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April 7, 2009

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-09158

Subject: MHI's Responses to US-APWR DCD RAI No. 191-2048 Revision 0

Reference: 1) "Request for Additional Information No. 191-2048 Revision 0, SRP Section: 14.03.04 – Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria Application Section: DCD Section 2.7.1" dated February 09, 2009.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Responses to Request for Additional Information No. 191-2048 Revision 0."

Enclosed are the responses to Questions 14.03.04-1 through 14.03.04-9 that are contained within Reference 1.

Please contact Dr. C. Keith Paulson, Senior Technical Manager, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittals. His contact information is below.

Sincerely,

Y. Ogata

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

Enclosure:

1. Responses to Request for Additional Information No. 191-2048 Revision 0

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-09158
Docket No. 52-021

Responses to Request for Additional Information No. 191-2048
Revision 0

April 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/7/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 191-2048 REVISION 0**
SRP SECTION:	**14.03.04 - Plant Systems- Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**DCD SECTION 2.7.1**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-01

Editorial, grammatical, or typographical errors

1. Page 2.7-3, Table 2.7.1.1-1, Items 2 and 3, Inspections, Tests, Analyses description: "as-build" should be "as-built."
2. Page 2.7-4, Section 2.7.1.2.1, Design Description- System Purpose and Functions, First Paragraph, First Sentence: "bypass isolation valve" should be "bypass isolation valves."
3. Page 2.7-4, Section 2.7.1.2.1, Design Description-System Purpose and Functions, Second Paragraph: "valve wide open" should be "valves wide open."
4. Page 2.7-6, Section 2.7.1.2.1, Design Description-Class 1E Electrical Power Sources and Divisions, First Sentence: "Table 2.7.1.2-1" should be "Table 2.7.1.2-2."
5. Page 2.7-15, Table 2.7.1.2-5, Item 8.b, Acceptance Criteria description: "8.b" should be "8.b.i" and "8.c" should be "8.b.ii."
6. Page 2.7-15, Table 2.7.1.2-5, Item 9.a, Design Commitment description: "motor-operated," should be "motor-operated valves."
7. Page 2.7-15, Table 2.7.1.2-5, Items 9.a.i and 9.a.ii, Acceptance Criteria descriptions: "valves change" should be "valve changes."
8. Page 2.7-16, Table 2.7.1.2-5, Items 9.b.i, 9.b.ii, and 9.c, Acceptance Criteria descriptions: "valves change" should be "valve changes."
9. Page 2.7-16, Table 2.7.1.2-5, Item 9.c, Inspections, Tests, Analyses and Acceptance Criteria descriptions: "9.c.iii" should be "9.c."
10. Page 2.7-16, Table 2.7.1.2-5, Item 9d, Inspections, Tests, Analyses and Acceptance Criteria descriptions: "9.b" should be "9.d."
11. Page 2.7.17, Table 2.7.1.2-5, Item 13.a.ii, Acceptance Criteria description: "The result of test and analysis conforms" should be "The results of the tests and analyses conform."
12. Page 2.7-18, Figure 2.7.1.2-1, Lower Right Corner, "TRUBINE BUILDING" should be "TURBINE BUILDING."
13. Page 2.7-31, Section 2.7.1.9.1, Design Description- Alarms, Displays, and Controls, First Sentence; "Table 2.7.1.9-3 identifies alarms" should be "Table 2.7.1.9-4 identifies alarms."
14. Page 2.7-39, Table 2.7.1.9-5, Item 8.b, Inspections, Tests, Analyses and Acceptance Criteria descriptions: "8.b" should be "8.b.i" and "8.c" should be "8.b.ii."
15. Page 2.7-39, Table 2.7.1.9-5, Items 9.a.i and 9.a.ii, Acceptance Criteria descriptions: "valves change" should be "valve changes."
16. Page 2.7-39, Table 2.7.1.9-5, Item 9.b, Inspections, Tests, Analyses and Acceptance Criteria descriptions: "9." should be "9.b."
17. Page 2.7-41, Section 2.7.1.10.1, Design Description- System Purpose and Functions, First paragraph, First Sentence: "SG)" should be "SG."

18. Page 2.7-41, Section 2.7.1.10.1, Design Description- Key Design Features, Third Paragraph, Second Sentence: "demineralizers includes" should be "demineralizers include."
19. Page 2.7-49, Section 2.7.1.11.1, Design Description- Key Design Features, Second Paragraph, First Sentence: "with tie line" should be "to a tie line."
20. Page 2.7-49, Section 2.7.1.11.1, Design Description- Key Design Features, Second Paragraph, Second Sentence: "separation of four trains" should be "separation of the four trains."
21. Page 2.7-49, Section 2.7.1.11.1, Design Description- Key Design Features, Second Paragraph, Third Sentence: "When the one of the EFW pump is not" should be "When one of the EFW pumps is not." and "of an outage of maintenance" should be "of an outage or maintenance."
22. Page 2.7-49, Section 2.7.1.11.1, Design Description- Key Design Features, Fourth Paragraph, First Sentence: "sensible heat of reactor" should be "sensible heat of the reactor."
23. Page 2.7-50, Section 2.7.1.11.1, Design Description- Key Design Features, Seventh Paragraph, First Sentence: "EFW pump is designed" should be "Each EFW pump is designed."
24. Page 2.7-50, Section 2.7.1.11.1, Design Description- System Operation, Second Paragraph, First Sentence: "signal and provided with" should be "signal and is provided with."
25. Page 2.7-50, Section 2.7.1.11.1, Design Description- Logic, First Paragraph, First Sentence: "EFWS is automatically initiating flow upon receipt of EFW actuation signal" should be "EFWS automatically initiates flow upon receipt of an EFW actuation signal."
26. Page 2.7-61, Table 2.7.1.11-5, Item 4.a, Acceptance Criteria description: "Table 2.7.1.11" should be "Table 2.7.1.11-2."
27. Page 2.7-63, Table 2.7.1.11-5, Item 8.b, Acceptance Criteria description: "8.b" should be "8.b.i," and "8.c" should be "8.b.ii."
28. Page 2.7-63, Table 2.7.1.11-5, Items 9.a.i and 9.a.ii, Acceptance Criteria descriptions: "motor-operated valves change position" should be "motor-operated valve changes position."
29. Page 2.7-64, Table 2.7.1.11-5, Item 12, Acceptance Criteria description: "705 gpm to the any of the two SGs" should be "705 gpm to either of the two SGs.

ANSWER:

The above changes will be incorporated in DCD Tier 1, Section 2.7, Revision 2, with the following exceptions:
Item (3): "Valve wide open" (VWO), not "valves wide open," is the term consistently used in the DCD.
Item (29): The EFW flow requirement is 705 gpm to two SGs, e.g., as shown in DCD Tier 2 Table 10.4.9-2. Therefore, the requested change "705 gpm to either of the two SGs" is not incorporated.

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the changes incorporated as described above.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/07/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 191- 2048 REVISION 0**
SRP SECTION:	**14.03.04 - Plant Systems- Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**DCD SECTION 2.7.1**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-02

ITAAC Item 2 in Table 2.7.1.1-1

Resolve the difference in the Design Commitment statement on Page 2.7-3 in Table 2.7.1.1-1, Item 2, to be consistent with the Key Design Features Paragraphs of Section 2.7.1.1, Design Description.

In Table 2.7.1.1-1, Item 2, the design commitment description refers to SRP 3.5.1.3 as the basis for addressing turbine missile generation. However, Section 2.7.1.1.1, Design Description, discusses the turbine missile generation in the Second Paragraph of Key Design Features subsection in terms of probability. The subsection specifically indicates the probability of turbine missile generation is less than 1.0 E -05 per year and does not necessarily reference SRP 3.5.1.3 as the basis for 1.0E-5 per year if it indeed is the basis.

ANSWER:

Reference to SRP 3.5.1.3 will be removed from the ITAAC, consistent with SRP Section 14.3 APPENDIX A, IV.4.A, which states in part:

"... the applicable requirements from the regulations, codes, or standards should be stated in Tier 1, rather than reference them."

Specific reference to SRP 3.5.1.3 criteria is included in DCD Tier 2 Subsection 3.5.1.3.

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

ITAAC Item 2 in Table 2.7.1.1-1 will be revised as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2. The probability of turbine missile generation **is less than 1.0E-5 per year.** ~~satisfies the guideline of SRP 3.5.1.3.~~	2. Inspections and tests of the **as-built** ~~as-build~~ LP rotors will be performed.	2. The as-built LP rotor material conforms to the specified requirements as described in Subsection 2.7.1.1.1.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

04/07/2009

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Mitsubishi Heavy Industries

Docket No. 52-021

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DATE OF RAI ISSUE:	02/09/2009

QUESTION NO.: 14.03.04-03

ITAAC Item 6 in Table 2.7.1.2-5

The acceptance criterion 6.a.i for this ITAAC should follow more closely to the words stated in the design commitment. This is applicable to this ITAAC and all similar ITAAC for equipment being qualified for a harsh environment.

Other applicable ITAAC: The following list may not be a complete list of all applicable ITAAC.

ITAAC Item 6 in Table 2.7.1.9-5

ANSWER:

The acceptance criteria of the following ITAAC will be revised to be consistent with the wording in the design commitment:

ITAAC Item 6.a Table 2.7.1.2-5
ITAAC Item 6.a Table 2.7.1.9-5
ITAAC Item 6.a Table 2.7.1.11-5
ITAAC Item 6.a Table 2.7.3.3-5
ITAAC Item 6.a Table 2.7.6.7-3
ITAAC Item 3 Table 2.7.6.13-3

An ITAAC item for harsh environment EQ will be added to Tier 1 Table 2.7.1.10-3.

Similarly affected ITAAC in other DCD Tier 1 sections are addressed in response to other RAI questions. The following Section 2.4 ITAAC for harsh environment EQ are addressed in response to RAI 193-1842, Question 14.03.04-22:

ITAAC Item 10 in Table 2.4.1-2
ITAAC Item 9.a in Table 2.4.2-5
ITAAC Item 6.a in Table 2.4.4-5
ITAAC Item 6.a in Table 2.4.5-5
ITAAC Item 6.a in Table 2.4.6-5

The following Section 2.5 ITAAC for harsh environment EQ are addressed in response to RAI 181-2047, Question 14.03.05-06:

ITAAC Item 6 in Table 2.5.1-5
ITAAC Item 3 in Table 2.5.4-2

The following Section 2.11 ITAAC for harsh environment EQ are addressed in response to RAI 198-2069, Question 14.03.11-21:

ITAAC Item 6.a in Table 2.11.2-2
ITAAC Item 6.a in Table 2.11.3-5

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

ITAAC Item 6.a in Tier 1 Table 2.7.1.2-5 will be revised as follows:

6.a The Class 1E equipment identified in Table 2.7.1.2-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.2-2 as being qualified for a harsh environment can withstand the environmental conditions **that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function**.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.2-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.

ITAAC Item 6.a in Table 2.7.1.9-5 will be revised as follows:

6.a The Class 1E equipment identified in Table 2.7.1.9-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.9-2 as being qualified for a harsh environment can withstand the environmental conditions **that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function**.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.9-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.

The following ITAAC will be added to Tier 1 Table 2.7.1.10-3

10. The Class 1E equipment identified in Table 2.7.1.10-1 as being qualified for a harsh environment are designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	**10.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.**	**10.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.10-1 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.**
	10.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	**10.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.10-1 as being qualified for a harsh environment are bounded by type tests and/or analyses.**

ITAAC Item 6.a in Tier 1 Table 2.7.1.11-5 will be revised as follows:

6.a The Class 1E equipment identified in Table 2.7.1.11-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.11-2 as being qualified for a harsh environment can withstand the environmental conditions **<u>that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function</u>**.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.11-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.

ITAAC Item 6.a in Tier 1 Table 2.7.3.3-5 will be revised as follows:

6.a The applicable Class 1E equipment identified in Table 2.7.3.3-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.3.3-2 as being qualified for a harsh environment can withstand the environmental conditions **<u>that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function</u>**.
	6.a.ii An inspection will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.3.3-2, as being qualified for a harsh environment are bounded by type tests and/or analyses.

ITAAC Item 6.a in Tier 1 Table 2.7.6.7-3 will be revised as follows:

6.a The Class 1E equipment identified in Tables 2.7.6.7-1 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis accident without loss of their safety function, for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The Class 1E equipment identified in Table 2.7.6.7-1 as being qualified for a harsh environment withstands the environmental conditions **that would exist before, during, and following a design basis accident without loss of their safety function, for the time required to perform the safety function**.
	6.a.ii An inspection will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.6.7-1 as being qualified for a harsh environment are bounded by type tests, and/or analyses.

ITAAC Item 3 in Tier 1 Table 2.7.6.13-3 will be revised as follows:

3. The Class 1E radiation monitors identified in Table 2.7.6.13-1 **as being designed for harsh environment are designed to** ~~can~~ withstand the environmental conditions that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function.	3. Type tests and/or analyses will be performed on the Class 1E radiation monitor.	3. The results of the type tests and/or analyses conclude that the Class 1E radiation monitors identified in Table 2.7.6.13-1 as being qualified for a harsh environment can withstand the environmental conditions **that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function**.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/07/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 191- 2048 REVISION 0**
SRP SECTION:	**14.03.04 - Plant Systems- Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**DCD SECTION 2.7.1**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-04

ITAAC Item 8.b.ii in Table 2.7.1.2-5

The design commitment is concerned with valves in Table 2.7.2.2-2 performing a function for an RPS signal. However, this ITAAC is concerned with the MSIV and MSRVBV valves closing within the required response time. The deficieny needs to be corrected.

ANSWER:

Response time testing of the main steam isolation valves (MSIVs) and main steam bypass isolation valves (MSBIVs) will be treated as a separate ITAAC item. ITAAC Item 8.b.ii will be deleted. ITAAC item 13.b in Table 2.7.1.2-5 will be revised to refer to new ITAAC Item 14 for MSIV closure time, which supports the MSIVs' function to limit blowdown of the steam generators (SGs) during a design basis event. And the description regarding the MSRVBV is deleted because the valves have no PSMS control and active safety function. The response to Question 14.03.04-6 addresses the design commitment for the valves in Table 2.7.1.2-2 to perform a function in response to a signal initiated by the protection and safety monitoring system (PSMS).

Impact on DCD

The changes to ITAAC Item 8 indicated in the above response will be incorporated as shown in Question 14.03.04-6.

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

Delete ITAAC Item 8.b.ii in Table 2.7.1.2-5.

Revise ITAAC Item 13.b in Table 2.7.1.2-5 as follows:

13.b During design basis events, the MSS limits SG blowdown.	13.b.i Tests will be performed to demonstrate that the as-built remotely operated MSIV close within the required response times. See item **14** ~~8~~ in this table.	13.b.i See item **14** ~~8~~ in this table.
	13.b.ii Inspections will be performed on the area of the as-built flow restrictor within the SG main steam outlet nozzle will limit releases to the containment.	13.b.ii The as-built flow restrictor within the SG main steam line discharge nozzle does not exceed 1.4 sq. ft.

Add the following ITAAC Item 14 to Tier 1 Table 2.7.1.2-5:

14. The MSIVs and MSBIVs will close within the required response time.	**14. Tests will be performed to demonstrate that as-built MSIVs and MSBIVs close within the required response time.**	**14. The as-built valves close within the following times after receipt of an actuation signal:** **The as-built MSIVs close within 5 seconds.** **The as-built MSBIVs close within 5 seconds.**

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-05

Determine whether the column labeled "Control Function" in Table 2.7.1.2-4 on Page 2.7-11 refers to a main control room (MCR) function.

Section 2.7.1.2.1, Design Description, Alarms, Displays, and Controls subsection on Page 2.7-5 indicates that Table 2.7.1.2-4 contains information for both the MCR and the remote shutdown console (RSC). Item 10 in Table 2.7.1.2-5 references parameters that can be retrieved in the MCR (with no mention of control capability) as a Design Commitment while Item 11 in Table 2.7.1.2-5 references parameters and controls as a Design Commitment. Where is the MCR control function evaluated in the ITA for Item 10?

ANSWER:

ITAAC Item 8.a in Table 2.7.1.2-5 requires testing to demonstrate that controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.1.2-2, which also addresses the valves identified as having control functions in Table 2.7.1.2-4.

Tables 2.7.1.2-2 and 2.7.1.2-4 will be revised to more clearly present the MCR and RSC alarms, displays and controls for MSS equipment.

ITAAC Item 10 in Table 2.7.1.2-5, which is presently limited to MCR displays, will be revised to include verification of alarms for the equipment in Table 2.7.1.2-4.

ITAAC Item 11 in Table 2.7.1.2-5, which is presently limited to RSC displays and controls, will be revised to include verification of alarms for the equipment in Table 2.7.1.2-4. ITAAC Item 11 revision is also related to the response to RAI No. 198, 14.03.11-27.

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

Table 2.7.1.2-2 will be revised to more clearly present the PSMS control as well as MCR controls (Remote/Manual operation) for MSS equipment as shown in Attachment 1.

Table 2.7.1.2-4 will be revised to more clearly present the MCR and RSC alarms, displays and controls for MSS equipment.

ITAAC Items 10 and 11 in Table 2.7.1.2-5 will be revised as follows:

10. **MCR alarms and displays** ~~Displays~~ of the parameters identified in Table 2.7.1.2-4. can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the MSS parameters in the as-built MCR.	10. The **MCR alarms and** displays identified in Table 2.7.1.2-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) **alarms,** displays and/~~or~~ controls ~~provided for the MSS~~ are identified in Table 2.7.1.2-4.	11. Inspections **of the as-built RSC alarms, displays and controls** will be performed. ~~on the as-built RSC displays and/or controls for the MSS~~	11. **Alarms, displays** ~~Displays~~ and/~~or~~ controls exist on the as-built RSC as identified in Table 2.7.1.2 -4.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/07/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

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APPLICATION SECTION:	**DCD SECTION 2.7.1**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-06

Revise the Design Description of Section 2.7.1.2, Main Steam Supply System (MSS) and Table 2.7.1.2-2 to be consistent with Table 2.7.1.2-5 on Page 2.7-15, Item 8 to include information regarding the interface between MSS and the reactor protection system (RPS).

Table 2.7.1.2-5, Item 8 on Page 2.7-15 specifically includes a Design Commitment that MSS valves identified in Table 2.7.1.2-2 as having RPS control also have an ITAAC associated with their active safety function. Further, Table 2.7.1.2-5, Item 8.b.ii, Inspections, Tests, Analyses requires tests to be performed that demonstrate that the as-built remotely operated MSIVs and MSRVBVs close within the required response time, and the Acceptance Criteria for the same item specifies that the MSIVs close within 5 seconds and the MSRVBVs close within 30 seconds. However, none of this information is discussed in Section 2.7.1.2.1, Design Description, nor is this information contained in Table 2.7.1.2-2. The RPS interface for these valves should be discussed in Section 2.7.1.2.1 and their RPS control function should be listed in Table 2.7.1.2-2.

ANSWER:

ITAAC Item 8 in Table 2.7.1.2-5 is intended to verify the active safety function of the MSS valves that receive a signal from the PSMS. The ESF functions and actuation signals are shown on Table 2.5.1-3, *ESF Actuations and Monitored Variables*. ITAAC Item 14 in Table 2.5.1-5, *RT System and ESF System Inspections, Tests, Analyses, and Acceptance Criteria,* requires testing to demonstrate the as-built protection and safety monitoring system (PSMS) initiates automatic reactor trips and ESF actuations when the plant process signals reach a predetermined limit.

The Subsection 2.7.1.2.1 Design Description, Table 2.7.1.2-2 and ITAAC Item 8 in Table 2.7.1.2-5 will be revised to clarify the PSMS functions for the MSS valves listed in Table 2.7.1.2-2. Table 2.7.1.2-2 will be revised to identify the PSMS control for the MSS equipment, and the active safety function of the MSRVBVs will be deleted because the valves have no PSMS control and active safety function. As indicated in response to Question No. 14.03.04-04 above, ITAAC Item 8.b.ii will be replaced with a separate ITAAC item for response time testing of the MSIVs and MSBIVs.

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

The following will be added to the Alarms Displays and Controls of the Subsection 2.7.1.2.1 Design Description:

"**The valves identified in Table 2.7.1.2-2 as having PSMS control perform an active safety function after receiving a signal from PSMS.**"

Table 2.7.1.2-2 will be revised to include a column identifying the PSMS control for MSS valves.

ITAAC Item 8.b in Table 2.7.1.2-5 will be revised as follows:

8.b The valves identified in Table 2.7.1.2-2 as having ~~reactor protection (RPS)~~ **PSMS** control perform an active safety function after receiving a signal from **PSMS**~~RPS~~.	8.b.~~i~~ Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.2-2 using simulated signals.	8.b The as-built remotely-operated valves identified in Table 2.7.1.2-2 perform the active function identified in the table after receiving a simulated signal.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/07/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 191- 2048 REVISION 0**
SRP SECTION:	**14.03.04 - Plant Systems- Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**DCD SECTION 2.7.1**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-07

Clarify the design commitment in Table 2.7.1.2-5, item 9.a. The sentence fragment before the comma in the design commitment is missing the object for the phrase "active safety-related." The choice of an appropriate object impacts the implementation of the ITAAC for the design commitment.

This same sentence fragment structure exists for:

- Tier 1 Table 2.7.3.1-5, item 9.a
- Tier 1 Table 2.7.3.3-5, item 9.a
- Tier 1 Table 2.7.3.5-5, item 9.a

ANSWER:

MHI will provide editorial clarifications to the design commitments of the following ITAAC:

Table 2.7.1.2-5, item 9.a
Table 2.7.1.9-5, item 9.a
Table 2.7.1.11-5, item 9.a
Table 2.7.3.1-5, item 9.a
Table 2.7.3.3-5, item 9.a
Table 2.7.3.5-5, item 9.a

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

ITAAC item 9.a in Table 2.7.1.2-5 will be revised as follows:

9.a The motor-operated **valves**, identified in Table 2.7.1.2-2, ~~to~~ perform an active safety~~-related,~~ function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valve~~s~~ changes position as indicated in Table 2.7.1.2-2 under design conditions.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational conditions.	9.a.ii Each as-built valve~~s~~ changes position as indicated in Table 2.7.1.2-2 under pre-operational test conditions.

ITAAC item 9.a in Table 2.7.1.9-5 will be revised as follows:

9.a The motor-operated valves, identified in Table 2.7.1.9-2 ~~to~~ perform an active safety~~-related,~~ function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valve~~s~~ changes position as indicated in Table 2.7.1.9-2 under design condition.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational conditions.	9.a.ii Each as-built valve~~s~~ changes position as indicated in Table 2.7.1.9-2 under the pre-operational test conditions.

ITAAC item 9.a in Table 2.7.1.11-5 will be revised as follows:

9.a The motor-operated **valves**, identified in Table 2.7.1.11-2, ~~to~~ perform an active safety~~-related,~~ function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valve~~s~~ changes position as indicated in Table 2.7.1.11-2 under design conditions.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built **motor-operated** valve~~s~~ changes position as indicated in Table 2.7.1.11-2 under pre-operational test conditions.

ITAAC item 9.a in Table 2.7.3.1-5 will be revised as follows:

9.a	The remotely operated valves, identified in Table 2.7.3.1-2, ~~to~~ perform an active safety~~-related,~~ function to change position as indicated in the table.	9.a.i	Tests or type tests of the valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i	Each valve changes position as indicated in Table 2.7.3.1-2 under design conditions.
		9.a.ii	Tests of the as-built valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii	Each as-built valve changes position as indicated in Table 2.7.3.1-2 under pre-operational test conditions.

ITAAC item 9.a in Table 2.7.3.3-5 will be revised as follows:

9.a	The remotely operated **valves**, identified in Table 2.7.3.3-2**,** ~~to~~ perform an active safety~~-related,~~ function to change position as indicated in the table.	9.a.i	Tests or type tests of the valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i	Each valve changes position as indicated in Table 2.7.3.3-2 under design conditions.
		9.a.ii	Tests of the as-built valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii	Each as-built valve changes position as indicated in Table 2.7.3.3-2 under pre-operational test conditions.

ITAAC item 9.a in Table 2.7.3.5-5 will be revised as follows:

9.a	The **remotely operated** valves, identified in Table 2.7.3.5-2, ~~to~~ perform an active safety~~-related,~~ function to change position as indicated in the table.	9.a.i	Tests or type tests of the valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i	Each valve changes position as indicated in Table 2.7.3.5-2 under design conditions.
		9.a.ii	Tests of the as-built valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii	Each as-built valve changes position as indicated in Table 2.7.3.5-2 under pre-operational test conditions.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/07/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 191- 2048 REVISION 0**
SRP SECTION:	**14.03.04 - Plant Systems- Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**DCD SECTION 2.7.1**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-08

ITAAC Item 1.b in Table 2.7.1.11-5

The acceptance criterion for this ITAAC does not contain the exception noted in the design commitment. Is the fire barrier able to serve as a suitable barrier for physical separation?

ANSWER:

Refer to MHI's response to RAI 192, Question 14.03.04-10.

Impact on DCD

Refer to MHI's response to RAI 192, Question 14.03.04-10.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/07/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 191- 2048 REVISION 0

SRP SECTION: 14.03.04 - Plant Systems- Inspections, Tests, Analyses, and Acceptance Criteria

APPLICATION SECTION: DCD SECTION 2.7.1

DATE OF RAI ISSUE: 02/09/2009

QUESTION NO.: 14.03.04-09

ITAAC Item 6.c in Table 2.7.1.2-5

The design commitment is concerned with separation between Class 1 E divisions and between those divisions and non-class 1E cable. The acceptance criterion is concerned only with raceways. But what about inside panels and switchgear, and at the components themselves? This ITAAC is meant to be more generic than just addressing raceways. This is applicable to this ITAAC and all similar ITAAC for the same subject matter.

ANSWER:

The following ITAAC, which address inspection to verify physical separation of the Class1 E divisions' cables and the separation of Class 1E divisions' cables from non-Class 1E cables, will be revised to be more generic.

ITAAC Item 6.c Table 2.7.1.2-5
ITAAC Item 6.c Table 2.7.1.9-5
ITAAC Item 7 Table 2.7.1.10-3
ITAAC Item 6.c Table 2.7.1.11-5
ITAAC Item 6.b Table 2.7.3.1-5
ITAAC Item 6.c Table 2.7.3.3-5
ITAAC Item 6.b Table 2.7.3.5-5
ITAAC Item 3.b Table 2.7.5.1-3
ITAAC Item 3.b Table 2.7.5.2-3
ITAAC Item 3.b Table 2.7.5.4-3
ITAAC Item 7.b Table 2.7.6.3-5
ITAAC Item 3.b Table 2.7.6.6-2
ITAAC Item 6.c Table 2.7.6.7-3
ITAAC Item 4.b Table 2.7.6.13-3
ITAAC Item 12 Table 2.4.1-2
ITAAC Item 9.c Table 2.4.2-5
ITAAC Item 6.c Table 2.4.4-5
ITAAC Item 6.c Table 2.4.5-5
ITAAC Item 6.c Table 2.4.6-5
ITAAC Item 6.c Table 2.11.2-2

ITAAC Item 6.c Table 2.11.3-5

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.7, Revision 2, with the following changes:

ITAAC Item 6.c in Tier 1 table 2.7.1.2-5 will be revised as follows:

6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	6.c ~~The as-built class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ **Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.**

Attachment 1 includes similar changes to the following ITAAC in Tier 1 Section 2.7:

ITAAC Item 6.c Table 2.7.1.9-5
ITAAC Item 7 Table 2.7.1.10-3
ITAAC Item 6.c Table 2.7.1.11-5
ITAAC Item 6.b Table 2.7.3.1-5
ITAAC Item 6.c Table 2.7.3.3-5
ITAAC Item 6.b Table 2.7.3.5-5
ITAAC Item 3.b Table 2.7.5.1-3
ITAAC Item 3.b Table 2.7.5.2-3
ITAAC Item 3.b Table 2.7.5.4-3
ITAAC Item 7.b Table 2.7.6.3-5
ITAAC Item 3.b Table 2.7.6.6-2
ITAAC Item 6.c Table 2.7.6.7-3
ITAAC Item 4.b Table 2.7.6.13-3

Attachment 2 includes similar changes to the following ITAAC in Tier 1 Section 2.4:

ITAAC Item 12 Table 2.4.1-2
ITAAC Item 9.c Table 2.4.2-5
ITAAC Item 6.c Table 2.4.4-5
ITAAC Item 6.c Table 2.4.5-5
ITAAC Item 6.c Table 2.4.6-5

Attachment 3 includes similar changes to the following ITAAC in Tier 1 Section 2.11:

ITAAC Item 6.c Table 2.11.2-2
ITAAC Item 6.c Table 2.11.3-5

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

Attachment 1

US-APWR DCD Tier 1 Section 2.7 Mark-up

RESPONSE TO RAI NO. 191-2048 REVISION 0

RAI 191
14.03.04-02

Table 2.7.1.1-1 Turbine Generator Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the turbine generator is as described in Subsection 2.7.1.1.1.	1. An inspection of the as-built system will be performed.	1. The as-built turbine generator conforms to the functional arrangement as described in Subsection 2.7.1.1.1.
2. The probability of turbine missile generation is less than 1.0E-5 per year satisfies the guideline of SRP 3.5.1.3.	2. Inspections and tests of the as-builtas-build LP rotors will be performed.	2. The as-built LP rotor material conforms to the specified requirements as described in Subsection 2.7.1.1.1.
3. The turbine generator trips on a reactor trip.	3. A test of the as-builtas-build system will be performed.	3. The as-built control logic provides a simulated turbine generator trip on a simulated reactor trip.

RAI 191 14.03.04-01

2.7.1.2 Main Steam Supply System (MSS)

2.7.1.2.1 Design Description

System Purpose and Functions

The MSS is provided with safety-related main steam isolation valves (MSIVs) and associated main steam bypass isolation valves (MSBIVs) in each main steam line. These valves isolate the secondary side of the steam generators (SGs) to prevent the uncontrolled blowdown of more than one SG and isolate non safety-related portions of the system.

The main function of the MSS is to transport steam from the SGs to the high-pressure turbine and to the moisture separator/reheater (MS/R) over a range of flows and pressures covering the entire operating range from system warmup to valve wide open (VWO) turbine conditions

MSS also supplies steam to the gland seal system, the emergency feedwater pump turbines, deaerator heater, and so on. The system also dissipates heat generated by the nuclear steam supply system (NSSS) by means of turbine bypass valves to the condenser or to the atmosphere through air-operated main steam relief valves (MSRVs) or motor-operated main steam depressurization valves (MSDVs) or spring-loaded main steam safety valves (MSSVs) when either the turbine, generator, or the condenser is unavailable.

Location and Functional Arrangement

MSS piping and components are located within the containment, in the reactor building, and the turbine building. Figure 2.7.1.2-1 illustrates the MSS, showing the arrangement of the MSS components including the MSIVs. Table 2.7.1.2-1 also provides a tabulation of the location of MSS equipment.

Key Design Features

Six MSSVs are provided per main steam line. MSSVs with sufficient rated capacity are provided to prevent the steam pressure from exceeding 110 percent of the MSS design pressure.

One air-operated MSRV is installed on the each MSS piping from SG. The primary function of the MSRVs is to prevent an unnecessary lifting of the MSSVs.

One motor-operated MSDV is installed on the main steam piping from each SG. MSDV provides controlled removal of reactor decay heat (in conjunction with the emergency feedwater system) during safe shutdown, after plant transient, accident condition, and emergency condition.

One MSIV is provided on ~~the~~ each main steam piping to limit uncontrolled steam release from one SG in the event of steam line break.

One main steam check valve (MSCV) is provided downstream of the MSIVs on the each main steam piping to prevent blowdown of the SGs by reverse flow in the event the break is upsteam of a MSIV.

The safety-related portions of the MSS are designed to withstand the effects of a safe-shutdown earthquake (SSE), and to perform its intended functions during normal conditions, adverse environmental occurrences and accident conditions, including loss of offsite power, with a single malfunction or failure of an active component.

Seismic and ASME Code Classifications

The seismic category and ASME Code Section III requirements are identified in Tables 2.7.1.2-2 and 2.7.1.2-3 for safety-related MSS components and piping, respectively.

System Operation

The MSS transports and distributes steam from the SGs to the main turbine during power generation and directly to the main condenser when the main turbine is not available. Four main steam lines, one from each SG, supply steam to the turbine generator (T/G). The main steam lines from the SGs are connected to an equalization piping. A portion of the steam from the equalization piping flows to steam seals, the moisture separator reheaters, and deaerator heating, with the high pressure turbine receiving balance of the flow via four individual lines with a set of turbine stop and control valves.

Alarms, Displays, and Controls

The valves identified in Table 2.7.1.2-2 as having PSMS control perform an active safety function after receiving a signal from PSMS.

Table 2.7.1.2-4 identifies alarms, displays, and controls associated with the MSS that are located in the main control room (MCR). MSS equipment and instrumentation that is required for remote shutdown and that is available at the remote shutdown console (RSC) is also shown on Table 2.7.1.2-4.

Logic

Closure of the MSIV is initiated by following:

- Hign-high containment pressure
- Low main steam line pressure
- High main steam line pressure negative rate
- Manual actuation

Interlocks

There are no interlocks needed for direct safety functions related to the MSS.

Class 1E Electrical Power Sources and Divisions

The safety-related MSS components identified in Table 2.7.1.2-1 2 as Class 1E are powered from their respective Class 1E division. Separation is provided between these Class 1E divisions and between non-Class 1E divisions and non-Class 1E electrical cable.

Equipment to be Qualified for Harsh Environments

The safety-related MSS equipment identified in Table 2.7.1.2-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.

Interface Requirements

There are no safety-related interfaces with systems outside of the certified design.

Numeric Performance Values

When necessary to demonstrate satisfaction of a design commitment, numeric performance values for selected components have been specified as ITAAC acceptance criteria in Table 2.7.1.2-5. Key parameters of the MSS design that are used in the safety analysis and which are included in the Table 2.7.1.2-5 are over-pressurization protection and isolation of MSS.

2.7.1.2.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.1.2-5 describes the ITAAC for the MSS.

Table 2.7.1.2-2 Main Steam Supply System Equipment Characteristics (Sheet 1 of 2)

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
Main Steam Isolation Valves	NMS-AOV-515A,B,C,D	2	Yes	Yes	Yes/Yes	Main steam line isolation	Transfer Closed	Closed
Main Steam Bypass Isolation Valves	NMS-HCV-3615 NMS-HCV-3625 NMS-HCV-3635 NMS-HCV-3645	2	Yes	Yes	Yes/Yes	Main steam line isolation	Transfer Closed	Closed
Main Steam Safety Valves	NMS-VLV-509A,B,C,D NMS-VLV-510A,B,C,D NMS-VLV-511A,B,C,D NMS-VLV-512A,B,C,D NMS-VLV-513A,B,C,D NMS-VLV-514A,B,C,D	2	Yes	No	-/-	-	Transfer Open Transfer Closed	-
Main Steam Relief Valves	NMS-PCV-465 NMS-PCV-475 NMS-PCV-485 NMS-PCV-495	2	Yes	Yes	Yes/Yes	-	-	Closed
Main Steam Depressurization Valves	NMS-MOV-508A,B,C,D	2	Yes	Yes	Yes/Yes	Remote Manual	Transfer Open Transfer Closed	As Is
Main Steam Relief Valve Block Valves	NMS-MOV-507A,B,C,D	2	Yes	Yes	Yes/Yes	-	~~Transfer Open Transfer Closed~~	As Is
Main Steam Drain Line Isolation Valves	NMS-MOV-701A,B,C,D	2	Yes	Yes	Yes/Yes	Remote Manual	Transfer Closed	As Is
Main Steam Check Valves	NMS-VLV-516A,B,C,D	3	Yes	No	-/-	-	Transfer Closed	-

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14.03.04-05

Table 2.7.1.2-2 Main Steam Supply System Equipment Characteristics (Sheet 2 of 2)

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
Main Steam Line Pressure	NMS-PT-465, 466, 467, 468, 475, 476, 477, 478, 485, 486, 487, 488, 495, 496, 497, 498,	-	Yes	-	Yes/No	-	-	-
Turbine Inlet Pressure	NMS-PT-505, 506, 507, 508	-	No	-	Yes/No	-	-	-

Note: Dash (-) indicates not applicable

Table 2.7.1.2-4 Main Steam Supply System Equipment Alarms, Displays, and Control Functions

Equipment/Instrument Name	MCR/RSC Alarm	MCR Display	MCR/RSC Control Function	RSC Display
Main Steam Isolation Valves (NMS-AOV-515A, B, C, D)	No	Yes	Yes	Yes
Main Steam Bypass Isolation Valve (NMS-HCV-3615, 3625, 3635, 3645)	No	Yes	Yes	Yes
Main Steam Safety Valve (Position Indication) (NMS-VLV-509A,B,C,D NMS-VLV-510A,B,C,D NMS-VLV-511A,B,C,D NMS-VLV-512A,B,C,D NMS-VLV-513A,B,C,D NMS-VLV-514A,B,C,D)	No	Yes	No	Yes
Main Steam Relief Valve (NMS-AOV-515A, B, C, D)	No	Yes	Yes	Yes
Main Steam Depressurization Valves (NMS-HCV-3615, 3625, 3635, 3645)	No	Yes	Yes	Yes
Main Steam Relief Valve Block Valves (NMS-MOV-507A, B, C, D)	No	Yes	Yes	Yes
Main Steam Drain Line Isolation Valve (NMS-MOV-701A, B, C, D)	No	Yes	YESYes	Yes
Main Steam Line Pressure (NMS-PT-465, 466, 467, 468, 475, 476, 477, 478, 485, 486, 487, 488, 495, 496, 497, 498)	Yes	Yes	Yes	Yes
Turbine Inlet Pressure (NMS-PT-505, 506, 507, 508)	Yes	Yes	Yes	Yes

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14.03.04-03
14.03.04-09

Table 2.7.1.2-5 Main Steam Supply System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 6)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a The Class 1E equipment identified in Table 2.7.1.2-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.2-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.2-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
6.b The Class 1E components, identified in Table 2.7.1.2-2, are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built MSS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.1.2-2 under tests in the as-built MSS.
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables-and-raceways will be performed.	6.c ~~The as-built class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The MSS provides containment isolation of the MSS piping that penetrating the containment.	7. See Subsection 2.11.2 (Containment Isolation Systems).	7. See Subsection 2.11.2 (Containment Isolation Systems).

Table 2.7.1.2-5 Main Steam Supply System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 4 of 6)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.a Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.1.2-2.	8.a Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.2-2 using controls in the MCR.	8.a Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.1.2-2.
8.b The valves identified in Table 2.7.1.2-2 as having PSMSreactor protection system (RPS) control perform an active safety function after receiving a signal from PSMSRPS.	8.b.i Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.2-2 using simulated signals.	8.b The as-built remotely-operated valves identified in Table 2.7.1.2-2 perform the active function identified in the table after receiving a simulated signal.
	8.b.ii Tests will be performed to demonstrate that as-built remotely operated MSIV and MSRVBV close within the required response time under pre-operational condition..	8.c The as-built valves close within the following times after receipt of an actuation signal. The as-built MSIVs close within 5 seconds. The as-built MSRVBVs close within 30 seconds.
9.a The motor-operated valves, identified in Table 2.7.1.2-2, to perform an active safety-related, function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valves changes position as indicated in Table 2.7.1.2-2 under design conditions.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational conditions.	9.a.ii Each as-built valves changes position as indicated in Table 2.7.1.2-2 under pre-operational test conditions.

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Table 2.7.1.2-5 Main Steam Supply System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 5 of 6)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.b The air-operated valves, identified in Table 2.7.1.2-2, to perform an active safety-related, function to change position as indicated in the table.	9.b.i Tests or type tests of air-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.b.i Each air-operated valves changes position as indicated in Table 2.7.1.2-2 under design conditions.
	9.b.ii Tests of the as-built air-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.b.ii Each as-built air-operated valves changes position as indicated in Table 2.7.1.2-2 under pre-operational test conditions.
9.c The check valves, identified in Table 2.7.1.2-2 to perform an active safety-related, function to change position as indicated in the table.	9.c.iii Tests of the as-built check valves with active safety functions identified in Table 2.7.1.2-2 will be performed under pre-operational test pressure, temperature, and fluid flow conditions.	9.c.iii Each as-built check valves changes position as indicated in Table 2.7.1.2-2.
9.d After loss of motive power, the remotely operated valves, identified in Table 2.7.1.2-2, assume the indicated loss of motive power position.	9.db. Tests of the as-built valves will be performed under the conditions of loss of motive power.	9.db Upon loss of motive power, each as-built remotely operated valves identified in Table 2.7.1.2-2 assumes the indicated loss of motive power position.
10. MCR alarms and Ddisplays of the parameters identified in Table 2.7.1.2-4 can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the MSS parameters in the as-built MCR.	10. The MCR alarms and displays identified in Table 2.7.1.2-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) alarms, displays, and/or controls ~~provided for the MSS~~ are identified in Table 2.7.1.2-4.	11. Inspections of the as-built alarms, displays, and controls will be performed ~~on the as-built RSC displays and/or controls for the MSS~~.	11. ~~Displays~~ Alarms, displays and/or controls exist on the as-built RSC as identified in Table 2.7.1.2-4.
12. Each of the as-built piping identified in Table 2.7.1.2-3 as designed for leak before break (LBB) meets the LBB criteria, or an evaluation is performed of the protection from the dynamic effects of a rupture of the line.	12. Inspections will be performed on the evaluation report for LBB or the protection from dynamic effects of a pipe break, as specified in Section 2.3.	12. The LBB acceptance criteria are met by the as-built piping and pipe materials, or the protection is provided for the dynamic effects of the piping break.

Table 2.7.1.2-5 Main Steam Supply System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 6 of 6)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13.a The MSSVs provide overpressure protection for the secondary side of the seam generators and for pressure boundary components in the MSS.	13.a.i Inspections will be performed to confirm that the value of the vendor code plate rating of the as-built MSSV is greater than or equal to system relief requirements.	13.a.i The sum of the rated capacities recorded on the valve ASME Code plates of the as-built MSSVs exceeds 21,210,000 lb/hr.
	13.a.ii Tests and analyses in accordance with ASME Code Section III will be performed to determine set pressure.	13.a.ii The results of the tests and analysesanalysis conforms with the safety valves set pressure less than 1305 psig.
13.b During design basis events, the MSS limits SG blowdown.	13.b.i Tests will be performed to demonstrate that the as-built remotely operated MSIV close within the required response times. See item 8-14 in this table.	13.b.i See item 8-14 in this table.
	13.b.ii Inspections will be performed on the area of the as-built flow restrictor within the SG main steam outlet nozzle will limit releases to the containment.	13.b.ii The as-built flow restrictor within the SG main steam line discharge nozzle does not exceed 1.4 sq. ft.
14. The MSIVs and MSBIVs will close within the required response time.	14. Tests will be performed to demonstrate that as-built MSIVs and MSBIVs close within the required response time.	14. The as-built valves close within the following times after receipt of an actuation signal: The as-built MSIVs close within 5 seconds. The as-built MSBIVs close within 5 seconds.

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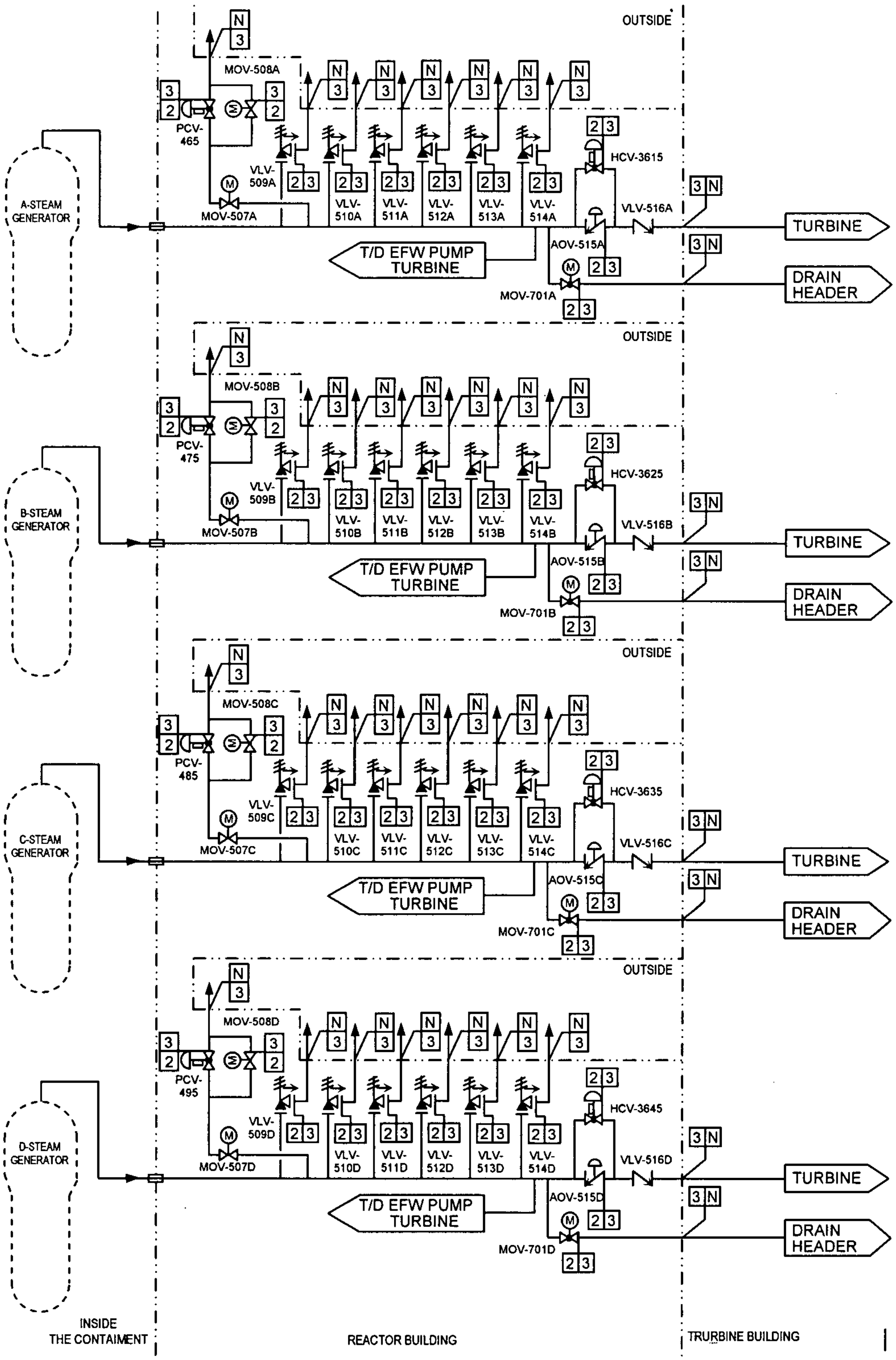

REMARK
System name of valve number is omitted in this drawing.

~~NMS-###~~+++

Figure 2.7.1.2-1 Main Steam Supply System

2.7.1.9 Condensate and Feedwater System (CFS)

2.7.1.9.1 Design Description

System Purpose and Functions

The safety-related function of the CFS is to provide containment and feedwater isolation following a design basis accident. The CFS provides feedwater at the required temperature, pressure, and flow rate to the SGs.

Location and Functional Arrangement

CFS equipment and piping are located in the containment, the reactor building and the turbine building. Figure 2.7.1.9-1 illustrates the main feedwater lines, showing the arrangement of the safety-related CFS components. The CFS is composed of the condensate system (CDS) and the feedwater system (FWS).

Key Design Features

The CFS is designed with the capability of automatically providing the required flow to the SGs during startup, shutdown at power levels up to the rated power and during the plant design transients without interruption of operation or damage to equipment.

The system provides main feedwater isolation valves (MFIVs) for the main feedwater lines routed into containment. The MFIVs close after receipt of an isolation signal in sufficient time to limit the mass and energy release to containment consistent with the containment analysis.

Seismic and ASME Classifications

The seismic category and ASME Code Section III requirements are identified in Tables 2.7.1.9-2 and 2.7.1.9-3 for safety-related CFS components and piping, respectively.

System Operation

The CFS supplies the SGs with heated feedwater in a closed steam cycle using regenerative feedwater heating

The CDS takes suction from the main condenser hotwell and pumps condensate forward to the deaerator utilizing the condensate pumps. The FWS takes suction from the deaerator and pumps feedwater forward to the SGs utilizing the feedwater booster/main feedwater pumps.

Alarms, Displays, and Controls

Table 2.7.1.9-~~3~~4 identifies alarms, displays, and controls associated with the CFS that are located in the MCR. CFS equipment and instrumentation that is required for remote shutdown and that is available at the remote shutdown console (RSC) is also shown on Table 2.7.1.9-4.

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Table 2.7.1.9-5 Condensate and Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a The Class 1E equipment identified in Table 2.7.1.9-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.9-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.9-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
6.b The Class 1E components, identified in Table 2.7.1.9-2, are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built CFS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.1.9-2 under tests in the as-built CFS.
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	6.c ~~The as-built class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The CFS provides containment isolation of the CFS piping that penetrating the containment.	7. See Subsection 2.11.2 (Containment Isolation Systems).	7. See Subsection 2.11.2 (Containment Isolation Systems).

Table 2.7.1.9-5 Condensate and Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 4 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.a Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.1.9-2.	8.a Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.9-2 using controls in the MCR.	8.a Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.1.9-2.
8.b The valves identified in Table 2.7.1.9-2 as having reactor protection system (RPS)PSMS control perform an active safety function after receiving a signal from RPSPSMS.	8.b.i Tests of the as-built valves will be performed on the as-built remotely operated valves listed in Table 2.7.1.9-2 using simulated signals.	8.b.i The as-built remotely-operated valves identified in Table 2.7.1.9-2 perform the active function identified in the table after receiving a simulated signal.
	8.b.ii Tests will be performed to demonstrate that remotely operated as-built MFIVs close within the required response time under preoperational condition.	8.b.iic The as-built valves close within the following times after receipt of an actuation signal. The as-built MFIVs close within 5 seconds.
9.a The motor-operated valves, identified in Table 2.7.1.9-2 to perform an active safety-related, function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valves changes position as indicated in Table 2.7.1.9-2 under design condition.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational conditions.	9.a.ii Each as-built valves changes position as indicated in Table 2.7.1.9-2 under the pre-operational test conditions.
9.b After loss of motive power, the remotely operated valves, identified in Table 2.7.1.9-2, assume the indicated loss of motive power position.	9.b Tests of the as-built valves will be performed under the conditions of loss of motive power.	9.b Upon loss of motive power, each as-built remotely operated valves identified in Table 2.7.1.9-2 assumes the indicated loss of motive power position.
10. Displays of the parameters identified in Table 2.7.1.9-4 can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the CFS parameters in the as-built MCR.	10. The displays identified in Table 2.7.1.9-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) displays and/or controls provided for the CFS are identified in Table 2.7.1.9-4.	11. Inspections will be performed on the as-built RSC displays and/or controls for the CFS.	11. Displays and/or controls exist on the as-built RSC as identified in Table 2.7.1.9-4.

2.7.1.10 Steam Generator Blowdown System (SGBDS)

2.7.1.10.1 Design Description

System Purpose and Functions

The SGBDS has a safety-related function of isolating the secondary side of the SG) using two isolation valves in series in the blowdown line from each SG. This provides a heat sink for a safe shutdown or to mitigate the consequences of a design basis accident.

The SGBDS assists in maintaining secondary side water chemistry within acceptable limits during normal plant operation and during anticipated operational occurrences (AOO) due to main condenser in leakage or primary to secondary steam generator tube leakage.

Location and Functional Arrangement

The SGBDS equipment and piping are located in the containment, the R/B, the A/B and the T/B. Figure 2.7.1.10-1 illustrates the SGBDS, showing the arrangement of the SGBDS components.

Key Design Features

One blowdown line per SG is provided. The blowdown line from each steam generator is provided with two flow paths: (1) purify and recovery line for normal plant operation and (2) line discharging to the condenser, the liquid waste management system and waste water system used during startup and abnormal water conditions.

The blowdown water is drawn from each SG from a location above the tube sheet where impurities are expected to accumulate. The blowdown from each SG is depressurized by a throttle valve located downstream of the isolation valves. The throttle valves can be manually adjusted to control blowdown rate.

Impurity removal includes filters and demineralizers. These demineralizers includes cation demineralizers and mix bed demineralizers.

The radiation monitor provided downstream of the demineralizers and the radiation monitor provided in the blowdown sampling line measure the radiation level. The blowdown water samples provide the information about impurities in blowdown water.

Seismic and ASME Code Classifications

The seismic category and ASME Code Section III requirements are identified in Tables 2.7.1.10-1 and 2.7.1.10-2 for safety-related SGBDS components and piping, respectively.

Table 2.7.1.10-3 Steam Generator Blowdown System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of ~~2~~3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a The seismic Category I equipment identified in Table 2.7.1.10-1 can withstand seismic design basis loads without loss of safety function.	5.a.i Inspections will be performed to verify that the as-built seismic Category I equipment and piping identified in Table 2.7.1.10-1 is located in the Nuclear Island.	5.a.i The as-built seismic Category I equipment identified in Tables 2.7.1.10-1 is located in the Nuclear Island.
	5.a.ii Type tests and/or analyses of the seismic Category I equipment will be performed.	5.a.ii The results of the type tests and /or analyses concludes that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
	5.a.iii Inspections will be performed on the as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.	5.a.iii The as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.
5.b Each of the seismic category piping identified in Table 2.7.1.10-2 is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability.	5.b Inspections will be performed on the as-built piping.	5.b Each of the as-built seismic category piping identified in Table 2.7.1.10-2 meets the seismic category requirements.
6. The Class 1E components of equipment identified in Table 2.7.1.10-2 are powered from their respective Class 1E division.	6. Tests will be performed on the as-built SGBDS by providing a test signal in only one Class 1E division at a time.	6. Within the SGBDS, a test signal exists only at the as-built equipment powered from the Class 1E division under test.
7. <u>Separation</u>~~Independence~~ is provided between SGBDS Class 1E divisions, and between Class 1E divisions and non-Class 1E equipment.	7. Inspections of the as-built Class 1E <u>divisional cables</u>~~divisions in the SGBDS~~ will be performed.	7. ~~The p~~<u>P</u>hysical separation <u>or electrical isolation is provided</u> exists between <u>the as-built cables of</u> Class 1E divisions ~~in the SGBDS,~~ and <u>between Class 1E divisions and non-Class 1E cables</u>~~that physical separation exists between as-built Class 1E Divisions and non-Class 1E equipment in the SGBDS~~.
8. The air-operated valve(s) designated in Table 2.7.1.10-1 for the SGBDS closes (opens) if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.	8. Tests will be conducted on the as-built power generation systems air-operated valve(s) designated in Table 2.7.1.10-1 for the SGBDS.	8. The air-operated power generation systems as-built valve(s) designated in Table 2.7.1.10-1 for the SGBDS closes (opens) when either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.
9. Each mechanical division of the SGBDS is physically separated from the other	9. Inspections of the as-built SGBDS will be performed.	9. Each mechanical division of the as-built SGBDS is physically separated from

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Table 2.7.1.10-3 Steam Generator Blowdown System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. The Class 1E equipment identified in Table 2.7.1.10-1 as being qualified for a harsh environment are designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	10.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	10.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.10-1 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.
	10.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	10.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.10-1 as being qualified for a harsh environment are bounded by type tests and/or analyses.

2.7.1.11 Emergency Feedwater System (EFWS)

2.7.1.11.1 Design Description

System Purpose and Functions

The EFWS is a safety-related system. The EFWS is designed to supply feedwater to the steam generators (SGs) when the main feedwater system is not in operation for transient conditions or postulated accidents.

Location and Functional Arrangement

The EFWS components are located in the reactor building. Figure 2.7.1.11-1 illustrates the arrangement of the EFWS components. Table 2.7.1.11-1 also provides a tabulation of the location of EFWS equipment.

Key Design Features

The EFWS consists of two motor-driven emergency feedwater (EFW) pumps, two turbine-driven EFW pumps, two EFW pits, piping, valves and associated instrumentation. Each EFW pumps has 50 percent capacity.

Each EFW pump discharge line connects ~~with~~ to a tie line with motor-operated isolation valves. During normal plant operation, all the isolation valves are closed to provide separation of the four trains. When ~~the~~ one of the EFW pumps is not available because of an outage ~~of~~ or maintenance or failure during normal plant operation, all the tie isolation valves are kept open to supply specified EFW flow to the SGs following a transient or accident condition.

The flow recirculation line from each EFW pump discharge back to its associated EFW pit provides required EFW pump minimum flow and permits testing each EFW pump at full flow.

The EFWS is designed to remove reactor core decay heat and sensible heat of the reactor coolant system through the SGs following transient conditions or postulated accidents such as:

- Reactor trip
- Loss of offsite power (LOOP)
- Loss of main feedwater
- Small break loss of coolant accident (small break LOCA)
- Feedwater line break (FLB)
- Main steam line break (MSLB)

- Station blackout (SBO)
- Anticipated transient without scram (ATWS)
- SG tube rupture (SGTR)

The EFWS is capable of automatically initiating flow upon receipt of a system actuation signal.

The EFWS design is provided with the capability to automatically terminate EFW flow to a depressurized (faulty) SG and to automatically provide feedwater to the intact SGs.

Each EFW pump is designed to develop adequate head to supply the design flow to each SG, when the SG pressure is equivalent to the set pressure of the first stage of main steam safety valve plus three percent.

The EFWS has the capability to permit operation at hot shutdown for eight hours followed by six hours of cooldown to the initiation temperature of residual heat removal system.

The EFWS is designed such that in the unlikely event that the main control room must be evacuated, the EFWS can be operated from the remote shutdown console (RSC) outside the main control room (MCR).

Seismic and ASME Code Classifications

The seismic category and ASME Code Section III requirements are identified in Tables 2.7.1.11-2 and 2.7.1.11-3 for safety-related EFWS components and piping, respectively.

System Operation

The EFWS is not used during plant startup and shutdown.

The EFWS is capable of automatically initiating flow upon receipt of an EFW actuation signal and is provided with the capability to automatically terminate EFW flow to a faulty SG and to provide EFW to the intact SGs.

To maintain the adequate range of water level in SGs, EFW flow rate is manually controlled by the operator from the MCR.

Alarms, Displays, and Controls

Table 2.7.1.11-4 identifies alarms, displays, and controls associated with the EFWS that are located in the MCR. EFWS equipment and instrumentation that is required for remote shutdown and that is available at the RSC is also shown on Table 2.7.1.11-4.

Logic

The EFWS is automatically initiatesinitiating flow upon receipt of an EFW actuation signal, such as:

- Low SG water level
- ECCS actuation signal
- LOOP signal
- MFW pumps trip
- Manual actuation

The EFWS is provided with the capability to automatically terminate by signal, such as:

- Low main steam line pressure
- High SG water level

Interlocks

There are no interlocks needed for direct safety functions related to the EFWS.

Class 1E Electrical Power Sources and Divisions

The safety-related EFWS components identified in Table 2.7.1.11-2 as Class 1E are powered from their respective Class 1E division. Separation is provided between these Class 1E divisions and between non-Class 1E divisions and non-Class 1E electrical cable.

Equipment to be Qualified for Harsh Environments

The safety-related EFWS equipment identified in Table 2.7.1.11-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.

Interface Requirements

There are no safety-related interfaces with systems outside of the certified design.

Numeric Performance Values

When necessary to demonstrate satisfaction of a design commitment, numeric performance values for selected components have been specified as ITAAC acceptance criteria in Table 2.7.1.11-5. Key parameters of the EFWS design that are used in the safety analysis and which are included in the Table 2.7.1.11-5 are activation of the EFWS, its ability to deliver EFW to SGs and termination of EFW to a faulty SG.

2.7.1.11.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.a The ASME Code Section III components, identified in Table 2.7.1.11-2, retain their pressure boundary integrity at their design pressure.	4.a Hydrostatic tests will be performed on the as-built components required by the ASME Code Section III to be hydrostatically tested.	4.a The results of the hydrostatic tests of the as-built components identified in Table 2.7.1.11-2 as ASME Code Section III conform with the requirements of the ASME Code Section III.
4.b The ASME Code Section III piping, identified in Table 2.7.1.11-3, retains its pressure boundary integrity at its design pressure.	4.b Hydrostatic tests will be performed on the as-built piping required by the ASME Code Section III to be hydrostatically tested.	4.b The results of the hydrostatic tests of the as-built piping identified in Table 2.7.1.11-3 as ASME Code Section III conform with the requirements of the ASME Code Section III.
5.a The seismic Category I equipment, identified in Table 2.7.1.11-2, can withstand seismic design basis loads without loss of safety function.	5.a.i Inspections will be performed to verify that the as-built seismic Category I as-built equipment identified in Table 2.7.1.11-2 are located in the reactor building.	5.a.i The as-built seismic Category I equipment identified in Table 2.7.1.11-2 is located in the reactor building.
	5.a.ii Type tests and/or analyses of the seismic Category I equipment will be performed.	5.a.ii The results of the type tests and/or analyses conclude that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
	5.a.iii Inspections will be performed on the as-built equipment including anchorage.	5.a.iii The as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.
5.b Each of the seismic category piping identified in Table 2.7.1.11-3 is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability.	5.b Inspections will be performed on the as-built piping.	5.b Each of the as-built seismic category piping identified in Table 2.7.1.11-3 meets the seismic category requirements.

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Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analys Acceptance Criteria (Sheet 3 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a The Class 1E equipment identified in Table 2.7.1.11-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.1.11-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.1.11-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
6.b The Class 1E components, identified in Table 2.7.1.11-2, are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built EFWS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.1.11-2 under tests in the as-built EFWS.
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	6.c ~~The as-built class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The EFWS provides containment isolation of the EFWS piping that penetrating the containment.	7. See Subsection 2.11.2 (Containment Isolation Systems).	7. See Subsection 2.11.2 (Containment Isolation Systems).

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Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 4 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.a Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.1.11-2.	8.a Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.11-2 using controls in the MCR.	8.a Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.1.11-2.
8.b The valves identified in Table 2.7.1.11-2 as having reactor protection system (RPS) control perform an active safety function after receiving a signal from RPS.	8.b.i Tests will be performed on the as-built remotely operated valves listed in Table 2.7.1.11-2 using simulated signals.	8.b.i The as-built remotely-operated valves identified in Table 2.7.1.11-2 perform the active function identified in the table after receiving a signal.
	8.b.ii Tests will be performed to demonstrate that remotely operated as-built EFW control valves and EFW isolation valves close within the required response time under preoperational condition.	8. b.iic These as-built valves close within the following times after receipt of an actuation signal. The as-built EFW control valves close within 20 seconds. The as-built EFW isolation valves close within 20 seconds.
9.a The motor-operated valves, identified in Table 2.7.1.11-2-to perform an active safety-related, function to change position as indicated in the table.	9.a.i Tests or type tests of motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each motor-operated valves changes position as indicated in Table 2.7.1.11-2 under design conditions.
	9.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built motor-operated valves changes position as indicated in Table 2.7.1.11-2 under pre-operational test conditions.
	9.a.iii Tests of the as-built check valves will be performed for the operation of the valves.	9.a.iii Each as-built check valves indicated in Table 2.7.1.11-2 perform their functions indicated in Table 2.7.1.11-2.
9.b After loss of motive power, the remotely operated valves, identified in Table 2.7.1.11-2, assume the indicated loss of motive power position.	9.b. Tests of the as-built valves will be performed under the conditions of loss of motive power.	9.b Upon loss of motive power, each as-built remotely operated valves identified in Table 2.7.1.11-2 assumes the indicated loss of motive power position.

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Table 2.7.3.1-5 Essential Service Water System Inspections and Acceptance Criteria (Sheet 2 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a The seismic Category I equipment identified in Table 2.7.3.1-2 can withstand seismic design basis loads without loss of safety function.	5.a.i Inspections will be performed to verify that the seismic Category I as-built equipment identified in Table 2.7.3.1-2 is installed in the location identified in Table 2.7.3.1-1.	5.a.i The seismic Category I as-built equipment identified in Table 2.7.3.1-2 is installed in the location identified in Table 2.7.3.1-1.
	5.a.ii Type tests and/or analyses of the seismic Category I equipment will be performed.	5.a.ii The results of the type tests and/or analyses concludes that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
	5.a.iii Inspections will be performed on the as-built equipment including anchorage.	5.a.iii The as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.
5.b Each of the seismic category piping identified in Table 2.7.3.1-3 is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability.	5.b Inspections will be performed on the as-built piping.	5.b Each of the as-built seismic category piping identified in Table 2.7.3.1-3 meets the seismic category requirements.
6.a The Class 1E components identified in Table 2.7.3.1-2 are powered from their respective Class 1E division.	6.a A test will be performed on the as-built ESWS by providing a simulated test signal in each Class 1E division.	6.a The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.3.1-2 under test in the as-built ESWS
6.b Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	6.b ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The ESWS provides adequate cooling water required for the various components during all plant operating conditions, including normal plant operating, abnormal and accident conditions.	7. Tests of the as-built ESWS will be performed.	7. The as-built ESWS provides adequate cooling water required for the various components during all plant operating conditions, including normal plant operating, abnormal and accident conditions.

Table 2.7.3.1-5 Essential Service Water System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.3.1-2.	8. Tests will be performed on the as-built remotely operated valves listed in Table 2.7.3.1-2 using controls in the MCR.	8. Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.3.1-2.
9.a The remotely operated valves, identified in Table 2.7.3.1-2, ~~to~~ perform an active safety-~~related,~~ function to change position as indicated in the table.	9.a.i Tests or type tests of the valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each valve changes position as indicated in Table 2.7.3.1-2 under design conditions.
	9.a.ii Tests of the as-built valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built valve changes position as indicated in Table 2.7.3.1-2 under pre-operational test conditions.
9.b Upon the receipt of an ESWP start signal, the essential service water discharge valve opens automatically.	9.b Tests of the as-built essential service water discharge valve will be performed using a simulated test signal.	9.b Upon the receipt of a simulated test signal, the as-built discharge valve opens automatically.
9.c After loss of motive power, the remotely operated valves, identified in Table 2.7.3.1-2, assume the indicated loss of motive power position.	9.c Tests of the as-built valves will be performed under the conditions of loss of motive power.	9.c Upon loss of motive power, each as-built remotely operated valve identified in Table 2.7.3.1-2 assumes the indicated loss of motive power position.
10.a Controls exist in the MCR to start and stop the pumps identified in Table 2.7.3.1-4.	10.a Tests will be performed on the as-built pumps in Table 2.7.3.1-4 using controls in the MCR.	10.a Controls in the MCR operate to start and stop the as-built pumps listed in Table 2.7.3.1-4.
10.b The pump identified in Table 2.7.3.1-4 starts after receiving a signal.	10.b Tests will be performed using simulated signal.	10.b The as-built pump identified in Table 2.7.3.1-4 starts after receiving simulated signal.
11. Displays of the parameters identified in Table 2.7.3.1-4 can be retrieved in the MCR.	11. Inspections will be performed for retrievability of the ESWS parameters in the as-built MCR.	11. The displays identified in Table 2.7.3.1-4 can be retrieved in the as-built MCR.
12. Remote shutdown console (RSC) displays and/or controls provided for the ESWS are identified in Table 2.7.3.1-4.	12. Inspections will be performed on the as-built RSC displays and/or controls for the ESWS.	12. Displays and/or controls exist on the as-built RSC as identified in Table 2.7.3.1-4.

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Table 2.7.3.3-5 Component Cooling Water System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.a The seismic Category I equipment identified in Table 2.7.3.3-2 can withstand seismic design basis loads without loss of safety function.	5.a.i Inspections will be performed to verify that the structural adequacy of seismic Category I as-built equipment identified in Table 2.7.3.3-2 is located in the safety-related buildings.	5.a.i The seismic Category I as-built equipment identified in Table 2.7.3.3-2 is located in the safety-related buildings.
	5.a.ii Type tests and/or analyses of the seismic Category I equipment will be performed.	5.a.ii The results of the type tests and/or analyses conclude that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
	5.a.iii Inspections will be performed on the as-built equipment including anchorage.	5.a.iii The as-built equipment including anchorage are seismically bounded by the tested or analyzed conditions.
5.b Each of the seismic category piping identified in Table 2.7.3.3-3 is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability.	5.b Inspections will be performed on the as-built piping.	5.b Each of the as-built seismic category piping identified in Table 2.7.3.3-3 meets the seismic category requirements.
6.a The applicable Class 1E equipment identified in Table 2.7.3.3-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.7.3.3-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.
	6.a.ii An inspection will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.3.3-2, as being qualified for a harsh environment are bounded by type tests and/or analyses.

6.b The Class 1E components identified in Table 2.7.3.3-2 are powered from their respective Class 1E division.	6.b A test will be performed on the as-built CCWS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.3.3-2 under test in the as-built CCWS.

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Table 2.7.3.3-5 Component Cooling Water System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	6.c ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical separation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7.b The CCWS provides adequate cooling water required for the various components during all plant operating conditions, including normal plant operating, abnormal and accident conditions.	7.b Tests of the as-built CCWS will be performed.	7.b The as-built CCWS provides adequate cooling water required for the various components during all plant operating conditions, including normal plant operating, abnormal and accident conditions.
8. Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.3.3-2.	8. Test will be performed on the as-built remotely operated valves listed in Table 2.7.3.3-2 using controls in the MCR.	8. Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.3.3-2.
9.a The remotely operated valves, identified in Table 2.7.3.3-2, ~~to~~ perform an active safety-~~related,~~ function to change position as indicated in the table.	9.a.i Tests or type tests of the valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each valve changes position as indicated in Table 2.7.3.3-2 under design conditions.
	9.a.ii Tests of the as-built valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built valve changes position as indicated in Table 2.7.3.3-2 under pre-operational test conditions.

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Table 2.7.3.5-5 Essential Chilled Water System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.b Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.b Inspections of the as-built Class 1E divisional cables and raceways will be performed.	6.b The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division. Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The ECWS provides chilled water required for the various cooling coils during all plant operating conditions, including normal plant operating, abnormal and accident conditions.	7. Tests of as-built ECWS will be performed.	7. The as-built ECWS provides chilled water required for the various cooling coils during all plant operating conditions, including normal plant operating, abnormal and accident conditions.
8. Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.7.3.5-2.	8. Test will be performed on the as-built remotely operated valves listed in Table 2.7.3.5-2 using controls in the MCR.	8. Controls in the MCR operate to open and close the as-built remotely operated valves listed in Table 2.7.3.5-2.
9.a The remotely operated valves, identified in Table 2.7.3.5-2, to perform an active safety-related, function to change position as indicated in the table.	9.a.i Tests or type tests of the valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i Each valve changes position as indicated in Table 2.7.3.5-2 under design conditions.
	9.a.ii Tests of the as-built valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii Each as-built valve changes position as indicated in Table 2.7.3.5-2 under pre-operational test conditions.
9.b After loss of motive power, the remotely operated valves, identified in Table 2.7.3.5-2, assume the indicated loss of motive power position.	9.b Tests of the as-built remotely operated valves will be performed under the conditions of loss of motive power.	9.b Upon loss of motive power, each as-built remotely operated valve identified in Table 2.7.3.5-2 assumes the indicated loss of motive power position.

3.b Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	3.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	3.b ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

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3.b. Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	3.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	3.b ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

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Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3.b. Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	3.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	3.b ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

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5. The seismic Category I equipment, identified in Table 2.7.6.3-1 can withstand seismic design basis loads without loss of safety function.	5.a Inspections will be performed to verify that the as-built seismic Category I equipment identified in Table 2.7.6.3-1 are located in the containment and reactor building.	5.a The as-built seismic Category I equipment identified in Table 2.7.6.3-1 is located in the containment and reactor building.
	5.b Type tests and/or analyses of seismic Category I equipment will be performed.	5.b The results of the type tests and/or analyses conclude that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
	5.c Inspections will be performed on the as-built equipment including anchorage.	5.c The as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.
6. Each of the seismic category piping identified in Table 2.7.6.3-2 is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability.	6. Inspections will be performed on the as-built piping.	6. Each of the as-built seismic category piping identified in Table 2.7.6.3-2 meets the seismic category requirements.
7.a The Class 1E equipment identified in Table 2.7.6.3-1 is powered from their respective Class 1E division.	7.a Tests will be performed on the as-built SFPCS by providing a simulated test signal in each Class 1E division.	7.a The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.6.3-1 under tests in the as-built SFPCS.
7.b Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	7.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	7.b ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same divisions. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
8. The SFP pump provides adequate cooling water required for the SFP heat exchangers during all plant operating conditions, including normal plant operating, abnormal and accident conditions.	8. Tests of the as-built SFP pump will be performed.	8. The as-built SFP pump provides adequate cooling water required for the SFP all plant operating conditions, including normal plant operating, abnormal and accident conditions.
9. Displays of the parameters identified in Table 2.7.6.3-3 can be retrieved in the MCR.	9. Inspections will be performed for the retrievability of the SFPCS parameters in the as-built MCR.	9. The displays identified in Table 2.7.6.3-3 can be retrieved in the as-built MCR.

Table 2.7.6.6-2 Process Effluent Radiation Monitoring and Sampling System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 1 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The radiation monitors identified in Table 2.7.6.6-1 are provided in accordance with the applicable NRC regulations.	1. An inspection of the as-built radiation monitors will be performed.	1. Each of the as-built radiation monitor identified in Table 2.7.6.6-1 exists.
2. The ~~Class 1E~~ seismic Category I radiation monitors identified in Table 2.7.6.6-1 are designed to withstand seismic design basis loads without loss of safety function.	2.i Inspections will be performed to verify that the as-built, seismic Category I radiation monitors identified in Table 2.7.6.6-1, are located in a seismic Category I structure.	2.i The as-built seismic Category I radiation monitors identified in Table 2.7.6.6-1 are located in a seismic Category I structure.
	2.aiiType tests and/or analyses of the seismic Category I radiation monitors will be performed.	2.aiiThe seismic Category I radiation monitors identified in Table 2.7.6.6-1 can withstand seismic design basis loads without loss of safety function.
	2.biii An inspection will be performed on the as-built radiation monitors including anchorage.	2.biii The as-built radiation monitors identified in Table 2.7.6.6-1 including anchorage ~~is~~ are seismically bounded by the tested or analyzed conditions.
3.a The Class 1E radiation monitors identified in Table 2.7.6.6-1 are powered from their respective Class 1E division.	3.a A test will be performed on the as-built PERMS by providing a simulated test signal in each Class 1E division.	3.a A simulated test signal exists at the as-built Class 1E radiation monitors identified in Table 2.7.6.6-1 when the assigned Class 1E division is provided the test signal.
3.b Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	3.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	3.b ~~The as-built Class 1E electrical cables and communication cables associated with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

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6.a The Class 1E equipment identified in Tables 2.7.6.7-1 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis accident without loss of their safety function, for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The Class 1E equipment identified in Table 2.7.6.7-1 as being qualified for a harsh environment withstands the environmental conditions that would exist before, during, and following a design basis accident without loss of their safety function, for the time required to perform the safety function.
	6.a.ii An inspection will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.7.6.7-1 as being qualified for a harsh environment are bounded by type tests, and/or analyses.
6.b The Class 1E components identified in Table 2.7.6.7-1 are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built PSS by providing a simulated test signal in each Class 1E division.	6.b A simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.6.7-1 when the assigned Class 1E division is provided the test signal.
6.c Separation is provided between PSS Class 1E divisions, and between Class 1E divisions and non-Class 1E divisions.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	6.c ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The PSS provides the safety-related function of preserving containment integrity by isolation of the PSS lines penetrating the containment.	7. See Subsection 2.11.2 (Containment Isolation)	7. See Subsection 2.11.2 (Containment Isolation)
8. The PSS provides the nonsafety-related function of providing the capability of obtaining reactor coolant and containment atmosphere samples.	8. Tests of the as-built system will be performed to obtain samples of the reactor coolant and containment atmosphere.	8. A sample is drawn from the reactor coolant and the containment atmosphere.

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Table 2.7.6.13-3 Area Radiation and Airborne Radioactivity Monitoring Systems Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 1 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The radiation monitors identified in Tables 2.7.6.13-1 and 2.7.6.13-2 are provided in accordance with the applicable NRC regulations.	1. An inspection of the as-built radiation monitors will be performed.	1. Each of the as-built radiation monitors identified in Tables 2.7.6.13-1 and 2.7.6.13-2 exists.
2. The Class 1E seismic Category I radiation monitors identified in Table 2.7.6.13-1 can withstand seismic design basis loads without loss of safety function.	2.i Inspections will be performed to verify that the as-built, seismic Category I radiation monitors identified in Table 2.7.6.13-1, are located in the containment or the reactor building.	2.i The as-built seismic Category I radiation monitors identified in Table 2.7.6.13-1 are located in the containment or the reactor building.
	2.ii Type tests and/or analyses of the seismic Category I radiation monitors will be performed.	2.ii The seismic Category I radiation monitors identified in Table 2.7.6.13-1 can withstand seismic design basis loads without loss of safety function.
	2.iii An inspection will be performed on the as-built radiation monitors including anchorage.	2.iii The as-built radiation monitors identified in Table 2.7.6.13-1 including anchorage is are seismically bounded by the tested or analyzed conditions.
3. The Class 1E radiation monitors identified in Table 2.7.6.13-1 can as being designed for harsh environment are designed to withstand the environmental conditions that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function.	3. Type tests and/or analyses will be performed on the Class 1E radiation monitor.	3. The results of the type tests and/or analyses conclude that the Class 1E radiation monitors identified in Table 2.7.6.13-1 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function.
4.a The Class 1E radiation monitors identified in Table 2.7.6.13-1 are powered from their respective Class 1E division.	4.a A test will be performed on the as-built Monitoring Systems by providing a simulated test signal in each Class 1E division.	4.a A simulated test signal exists at the as-built Class 1E radiation monitors, are identified in Tables 2.7.6.13-1, when the assigned Class 1E division is provided the test signal.

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Table 2.7.6.13-3 Area Radiation and Airborne Radioactivity Monitoring Systems Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.b Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	4.b Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	4.b ~~The as-built Class 1E electrical cables and communication cables associated with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
5. Each division of Class 1E radiation monitors identified in Table 2.7.6.13-1 is physically separated from the other divisions.	5. Inspections of the as-built Class 1E radiation monitors will be performed.	5. Each division of the Class 1E radiation monitors identified in Table 2.7.6.13-1 is physically separated from other divisions by structural and/or fire barriers.
6. Data and alarm signals, including control logic, annunciation, and power failure alarms, from the Class 1E radiation monitors identified in Table 2.7.6.13-1 are transmitted to the main control room and made accessible to plant operators.	6. An inspection will be performed for retrievability of data and alarms in the as-built MCR.	6. The as-built data and alarm signals from the Class 1E radiation monitors identified in Table 2.7.6.13-1 can be retrieved in the as-built MCR.

Attachment 2

US-APWR DCD Tier 1 Section 2.4 Mark-up

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Table 2.4.1-2 Reactor System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 31)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. The seismic Category I equipment, identified in Table 2.4.1-1, is designed to withstand seismic design basis loads without loss of safety function.	8. Type tests and/or analyses of seismic Category I equipment will be performed.	8. The results of the type tests and/or analyses concludes that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
9. The reactor internals withstand flow-induced vibration.	9. The flow-induced vibration test will be performed to measure the vibration response in the pre-operational test on the first US-APWR unit, with associated pre-test and post-test inspections.	9. The results of the flow-induced vibration test show that the alternative stress is acceptably low in comparison with the limit for high cycle fatigue in the ASME code. No structural damage or change is observed in post-test inspections.
10. The equipment identified in Table 2.4.1-1 as Class 1E/qualified for a harsh environment can maintain functional operability under all service conditions, including the design basis accident.	10. Type tests and/or analyses will be performed on Class 1E equipment located in a harsh environment.	10. The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.4.1-1 as being qualified for a harsh environment can withstand the environmental conditions.
11. The Class 1E components, identified in Table 2.4.1-1, are powered from their respective Class 1E division.	11. Tests of the as-built components will be performed by providing simulated test signals.	11. The results of tests conclude that power to the as-built components is supplied from their Class 1E division.
12. Separation is provided between the Class 1E divisions for the components identified in Table 2.4.1-1 as Class 1E/qualified and non-Class 1E divisions.	12. Inspections of the as-built Class 1E divisional cables and raceways will be performed.	12. The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division. Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

Table 2.4.2-5 Reactor Coolant System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Each of the seismic category piping identified in Table 2.4.2-3 is designed to withstand combined normal and seismic design basis loads without a loss of its functional capability.	8. Inspections will be performed on the as-built piping.	8. Each of the as-built seismic category piping identified in Table 2.4.2-3 meets the seismic category requirements.
9.a The Class 1E equipment identified in Table 2.4.2-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	9.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	9.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.4.2-2 as being qualified for a harsh environment can withstand the environmental conditions.
	9.a.ii An inspection will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	9.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.4.2-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
9.b The Class 1E components, identified in Table 2.4.2-2, are powered from their respective Class 1E division.	9.b A test will be performed on the as-built RCS by providing a simulated test signal in each Class 1E division.	9.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.4.2-2 under test in the as-built RCS.
9.c Separation is provided between RCS Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	9.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	9.c ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.

Table 2.4.4-5 Emergency Core Cooling System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 6)

Design Commitment		Inspections, Tests, Analyses		Acceptance Criteria	
6.a	The Class 1E equipments identified in Table 2.4.4-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i	Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i	The results of the type tests and/or analyses concludes that the Class 1E equipment identified in Table 2.4.4-2 as being qualified for a harsh environment can withstand the environmental conditions.
		6.a.ii	Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii	The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.4.4-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
6.b	The Class 1E components, identified in Table 2.4.4-2, are powered from their respective Class 1E division.	6.b	Tests will be performed on the as-built ECCS by providing a simulated test signal in each Class 1E division.	6.b	The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.4.4-2 under tests in the as-built ECCS.
6.c	Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c	Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	6.c	~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7.a	The ECCS provides containment isolation of the ECCS piping that penetrating the containment.	7.a	See Subsection 2.11.2 (Containment Isolation Systems).	7.a	See Subsection 2.11.2 (Containment Isolation Systems).

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Table 2.4.5-5 Residual Heat Removal System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 7)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a The Class 1E equipment identified in Table 2.4.5-2 as being qualified for a harsh environment is designed to withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses conclude that the Class 1E equipment identified in Table 2.4.5-2 as being qualified for a harsh environment can withstand the environmental conditions.
	6.a.ii An inspection will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.4.5-2 as being qualified for a harsh environment are bounded by type tests and/or , analyses.
6.b The Class 1E components, identified in Table 2.4.5-2, are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built RHRS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.4.5-2 under tests in the as-built RHRS.
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways will~~ be conducted.	6.c ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7.a The RHRS is provided with isolation valves in each pump suction piping with interlock capabilities to prevent them from being opened to the RCS above the pressure setpoint.	7.a Tests will be performed using a simulated test signal	7.a The interlocks prevent the as-built RHRS isolation valves in each pump suction piping from being opened to the RCS above the pressure setpoint.

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Table 2.4.6-5 Chemical and Volume Control System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.c Separation is provided between CVCS Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be performed.	6.c ~~The as-built Class 1E electrical cables associated with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. The CVCS provides containment isolation of the CVCS piping that penetrating the containment.	7. See Subsection 2.11.2 'Containment Isolation'.	7. See Subsection 2.11.2 'Containment Isolation'.
8.a The CVCS provides makeup capability to maintain the RCS volume.	8.a A test of the as-built CVCS will be performed to measure the makeup flow rate.	8.a Each as-built CVCS charging pump provides a flow rate of greater than or equal to 160 gpm.
8.b The CVCS provides pressurizer auxiliary spray water for depressurization.	8.b A test of the as-built CVCS will be performed by aligning a flow path from each CVCS charging pump to the pressurizer auxiliary spray.	8.b Each as-built CVCS charging pump provides spray flow to the pressurizer.
8.c The CVCS supplies seal water to the RCP seals.	8.c A test of the as-built CVCS will be performed by aligning a flow path to each RCP.	8.c Each as-built CVCS charging pump provides a flow rate of greater than or equal to 8 gpm to each RCP seal.
9. Controls exist in the MCR to open and close the remotely operated valves identified in Table 2.4.6-2 to perform active functions.	9. i Tests will be performed on the as-built remotely operated valves listed in Table 2.4.6-2 using controls in the MCR.	9.i Controls in the MCR operate to open and close the as-built remotely operated valves to perform active functions.
	9. ii Tests will be performed to demonstrate that the as-built remotely operated valves open within the required response times.	9. ii After receipt of an actuation signal, the as-built valves open within the required times.

Attachment 3

US-APWR DCD Tier 1 Section 2.11 Mark-up

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Table 2.11.2-2 Containment Isolation System Inspections, Tests and Acceptance Criteria (Sheet 3 of 4)

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Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.b The Class 1E components, identified in Table 2.11.2-1, are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built CIS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.11.2-1 under tests in the as-built CIS.
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	6.c ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7. CIS isolates containment upon receipt of a containment isolation signal.	7. Tests will be performed to verify that the as-built containment isolation air operated valves and motor operated valves close on receipt of an isolation signal.	7. The as-built containment isolation air operated valves and motor operated valves close on receipt of an isolation signal.
8. Containment isolates within the design time limit.	8. Tests will be performed to verify as-built containment valve isolation closure times.	8. The as-built containment isolation valve closure times are within design limits.
9. The systems penetrating containment retain their containment inventory during containment isolation.	9. Tests will be performed to verify the as-built containment isolation valve leakage.	9. The as-built containment isolation valve leakage is within design limits.
10. Control exist in the MCR to cause the remotely operated valves to perform active function.	10. Tests will be performed on the as-built remotely operated valves using controls in the MCR.	10. Controls in the MCR operate to cause the as-built remotely operated valves to perform active function.
11. Displays of the parameters identified in Table 2.11.2-1 can be retrieved in the MCR.	11. Inspections will be performed for retrievability in the as-built MCR.	11. The as-built displays identified in Table 2.11.2-1 can be retrieved in the as-built MCR.

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Table 2.11.3-5 Containment Spray System Inspections, Tests, A
and Acceptance Criteria (Sheet 3 of 5)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
6.a The Class 1E equipment identified in Table 2.11.3-2 as being qualified for a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis event without loss of safety function for the time required to perform the safety function.	6.a.i Type tests and/or analyses will be performed on the Class 1E equipment located in a harsh environment.	6.a.i The results of the type tests and/or analyses concludes that the Class 1E equipment identified in Table 2.11.3-2 as being qualified for a harsh environment can withstand the environmental conditions.
	6.a.ii Inspections will be performed on the as-built Class 1E equipment and the associated wiring, cables, and terminations located in a harsh environment.	6.a.ii The as-built Class 1E equipment and the associated wiring, cables, and terminations identified in Table 2.11.3 -2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
6.b The Class 1E components, identified in Table 2.11.3-2, are powered from their respective Class 1E division.	6.b Tests will be performed on the as-built CSS by providing a simulated test signal in each Class 1E division.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.11.3-2 under tests in the as-built CSS.
6.c Separation is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E cable.	6.c Inspections of the as-built Class 1E divisional cables ~~and raceways~~ will be conducted.	6.c ~~The as-built Class 1E electrical cables with only one division are routed in raceways assigned to the same division. There are no other safety division electrical cables in a raceway assigned to a different division.~~ Physical separation or electrical isolation is provided between the as-built cables of Class 1E divisions and between Class 1E divisions and non-Class 1E cables.
7.a The CSS provides containment isolation of the CSS piping that penetrating the containment.	7.a See Subsection 2.11.2 (Containment Isolation Systems).	7.a See Subsection 2.11.2 (Containment Isolation Systems).
7.b The CSS provides containment spray during design basis events.	7.b The as-built CS/RHR pump full flow tests will be performed. Analysis will be performed to convert the test results from the test conditions to the design condition.	7.b Two as-built CS/RHR pumps deliver no less than 5290 gpm of RWSP water into the containment.