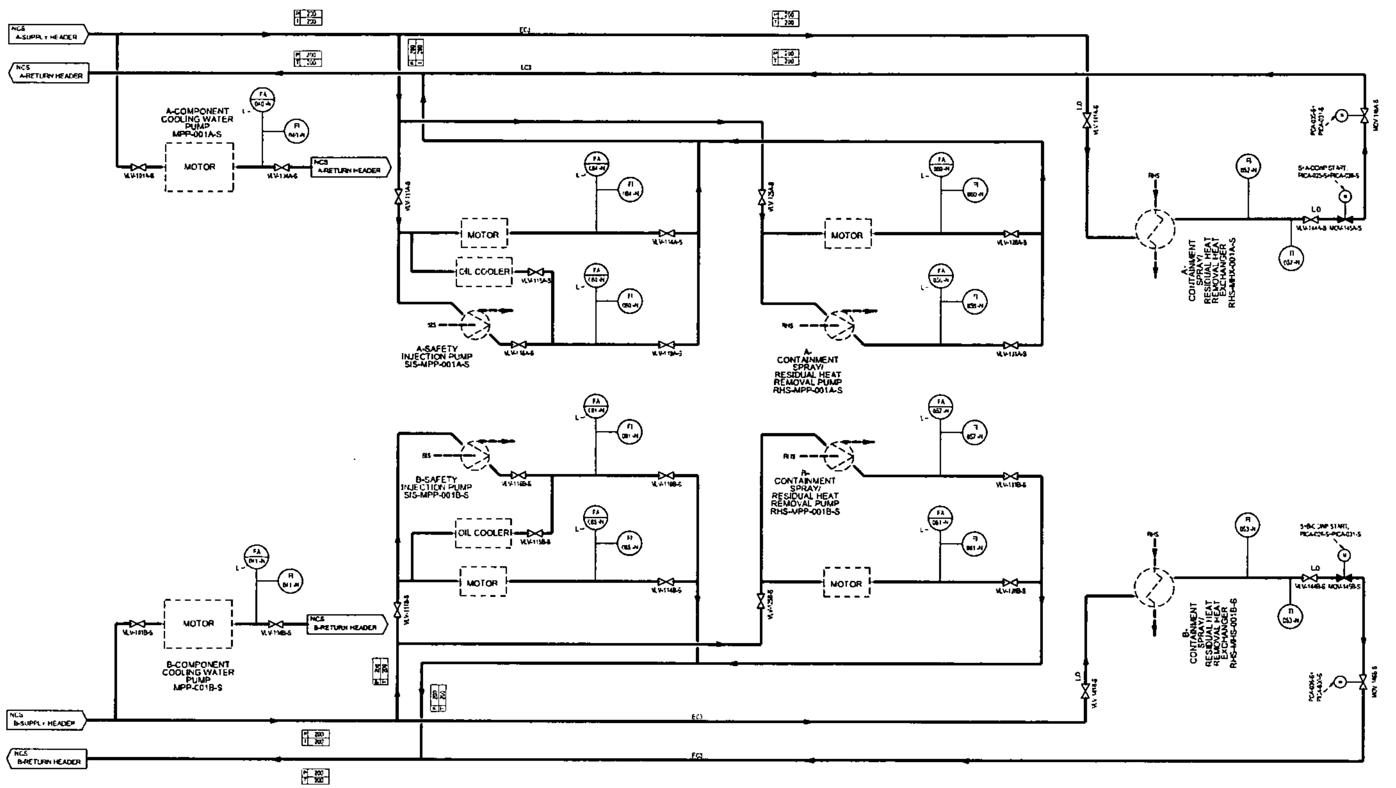

Figure 9.2.2-1 Component Cooling Water System Piping and Instrumentation Diagram (Sheet 3 of 9)

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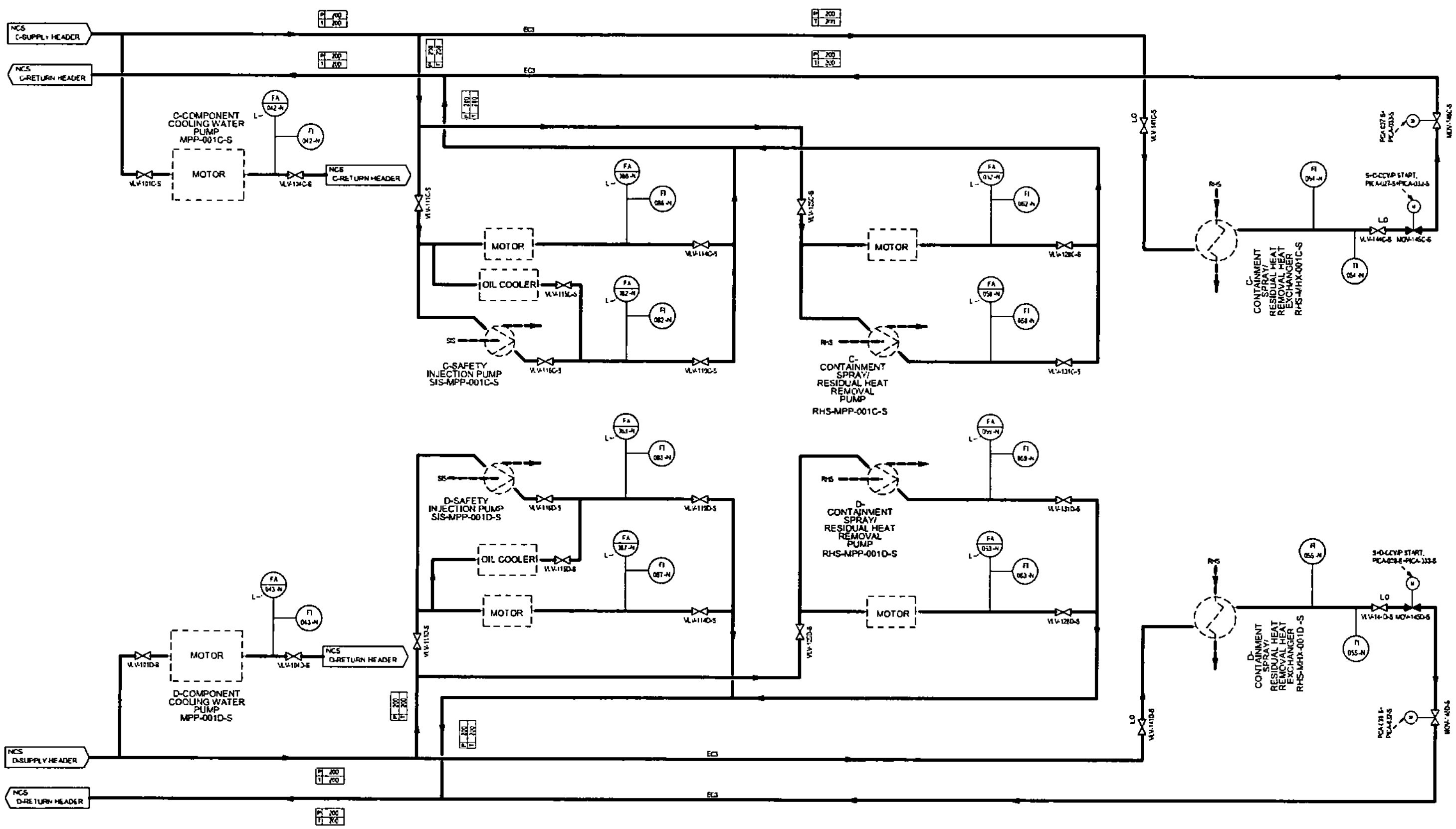

Figure 9.2.2-1 Component Cooling Water System Piping and Instrumentation Diagram (Sheet 4 of 9)

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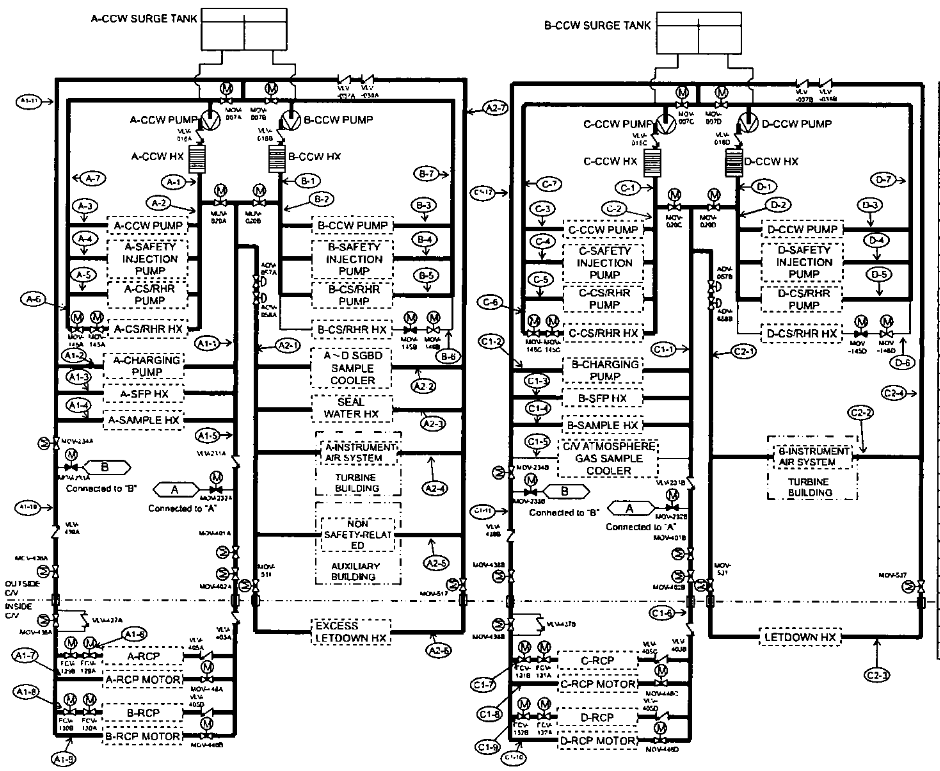

Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)	Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)
A-1	121	100	5918.5	C-1	121	100	5532.5
A-2	121	100	4700	C-2	121	100	4700
A-3	57	~200	40	C-3	57	~200	40
A-4	57	~200	180	C-4	57	~200	180
A-5	57	~200	80	C-5	57	~200	80
A-6	57	~200	4400	C-6	57	~200	4400
A-7	57	~200	4700	C-7	57	~200	4700
B-1	121	100	5918.5	D-1	121	100	5532.5
B-2	121	100	300	D-2	121	100	300
B-3	57	~200	40	D-3	57	~200	40
B-4	57	~200	180	D-4	57	~200	180
B-5	57	~200	80	D-5	57	~200	80
B-6	-	-	0	D-6	-	-	0
B-7	57	~200	300	D-7	57	~200	300
A1-1	121	100	4575	C1-1	121	100	4575
A1-2	57	~200	180	C1-2	57	~200	180
A1-3	57	~200	3600	C1-3	57	~200	3600
A1-4	57	~200	14.1	C1-4	57	~200	14.1
A1-5	121	100	780	C1-5	-	-	0
A1-6	57	~200	40	C1-6	121	100	780
A1-7	57	~200	350	C1-7	57	~200	40
A1-8	57	~200	40	C1-8	57	~200	350
A1-9	57	~200	350	C1-9	57	~200	40
A1-10	57	~200	780	C1-10	57	~200	350
A1-11	57	~200	4575	C1-11	57	~200	780
A2-1	121	100	2262	C1-12	57	~200	4575
A2-2	57	~200	60	C2-1	121	100	1490
A2-3	57	~200	250	C2-2	57	~200	190
A2-4	57	~200	190	C2-3	57	~200	1300
A2-5	57	~200	1488	C2-4	57	~200	1490
A2-6	57	~200	273.7				
A2-7	57	~200	2262				

Figure 9.2.2-2 Component Cooling Water System Mode Diagram (Sheet 1 of 6) Design - Startup

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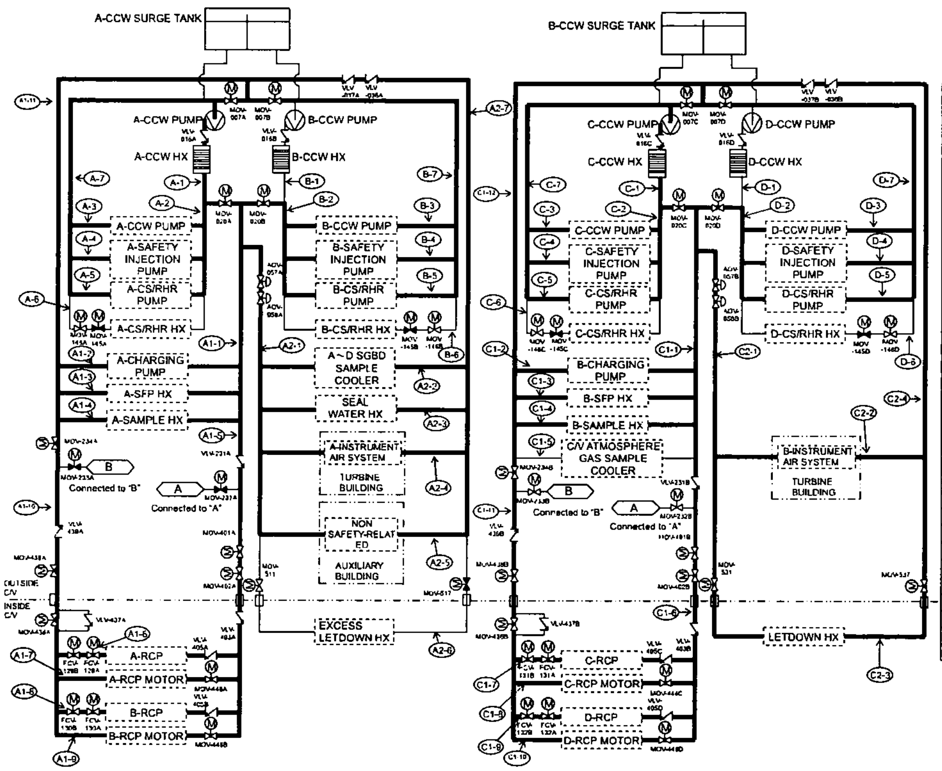

Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)	Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)
A-1	121	100	7163	C-1	121	100	6100
A-2	121	100	300	C-2	121	100	300
A-3	57	~200	40	C-3	57	~200	40
A-4	57	~200	180	C-4	57	~200	180
A-5	57	~200	80	C-5	57	~200	80
A-6	-	-	0	C-6	-	-	0
A-7	57	~200	300	C-7	57	~200	300
B-1	-	-	0	D-1	-	-	0
B-2	121	100	300	D-2	121	100	300
B-3	57	~200	40	D-3	57	~200	40
B-4	57	~200	180	D-4	57	~200	180
B-5	57	~200	80	D-5	57	~200	80
B-6	-	-	0	D-6	-	-	0
B-7	57	~200	300	D-7	57	~200	300
A1-1	121	100	4575	C1-1	121	100	4575
A1-2	57	~200	180	C1-2	57	~200	180
A1-3	57	~200	3600	C1-3	57	~200	3600
A1-4	57	~200	14.1	C1-4	57	~200	14.1
A1-5	121	100	780	C1-5	-	-	0
A1-6	57	~200	40	C1-6	121	100	780
A1-7	57	~200	350	C1-7	57	~200	40
A1-8	57	~200	40	C1-8	57	~200	350
A1-9	57	~200	350	C1-9	57	~200	40
A1-10	57	~200	780	C1-10	57	~200	350
A1-11	57	~200	4575	C1-11	57	~200	780
A2-1	121	100	1988	C1-12	57	~200	4575
A2-2	57	~200	60	C2-1	121	100	925
A2-3	57	~200	250	C2-2	57	~200	190
A2-4	57	~200	190	C2-3	57	~200	734.4
A2-5	57	~200	1488	C2-4	57	~200	925
A2-6	-	-	0				
A2-7	57	~200	1988				

Figure 9.2.2-2 Component Cooling Water System Mode Diagram (Sheet 2 of 6) Design - Power Operation

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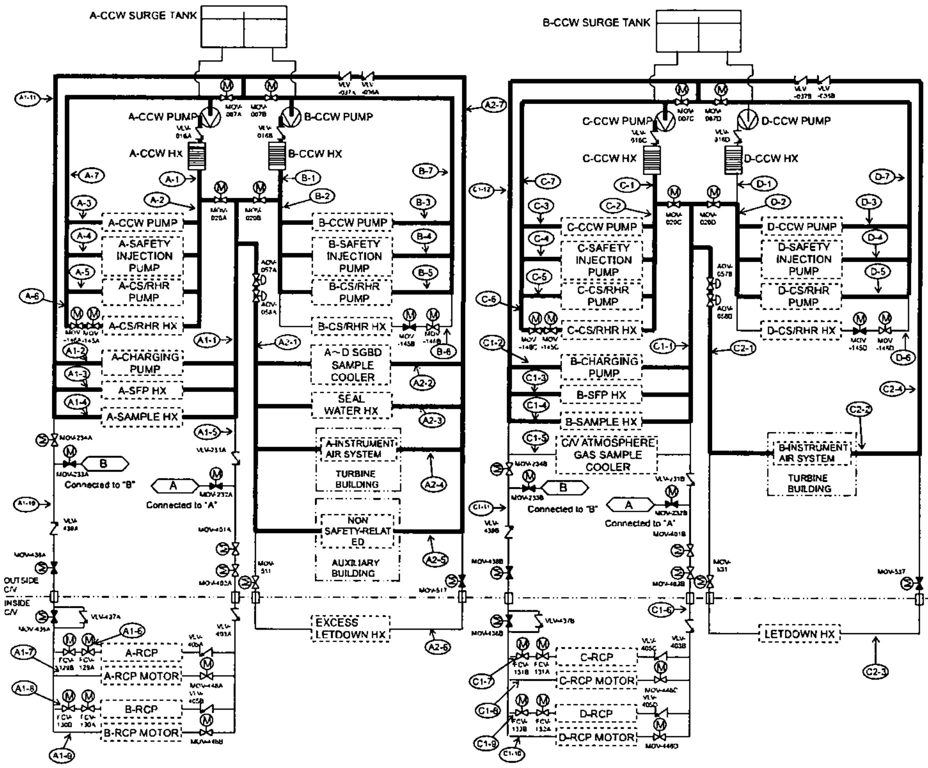

Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)	Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)
A-1	121	100	5391.5	C-1	121	100	8985
A-2	121	100	4700	C-2	121	100	4700
A-3	57	~200	40	C-3	57	~200	40
A-4	57	~200	180	C-4	57	~200	180
A-5	57	~200	80	C-5	57	~200	80
A-6	57	~200	4400	C-6	57	~200	4400
A-7	57	~200	4700	C-7	57	~200	4700
B-1	121	100	5391.5	D-1	-	-	0
B-2	121	100	300	D-2	121	100	300
B-3	57	~200	40	D-3	57	~200	40
B-4	57	~200	180	D-4	57	~200	180
B-5	57	~200	80	D-5	57	~200	80
B-6	-	-	0	D-6	-	-	0
B-7	57	~200	300	D-7	57	~200	300
A1-1	121	100	3795	C1-1	121	100	3795
A1-2	57	~200	180	C1-2	57	~200	180
A1-3	57	~200	3600	C1-3	57	~200	3600
A1-4	57	~200	14.1	C1-4	57	~200	14.1
A1-5	-	-	0	C1-5	-	-	0
A1-6	-	-	0	C1-6	-	-	0
A1-7	-	-	0	C1-7	-	-	0
A1-8	-	-	0	C1-8	-	-	0
A1-9	-	-	0	C1-9	-	-	0
A1-10	-	-	0	C1-10	-	-	0
A1-11	57	~200	3795	C1-11	-	-	0
A2-1	121	100	1988	C1-12	57	~200	3795
A2-2	57	~200	60	C2-1	121	100	190
A2-3	57	~200	250	C2-2	57	~200	190
A2-4	57	~200	190	C2-3	-	-	0
A2-5	57	~200	1488	C2-4	57	~200	190
A2-6	-	-	0				
A2-7	57	~200	1988				

Figure 9.2.2-2 Component Cooling Water System Mode Diagram (Sheet 3 of 6) Design - Refueling

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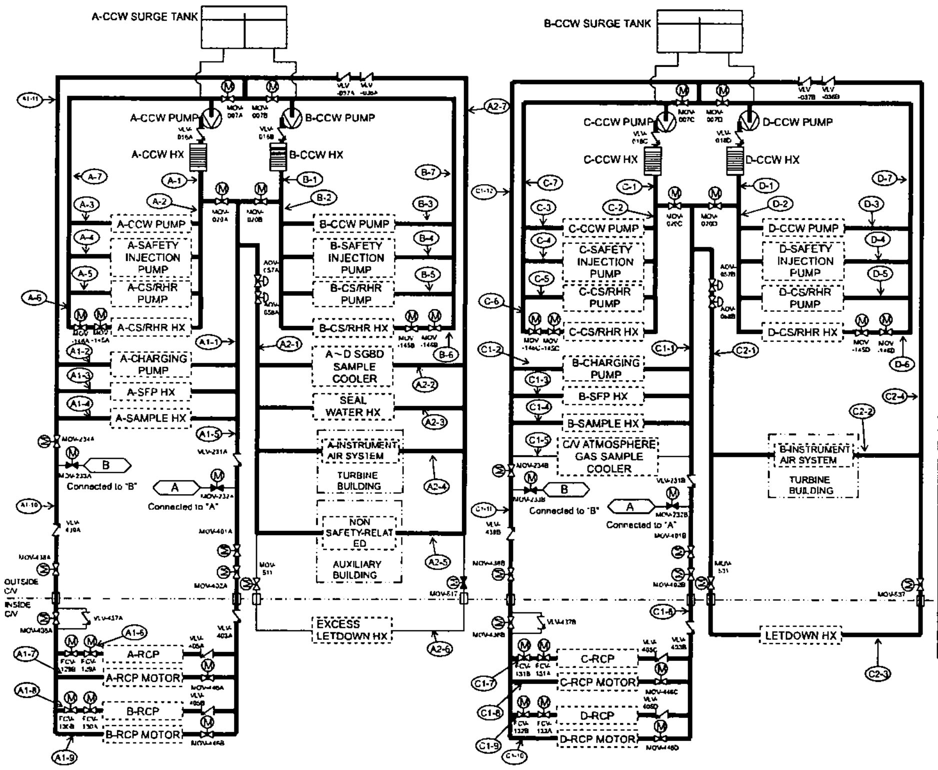
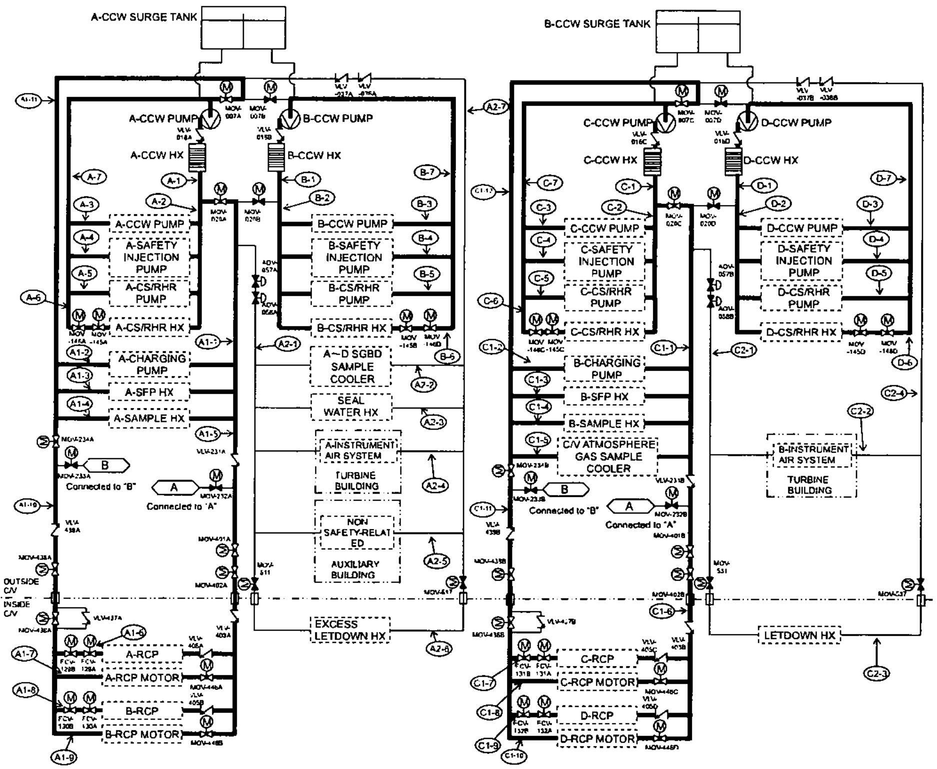


Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)	Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)
A-1	121	104	7981.5	C-1	121	104	7732.5
A-2	121	104	4700	C-2	121	104	4700
A-3	57	~200	40	C-3	57	~200	40
A-4	57	~200	180	C-4	57	~200	180
A-5	57	~200	80	C-5	57	~200	80
A-6	57	~200	4400	C-6	57	~200	4400
A-7	57	~200	4700	C-7	57	~200	4700
B-1	121	104	7981.5	D-1	121	104	7732.5
B-2	121	104	4700	D-2	121	104	4700
B-3	57	~200	40	D-3	57	~200	40
B-4	57	~200	180	D-4	57	~200	180
B-5	57	~200	80	D-5	57	~200	80
B-6	57	~200	4400	D-6	57	~200	4400
B-7	57	~200	4700	D-7	57	~200	4700
A1-1	121	104	4575	C1-1	121	104	4575
A1-2	57	~200	180	C1-2	57	~200	180
A1-3	57	~200	3600	C1-3	57	~200	3600
A1-4	57	~200	14.1	C1-4	57	~200	14.1
A1-5	121	104	780	C1-5	-	-	0
A1-6	57	~200	40	C1-6	121	104	780
A1-7	57	~200	350	C1-7	57	~200	40
A1-8	57	~200	40	C1-8	57	~200	350
A1-9	57	~200	350	C1-9	57	~200	40
A1-10	57	~200	780	C1-10	57	~200	350
A1-11	57	~200	4575	C1-11	57	~200	780
A2-1	121	104	1988	C1-12	57	~200	4575
A2-2	57	~200	60	C2-1	121	100	1490
A2-3	57	~200	250	C2-2	57	~200	190
A2-4	57	~200	190	C2-3	57	~200	1300
A2-5	57	~200	1488	C2-4	57	~200	1490
A2-6	-	-	0				
A2-7	57	~200	1988				

Figure 9.2.2-2 Component Cooling Water System Mode Diagram (Sheet 4 of 6) Design - Cooldown by CS/RHRS

DCD_09.02.02-51
DCD_09.02.02-86

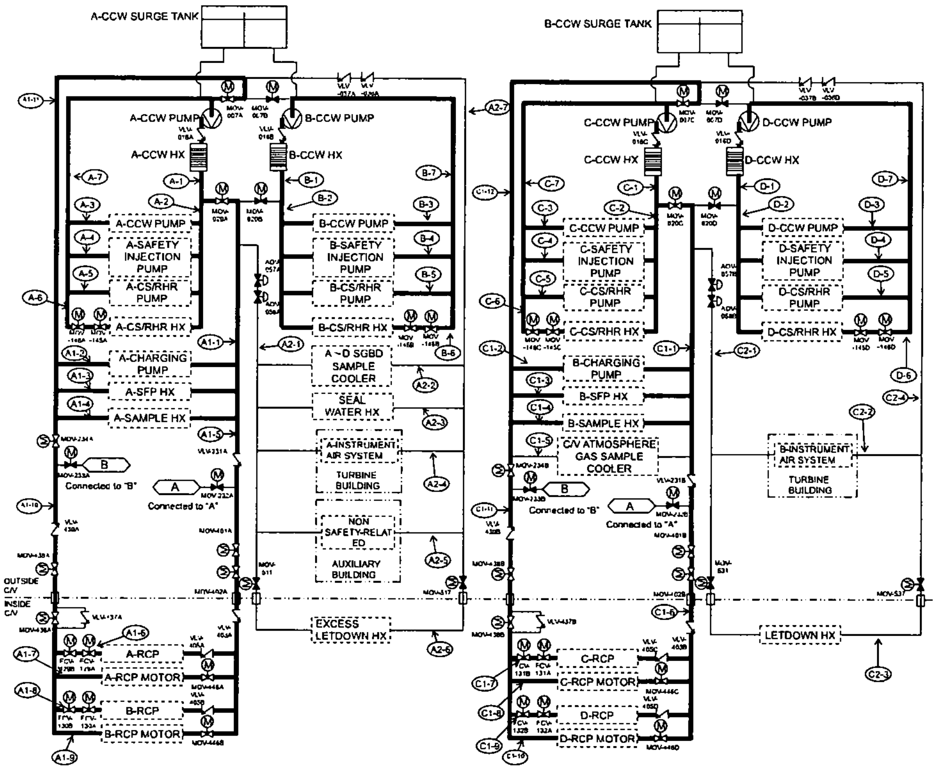


Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)	Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)
A-1	121	125	9275	C-1	121	125	9292
A-2	121	125	4700	C-2	121	125	4700
A-3	57	~200	40	C-3	57	~200	40
A-4	57	~200	180	C-4	57	~200	180
A-5	57	~200	80	C-5	57	~200	80
A-6	57	~200	4400	C-6	57	~200	4400
A-7	57	~200	4700	C-7	57	~200	4700
B-1	121	125	4700	D-1	121	125	4700
B-2	121	125	4700	D-2	121	125	4700
B-3	57	~200	40	D-3	57	~200	40
B-4	57	~200	180	D-4	57	~200	180
B-5	57	~200	80	D-5	57	~200	80
B-6	57	~200	4400	D-6	57	~200	4400
B-7	57	~200	4700	D-7	57	~200	4700
A1-1	121	125	4575	C1-1	121	125	4592
A1-2	57	~200	180	C1-2	57	~200	180
A1-3	57	~200	3600	C1-3	57	~200	3600
A1-4	57	~200	14.1	C1-4	57	~200	14.1
A1-5	121	125	780	C1-5	57	~200	17.7
A1-6	57	~200	40	C1-6	121	125	780
A1-7	57	~200	350	C1-7	57	~200	40
A1-8	57	~200	40	C1-8	57	~200	350
A1-9	57	~200	350	C1-9	57	~200	40
A1-10	57	~200	780	C1-10	57	~200	350
A1-11	57	~200	4575	C1-11	57	~200	780
A2-1	-	-	0	C1-12	57	~200	4592
A2-2	-	-	0	C2-1	-	-	0
A2-3	-	-	0	C2-2	-	-	0
A2-4	-	-	0	C2-3	-	-	0
A2-5	-	-	0	C2-4	-	-	0
A2-6	-	-	0				
A2-7	-	-	0				

Note1: The figure illustrates configuration after a pair of header tie line isolation valve(s) (NCS-MOV-007, NCS-MOV-020) are manually closed to provide train separation.

Figure 9.2.2-2 Component Cooling Water System Mode Diagram (Sheet 5 of 6) Design - Accident

DCD_09.02.02-51
DCD_09.02.02-86



Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)	Location	Pressure (psig)	Temperature (deg F)	Flow Rate (gpm)
A-1	121	125	9275	C-1	121	125	9275
A-2	121	125	4700	C-2	121	125	4700
A-3	57	~200	40	C-3	57	~200	40
A-4	57	~200	180	C-4	57	~200	180
A-5	57	~200	80	C-5	57	~200	80
A-6	57	~200	4400	C-6	57	~200	4400
A-7	57	~200	4700	C-7	57	~200	4700
B-1	121	125	4700	D-1	121	125	4700
B-2	121	125	4700	D-2	121	125	4700
B-3	57	~200	40	D-3	57	~200	40
B-4	57	~200	180	D-4	57	~200	180
B-5	57	~200	80	D-5	57	~200	80
B-6	57	~200	4400	D-6	57	~200	4400
B-7	57	~200	4700	D-7	57	~200	4700
A1-1	121	125	4575	C1-1	121	125	4575
A1-2	57	~200	180	C1-2	57	~200	180
A1-3	57	~200	3600	C1-3	57	~200	3600
A1-4	57	~200	14.1	C1-4	57	~200	14.1
A1-5	121	125	780	C1-5	-	-	0
A1-6	57	~200	40	C1-6	121	125	780
A1-7	57	~200	350	C1-7	57	~200	40
A1-8	57	~200	40	C1-8	57	~200	350
A1-9	57	~200	350	C1-9	57	~200	40
A1-10	57	~200	780	C1-10	57	~200	350
A1-11	57	~200	4575	C1-11	57	~200	780
A2-1	-	-	0	C1-12	57	~200	4575
A2-2	-	-	0	C2-1	-	-	0
A2-3	-	-	0	C2-2	-	-	0
A2-4	-	-	0	C2-3	-	-	0
A2-5	-	-	0	C2-4	-	-	0
A2-6	-	-	0				
A2-7	-	-	0				

Note1: The figure illustrates configuration after a pair of header tie line isolation valve(s) (NCS-MOV-007, NCS-MOV-020) are manually closed to provide train separation.

Figure 9.2.2-2 Component Cooling Water System Mode Diagram (Sheet 6 of 6) Design - Safe Shutdown