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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 202 - Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment, and Systems - RAI Number 14.3-301 S01**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to a portion of the U.S. Nuclear Regulatory Commission Request for Additional Information (RAI) sent by NRC Letter 202 (Reference 1). The GEH response to RAI Number 14.3-301 S01 is addressed in Enclosure 1.

RAI 14.3-301 was received from the NRC on December 20, 2007 (Reference 2), and the GEH response was transmitted to the NRC on April 25, 2008 (Reference 3).

If you have any questions about the information provided here, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

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NRO

References:

1. MFN 08-486, *Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 202, Related To ESBWR Design Certification Application*, dated May 21, 2008
2. MFN 07-718, *Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 126, Related To ESBWR Design Certification Application*, dated December 20, 2007
3. MFN 08-086, Supplement 38, *Response to NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application – RAI Numbers RAI Numbers 14.3-220, 14.3-221, 14.3-222, 14.3-223, and 14.3-3017* dated April 25, 2008

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 202, Related to ESBWR Design Certification Application - RAI Number 14.3-301 S01

cc:	AE Cubbage	USNRC (with enclosure)
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	eDRF	0000-0090-2610

Enclosure 1

MFN 08-086

Supplement 70

Response to Portion of NRC Request for

Additional Information Letter No. 202

Related to ESBWR Design Certification Application

Design of Structures, Components, Equipment, and Systems

RAI Number 14.3-301 S01

For historical purposes, the original text of RAI 14.3-301 and the GE response is included. This response does not include any attachments or DCD mark-ups.

NRC RAI 14.3-301

NRC Summary:

Structural and/or fire barriers

NRC Full Text:

In ITAAC Table 2.1.2-3, ITAAC #7, the staff requests that the applicant not use "and/or" in the acceptance criteria because it is vague. It should be one or the other term. Please review all ITAAC in the DCD and eliminate the use of "and/or."

In addition, the staff requests that the term "physical separation" be defined. The usage of "physical separation" for this ITAAC implies that criteria for divisional separation to comply with single failure criterion are synonymous with separation criteria for fire hazards analysis.

Also, the staff requests that the applicant revise the DC to clarify whether the design commitment is to comply with single failure criterion or separation criteria for fire hazards analysis.

GEH Response

GEH has evaluated the use of and/or throughout the Tier 1 DCD material. Specific examples using structural and/or fire barriers are addressed in the response to this RAI while the other examples of usage of and/or in other Tier 1 sections is addressed by the GEH response to RAI 14.3-303 (MFN 08-086 Supplement 27).

In addition, this RAI response supersedes the responses to RAI 5.2-29 (MFN-06-178) for Table 2.1.2-3, ITAAC #7 for the Nuclear Boiler System and RAI 6.3-25 (MFN 06-241 Supplement 2) for Table 2.4.2-3, ITAAC #16 for the Gravity-Driven Cooling System.

A review of DCD Tier 1 Rev 4 identified the use of "physical separation between trains by structural and/or fire barriers" in the following ITAAC tables:

- Table 2.1.2-3 ITAAC for the Nuclear Boiler System
- Table 2.2.4-6 ITAAC for the Standby Liquid Control System
- Table 2.4.1-3 ITAAC for the Isolation Condenser System
- Table 2.4.2-3 ITAAC for the Gravity-Driven Cooling System
- Table 2.15.4-2 ITAAC for the Passive Containment Cooling System

These ITAAC are focused on providing physical separation to comply with single failure criterion. Separation criteria for Fire Hazard Analysis (FHA) is addressed in ITAAC Table 2.16.3.1-1, Item 1 which requires 3-hour rated fire barriers between redundant divisions or trains of safety-related systems to prevent damage that could adversely affect a safe shutdown function from a single fire.

IEEE Standard 384-74 provides the separation criteria for Class 1E systems and components and states that acceptable separation is achieved by safety class structures, distance, or barriers, or any combination thereof. Similar requirements are also necessary to ensure single failure criterion is met for mechanical systems.

Physical separation is provided for safety-related system to assure a single failure will not prevent safe shutdown of the plant. Safety-related structures provide 'positive' separation; and are used to provide separation when feasible. Sometimes safety-related structures are not feasible and design features such as spatial separation or whip restraints versus structures are used to achieve physical separation. The requirements are dependent on the specific hazard. For example, for some low energy systems, analysis may determine spatial separation is acceptable. A whip restraint or jet/missile shield would provide protection from mechanical damage, but would not provide protection from an environmental hazard. The methods used to protect redundant safety-related systems from results of single failures or events are utilization of safety-related structures, spatial separation, or other design features.

Following is an excerpt from DCD Tier 2 Revision 4, Subsection 3.6.1.3, states, in part:

<u>Protection Methods by Separation</u>

> The plant arrangement provides physical separation to the extent practicable to maintain the independence of redundant safety-related systems (including their auxiliaries) in order to prevent the loss of safety function caused by any single postulated event. Redundant trains (e.g., A and B trains) and divisions are located in separate compartments to the extent possible. Physical separation between redundant safety-related systems with their related auxiliary supporting features, therefore, is the basic protective measure incorporated in the design to protect against the dynamic effects of postulated pipe failures.
>
> Because of the complexities of several divisions being adjacent to high-energy lines in the drywell, specific break locations are determined in accordance with Subsection 3.6.2.1 for possible spatial separation. Care is taken to avoid concentrating safety-related equipment in the break exclusion zone allowed according to Subsection 3.6.2.1. If spatial separation requirements (distance and/or arrangement to prevent damage) cannot be met based on the postulation of specific breaks, then barriers, enclosures, shields, or restraints are provided

ITAAC Table 3.1-1, ITAAC For The Generic Piping Design, assures design features are adequate to ensure design features protect mechanical systems from postulated failures as addressed in the excerpt above. ITAAC Item 6 (modified via RAI 14.3-131 S01 - MFN 07-266 Supplement 1) in Table 3.1-1 commits to identify "the features that protect against dynamic effects of pipe failures, such as whip restraints, equipment shields, drainage systems, and physical separation of piping, equipment, and instrumentation are installed as defined in the design analyses". ITAAC Item 3 assures protection or qualification against the dynamic and environmental effects associated with analysis of postulated failures. For these five (5) systems with ITAACs requiring physical separation, a pipe break is the most credible failure, which could adversely affect the other train. Therefore the ITAACs in Table 3.1-1 verify that a single failure of a mechanical train of NBS, SLC, ICS, GDCS, or PCCS will not adversely affect the other train of these systems. The Table 3.1-1 ITAACs are more inclusive and will assure safe shutdown will not be prevented due to failure of a mechanical train, when structural barriers are not provided.

Since performance of ITAAC Item 6 in Table 3.1-1 fulfills the requirement of the five (5) ITAAC addressed by this RAI, these five (5) ITAACs are being deleted.

DCD IMPACT:

The following changes are made in DCD Tier 1 revision 5 as noted in the attached mark-ups.

Design Commitment (7) and associated ITAAC #7 in Table 2.1.2-3 are deleted from Subsection 2.1.2 for NBS.

Design Commitment (17) and associated ITAAC #17 in Table 2.2.4-6 are deleted from Subsection 2.1.2 for SLC.

Table 2.4.1-3 ITAAC #7 is deleted from Subsection 2.4.1 for ICS.

Design Commitment (16) and associated ITAAC #16 in Table 2.4.2-3 are deleted from Subsection 2.4.2 for GDCS.

Design Commitment (6) and associated ITAAC #6 in Table 2.15.4-2 are deleted from Subsection 2.15.4 for PCCS.

NRC RAI 14.3-301 S01

NRC Summary:

Separation by structural and/or fire barriers

NRC Full Text:

In response to RAI 14.3-301, GEH acknowledged that the intent of the acceptance criteria for "physical separation" of redundant divisions is to ensure that compliance with single failure criterion. However, in attempting to clarify the acceptance criteria phrase "physical separation between trains by structural and/or fire barriers", GEH proposed replacing the "physical separation" ITAAC for five systems (Nuclear Boiler System, Standby Liquid Control System, Isolation Condenser System, Gravity-Driven Cooling System, and Passive Containment Cooling System) with one "physical separation" ITAAC in Tier 1, Section 3.1, Design of Piping Systems and Components.

The staff does not agree with this approach. The staff understands the scope of Tier 1, Section 3.0, Non-System Based Material, to be self explanatory and the five ITAAC being replaced are clearly system-based. The staff understands the "physical separation" ITAAC included in Tier 1, Section 3.1, to be associated only with those piping systems which have not yet been designed as part of the ESBWR design certification application and will be designed in the future in accordance with the design process established in Section 3.1. Finally, the staff finds that by grouping the five systems discussed above into one "physical separation" ITAAC will be extremely problematic with respect to ITAAC closeout and verification activities.

The staff requests that the applicant clarify the acceptance criteria phrase "physical separation between trains by structural and/or fire barriers" and in a simple manner that is straight forward in addressing compliance with the single failure criterion while at the same time avoids complicating the closeout and verification activities for the ITAAC.

GEH Response

As a result of discussions with the NRC staff, GEH agreed to make the changes to clarify the ITAAC Acceptance Criteria on a system-by-system basis. This agreement was reached very late in the DCD Revision 5 development process and as a result was not included in DCD Rev 5.

GEH will modify the Design Requirements and ITAAC tables for the following sections to clarify the requirement for physical separation, which defined as protection against design basis events and their direct consequences so as not to preclude accomplishment of the intended safety-related function, of mechanical trains for the five systems (Nuclear Boiler System, Standby Liquid Control System, Isolation Condenser System, Gravity-Driven Cooling System, and Passive Containment Cooling System) as part of the reconciliation of DCD Revision 5:

Tier 1 Subsection 2.1.2 and Table 2.1.2-3, Item 7
Tier 1 Subsection 2.2.4 and Table 2.2.4-6, Item 17
Tier 1 Subsection 2.4.1 and Table 2.4.1-3, Item 7
Tier 1 Subsection 2.4.2 and Table 2.4.2-3, Item 16
Tier 1 Subsection 2.15.4 and Table 2.15.4-2, Item 6

The attached pages show the exact changes to be made in response to this RAI supplement.

DCD Impact

DCD Revision 5 Tier 1 will be modified as shown in the attached markup.

b. Separation is provided between NBS safety-related electrical equipment, and between safety-related electrical equipment and nonsafety-related cable[KRD4].

(7) ~~Deleted~~ Mechanical Separation

a. Each mechanical train of the NBS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

b. Each mechanical train of the NBS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

(8) Isolation Capability

a. The MSIVs close upon command

b. The FWIVs close upon command

(9) Deleted.

(10) MSIVs and FWIVs fail closed upon loss of electrical power to the valve actuating solenoid.

(11) Check valves designated in Table 2.1.2-1 as having an active safety-related function open, close, or both open and also close under system pressure, fluid flow, and temperature conditions.

(12) The throat diameter of each MSL flow restrictor is sized for design choke flow requirements.

(13) Each MSL flow restrictor has taps for two instrument connections to be used for monitoring the flow through its associated MSL.

(14) The combined steamline volume from the RPV to the main steam turbine stop valves and steam bypass valves is sufficient to meet the assumptions for AOOs and infrequent events.

(15) a. The MSIVs are capable of fast closing under design differential pressure, fluid flow, and temperature conditions.

b. The FWIVs are capable of fast closing under design differential pressure, fluid flow and temperature conditions.

(16) a. When all four inboard or outboard MSIVs are stroked from a full-open to full-closed position by their actuators, the combined leakage through the MSIVs for all four MSLs will be less than or equal to the design bases assumption value.

b. When all four FWIVs are stroked from full-open to full-closed position by their actuators, the combined liquid inflow leakage through the FWIVs for both feedwater lines will be less than or equal to the design bases assumption value.

c. When all four FWIVs are stroked from full-open to full-closed position by their actuators, the combined gas outflow leakage through the FWIVs for both feedwater lines will be less than or equal to the design bases assumption value.

Table 2.1.2-3

ITAAC For The Nuclear Boiler System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7a. Deleted Each mechanical train of the NBS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	a. Inspections or analysis will be conducted for each of the NBS mechanical trains located outside the containment.	a. Report(s) exist and conclude(s) that each mechanical train of NBS located outside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
b. Each mechanical train of the NBS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	b. Inspections or analysis will be conducted for each of the NBS mechanical trains located inside the containment.	b. Report(s) exist and conclude(s) that each mechanical train of NBS located inside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
8. Isolation Capability[AH12]		
a. The MSIVs close upon command[AH13]	Valve closure tests will be performed on the as-built MSIVs using a manual closure command to simulate an isolation signal. [AH14]	Report(s) document that MSIVs close upon command. [AH15]
b. The FWIVs close upon command[AH16]	Valve closure tests will be performed on the as-built FWIVs using a manual closure command to simulate an isolation signal. [AH17]	Report(s) document that the FWIVs close upon command[AH18]

b1. The piping identified in Table 2.2.4-4 as ASME Code Section III is designed in accordance with ASME Code Section III requirements and seismic Category I requirements.

b2. The as-built piping identified in Table 2.2.4-4 as ASME Code Section III shall be reconciled with the with the piping design requirements.

b3. The piping identified in Table 2.2.4-4 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

(11) Pressure boundary welds

a. Pressure boundary welds in components identified in Table 2.2.4-4 as ASME Code Section III meet ASME Code Section III requirements.

b. Pressure boundary welds in piping identified in Table 2.2.4-4 as ASME Code Section III meet ASME Code Section III requirements.

(12) Pressure boundary integrity

a. The components identified in Table 2.2.4-4 as ASME Code Section III retain their pressure boundary integrity at their design pressure.

b. The piping identified in Table 2.2.4-4 as ASME Code Section III retains its pressure boundary integrity at its design pressure.

(13) The Seismic Category I components [AH55]identified in Tables 2.2.4-4 and 2.2.4-5 can withstand seismic design basis loads without loss of safety function.

(14) Deleted.[JCB56]

(15) Each of the SLC System safety-related loads/components identified in Tables 2.2.4-4 and 2.2.4-5 is powered from its respective safety-related division.

(16) In the SLC System, independence is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.

(17) ~~Deleted~~ Mechanical Separation

a. Each mechanical train of the SLCS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

b. Each mechanical train of the SLCS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

(18) Re-positionable (not squib) valves designated in Table 2.2.4-4 as having an active safety-related function open, close, or both open and close under differential pressure, fluid flow, and temperature conditions.

(19) The pneumatically operated valve(s) designated in Table 2.2.4-4 fail in the mode listed if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.

(20) Check valves designated in Table 2.2.4-4 as having a safety-related function open, close, or both open and close under system pressure, fluid flow, and temperature conditions.

Table 2.2.4-6

ITAAC For The Standby Liquid Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
16. In the SLC System, independence is provided between safety-related divisions, and between safety-related divisions and nonsafety-related equipment.	a. Tests will be performed on the SLC System by providing a test signal in only one safety-related division at a time. b. Inspection of the as-installed safety-related divisions in the SLC System will be performed.	a. Report(s) document that the test signal exists only in the safety-related division under test in the System. b. Inspection report(s) of the as-installed safety-related divisions in the SLC System document(s) that: i) Physical separation or electrical isolation exists between these safety-related divisions in accordance with RG 1.75. ii) Physical separation or electrical isolation exists between safety-related Divisions and nonsafety-related equipment in accordance with RG 1.75. [SMK65]
17a ~~Deleted~~ Each mechanical train of the SLCS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	~~Deleted~~ a. Inspections or analysis will be conducted for each of the SLCS mechanical trains located outside the containment.	~~Deleted~~a. Report(s) exist and conclude(s) that each mechanical train of SLCS located outside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.

Table 2.2.4-6

ITAAC For The Standby Liquid Control System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
b. Each mechanical train of the SLCS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	b. Inspections or analysis will be conducted for each of the SLCS mechanical trains located inside the containment.	b. Report(s) exist and conclude(s) that each mechanical train of SLCS located inside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
18. Re-positionable (not squib) valves designated in Table 2.2.4-4 as having an active safety-related function open, close, or both open and close under differential pressure, fluid flow, and temperature conditions.	Tests of installed valves will be performed for opening, closing, or both opening and closing under system preoperational differential pressure, fluid flow, and temperature conditions.	Report(s) document that, upon receipt of the actuating signal, each valve opens, closes, or both opens and closes, depending upon the valve's safety function.
19. The pneumatically operated valve(s) designated in Table 2.2.4-4 fail in the mode listed if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.	Tests will be conducted on the as-built valve(s).	Report(s) document that the pneumatically operated valve(s) identified in Table 2.2.4-4 fail in the listed mode when either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.
20. Check valves designated in Table 2.2.4-4 as having a safety-related function open, close, or both open and close under system pressure, fluid flow, and temperature conditions	Tests of installed valves for opening, closing, or both opening and closing, will be conducted under system preoperational pressure, fluid flow, and temperature conditions.	Report(s) document that, based on the direction of the differential pressure across the valve, each CV opens, closes, or both opens and closes, depending upon the valve's safety functions.

b. The piping identified in Table 2.4.1-1 as ASME Code Section III retains its pressure boundary integrity at its design pressure.

(5) a. The seismic Category I components identified in Tables 2.4.2-1 can withstand seismic design basis loads without loss of safety function.

(6) a. Each of the IC System divisions (or safety-related loads/components) identified in Table 2.4.1-2 is powered from its respective safety-related division.

b. In the IC System, independence is provided between safety-related divisions, and between safety-related divisions and non-safety related equipment.

(7) ~~(Deleted)~~Mechanical Separation

a. Each mechanical train of the ICS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

b. Each mechanical train of the ICS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

(8) Control Room displays provided for the IC System are defined in Table 2.4.1-2.

(9) Re-positionable (NOT squib) valves designated in Table 2.4.1-1 as having an active safety-related function open, close, or both open and also close under differential pressure, fluid flow, and temperature conditions.

(10) The pneumatically operated valve(s) designated in Table 2.4.1-1 fail in the mode listed if either electric power to the valve actuating solenoid is lost, or pneumatic pressure to the valve(s) is lost.

(11) The equipment qualification of IC system components is addressed in Tier 1 Section 3.8.

(12) The containment isolation portions of the IC System are addressed in Tier 1 Subsection 2.15.1.

(13) Each condensate return valve (V-5 and V-6) shown on Figure 2.4.1-1 will open to initiate the ICS.

(14) The normally open ICS isolation valves (V-1, V-2, V-3 and V-4) in the steam supply and condensate return lines close automatically on receipt of high vent line radiation from the Process Radiation Monitoring System (PRMS).

(15) The normally open ICS isolation valves (V-1, V-2, V-3 and V-4) in the steam supply and condensate return lines close automatically on receipt of signals from the LD&IS.

(16) Each ICS train normally closed condensate return valve (V-5) opens upon receipt of the following automatic actuation signals:

RPV high pressure following a time delay

RPV water level below level 2 following a time delay

RPV water level below level 1

Table 2.4.1-3

ITAAC For The Isolation Condenser System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7a. Deleted Each mechanical train of the ICS located outside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	Deleted a. Inspections or analysis will be conducted for each of the ICS mechanical trains located outside the containment.	Deleteda. Report(s) exist and conclude(s) that each mechanical train of ICS located outside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
b. Each mechanical train of the ICS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	b. Inspections or analysis will be conducted for each of the ICS mechanical trains located inside the containment.	b. Report(s) exist and conclude(s) that each mechanical train of ICS located inside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
8. Control Room displays provided for the IC System are defined in Table 2.4.1-2	Inspections will be performed on the Control Room displays for the IC System.	Report(s) document that displays exist or can be retrieved in the Control Room as defined in Table 2.4.1-2

(8) The GDCS injections lines provide sufficient flow to maintain water coverage above TAF for 72 hours following a design basis LOCA.

a. The GDCS equalizing lines provide sufficient flow to maintain water coverage above TAF for 72 hours following a design basis LOCA.

(9) The GDCS squib valve used in the injection and equalization open as designed.

(10) a. Check valves shown on Figure 2.4.2-1 open[BMO86], close, or both open and also close under system pressure, fluid flow, and temperature conditions.

b. The GDCS injection line check valves meet the criterion for maximum fully open flow coefficient in the reverse flow direction[BMO87].

(11) Control Room indications and controls are provided for the GDCS.

(12) GDCS squib valves maintain RPV backflow leak tightness and maintain reactor coolant pressure boundary integrity during normal plant operation.

(13) Each GDCS injection line includes a nozzle flow limiter to limit break size. [N88]

(14) Each GDCS equalizing line includes a nozzle flow limiter to limit break size. [N89]

(15) Each of the GDCS divisions is powered from their respective safety-related power divisions.

(16) ~~Deleted~~Mechanical Separation

Each mechanical train of the GDCS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

(17) The GDCS pools A, B/C, and D are sized to hold a minimum drainable water volume.

(18) The GDCS pools A, B/C, and D are of sized for holding a specified minimum water level.

(19) The minimum elevation change between minimum water level of GDCS pools and the centerline of GDCS injection line nozzles is sufficient to provide gravity-driven flow.

(20) The minimum drainable volume from the suppression pool to the RPV is sufficient to meet long-term post-LOCA core cooling requirements.

(21) The long-term GDCS minimum equalizing driving head is based on RPV Level 0.5.

(22) The GDCS Deluge squib valves open as designed.

(23) GDCS software is developed in accordance with the software development program described in Section 3.2. [SMK90]

(24) The GDCS injection piping is installed to allow venting of non-condensable gases to GDCS pools and to RPV, to prevent collection in the GDCS injection pipes. [AH91]

Table 2.4.2-3

ITAAC For The Gravity-Driven Cooling System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
14. Each GDCS equalizing line includes a nozzle flow limiter to limit break size. [N104]	Inspections of the as-built GDCS equalizing flow limiters will be taken	A report exists that confirms each GDCS equalizing line nozzle flow limiter is less than or equal to 2.027E-3 m^2 (0.0218 ft^2) and a nominal reactor-side outlet length to diameter value of 6.59. [AH105]
15. Each of the GDCS divisions is powered from their respective safety-related power divisions.	Tests will be performed on the GDCS by providing a test signal in only one safety-related power division at a time.	Testing confirms the signal exists only in the safety-related power division under test in the GDCS.[GD106]
16. Delete Each mechanical train of the GDCS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	DeleteInspections or analysis will be conducted for each of the GDCS mechanical trains located inside the containment.	DeleteReport(s) exist and conclude(s) that each mechanical train of GDCS located inside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
17. The GDCS pools A, B/C, and D are sized to hold a minimum drainable water volume.	An analysis of combined minimum drainable volume for GDCS pools A, B/C, and D will be performed.	Analysis confirms the combined minimum drainable water volume for GDCS pools A, B/C, and D is 1636 m^3 (57775 ft^3).[GD107]
18. The GDCS pools A, B/C, and D are of sized for holding a specified minimum water level.	An analysis of minimum water level in GDCS pools A, B/C, and D will be performed.	Analysis confirms the minimum water level in GDCS pools A, B/C, and D is 6.5 m (21.33 ft).[GD108]

2.15.4 Passive Containment Cooling System

Design Description

The Passive Containment Cooling System (PCCS), in conjunction with the suppression pool, maintains the containment within its pressure limits for DBAs such as a LOCA, by condensing steam from the DW atmosphere and returning the condensed liquid to the Gravity Driven Cooling System (GDCS) pools. The system is passive, with no components that must actively function in the first 72-hours after a DBA. [AS115]

(1) The functional arrangement for the PCCS is as described in the Design Description in this subsection 2.15.4, Table 2.15.4-1 and Figure 2.15.4-1.

(2) ASME Code Section III

a1. The components identified in Table 2.15.4-1 as ASME Code Section III are designed in accordance with ASME Code Section III requirements and seismic Category I requirements.

a2. The components identified in Table 2.15.4-1 as ASME Code Section III shall be reconciled with the design requirements.

a3. The components identified in Table 2.15.4-1 as ASME Code Section III are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

b1. The piping identified in Table 2.15.4-1 as ASME Code Section III is designed in accordance with ASME Code Section III requirements and seismic Category I requirements.

b2. The as-built piping identified in Table 2.15.4-1 as ASME Code Section III shall be reconciled with the with the piping design requirements.

b3. The piping identified in Table 2.15.4-1 as ASME Code Section III is fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

(3) Pressure Boundary Welds

a. Pressure boundary welds in components identified in Table 2.15.4-1 as ASME Code Section III meet ASME Code Section III requirements.

b. Pressure boundary welds in piping identified in Table 2.15.4-1 as ASME Code Section III meet ASME Code Section III requirements.

(4) The pressure boundary of the PCCS retains its integrity under the design pressure of 310 kPa gauge (45 psig).[KTS116]

(5) The seismic Category I components identified in Table 2.15.4-1 can withstand seismic design basis loads without loss of safety function[AH117].

(6) ~~Deleted~~Mechanical Separation

Each mechanical train of the PCCS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.

Table 2.15.4-2

ITAAC For The Passive Containment Cooling System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
b. Deleted		
6. ~~Deleted~~ Each mechanical train of the PCCS located inside the containment is physically separated from the other train(s) so as not to preclude accomplishment of the intended safety-related function.	Inspections or analysis will be conducted for each of the PCCS mechanical trains located inside the containment.	Report(s) exist and conclude(s) that each mechanical train of PCCS located inside containment is protected against design basis events and their direct consequences by spatial separation, barriers, restraints, or enclosures so as not to preclude accomplishment of the intended safety-related function.
7. The PCCS together with the pressure suppression containment system will limit containment pressure to less than its design pressure for 72 hours after a LOCA.	Using prototype test data and as-built PCC unit information, an analysis will be performed to establish the heat removal capability of the PCC unit.	Test(s) and analysis(es) reports exist and conclude that analyzed containment pressure for 72 hours after a LOCA is less than containment design pressure, and that the PCC unit heat removal capacity is no less than 11 MWt given the following conditions: • Pure saturated steam in the tubes at 308 kPa (44.7 psia) absolute and 134°C (273°F) • IC/PCC pool water temperature is at atmospheric pressure and 102°C (216°F)
8. The equipment qualification of PCCS components is addressed in Tier 1 Section 3.8.	See Tier 1 Section 3.8.	See Tier 1 Section 3.8.