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April 09, 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-09164

Subject: MHI's Responses to US-APWR DCD RAI No. 193-1842 Revision 0

Reference: 1) "Request for Additional Information No. 193-1842 Revision 0, SRP Section: 14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria Application Section: SRP Section 14.3.4" 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. 193-1842 Revision 0."

Enclosed are the responses to Questions 14.03.04-19 through 14.03.04-30 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.193-1842 Revision 0

CC: J. A. Ciocco
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Enclosure 1

UAP-HF-09164
Docket No. 52-021

Responses to Request for Additional Information No. 193-1842
Revision 0

April 2009

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

04/09/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 193-1842 REVISION 0**
SRP SECTION:	**14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-19

The following typographical or editorial errors were noted in US-APWR Tier 2, Chapter 14, Section 14.3.4.4 and Tier 1, Chapter 2, Section 2.4:

1. Page 14.3-13, ITAAC for Reactor Systems, 1st Paragraph, 2nd Sentence: "ITTAC" should be "ITAAC."
2. Page 2.4-1, Key Design Features, 1st Paragraph, 3rd Sentence: The phrase "does not be" is improper grammar.
3. Page 2.4-5, Table 2.4.1-2, 2nd Item, Acceptance Criteria: The phrase "is complied" should be "complies with."
4. Page 2.4-5, Table 2.4.1-2, 3rd Item, Design Commitment: Insert the word "as" in front of "described" per the example in Table 14.3-2.
5. Page 2.4-12, Key Design Features, Last Paragraph: The phrase "depressurization valves are could be used" is improper grammar.
6. Page 2.4-25, Table 2.4.2-5 Item 13.b: The word "pump" should be "pumps," and the word "trips should be "trip." There are four pumps (A, B, C, and D).
7. Page 2.4-44, Design Commitment Item 7.a: The word "penetrating" should be "penetrates."
8. Page 2.4-47, Table 2.4.4-5 Item 10.b: The word "pump" should be "pumps," and the word "starts' should be "start." There are four pumps noted in Table 2.4.4-4 (A, B, C, and D).
9. Page 2.4-63, Inspection, Test, Analyses Item 5.b: The sentence construction is improper grammar. The phrase "meets the seismic Category 1 requirements" does not fit with the first part of the sentence and could be left off.
10. Page 2.4-64, Acceptance Criteria Item 6.b: The word "tests" near the end of the sentence should be "test."
11. Page 2.4-84, Acceptance Criteria Item 5.ii: The word "withstands" should be "withstand."
12. Page 2.4-84, Inspection, Test, Analyses Item 5.iii: The sentence is incomplete and does not define an inspection requirement. Similar requirements have used "on" instead of "to verify that."

ANSWER:
MHI will incorporate the above editorial comments, unless they are superseded by other DCD changes. . Specific exceptions are noted below.

Item 7 above will not be incorporated since this ITAAC will be deleted per MHI's Response to RAI 184 question 14.03.07-27.

Impact on DCD

See Attachment 1 for a mark-up of DCD Tier 1, Section 2.4, Revision 2, with the editorial corrections incorporated as described above.

See Attachment 2 for a mark-up of DCD Tier 2 Section 14.3, Revision 2, with the editorial corrections incorporated as described above.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.04-20

ITAAC Item 4 in Table 2.4.1-2

Indicate that satisfaction of the fracture toughness requirements of 10 CFR 50, Appendix G is specifically included in the Design Commitment and Acceptance Criteria for Item 4 in US-APWR DCD Tier 1 Table 2.4.1-2. This requirement is identified in the design commitments on Tier 1 page 2.4-2.

Use of the phrase "and any additional requirements" in the design commitment and acceptance criteria is vague. It would not be possible for an inspector to verify that the acceptance criterion for Item 4 in US-APWR DCD Tier 1 Table 2.4.1-2 is met as written.

ANSWER:

As noted in the question, the fracture toughness requirements of 10 CFR 50, Appendix G are referenced in the reactor system design description in Subsection 2.4.1.1. ITAAC Item 4 in Table 2.4.1-2 will be expanded to specifically include 10 CFR 50 Appendix G, and delete the reference to "any additional requirements."

Impact on DCD

Table 2.4.1-2, ITAAC Item 4 of Section 2.4 will be revised as follows:

4.**a** The **materials of construction of the** ASME Code Section III components~~,~~ identified in Table 2.4.1-1~~,~~ are ~~constructed of material~~ in accordance with ASME Code requirements.~~ and any additional requirements described in this subsection.~~	4.**a** Inspection of the certified material test reports will be performed.	4.**a** The material**s of construction** of the ASME Code Section III components identified in Table 2.4.1-1 **are in accordance with** ~~conform to the requirements of the~~ ASME Code **requirements.** ~~and any additional requirements described in this subsection.~~

4.b <u>The low alloy steel materials of construction used for the reactor vessel pressure boundary satisfy the fracture toughness requirements of 10 CFR 50 Appendix G and ASME Code Section III.</u>	4.b <u>Tests and/or analyses of the materials of construction will be performed.</u>	4.b <u>The low alloy steel materials of construction used for the reactor vessel pressure boundary satisfy the fracture toughness requirements of 10 CFR 50 Appendix G and ASME Code Section III.</u>

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: **NO. 193-1842 REVISION 0**

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

APPLICATION SECTION: **14.3**

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

QUESTION NO.: 14.03.04-21

ITAAC Item 8 in Table 2.4.1-2

Why doesn't this ITAAC include a sub-step with separate ITA and AC for an inspection to verify that the equipment was installed per or is bounded by the analysis?

ANSWER:

MHI agrees to revise the Tier 1 Section 2.4.1-2 Item 8 seismic qualification ITAAC, to list the three steps consistent with ITAAC Item 5 in Table 2.4.6-5.

Impact on DCD

ITAAC Item 8 in Table 2.4.1-2 will be revised as follows:

8. The seismic Category I <u>Reactor Systems</u> 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.~~ **<u>8.i Inspections will be performed to verify that the as-built seismic Category I equipment is located in the containment.</u>**	~~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.~~ **<u>8.i The seismic Category I equipment identified in Table 2.4.1-1 is located in the containment.</u>**
	<u>8.ii Type tests and/or analyses of the seismic Category I equipment will be performed.</u>	**<u>8.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</u>**

	8.iii An inspection will be performed on the as-built equipment including anchorage.	8.iii The as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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QUESTION NO.: 14.03.04-22

ITAAC Item 10 in Table 2.4.1-2

The ability of the as-built equipment to perform the designated safety function for a minimum required timeperiod is not captured in by the design commitment or AC. Example 6.a in Tier 2 Table 14.3-2 more fully describes the time aspect of the commitment.

There should be a separate ITAAC or sub-step of this ITAAC with ITA and AC to indicate an inspection to verify that the equipment evaluated in the analysis, for example, the equipment in Table 2.4.1-1 and wiring, cables, or terminations are the ones that were actually installed.

Table 2.4.1-1 includes Class 1E/qualified items which will require wiring, cables, or terminations that are located in a harsh environment. Example 6.a.ii in Tier 2 Table 14.3- 2 provides sample ITAAC statements that would address this issue.

Also applicable to following ITAAC:

ITAAC Item 6.a.i in Table 2.4.6-5

ANSWER:

The following ITAAC will be revised to include inspections, tests and analyses to verify that the equipment is qualified for harsh environments. The revised ITAAC will follow the ITAAC template for harsh environment qualification in Table 14.3-2. See MHI's Response to RAI 191-2048 question 14.03.04-03.

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

Impact on DCD

ITAAC Item 10 in Tier 1 Table 2.4.1-2 will be revised as follows:

10. The **Class 1E** equipment identified in Table 2.4.1-1 ~~as Class 1E/qualified~~ **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.** ~~can maintain functional operability under all service conditions, including the design basis accident.~~	10.i Type tests and/or analyses will be performed on 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 2.4.1-1 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 2.4.1-1 as being qualified for a harsh environment are bounded by type tests and/or analyses.**

ITAAC Item 9.a in Tier 1 Table 2.4.2-5 will be revised as follows:

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 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 **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.ii ~~An inspections~~ **Inspections** 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.

ITAAC Item 6.a in Tier 1 Table 2.4.4-5 will be revised as follows:

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 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 2.4.4-2 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.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.

ITAAC Item 6.a in Tier 1 Table 2.4.5-5 will be revised as follows:

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 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 **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 inspections~~ **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 2.4.5-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.

ITAAC Item 6.a in Tier 1 Table 2.4.6-5 will be revised as follows:

6.a	The Class 1E equipment identified in Table 2.4.6-2 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 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 2.4.6-2 as being qualified for a harsh environment **can** withstands 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**.
		6a.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 2.4.6-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.

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

04/09/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 193-1842 REVISION 0**
SRP SECTION:	**14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-23

ITAAC Item 11 in Table 2.4.1-2

Include the provision for simulated test signals in each Class 1E division to test that Class 1E components are powered from their respective Class 1E division in the ITA column for Item 11 in US-APWR DCD Tier 1 Table 2.4.1-2. The AC column should indicate that only the equipment for each division, when it is tested, receives power from a power supply in the same division. This completely describes the extent of the necessary tests and corresponds to Example 6.b in Tier 2 Table 14.3-2.

Establish that simulated test signals exist only at the Class 1E equipment, identified in Tier I Table 2.4.1-1, under test. An important aspect of the design commitment for item 11 is that the power supplies to common components are independent.

Also applicable to the following ITAAC:

ITAAC Item 11 in Table 2.4.2-5
ITAAC Item 6.b in Table 2.4.5-5
ITAAC Item 6.b in Table 2.4.6-5
ITAAC Item 6.b in Table 2.7.1.2-5
ITAAC Item 6.b in Table 2.7.1.9-5
ITAAC Item 6.b in Table 2.7.1.11-5
ITAAC Item 6.a in Table 2.7.3.1-5
ITAAC Item 6.b in Table 2.7.3.3-5
ITAAC Item 6.a in Table 2.7.3.5-5

ANSWER:

Refer to response to RAI 184-1912, question 14.03.07-16, which addresses ITAAC similar to those cited in this question. The design commitments for ITAAC of this type require that the Class 1E components are powered from their respective Class 1E division. This design commitment may be shown to be met by verifying that a simulated test signal that is injected only in the division under test, is detected at the equipment under test (in the same division as the simulated test signal).

Impact on DCD

ITAAC Item 11 in Table 2.4.1-2 will be revised as shown:

11. The Class 1E components, identified in Table 2.4.1-1, are powered from their respective Class 1E division.	11. ~~Tests~~ **A test will be performed on each division** of the as-built components ~~will be performed~~ by providing **a** simulated test signal~~s~~ **only in the Class 1E division under test.**	11. ~~The results of tests conclude that power to the as-built components is supplied from their Class 1E division.~~ The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.4.1-1 under test.

Attachment 1 and Attachment 3 include similar changes to the following ITAAC:

Attachment 1

ITAAC Item 9.b in Table 2.4.2-5
ITAAC Item 6.b in Table 2.4.4-5
ITAAC Item 6.b in Table 2.4.5-5
ITAAC Item 6.b in Table 2.4.6-5

Attachment 3

ITAAC Item 6.b in Table 2.7.1.2-5
ITAAC Item 6.b in Table 2.7.1.9-5
ITAAC Item 6 in Table 2.7.1.10-3
ITAAC Item 6.b in Table 2.7.1.11-5
ITAAC Item 6.a in Table 2.7.3.1-5
ITAAC Item 6.b in Table 2.7.3.3-5
ITAAC Item 6.a in Table 2.7.3.5-5

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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

QUESTION NO.: 14.03.04-24

ITAAC Item 12 in Table 2.4.1-2

The design commitment refers to non-Class 1E divisions, why does the AC not indicate that non-class 1E cables are routed in their own raceways?

Will inspections be able to verify only cables from a certain division are routed in crowded raceways?

This is also applicable to the following ITAAC:

ITAAC Item 9.c in Table 2.4.2-5
ITAAC Item 6.c in Table 2.7.1.2-5
ITAAC Item 6.c in Table 2.7.1.9-5
ITAAC Item 6.c in Table 2.7.1.11-5
ITAAC Item 6.b in Table 2.7.3.1-5
ITAAC Item 6.c in Table 2.7.3.3-5
ITAAC Item 6.b in Table 2.7.3.5-5

ANSWER:

The ITAAC cited in this question are addressed in MHI's response to RAI 191, Question No. 14.03.04-09.

Inspectability of raceways is facilitated by color coding of Class 1E cables and raceways to indicate their division, as described in DCD Tier 2, Subsection 8.3.1.1.8, *Electrical Equipment Layout*.

Impact on DCD

Refer to MHI's response to RAI 191, Question No. 14.03.04-09.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-25

ITAAC Item 14 in Table 2.4.1-2

Identify the minimum number of capsules in the Acceptance Criteria column for Item 14 in US-APWR DCD Tier 1 Table 2.4.1-2 that is sufficient to satisfy the design commitment. The mere presence of specimen guides with surveillance capsules does not ensure that the intent of the design commitment is met.

ANSWER:

As described in DCD Tier 2 Subsection 5.3.1.6.1, *Surveilllance Capsules* the minimum number of capsule withdrawal sequences for the US-APWR reactor vessel surveillance program is three. MHI will revise ITAAC Item 14 in Table 2.4.1-2 accordingly.

Impact on DCD

ITAAC Item 14 in Table 2.4.1-2 will be revised as follows:

14. Irradiation specimen guides are attached to the core barrel to hold capsules with material surveillance specimens.	14. Inspection of the as-built core barrel will be performed for attachment of the irradiation specimen guides and existence of surveillance capsules.	14. Irradiation specimen guides are attached to the as-built core barrel and **a minimum of three as-built** surveillance capsules are provided.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-26

ITAAC Item 8 in Table 2.4.2-5

The piping identified here should be included with Item 7 in Table 2.4.2-5 or another separate ITAAC similar to Item 7 should be developed for the piping in this ITAAC.

Also applicable to the following ITAAC:

ITAAC Item 5.b in Table 2.7.1.2-5 in conjunction with ITAAC 5.a in same table.
ITAAC Item 5.b in Table 2.7.1.9-5 in conjunction with ITAAC 5.a in same table.
ITAAC Item 5.b in Table 2.7.1.10-5 in conjunction with ITAAC 5.a in same table
ITAAC Item 5.b in Table 2.7.1.11-5 in conjunction with ITAAC 5.a in same table
ITAAC Item 5.b in Table 2.7.3.1-5 in conjunction with ITAAC 5.a in same table
ITAAC Item 5.b in Table 2.7.3.5-5 in conjunction with ITAAC 5.a in same table

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ANSWER:

MHI believes that the current description of Item 8 is reasonable. The ITAAC for the location of the piping is essentially same as ITAAC item 2. Therefore, ITAAC for item 7.i is included in ITAAC item 2. With regard to item 7.ii and 7.iii, their analyses or inspections are included in item 8.

Design commitment of ITAAC item 2 in Table 2.4.2-5 refers to Subsection 2.4.2.1, Design Description, but it does not clearly state the piping location. Therefore, Subsection 2.4.2.1, Location and Functional Arrangement, will be revised to add the reference of Table 2.4.2-1.

MHI reviewed the listed ITAAC, and MHI found that the location of the piping was not clearly stated in the design description, Location and Functional Arrangement. MHI revises Subsections 2.7.1.9.1 and 2.7.1.10.1 to provide an additional clarification for the piping location.

This response is consistent with MHI's response to RAI 198-2069 question 14.03.11-20.

Impact on DCD

The first paragraph of Subsection 2.4.2.1, Location and Functional Arrangement, will be revised as follows:

> Figure 2.4.2-1 and Figure 2.4.2-2 show the functional arrangement of the system. The locations of the major RCS components **and piping** are specified in Table 2.4.2-1.

Subsection 2.7.1.9.1, Location and Functional Arrangement, will be revised as follows:

> 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. **Table 2.7.1.9-1 also provides a tabulation of the location of CFS equipment.** The CFS is composed of the condensate system (CDS) and the feedwater system (FWS).

Subsection 2.7.1.10.1, Location and Functional Arrangement, will be revised as follows:

> The SGBDS equipment and piping are located in the containment, the R/B, the A/B and the T/B. **Seismic Category I piping identified in Table 2.7.1.10-2 is located in the containment and the R/B.** Figure 2.7.1.10-1 illustrates the SGBDS, showing the arrangement of the SGBDS components.

Impact on COLA

There is no impact on the COLA.

Impact on PRA

There is no impact on the PRA.

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RAI NO.: NO. 193-1842 REVISION 0

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

APPLICATION SECTION: 14.3

DATE OF RAI ISSUE: 02/09/2009

QUESTION NO.: 14.03.04-27

ITAAC Item 10.c in Table 2.4.2-5

Identify the required rotating inertia for each as-built RCP in the Acceptance Criteria column.

The specified acceptance criteria for item 10.c do not provide a basis for evaluating the acceptability of the tests and analyses. Additionally, it is expected that a pump flow coastdown curve will be generated as part of the test for item 10.c and evaluated. If a pump flow coastdown curve is to be generated, it should be noted in the Inspections, Tests, Analyses column for item 10.c.

ANSWER:

Since RCP coastdown curve can be estimated from rotating inertia, RCP rotating inertia of each as-built RCP will be confirmed to be no less than required value used in the safety evaluation. The following ITAAC will be revised to identify the required rotating inertia for each as-built RCP.

Impact on DCD

ITAAC Item 10.c in Tier 1 Table 2.4.2-5 will be revised as follows:

10.c RCP have a rotating inertia to provide RCS flow coastdown on loss of power to the pumps.	10.c Tests and**/or** analyses will be performed on the as-built RCP.	10.c The rotating inertia of each as-built RCP is no less than ~~the required rotating inertia~~ **115330lb-ft2**.

Mean to confirm RCP rotating inertia is determined in the detailed design phase.

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

04/09/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 193-1842 REVISION 0**
SRP SECTION:	**14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-28

ITAAC Item 12.a in Table 2.4.2-5

Clarify the design commitment in US-APWR DCD Tier 1 Table 2.4.2-5. 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:

- US-APWR DCD Tier 1 Table 2.4.4-5, item 9.a
- US-APWR DCD Tier 1 Table 2.4.5-5, item 10.a
- US-APWR DCD Tier 1 Table 2.4.6-5, item 10.a

ANSWER:

MHI will provide editorial corrections to the ITAAC cited in this question, to clarify that the design commitments require the valves perform an active safety function to change position as indicated in the appropriate tables. This change is consistent with MHI's Response to RAI 191 question 14.03.04-07.

Impact on DCD

ITAAC Item 12.a in Tier 1 Table 2.4.2-5 will be revised as follows:

12.a The motor-operated valves, identified in Table 2.4.2-2, ~~to~~ perform an active **safety** ~~safety-related,~~ function to change position as indicated in the table.	12.a Tests or type tests of the motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	12.a Each motor-operated valve changes position as indicated in Table 2.4.2-2 under design conditions.

ITAAC Item 9.a in Tier 1 Table 2.4.4-5 will be revised as follows:

9.a	The motor-operated, air-operated and check valves, identified in Table 2.4.4-2 ~~to~~ perform an active **safety** ~~safety-related,~~ function to change position as indicated in the table.	9.a.i	Tests or type tests of motor-operated and air operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	9.a.i	Each motor-operated and air operated valve changes position as indicated in Table 2.4.4-2 under design conditions.
		9.a.ii	Tests of the as-built motor-operated and air operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	9.a.ii	Each as-built motor-operated and air operated valve changes position as indicated in Table 2.4.4-2 under pre-operational test conditions.
		9.a.iii	Tests of the as-built check valves with active safety functions identified in Table 2.4.4-2 will be performed under pre-operational test pressure, temperature, and fluid flow conditions.	9.a.iii	Each as-built check valve changes position as indicated in Table 2.4.4-2.

ITAAC Item 10.a in Tier 1 table 2.4.5-5 will be revised as follows:

10.a	The motor-operated and check valves, identified in Table 2.4.5-2, ~~to~~ perform an active **safety** ~~safety-related,~~ function to change position as indicated in the table.	10.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.	10.a.i	Each motor-operated valve changes position as indicated in Table 2.4.5-2 under design conditions.
		10.a.ii	Tests of the as-built motor-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	10.a.ii	Each as-built motor-operated valve changes position as indicated in Table 2.4.5-2 under pre-operational test conditions.
		10.a.iii	Tests of the as-built check valves with active safety functions identified in Table 2.4.5-2 will be performed under pre-operational test pressure, temperature and fluid flow conditions.	10.a.iii	Each as-built check valve changes position as indicated in Table 2.4.5-2.

ITAAC Item 10.a in Tier 1 table 2.4.6-5 will be revised as follows:

10.a. The motor-operated valves and check valves, identified in Table 2.4.6-**2,** ~~to~~ perform an active **safety** ~~safety related,~~ function to change position as indicated in the table.	10.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.	10.a.i Each valve changes position as indicated in Table 2.4.6-2 under design conditions.
	10.a.ii Tests of the as-built motor-operated valves will be performed under pre-operational flow, differential pressure, and temperature conditions.	10.a.ii Each as-built motor-operated valve changes position as indicated in Table 2.4.6-2 under pre-operational test conditions.
	10.a.iii Tests of the as-built check valves with active safety functions identified in Table 2.4.6-2 will be performed under pre-operational test pressure, temperature, and fluid flow conditions.	10.a.iii Each as-built check valve changes position as indicated in Table 2.4.6-2.

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

04/09/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 193-1842 REVISION 0**
SRP SECTION:	**14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-29

ITAAC Item 13.b in Table 2.4.2-5

Identify the source of the trip signal in all columns. The Logic section in Tier 1 Section 2.4.2.1 on page 2.4-13 indicates that the RCPs trip at simultaneous transmission from emergency core cooling system (ECCS) accumulation signal and reactor trip signal. The specific trip signals should be identified and simulated independently to fully evaluate the pump trip function.

Clarify the design commitment listed for item 13.b in US-APWR DCD Tier 1 Table 2.4.2- 5. There are pump breakers and pump instrumentation listed in the referenced USAPWR DCD Tier 1 Table 2.4.2-4, but there are no pumps listed.

US-APWR DCD Tier 1 Table 2.4.2-2 identifies four RCPs (A, B, C, and D). The design commitment for item 13.b in US-APWR DCD Tier 1 Table 2.4.2-5 should reference the RCP breakers or the RCPs should be added to US-APWR DCD Tier 1 Table 2.4.2-4.

The aspect of about no pumps being in Table 2.4.2-4 also applies to Item 13.a in Table 2.4.2-5

Also applicable to ITAAC Items 10.a and b in Table 2.4.4-5
Also applicable to ITAAC Items 11.a and b in Table 2.4.6-5

ANSWER:

<u>ITAAC items 13.a and 13.b in Table 2.4.2-5</u>

ITAAC item 13.a in Table 2.4.2-5 verifies the MCR controls to start and stop the reactor coolant pumps (RCPs), with reference to DCD Tier 1Table 2.4.2-4, *Reactor Coolant System Equipment Alarms, Displays, and Control Functions*. Table 2.4.2-4 will be revised to clarify the alarms, displays and controls for the RCP.

ITAAC Item 13.b in Table 2.4.2-5 verifies the RCP trip function, which occurs in response to an ECCS actuation signal coincident with reactor trip (P-4). The RCP trip signal on P-4 is generated by the protection and safety monitoring system (PSMS). The *Logic* section in Tier 1 Subsection

2.4.2.1, Table 2.4.2-2 *Reactor Coolant System Equipment Characteristics* and ITAAC Item 13.b in Table 2.4.2-5 will be revised to clarify the RCP trip function via PSMS.

ITAAC Items 10.a and b in Table 2.4.4-5

ITAAC Item 10.a in Table 2.4.4-5 verifies MCR control capability for the safety injection pumps listed in Table 2.4.4-4 *Emergency Core Cooling System Equipment, Alarms, Displays and Control Functions*. Table 2.4.4-5 will be revised for clarity in response to question 14.03.04-30.

ITAAC Item 10.b in Table 2.4.4-5 verifies the safety injection pumps start in response to an ECCS actuation signal from PSMS, and will be revised accordingly.

ITAAC Items 11.a and b in Table 2.4.6-5

The CVCS charging pumps in Table 2.4.6-2 do not have an active safety function but have MCR control capability. Therefore, ITAAC Item 11.a in Table 2.4.6-5 will be revised to clarify verification of MCR controls to start and stop the charging pumps. ITAAC Item 11.b Table 2.4.6-5, which is similar to other ITAAC intended to verify an active safety function in response to a PSMS control signal, will be deleted.

Impact on DCD

The *Logic* section in Tier 1 Subsection 2.4.2.1 will be revised as follows:

"Logic

RCPs trip ~~at simultaneous transmission from~~ **in response to an** emergency core cooling system (ECCS) ~~accumulation~~ **actuation** signal ~~and~~ **coincident with a** reactor trip **(P-4)** signal."

ITAAC Table 2.4.2-4 will be revised as follows:

Equipment/Instrument Name	MCR/RSC Alarm	MCR Display	MCR/RSC Control Function	RSC Display
~~RCP Breaker (Status)~~**Reactor Coolant Pump**	No	Yes	No	Yes

ITAAC Item 13 in Table 2.4.2-5 will be revised as follows:

13.a Controls exist in the MCR to start and stop the pumps identified in Table 2.4.2-4.	13.a Tests will be performed on the as-built pumps in Table 2.4.2-4 using controls in the MCR.	13.a Controls in the MCR operate to start and stop the as-built pumps listed in Table 2.4.2-4.
13.b The ~~pump~~ **pumps** identified in Table **2.4.2-2 as having PSMS control perform an active safety function after receiving a signal from PSMS.** ~~2.4.2-4 trips after receiving a signal~~.	13.b Tests will be performed **on the as-built pumps in Table 2.4.2-2** using simulated signal**s**.	13.b The as-built pumps identified in Table **2.4.2-2 as having PSMS control perform the active function identified in the table** ~~2.4.2-4 trips~~ after receiving **a** simulated signal.

ITAAC Item 10.b in Table 2.4.4-5 will be revised as follows:

10.b The pump identified in Table 2.4.4-4 starts after receiving a**n ECCS actuation** signal.	10.b Tests will be performed using simulated signal.	10.b The as-built pump identified in Table 2.4.4-4 starts after receiving simulated signal.

ITAAC Items 11.a and b in Table 2.4.6-5 will be revised as follows:

11.a Controls exist in the MCR to start and stop the pumps identified in Table 2.4.6-4 ~~to perform the listed function~~.	11.a Tests will be performed on the as-built pumps in Table 2.4.6-4 using controls in the **as-built** MCR.	11.a Controls **exist** in the **as-built** MCR ~~operate~~ to start and stop the as-built pumps listed in Table 2.4.6-4.
~~11.b The pumps identified in Table 2.4.6-4 start after receiving a signal.~~	~~11.b Tests will be performed using real or simulated signals.~~	~~11.b The as-built pumps identified in Table 2.4.6-4 start after receiving a 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

04/09/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 193-1842 REVISION 0**
SRP SECTION:	**14.03.04 - Reactor Systems - Inspections, Tests, Analyses, and Acceptance Criteria**
APPLICATION SECTION:	**14.3**
DATE OF RAI ISSUE:	**02/09/2009**

QUESTION NO.: 14.03.04-30

ITAAC Items 14 and 15 in Table 2.4.2-5

Table 2.4.2-4 lists alarms, displays, and control functions for both MCR and RSC. It seems that both of these panels should be represented in Items 14 and 15. It would seem that both the MCR and RSC panels would have all of these alarms, displays, and control functions. If that is the case, then items 14 and 15 need to be revised along with Table 2.4.2-4.

Several components are listed in US-APWR DCD Tier 1 Table 2.4.2-4 with MCR alarms.
No ITAAC entry was noted to verify the retrieval of the listed alarms in the MCR.

Also applicable for ITAAC 11 and 12 in Table 2.4.4-5
Also applicable for ITAAC 12 and 13 in Table 2.4.5-5
Also applicable for ITAAC 12 and 13 in Table 2.4.6-5
Also applicable for ITAAC 10 and 11 in Table 2.7.1.2-5
Also applicable for ITAAC 10 and 11 in Table 2.7.1.9-5
Also applicable for ITAAC 10 and 11 in Table 2.7.1.11-5

ANSWER:

Table 2.4.2-5 will be revised to indicate that the alarms and displays are located at MCR and the alarms, displays and controls are located at RSC. Since Controls from MCR is identified in ITAAC item 8, 10.a and 10.b, they are not included in ITAAC item 14. Other similar tables that indicate alarms, displays and controls, associated with the ITAAC cited in the question, will be revised in the same manner as Table 2.4.2-5.

The ITAAC cited above will be revised, as applicable, to include the capability of retrieving or verifying the existence of alarms, displays and controls in the MCR and the RSC. If existing ITAAC items, e.g, for MCR controls of pumps and valves, do not provide complete coverage of the MCR control functions identified on the equipment tables, then the ITAAC are revised as necessary to ensure the control functions are verified. Alarms are included in the RSC ITAAC where necessary to provide complete coverage of RSC alarms, displays and controls.

ITAAC Item 11.a in Table 2.4.6-5 will be revised as shown in response to question 14.03.04-29.

ITAAC Item 10 in Table 2.7.1.2-5, and Table 2.7.1.2-4, will be revised as shown in MHI's Response to RAI 191-2048 question 14.03.07-05.

Impact on DCD

The following tables will be revised to clarify MCR and RSC alarms:

Similar changes to clarify MCR and RSC alarms, displays and controls will be made to Table 2.7.1.2-4 in response to RAI 191, question 14.03.07-5.

ITAAC Items 14 and 15 in Table 2.4.2-5 will be revised as follows:

14. **MCR alarms and displays are** ~~Displays~~ of the parameters identified in Table 2.4.2-4. can be retrieved in the MCR.	14. Inspections will be performed for retrievability of the RCS parameters in the as-built MCR.	14. ~~The~~ **MCR alarms and** displays identified in Table 2.4.2-4 can be retrieved in the as-built MCR.
15. RSC displays**, alarms** and/~~or~~ controls ~~provided for the RCS~~ are identified in Table 2.4.2-4.	15. Inspections **of the as-built RSC alarms, displays and controls** will be performed. ~~on the as-built RSC displays and/or controls for the RCS~~	15. ~~Displays~~ **Alarms, displays** and/~~or~~ controls exist on the as-built RSC as identified in Table 2.4.2-4.

ITAAC Items 11 and 12 in Table 2.4.4-5 will be revised as follows:

11. **MCR alarms and displays are** ~~Displays~~ of the parameters identified in Table 2.4.4-4. can be retrieved in the MCR.	11. Inspections will be performed for retrievability of the ECCS parameters in the as-built MCR.	11. ~~The~~ **MCR alarms and** displays identified in Table 2.4.4-4 can be retrieved in the as-built MCR.
12. RSC displays**, alarms** and/~~or~~ controls ~~provided for the RCS~~ are identified in Table 2.4.4-4.	12. Inspections **of the as-built RSC alarms, displays and controls** will be performed. ~~on the as-built RSC displays and/or controls for the ECCS~~	12. ~~Displays~~ **Alarms, displays** and/~~or~~ controls exist on the as-built RSC as identified in Table 2.4.4-4.

ITAAC Items 12 and 13 in Table 2.4.5-5 will be revised as follows:

12. **MCR alarms and displays are** ~~Displays~~ of the parameters identified in Table 2.4.5-4. can be retrieved in the MCR.	12. Inspections will be performed for retrievability of the RHRS parameters in the as-built MCR.	12. ~~The~~ **MCR alarms and** displays identified in Table 2.4.5-4 can be retrieved in the as-built MCR.
13. Remote shutdown console (RSC) displays**, alarms** and/~~or~~ controls ~~provided for the RHRS~~ are identified in Table 2.4.5-4.	13. Inspections **of the as-built RSC alarms, displays and controls** will be performed. ~~on the as-built RSC displays and/or controls for the RHRS~~	13. ~~Displays~~ **Alarms, displays** and/~~or~~ controls exist on the as-built RSC as identified in Table 2.4.5-4.

ITAAC Items 12 and 13 in Table 2.4.6-5 will be revised as follows:

12. **MCR alarms and displays are** ~~Displays~~ of the parameters identified in Table 2.4.6-4. can be retrieved in the MCR.	12. Inspections will be performed for retrievability of the **CVCS**~~RCS~~ parameters in the as-built MCR.	12. ~~The as-built~~ **MCR alarms and** displays identified in Table 2.4.6-4 **can be**~~are~~ retrieved in the as-built MCR.
13. Remote shutdown console (RSC) displays**, alarms** and/~~or~~ controls ~~provided for the CVCS~~ are identified in Table 2.4.6-4.	13. Inspections **of the as-built RSC alarms, displays and controls** will be performed. ~~on the as-built RSC displays and/or controls for the CVCS~~	13. ~~As-built displays~~ **Alarms, displays** and/~~or~~ controls exist on the as-built RSC as identified in Table 2.4.6-4.

ITAAC Items 10 and 11 in Table 2.7.1.9-5 will be revised as follows:

10. **MCR alarms and displays are** ~~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~~ **MCR alarms and** displays identified in Table 2.7.1.9-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) displays**, alarms** and/~~or~~ controls ~~provided for the CFS~~ are identified in Table 2.7.1.9-4.	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 CFS~~	11. ~~Displays~~ **Alarms, displays** and/~~or~~ controls exist on the as-built RSC as identified in Table 2.7.1.9-4.

ITAAC Items 10 and 11 in Table 2.7.1.11-5 will be revised as follows:

10. **MCR alarms and displays are** ~~Displays~~ of the parameters identified in Table 2.7.1.11-4. can be retrieved in the MCR.	10. Inspections will be performed for retrievability of the EFWS parameters in the as-built MCR.	10. ~~The~~ **MCR alarms and** displays identified in Table 2.7.1.11-4 can be retrieved in the as-built MCR.
11. Remote shutdown console (RSC) displays**, alarms** and/~~or~~ controls ~~provided for the EFWS~~ are identified in Table 2.7.1.11-4.	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 EFWS~~	11. ~~Displays~~ **Alarms, displays** and/~~or~~ controls exist on the as-built RSC as identified in Table 2.7.1.11-4.

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 2.4 Mark-up

RESPONSE TO RAI No. 193-1842, Revision 0

RAI 193
14.03.04-19

2.4 REACTOR SYSTEMS

2.4.1 Reactor System

2.4.1.1 Design Description

System Purpose and Functions

The primary purposes and functions of the reactor system are to:

- Generate heat by controlled nuclear fission and transfer the heat generated to the reactor coolant,
- Provide the primary means for controlling reactivity and shutting down the reactor, and,
- Provide barriers to contain radioactivity associated with reactor operation.

The reactor system is a safety-related system. Its significant safety functions include shutting down the reactor and containing radioactivity associated with reactor operation.

Location and Functional Arrangement

All reactor system is located within the containment. The reactor system includes the reactor internals, the fuel assemblies, the control rods, the reactor vessel, and the control rod drive mechanisms (CRDMs). Figure 2.4.1-1 illustrates the reactor general assembly, showing the arrangement of the reactor system components. Figure 2.4.1-2 and Figure 2.4.1-3 show the arrangement of the fuel assemblies and rod cluster control assemblies and the arrangement of the reactor vessel, respectively.

Key Design Features

The reactor core contains 257 fuel assemblies. Each fuel assembly is composed of fuel rods, which contains fuel pellets. The fuel assembly is designed so that it ~~does~~ would not be damaged in normal operation or during anticipated operational occurrences.

The core reactivity control is provided by 69 rod cluster control assemblies and by the soluble boron in the primary coolant. The CRDMs are magnetically operated.

The signals of ex-core detectors are used as input to the reactor protection system. The in-core instrumentation system consists of thermocouples and in-core neutron detectors. These neutron detectors are used to measure core power distribution and to calibrate the ex-core detectors.

The core support structures support and align the fuel assemblies. The reactor internals distribute coolant flow. The reactor internals consist of two major assemblies, the lower reactor internal assembly, and the upper reactor internal assembly. The core cavity is formed by a stainless steel neutron reflector. The flow induced vibration response of the

RAI 193
14.03.04-19

Table 2.4.1-2 Reactor System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 1 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Deleted	1. Deleted	1. Deleted
2. Fuel system is designed in accordance with the guidance of Standard Review Plan (SRP) 4.2 appendix A considering SSE and postulated LOCA event.	2. Analyses will be performed.	2. The results of analyses conclude that the fuel system ~~is complied~~ compiles with SRP 4.2 appendix A for coolability and safe shutdown of the reactor.
3. The functional arrangement of the reactor vessel is as shown in Figure 2.4.1-3 and as described in this subsection.	3. Inspections of the as-built system will be performed.	3. The as-built reactor vessel functional arrangement conforms to Figure 2.4.1-3 and the description in Subsection 2.4.1.1
4. The ASME Code Section III components, identified in Table 2.4.1-1, are constructed of material in accordance with ASME Code requirements and any additional requirements described in this subsection.	4. Inspection of the certified material test reports will be performed.	4. The material of the ASME Code Section III components identified in Table 2.4.1-1 conform to the requirements of the ASME Code and any additional requirements described in this subsection.
5. The ASME Code components of the reactor system identified in Table 2.4.1-1 are designed and fabricated in accordance with the requirements of Section III of the ASME Code.	5. An inspection of the as-built ASME Code components of the reactor system will be performed.	5. The ASME Code Section III design reports exist and conclude that the as-built ASME Code components of the reactor system identified in Table 2.4.1-1 are reconciled with the design documents.
6. Pressure boundary welds in ASME Code Section III components, identified in Table 2.4.1-1, meet ASME Code Section III requirements.	6. Inspections of the as-built pressure boundary welds will be performed in accordance with the ASME Code Section III.	6. The ASME Code Section III requirements are met for non-destructive examination of the as-built pressure boundary welds.
7. The ASME Code Section III components, identified in Table 2.4.1-1, retain their pressure boundary integrity at their design pressure.	7. A hydrostatic test will be performed on the as-built components required by the ASME Code Section III to be hydrostatically tested.	7. The results of the hydrostatic test of the as-built components identified in Table 2.4.1-1 as ASME Code Section III class 1 conform with the requirements of the ASME Code Section III.

Table 2.4.1-2 Reactor System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 3~~1~~)

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~~ A test will be performed on each division of the as-built components ~~will be performed~~ by providing a simulated test signals only in the Class 1E division under test.	11. ~~The results of tests conclude that power to the as-built components is supplied from their Class 1E division.~~ The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.4.1-1 under test.
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.

thereby preventing a rapid reduction in reactor coolant flow during loss of power. The pump suction is located at the bottom of the pump and the discharge is on the side.

The pressurizer, a vertically-oriented cylindrical vessel with hemispherical top and bottom heads, maintains liquid and vapor in equilibrium under saturated conditions for pressure control. Electrical immersion heaters are installed vertically through the bottom head of the vessel while the nozzles such as spray nozzle and safety valve nozzle are located in the top head of the vessel. The surge line, which is attached to the bottom of the pressurizer, connects to the hot leg of a reactor coolant loop.

Pressurizer safety valves provide overpressure protection for the RCS.

The reactor vessel head vent valves, the safety depressurization valve and depressurization valves ~~are~~ could be used for high point vents.

Seismic and ASME Code Classifications

System components meet the seismic category requirements identified in Table 2.4.2-2. System components are designed and constructed to ASME Code Section III requirements identified in this table.

System pipings meet the seismic category requirements identified in Table 2.4.2-3. System pipings are designed and constructed to ASME Code Section III requirements identified in this table.

Pressure boundary welds in ASME Code Section III components and piping meet ASME Code Section III requirements.

The materials of construction for RCS components and piping are as follows:

- Major components of the SGs are made of low-alloy steel, with the inner surfaces exposed to reactor coolant clad with stainless steel or nickel-chrome-iron alloy. The tube material is alloy 690 thermally treated.
- All parts of RCPs in contact with reactor coolant are stainless steel, except for seals, bearings, and special parts.
- The pressurizer is constructed of low-alloy steel with stainless steel cladding on all surfaces exposed to reactor coolant.
- The reactor coolant piping (hot leg, cold leg and cross-over leg) is stainless steel. Other RCS piping such as the pressurizer surge line, pressurizer spray lines and connecting lines to other systems are also stainless steel.

System Operation

There is no realignment of RCS following an actuation signal.

Alarms, Displays, and Controls

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 each division of the as-built ~~RCS~~ components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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.

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

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
12.a The motor-operated valves, identified in Table 2.4.2-2 to perform an active safety-related, function to change position as indicated in the table.	12.a Tests or type tests of the motor-operated valves will be performed that demonstrate the capability of the valve to operate under its design conditions.	12.a Each motor-operated valve changes position as indicated in Table 2.4.2-2 under design conditions.
12.b After loss of motive power, the remotely operated valves, identified in Table 2.4.2-2, assume the indicated loss of motive power position.	12.b Tests of the as-built valves will be performed under the conditions of loss of motive power.	12.b Upon loss of motive power, each as-built remotely operated valve identified in Table 2.4.2-2 assumes the indicated loss of motive power position.
13.a Controls exist in the MCR to start and stop the pumps identified in Table 2.4.2-4	13.a Tests will be performed on the as-built pumps in Table 2.4.2.-4 using controls in the MCR.	13.a Controls in the MCR operate to start and stop the as-built pumps listed in Table 2.4.2-4.
13.b The pumps identified in Table 2.4.2-4 trips after receiving a signal.	13.b Tests will be performed using simulated signal.	13.b The as-built pumps identified in Table 2.4.2-4 trips after receiving simulated signal.
14. Displays of the parameters identified in Table 2.4.2-4 can be retrieved in the MCR.	14. Inspections will be performed for retrievability of the RCS parameters in the as-built MCR.	14. The displays identified in Table 2.4.2-4 can be retrieved in the as-built MCR.
15. RSC displays and/or controls provided for the RCS are identified in Table 2.4.2-4.	15. Inspections will be performed on the as-built RSC displays and/or controls for the RCS.	15. Displays and/or controls exist on the as-built RSC as identified in Table 2.4.2-4.
16. Each of the as-built piping identified in Table 2.4.2-3 as designed for LBB meets the LBB criteria, or an evaluation is performed of the protection from the dynamic effects of a rupture of the piping.	16. 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.	16. The LBB acceptance criteria are met by the as-built piping and piping materials, or the protection is provided for the dynamic effects of the piping break.

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~~ A test will be performed on each division of the as-built ~~ECCS~~ components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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).

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

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.b After loss of motive power, the remotely operated valves, identified in Table 2.4.4-2, 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 valve identified in Table 2.4.4-2 assumes the indicated loss of motive power position.
10.a Controls exist in the MCR to start and stop the pumps identified in Table 2.4.4-4.	10.a Tests will be performed on the as-built pumps in Table 2.4.4-4 using controls in the MCR.	10.a Controls in the MCR operate to start and stop the as-built pumps listed in Table 2.4.4-4.
10.b The pumps identified in Table 2.4.4-4 starts after receiving a signal.	10.b Tests will be performed using simulated signal.	10.b The as-built pumps identified in Table 2.4.4-4 starts after receiving simulated signal.
10.c A confirmatory-open interlock is provided to automatically open the accumulator discharge valve upon the receipt of a safety injection signal.	10.b Tests will be performed using simulated signal.	10.b The as-built accumulator discharge valve automatically opens upon the receipt of simulated signal.
11. Displays of the parameters identified in Table 2.4.4-4 can be retrieved in the MCR.	11. Inspections will be performed for retrievability of the ECCS parameters in the as-built MCR.	11. The displays identified in Table 2.4.4-4 can be retrieved in the as-built MCR.
12. RSC displays and/or controls provided for the ECCS are identified in Table 2.4.4-4.	12. Inspections will be performed on the as-built RSC displays and/or controls for the ECCS.	12. Displays and/or controls exist on the as-built RSC as identified in Table 2.4.4-4.
13. Each of the as-built piping identified in Table 2.4.4-3 as designed for LBB meets the LBB criteria, or an evaluation is performed of the protection from the dynamic effects of a rupture of the line.	13. 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.	13. 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 2.4.5-5 Residual Heat Removal System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 7)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.b The ASME Code Section III piping, identified in Table 2.4.5-3, retains its pressure boundary integrity at its design pressure.	4.b A hydrostatic test 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 test of the as-built piping identified in Table 2.4.5-3 as ASME Code Section III conform to the requirements of the ASME Code Section III.
5.a The seismic Category I equipment, identified in Table 2.4.5-2, 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 2.4.5-2 are located on the containment and the reactor building.	5.a.i The seismic Category I as-built equipment identified in Table 2.4.5-2 is located on the containment and the reactor building.
	5.a.ii Type tests and/or analyses of 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 lines , identified in Table 2.4.5-3, 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 lines~~ meets the seismic Category I requirements~~.	5.b Each of the as-built seismic category piping, identified in Table 2.4.5-3, meets the seismic category requirements.

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~~ A test will be performed on each division of the as-built ~~RHRS~~ components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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.

Table 2.4.6-5 Chemical and Volume Control System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The seismic Category I equipment, identified in Table 2.4.6-2, is designed to withstand seismic design basis loads without loss of safety function.	5.i Inspections will be performed to verify that the as-built seismic Category I equipment and valves identified in Table 2.4.6-2 are located on the Nuclear Island.	5.i The as-built seismic Category I equipment identified in Table 2.4.6-2 is located in the containment and/or reactor building.
	5.ii Type tests and/or analyses of the seismic Category I equipment will be performed.	5.ii The seismic Category I equipment can withstands seismic design basis loads without loss of safety function.
	5.iii An inspection will be performed ~~to verify that~~ on the as-built equipment including anchorage.	5.iii The as-built equipment including anchorage is seismically bounded by the tested or analyzed conditions.
6.a The Class 1E equipment identified in Table 2.4.6-2 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 Class 1E equipment located in a harsh environment.	6.a.i The Class 1E equipment identified in Table 2.4.6-2 as being qualified for a harsh environment withstands the environmental conditions.
	6a.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 2.4.6-2 as being qualified for a harsh environment are bounded by type tests and/or analyses.
6.b The Class 1E components, identified in Table 2.4.6-2, are powered from their respective Class 1E division.	6.b A test will be performed on each division of the as-built ~~CVCS~~ components by providing a simulated test signal only in ~~each~~ the Class 1E division under test.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.4.6-2 under test ~~when the assigned Class 1E division is provided the test~~ signal.

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designed to retain their pressure boundary integrity and functional capability under internal design and operating pressures and design-basis loads.

- Requiring the existence of a pipe break analysis report that documents that the as-built SSCs that are required to be functional during and following a safe-shutdown earthquake have adequate high-energy pipe break mitigation features.
- Requiring the existence of an LBB evaluation report that documents that the as-built piping and piping materials comply with the LBB acceptance criteria for the systems to which LBB is applied.
- Requiring the existence of a report that documents the results of an as-built reconciliation confirming that the piping systems are built in accordance with the ASME Code certified stress report.

ITAAC for specific systems typically verify the following:

- Requirements such as piping and component safety classification
- Fabrication, especially pressure-boundary weld quality
- Hydrostatic testing
- Equipment seismic and dynamic qualification
- Design qualification of valves

Such ITAAC also address the verification of applicable dynamic qualification records and vendor test records, as well as performance of appropriate in-situ tests. All of these matters are addressed for safety-related systems, and appropriate ones are addressed for non-safety systems.

These ITAAC for the individual systems are covered in each plant system ITAAC such as Sections 2.4, 2.7 and 2.11 of Tier 1.

14.3.4.4 ITAAC for Reactor Systems

Section 2.4 of Tier 1, which addresses reactor systems identified in Table 14.3-3, is prepared in accordance with the guidance in RG 1.206 (Reference 14.3-1), SRP 14.3 (Reference 14.3-2), and SRP 14.3.4 (Reference 14.3-8). ~~ITTAC~~ ITAAC for reactor systems are provided to verify the following:

- Important input parameters used in the transient and accident analyses for the facility design
- Net positive suction head for key pumps
- Elevation differences between the reactor core and storage pools (pits) and/or tanks credited in the safety analyses for passive plants

Attachment 3

US-APWR DCD Tier 1 Section 2.7 Mark-up

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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~~A test will be performed on each division of the as-built ~~MSS~~ components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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.

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Table 2.7.1.9-5 Condensate and Feedwater System Inspectio 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~~ A test will be performed on each division of the as-built ~~CFS~~components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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 2.7.1.10-3 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~~ A test will be performed on each division of the as-built ~~SGBDS~~ components by providing a simulated test signal only in ~~only one~~the Class 1E division under test~~at a time~~.	6. ~~Within the SGBDS, a~~ The simulated test signal exists ~~only~~ at the as-built Class 1E equipment identified in Table 2.7.1.10-2~~powered from the Class 1E division~~ under test.
7. Separation~~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 divisional cables~~divisions in the SGBDS~~ will be performed.	7. ~~The p~~Physical separation or electrical isolation is provided ~~exists~~ between the as-built cables of Class 1E divisions ~~in the SGBDS,~~ and between Class 1E divisions and non-Class 1E cables~~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	9. Inspections of the as-built SGBDS will be performed.	9. Each mechanical division of the as-built SGBDS is

Table 2.7.1.11-5 Emergency Feedwater System Inspections, Tests, Analyse 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~~A test will be performed on each division of the as-built ~~EFWS~~components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	6.b The simulated test signal exists at the as-built Class 1E equipment identified in Table 2.7.1.11-2 under test~~s 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 2.7.3.1-5 Essential Service Water System Inspections, nd 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 each division of the as-built ~~ESWS~~ components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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	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

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 each division of the as-built ~~CCWS~~ components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	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 2 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.b The ASME Code Section III piping, identified in Table 2.7.3.5-3, retains its pressure boundary integrity at its design pressure.	4.b A hydrostatic test 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 test of the as-built piping identified in Table 2.7.3.5-3, 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 2.7.3.5-2, is designed to 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 identified in Table 2.7.3.5-2 is located in the reactor building and power source building.	5.a.i The as-built seismic Category I equipment identified in Table 2.7.3.5-2 is located in the reactor building and power source 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 Inspection 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 2.7.3.5-3 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 2.7.3.5-3 meets the seismic category requirements.
6.a The Class 1E components, identified in Table 2.7.3.5-2, are powered from their respective Class 1E division.	6.a A test will be performed on each division of the as-built ~~ECWS~~components by providing a simulated test signal only in ~~each~~the Class 1E division under test.	6.a The simulated test signal exists ~~only~~ at the as-built Class 1E equipment identified in Table 2.7.3.5-2 under test~~-in the as-built ECWS~~.