ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Wednesday, September 30, 2009 3:58 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); DUNCAN Leslie E (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 230, FSARCh. 14, Supplement 1
Attachments: RAI 230 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided responses to 4 of the 28 questions of RAI No. 230 on July 13, 2009. The attached file, "RAI 230 Supplement 1 Response US EPR DC," provides technically correct and complete responses to 11 of the remaining 24 questions and a partial response to 1 of the remaining 24 questions, as committed.

Since the response contains security-related sensitive information that should be withheld from public disclosure in accordance with 10 CFR 2.390, the attached file is a public version with the security-related sensitive information redacted. This email does not contain any security-related information. The unredacted SUNSI version is provided under separate email.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 230 Questions 14.03.02-14, 14.03.02-17, 14.03.02-26, 14.03.02-28, 14.03.02-29, 14.03.02-32, and 14.03.02-38.

The following table indicates the respective pages in the response document, "RAI 230 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 230 — 14.03.02-13, Part b	2	2
RAI 230 — 14.03.02-14	3	3
RAI 230 — 14.03.02-15	4	4
RAI 230 — 14.03.02-17	5	5
RAI 230 — 14.03.02-19	6	6
RAI 230 — 14.03.02-20	7	7
RAI 230 — 14.03.02-26	8	8
RAI 230 — 14.03.02-28	9	9
RAI 230 — 14.03.02-29	10	10
RAI 230 — 14.03.02-32	11	11
RAI 230 — 14.03.02-33	12	12
RAI 230 — 14.03.02-38	13	13

AREVA NP is unable to provide a response to Question 14.03.02-21 at this time. Design and analyses of the new and spent fuel storage racks are not yet complete. Therefore, the schedule for a technically correct and complete response to Question 14.03.02-21 has been revised to November 20, 2009. The schedule for technically correct and complete responses to the other remaining questions remains unchanged.

The schedule for technically correct and complete responses to the remaining 13 questions has changed as provided below:

Question #	Response Date

RAI 230 — 14.03.02-13, Part a	October 30, 2009
RAI 230 — 14.03.02-21	November 20, 2009
RAI 230 — 14.03.02-22	October 30, 2009
RAI 230 — 14.03.02-23	October 30, 2009
RAI 230 — 14.03.02-24	October 30, 2009
RAI 230 — 14.03.02-27	October 30, 2009
RAI 230 — 14.03.02-30	October 30, 2009
RAI 230 — 14.03.02-34	October 30, 2009
RAI 230 — 14.03.02-35	October 30, 2009
RAI 230 — 14.03.02-36	October 30, 2009
RAI 230 — 14.03.02-39	October 30, 2009
RAI 230 — 14.03.02-40	October 30, 2009
RAI 230 — 14.03.02-41	October 30, 2009

Sincerely,

Ronda Pederson
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An AREVA and Siemens company
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From: Pederson Ronda M (AREVA NP INC)
Sent: Monday, July 13, 2009 3:47 PM
To: 'Tesfaye, Getachew'
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); DUNCAN Leslie E (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 230, FSARCh. 14

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 230 Response US EPR DC.pdf," provides technically correct and complete responses to 4 of 28 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 230 Questions 14.03.02-16, 14.03.02-25, and 14.03.02-31.

The following table indicates the respective pages in the response document, "RAI 230 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 230 — 14.03.02-13	2	2
RAI 230 — 14.03.02-14	3	3
RAI 230 — 14.03.02-15	4	4
RAI 230 — 14.03.02-16	5	5
RAI 230 — 14.03.02-17	6	6

RAI 230 — 14.03.02-19	7	7
RAI 230 — 14.03.02-20	8	8
RAI 230 — 14.03.02-21	9	9
RAI 230 — 14.03.02-22	10	10
RAI 230 — 14.03.02-23	11	11
RAI 230 — 14.03.02-24	12	12
RAI 230 — 14.03.02-25	13	13
RAI 230 — 14.03.02-26	14	14
RAI 230 — 14.03.02-27	15	15
RAI 230 — 14.03.02-28	16	16
RAI 230 — 14.03.02-29	17	17
RAI 230 — 14.03.02-30	18	18
RAI 230 — 14.03.02-31	19	19
RAI 230 — 14.03.02-32	20	20
RAI 230 — 14.03.02-33	21	21
RAI 230 — 14.03.02-34	22	22
RAI 230 — 14.03.02-35	23	23
RAI 230 — 14.03.02-36	24	24
RAI 230 — 14.03.02-37	25	25
RAI 230 — 14.03.02-38	26	26
RAI 230 — 14.03.02-39	27	27
RAI 230 — 14.03.02-40	28	28
RAI 230 — 14.03.02-41	29	29

A complete answer is not provided for 24 of the 28 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 230 — 14.03.02-13, Part a	October 30, 2009
RAI 230 — 14.03.02-13, Part b	September 30, 2009
RAI 230 — 14.03.02-14	September 30, 2009
RAI 230 — 14.03.02-15	September 30, 2009
RAI 230 — 14.03.02-17	September 30, 2009
RAI 230 — 14.03.02-19	September 30, 2009
RAI 230 — 14.03.02-20	September 30, 2009
RAI 230 — 14.03.02-21	September 30, 2009
RAI 230 — 14.03.02-22	October 30, 2009
RAI 230 — 14.03.02-23	October 30, 2009
RAI 230 — 14.03.02-24	October 30, 2009
RAI 230 — 14.03.02-26	September 30, 2009
RAI 230 — 14.03.02-27	October 30, 2009
RAI 230 — 14.03.02-28	September 30, 2009
RAI 230 — 14.03.02-29	September 30, 2009
RAI 230 — 14.03.02-30	October 30, 2009
RAI 230 — 14.03.02-32	September 30, 2009
RAI 230 — 14.03.02-33	September 30, 2009
RAI 230 — 14.03.02-34	October 30, 2009
RAI 230 — 14.03.02-35	October 30, 2009
RAI 230 — 14.03.02-36	October 30, 2009
RAI 230 — 14.03.02-38	September 30, 2009
RAI 230 — 14.03.02-39	October 30, 2009
RAI 230 — 14.03.02-40	October 30, 2009

Sincerely,

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From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, June 12, 2009 3:56 PM
To: ZZ-DL-A-USEPR-DL
Cc: Jeng, David; Xu, Jim; Patel, Jay; Jennings, Jason; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 230 (2794), FSARCh. 14

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on May 19, 2009, and discussed with your staff on June 9, 2009. Draft RAI Questions 14.03.02-14, 14.03.02-22, and 14.03.02-31 were modified as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 843

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Subject: Response to U.S. EPR Design Certification Application RAI No. 230, FSARCh. 14, Supplement 1
Sent Date: 9/30/2009 3:57:43 PM
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From: Pederson Ronda M (AREVA NP INC)

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Response to

Request for Additional Information No. 230, Supplement 1

6/12/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 14.03.02 - Structural and Systems Engineering - Inspections, Tests, Analyses, and Acceptance Criteria
Application Section: 14.3.2

QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)

Question 14.03.02-13:

Follow-up to RAI Question 14.03.02-11- 1

The staff finds the revised Tier 1 design descriptions and ITAAC tables have been improved with the additional information and are consistent in the manner in which safety functions have been addressed. However the level of detail is not consistent with other design certifications. The applicant is requested to provide additional information to include the following:

a. Some key dimensions have been provided for each of the structures. The bases for the selections should also be provided. As currently presented in the markup, it is not clear if all key dimensions have been included or what the safety significance is for the dimensions that have been provided.

b. In its response the applicant stated that the U.S. EPR FSAR Tier 1, Section 2.1 will be revised to provide additional details regarding the basis for protection against pressurization effects associated with postulated rupture of pipes. This detail was not found in the referenced section. The applicant is requested to provide the information it identified in its response to item h of RAI 132, Question 14.03.02-11-1.

Response to Question 14.03.02-13:

a) A response to this question will be provided by October 30, 2009, as previously committed.

b) The commitment to provide protection against pressurization effects associated with postulated rupture of pipes is included in U.S. EPR FSAR Tier 1, Section 2.1.1, Item 3.4 and the associated ITAAC in U.S. EPR FSAR Table 2.1.1-4, Item 3.4. Item 3.4 requires the completion of a pipe break hazards analysis that confirms that the plant can be safety shut down and maintained in cold safe shutdown following a pipe break, which includes the pressurization effects associated with postulated rupture of pipes. The wording of U.S. EPR FSAR Table 2.1.1-4, Item 3.4 was revised in the Response to RAI 222, Supplement 2, Question 03.06.02-31 to add an inspection of the features identified in the pipe break hazards analysis.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 14.03.02-14:

Tier 1, Section 2.1 does not identify floor elevations. It is difficult to determine where a particular plan view belongs in each structure. The staff requests that floor elevations be added to the elevation views. Also in Figure 2.1.1-1 the designation for dimension D1 is missing in the figure and should be corrected.

Response to Question 14.03.02-14:

Reference floor elevations will be added to U.S. EPR FSAR Tier 1, Figure 2.1.1-9, Figure 2.1.1-12, Figure 2.1.1-14, Figure 2.1.1-17, Figure 2.1.1-19, Figure 2.1.2-3, Figure 2.1.5-4, and Figure 2.1.5-5 with section views that are cross-referenced by plan views. These floor elevations are for reference purposes and are not considered part of U.S. EPR FSAR Tier 1 ITAAC.

The D1 dimension label in U.S. EPR FSAR Tier 1, Figure 2.1.1-1 will be moved so that it is clearly visible.

FSAR Impact:

U.S. EPR FSAR Tier 1, Figure 2.1.1-1, Figure 2.1.1-9, Figure 2.1.1-12, Figure 2.1.1-14, Figure 2.1.1-17, Figure 2.1.1-19, Figure 2.1.2-3, Figure 2.1.5-4, and Figure 2.1.5-5 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.02-15:

In SRP 14.3.2, SAC-08, for internal flood, it states that ITAAC should require inspections to verify that penetrations in division walls are at least 2.5 M above the floor and safety-related electrical, instrumentation, and control equipment are located at least 20 cm above the floor surface. The staff requests inspections for these features be added to the ITAAC tables or provide justification for not doing so.

Response to Question 14.03.02-15:

The requirements for penetration and equipment locations are not part of the U.S. EPR design approach for protection against internal flooding described in U.S. EPR FSAR Tier 2, Section 3.4.1. Therefore, an ITAAC to confirm that these requirements are met in U.S. EPR FSAR Tier 1 is not appropriate.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 14.03.02-17:

In ITAAC table 2.1.1.8, item 2.6 under Commitment Wording states that the RCB is a post-tensioned, pre-stressed concrete structure. Under Inspection Analysis or Test it states that inspection of the RCB will be performed, but does not state how this inspection is related to the commitment wording or what the purpose of the inspection is. The staff is requesting that the wording under Inspection Analysis or Test be revised to state what will be inspected and for what purpose it will be inspected and the Acceptance Criteria be revised accordingly. The staff further requests that the inspection involve more than confirming that the RCB is a post-tensioned structure.

Response to Question 14.03.02-17:

U.S. EPR FSAR Tier 1, Table 2.1.1-8, Item 2.6 will be revised to add specific line items to address the Inspection, Analyses, Tests, and Acceptance Criteria for the post-tensioned, pre-stressed concrete structure.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.1.1-8, Item 2.6 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.02-19:

In Tier 1, Section 2.1 no information has been provided for the Turbine Building. However the Turbine Building (TB) is adjacent to the Safeguards Buildings 2 and 3. The failure of the TB could impact the safety function of the two Safeguard Buildings. If the TB is designed so that it will not fail under earthquake load or tornado load and thus not collapse on adjacent safety related structures, then a Tier 1 description of this building needs to be provided along with appropriate ITAAC to verify it will not collapse. If it can collapse, then its collapse needs to be addressed as a design load on the adjacent safety-related structures in Tier 1, Section 2.1.1 and an ITAAC item added to Table 2.1-7. Provide the appropriate information in a revision to FSAR Section 2.1.

Response to Question 14.03.02-19:

The Turbine Building is identified in U.S. EPR FSAR Tier 1, Section 4.4 as a site-specific structure that is not included in the scope of the certified design. A U.S. EPR FSAR Tier 1 description of the Turbine Building and associated ITAAC are not required. However, verifying that “failure of any of the site specific structures not within the scope of the certified design shall not cause any of the Seismic Category I structures within the scope of the certified design to fail” is already identified as an interface requirement for site-specific structures in U.S. EPR FSAR Tier 1, Section 4.1.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 14.03.02-20:

EPR FSAR Table 2.1.1-7—Nuclear Island Inspections, Tests, Analyses, and Acceptance Criteria states in item 4.3 under the Commitment Wording column the following:

The RCB as described in Section 2.1.1, and its penetrations as described in Section 3.5, Containment Isolation, retain pressure boundary integrity associated with the RCB design pressure.

This ITAAC item 4.3 should include specific approach for implementing the pressure testing requirements of RCB and its associated components per ASME Section III, Division 2, Section CC-6000. However, the specific wording used under the "Acceptance Criteria" column is very vague in terms of RCB pressure test requirements, and may be interpreted as only pertains to components identified in Table 3.5.1-1 which does not include RCB.

Provide a RCB specific ITAAC table committing that the RCB pressure boundary retains its structural integrity when subject to design pressure, and under Inspection, Analysis and Tests column state that a Structural Integrity Test (SIT) of the RCB is performed in accordance with Article CC-6000 of ASME Code Section III, Division 2 and Regulatory Guide 1.136, after completion of the RCB construction, and the first prototype RCB will be instrumented to measure strains per ASME Code Section III, Division 2, CC-6000.

Lastly, under the Acceptance Criteria column of the table, state that test report documents that the RCB pressure boundary retains its structural integrity when tested and evaluated in accordance with ASME Code Section III, Division 2 at a test pressure of at least 115% of the design pressure.

Response to Question 14.03.02-20:

U.S. EPR FSAR Tier 1, Section 2.1 was revised in the Response to RAI 132, Supplement 1, Question 14.03.02-11. As a result, U.S. EPR FSAR Tier 1, Table 2.1.1-7, Item 4.3 was deleted. This information was subsequently rewritten and combined into U.S. EPR FSAR Tier 1, Table 2.1.1-8, Item 2.5. See the Response to Question 14.03.02-26.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 14.03.02-26:

Follow-up to RAI Question 14.03.02-11- 7

The staff has reviewed the revised markup and has determined that additional information is required. In reviewing U.S. EPR FSAR Table 3.3.1, item 1.0 there is no mention of pressure test requirements. In the revised markup the commitment wording for a pressure integrity test is found in Table 2.1.1.8 (Reactor Building ITAAC) under item 2.5. The Commitment Wording for this item should be revised to include the penetration assemblies. Under Inspection, Analysis or Test, item 2.5.a should be reworded to state that an analysis of the RCB including its liner and penetration assemblies will be performed against the applied design pressure per ASME Code Section III design requirements. This analysis will be reconciled against the final as-built installation. Item 2.5.b should be reworded to state that Inspections will be performed against the construction drawings to determine the final as-built installation. Item 2.5.c should be reworded to state that a test report documents that a Structural Integrity Test (SIT) of the containment structure is performed in accordance with Article CC-6000 of ASME Code Section III, Division 2 and Regulatory Guide 1.136. The first prototype containment structure will be instrumented to measure strains per ASME Code Section III, Division 2, CC-6221. Under Acceptance Criteria, item 2.5.a should be reworded to state that the analysis of the RCB including its liner and penetration assemblies has been reconciled with the as-built condition and ASME Code Section III stress reports exist and conclude the ASME III design code requirements have been met. Under item 2.5.b it should state that the RCB including its liner and penetrations has been inspected to the as-installed condition against the final construction drawings. Under item 2.5.c, it should state that a test report exists that documents the containment system pressure boundary retains its structural integrity when tested and evaluated in accordance with ASME Code Section III, Division 2 at a test pressure of at least 1.15 times the design pressure.

Response to Question 14.03.02-26:

U.S. EPR FSAR Tier 1, Section 2.1, Table 2.1.1-8, Item 2.5 was initially revised in the Response to RAI 220, Supplement 1, Question 06.01.01-18. U.S. EPR FSAR Tier 1, Section 2.1.1.1, Item 2.5 and Table 2.1.1-8, Item 2.5 will be revised to address Question 14.03.02-20 and this question as follows:

- Item 2.5 will include the penetration assemblies in the ITAAC.
- Item 2.5b will replace as-fabricated with as-built because as-fabricated is not defined in U.S. EPR FSAR Tier 1, Section 1.1.

Listing the test pressure in U.S. EPR FSAR Tier 1, Section 2.1, Table 2.1.1-8, Item 2.5 is not required because this is performed in accordance with ASME Code Section III requirements, and compliance with the test pressure requirements is documented in the Section III Data Report.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.1.1.1, Item 2.5 and Table 2.1.1-8, Item 2.5 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.02-28:

Follow-up to RAI Question 14.03.02-11- 11

SRP 14.3, Appendix C, Building Structures Checklist states that the acceptance criteria for an ITAAC item verifying the structural capability of a building to withstand design basis loads should be the existence of a structural analysis report which concludes the as-built building is able to withstand design basis loads. The applicant is requested to add this language to the "Acceptance Criteria" for Items. This should be included in the applicant's markup under "Acceptance Criteria" for Item 2.4 in Table 2.1.1-8, Item 2.1 in Table 2.1.1-10, Item 2.1 in Table 2.1.1-11, Item 3.4 of Table 2.1.2-3, and Item 3.5 of Table 2.1.5-3.

Response to Question 14.03.02-28:

Acceptance criteria in U.S. EPR FSAR Tier 1, Table 2.1.1-8, Item 2.4, Table 2.1.1-10, Item 2.1 , Table 2.1.1-11, Item 2.1 , Table 2.1.2-3, Item 3.4, and Table 2.1.5-3, Item 3.5 will be revised to include a report which reconciles deviations during construction and concludes that the as-built structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety-related functions.

U.S. EPR FSAR Tier 2, Section 3.8.1.5, Section 3.8.3.5, Section 3.8.4.5, and Section 3.8.5.5 will be revised to add a description of the as-built report.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.1.1-8, Item 2.4, Table 2.1.1-10, Item 2.1, Table 2.1.1-11, Item 2.1, Table 2.1.2-3, Item 3.4, and Table 2.1.5-3, Item 3.5 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Section 3.8.1.5, Section 3.8.3.5, Section 3.8.4.5, and Section 3.8.5.5 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.02-29:

Follow-up to RAI Question 14.03.02-11- 13

The FSAR markups for the referenced buildings now contain the appropriate design basis loads and are included in the ITAAC table for each structure. However, under the “Inspection, Analysis or Test” column there is no requirement for a final inspection and reconciliation of the as-built condition to the design basis loads. This should be done to address the cumulative effect of construction changes and to address the final loads and locations of these loads imposed by supported equipment and suspended systems. The applicant is requested to add this requirement under the “Inspection, Analysis or Test” column for each seismic Category I structure ITAAC table for the “Commitment Wording” item that addresses design basis loads. The need for a structural analysis report as part of the “Acceptance Criteria” is addressed in the staff assessment and supplementary RAI 14.03.02-11 –2 S1.

Response to Question 14.03.02-29:

See the Response to Question 14.03.02-28.

Question 14.03.02-32:

Follow-up to RAI Question 14.03.02-11- 18

In the markup to U.S. EPR FSAR Tier 1, Section 2.1 for protection from the dynamic effects of pipe breaks, in Table 2.2.1-4 under "Inspection, Analysis, or Test" there is a disconnect between Item 3.5.a and 3.5.b in that the analysis performed in item 3.5.a does not state what the analysis is based on, while in Item 3.5.b the inspection of the as-installed protective features is done to the construction drawings. The staff is requesting that Item 3.5.a be revised to state that the analysis is performed to the final as-built construction drawings and Item 3.5.b be revised to state that instead of construction drawings, final as-built construction drawings should be used. The staff is also requesting that for Item 3.5.b under "Acceptance Criteria" instead of construction drawings, final as-built construction drawings be used.

Response to Question 14.03.02-32:

The Response to RAI 222, Supplement 2, Question 03.06-01-31 deleted U.S. EPR FSAR Tier 1, Table 2.1.1-4, Item 3.5 and revised U.S. EPR FSAR Tier 1, Table 2.1.1-4, Item 3.4 to add an inspection of the features identified in the pipe break hazards analysis.

U.S. EPR FSAR Tier 1, Table 2.1.1-4, Item 3.4 will be revised to incorporate the wording "final as-built construction drawings."

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.1.1-4, Item 3.4 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.02-33:

Follow-up to RAI Question 14.03.02-11- 19

The response is not acceptable. In response to RAI 118, Question 03.04.01-7, which is provided as a reference for Question 14.03.02-19, changes were made to the FSAR which do not agree with the FSAR markup provided with the response to RAI 132, Supplement 1. For example in RAI 118, Question 03.04.01-7, reference is made to ITAAC Table 2.1.1-7 for changes to internal flooding responses for the FB and SB, while in the FSAR markup provided in response to RAI 132, Table 2.1.1-7 is a table of RBA penetrations that contain high energy pipes. In addition, the wording in the ITAAC tables for internal flooding for FB and SB are not consistent between the markups provided in RAI 118 and RAI 132. The applicant needs to provide a specific response to Question 14.03.02-11-19 without reference to RAI 118, Question 03.04.01-7.

Response to Question 14.03.02-33:

The Response to RAI 132, Supplement 1, Question 14.03.02-11 rewrote U.S. EPR FSAR Tier 1, Section 2.1. As a result, table numbers changed.

RAI 132, Question 14.03.02-11-19 requested clarification on the source or volume of internal flooding water and details about the interconnections and boundaries of the affected divisions for flooding mitigation. This question is no longer applicable because the approach for flooding ITAAC has changed. Flooding ITAAC items are now located in U.S. EPR FSAR Tier 1, Table 2.1.1-8, Item 2.10, Table 2.1.1-10, Item 2.2, and Table 2.1.1-11, Item 2.2. These ITAAC require that an internal flooding analysis and a walkdown of the identified flooding protection features be performed to confirm these features are installed. Specific water sources, volumes, or other details of the flooding protection features are not required in an ITAAC.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 14.03.02-38:

Follow-up to RAI Question 14.03.02-11- 24

In the revised ITAAC table under Commitment Wording for Item 3.1 it states that the NAB is designed to prevent failure on the adjacent FB or SB, Division 4. This is not adequate because it does not address the design basis loads for which the building must designed. For the same item number, under "Inspection, Analysis or Test, for the second sentence which states that "During construction, deviations from the approved design will be analyzed, it should state that the "During construction, deviations from the approved design will be reconciled with the building analysis. The staff requests that these changes be made to ITAAC Table 2.1.3-1.

Response to Question 14.03.02-38:

U.S. EPR FSAR Tier 1, Section 2.1.3, Item 3.1 and Table 2.1.3-1, Item 3.1 and the associated key design feature will be revised to include the design basis loads considered for interaction of non-Category I structures with Category I structures. The inspections, tests, analyses (ITA) wording will be revised as requested.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.1.3, Item 3.1 and Table 2.1.3-1, Item 3.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

2.2 As shown on Figure 2.1.1-4, a flooding barrier ~~consisting of several walls~~ is provided to prevent ingress of water into the core melt spreading area. ~~This barrier includes a watertight door that provides entry to the venting shaft of the spreading area.~~

2.3 Core melt cannot relocate to the upper containment due to the existence of concrete barriers, as shown on Figure 2.1.1-9.

2.4 The RB structures are Seismic Category I and are designed and constructed to withstand design basis loads without loss of structural integrity and safety-related functions. The design basis loads are those loads associated with:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrostatic, hydrodynamic, and temperature loads).
- Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads, including reaction loads, jet impingement loads, and missile impact loads).
- External events (including rain, snow, flood, tornado, tornado-generated missiles and earthquake).

2.5 The RCB, including the liner plate and penetration assemblies, maintains its pressure boundary integrity at the design pressure.

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2.6 The RCB is post-tensioned, pre-stressed concrete structure.

2.7 The RBA is separated from the SBs and the FB by an internal hazard protection barrier~~barriers, doors, dampers, and penetrations~~ that ~~have~~ has a minimum 3-hour fire rating, as ~~shown~~ indicated on Figure 2.1.1-20.

2.8 The following are provided for water flow to the in-containment refueling water storage tank (IRWST):

- As shown on Figure 2.1.1-4, RCB rooms which are adjacent to the IRWST contain wall openings slightly above the floor to allow water flow into the IRWST.
- As shown on Figure 2.1.1-5, RCB rooms which are directly above the IRWST, contain trapezoidal-shaped openings in the floor to allow water flow into the IRWST. The floor openings are protected by weirs and trash racks to provide a barrier against material transport into the IRWST.

2.9 RBA penetrations that contain high-energy pipelines, as described in Table 2.1.1 7, have guard pipes.

2.10 Essential equipment required for plant shutdown located in the RB and RBA is located above the internal flood level ~~or is designed to withstand flooding~~.

2.11 The reactor pressure vessel, reactor coolant pumps, pressurizer, steam generators, and interconnecting RCS piping are insulated with reflective metallic insulation.

2.12 The RB structures have key design dimensions that are confirmed after construction.

Table 2.1.1-4—Nuclear Island ITAAC (~~3~~ 4 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.4	A pipe break hazards analyses summary exists that concludes the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power.	a. A pipe break hazards analysis will be performed.	a. A pipe break hazards analyses summary exists that concludes the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power and confirms whether: • Piping stresses in the RCB penetration area are within allowable stress limits. • Pipe whip restraints and jet shield designs can mitigate pipe break loads. • Loads on safety-related SSCs are within design load limits. • SSCs are protected or qualified to withstand the environmental effects of postulated failures.
		14.03.02-32 b. Inspection of the as-built conditions of features identified in the part (a) analysis versus final as-built construction drawings of those features will be performed.	b. The as-built configuration of the pipe break analysis protection features agree with the associated final as-built construction drawings.
3.5	Deleted.~~Essential SSCs in RCB, SBs and FB rooms listed in Table 2.1.1-6 are protected from the dynamic effects of pipe breaks.~~	Deleted.~~a. An analysis of essential SSCs in the rooms listed in Table 2.1.1-6 will be performed to determine the protective features required for the dynamic effects of pipe breaks.~~	Deleted.~~a. Essential SSCs in rooms listed in Table 2.1.1-6 are protected from the dynamic effects of pipe breaks.~~
		~~b. An inspection of as-installed features providing protection for essential systems and components from the effects of piping failures versus construction drawings of protective~~	~~b. Essential SSCs in rooms listed in Table 2.1.1-6 are protected from the dynamic effects of pipe breaks and the features providing protection conform to the construction drawings.~~

Table 2.1.1-8—Reactor Building ITAAC (5 6 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.4	The RB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety related functions. • Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrostatic, hydrodynamic, and temperature loads). • Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads, including reaction loads, jet impingement loads, and missile impact loads). • External events (including rain, snow, flood, tornado, tornado-generated missiles and earthquake).	a. An analysis of the RB structures for the design basis loads will be performed. b. During construction, deviations from the approved design will be analyzed for design basis loads. 14.03.02-28 & 14.03.02-29	A report exists which reconciles deviations during construction and concludes that the as-built RB structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety-related functions.a. The design of the RB will withstand the design basis loads without loss of structural integrity and safety related functions. b. Deviations from the design during construction are reconciled.

Table 2.1.1-8—Reactor Building ITAAC (5 6 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.5	The RCB, including the liner plate and penetration assemblies, maintains its pressure boundary integrity at the design pressure.	a. Inspections will be performed for the existence of ASME Code Section III Design Report(s) for the RCB liner plate and penetration assemblies.An analysis of the RCB liner plate will be performed per ASME Code Section III design requirements.	a. ASME Code Section III Design Report(s) (NCA-3550) exist for the RCB liner plate and penetration assemblies.ASME Code Section III stress reports exist and conclude that the RCB liner plate meets ASME Code Section III design requirements.
		b. Inspections will be performed to verify the existence of RCB liner plate and penetration assemblies analyses which reconcile as-built deviations to the ASME Code Design Report as required by ASME Code Section III.Inspections will be conducted on the RCB liner plate to verify installation as specified on the liner plate construction drawings.	b. ASME Code Date Reports (NCA-8000) exist and conclude that Reconciliation (NCA-3554) of the as-built RCB liner plate and penetration assemblies with the Design Report (NCA-3550) has occurred.The RCB liner plate has been installed as specified on the liner plate construction drawings.
		c. Inspections of pressure boundary welds will be performed to verify that welding on the RCB liner plate and penetration assemblies is performed in accordance with ASME Code Section III requirements.A Structural Integrity Test of the RCB, including the liner plate, will be performed.	c. ASME Code Section III Data Reports exist and concludes that pressure boundary welding has been performed on the RCB liner plate and penetration assemblies in accordance with ASME Code Section III.The RCB, including the liner plate, maintains its integrity at the design pressure of at least 62 psig.

14.03.02-26

Table 2.1.1-8—Reactor Building ITAAC (5 6 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	14.03.02-26	d. A Structural Integrity Test of the RCB, including the liner plate and penetration assemblies, will be performed.A Structural Integrity Test of the RCB, including the liner plate, will be performed. e. Pre-service Inspections on the RCB liner plate and penetration assemblies has been performed in accordance with ASME Code Section III.	d. The RCB, including the liner plate and penetration assemblies, maintains its integrity at the design pressure of at least 62 psig.The RCB, including the liner plate, maintains its integrity at the design pressure of at least 62 psig. e. ASME Code Section III Data Reports exist and concludes that Pre-service NDE performed on the RCB liner plate and penetration assemblies meets ASME Section III requirements.
2.6	The RCB is a post-tensioned, pre-stressed concrete structure. 14.03.02-17	a. Inspections will be performed for the existence of ASME Code Section III Design Report(s) for the RCB post-tensioned, pre-stressed concrete structure. b. Inspections will be performed to verify the existence of RCB post-tensioned, pre-stressed concrete structure analyses which reconcile as-built deviations to the ASME Code Design Report as required by ASME Code Section III. c. A Structural Integrity Test of the RCB post-tensioned, pre-stressed concrete structure will be performed.	a. ASME Code Section III Design Report(s) (NCA-3550) exist for the RCB post-tensioned, pre-stressed concrete structure. b. ASME Code Date Reports (NCA-8000) exist and conclude that Reconciliation (NCA-3554) of the as-built RCB post-tensioned, pre-stressed concrete structure with the Design Report (NCA-3550) has occurred. c. The RCB post-tensioned, pre-stressed concrete structure maintains its integrity at the design pressure of at least 62 psig.

Table 2.1.1-8—Reactor Building ITAAC (5 6 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	14.03.02-17	d. Pre-Service Inspections on the RCB post-tensioned, pre-stressed concrete structure has been performed in accordance with ASME Code Section III. Inspection of the RCB will be performed.	d. ASME Code Section III Data Reports exist and concludes that Pre-Service Inspections on the RCB post-tensioned, pre-stressed concrete structure meets ASME Section III. The RCB contains post-tensioning tendons for pre-stressing the concrete structure.

Table 2.1.1-10—Safeguard Buildings ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The SB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety related functions. • Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrostatic, hydrodynamic, and temperature loads). • Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads, including reaction loads, jet impingement loads, and missile impact loads). • External events (including rain, snow, flood, tornado, tornado-generated missiles and earthquake).	a. An analysis of the SB structures for the design basis loads will be performed. b. During construction, deviations from the approved design will be analyzed for design basis loads.	A report exists which reconciles deviations during construction and concludes that the as-built SB structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety-related functions.a. The design of the SB structures will withstand the design basis loads without loss of structural integrity and safety related functions. b. Deviations from the design during construction are reconciled.

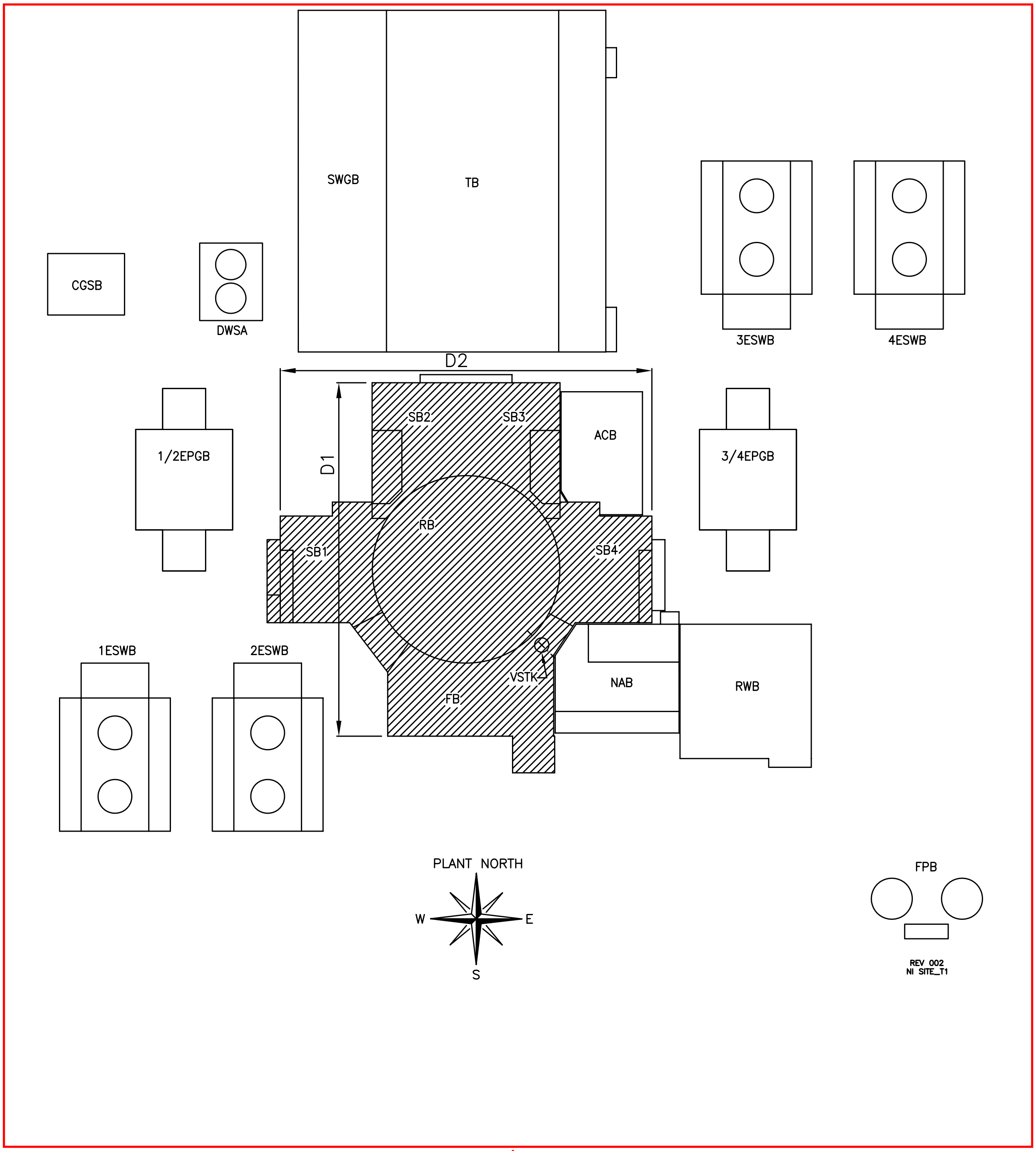
14.03.02-28 &
14.03.02-29

Table 2.1.1-11—Fuel Building ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The FB structure is Seismic Category I and is designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety related functions. • Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrostatic, hydrodynamic, and temperature loads). • Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads, including reaction loads, jet impingement loads, and missile impact loads). • External events (including rain, snow, flood, tornado, tornado-generated missiles and earthquake.	~~a.~~ An analysis of the FB structure for the design basis loads will be performed. ~~b.~~ During construction, deviations from the approved design will be analyzed for design basis loads.	A report exists which reconciles deviations during construction and concludes that the as-built FB structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety-related functions.~~a.~~ ~~The design of the FB structures will withstand the design basis loads without loss of structural integrity and safety related functions.~~ ~~b. Deviations from the design during construction are reconciled.~~

14.03.02-28 &
14.03.02-29

Figure 2.1.1-1—U.S. EPR Building Layout Showing NI Structures Location



14.03.02-14

Figure 2.1.1-9—Reactor Building Elevation Section C-C

Figure 2.1.1-12—Fuel Building Elevation Section A-A

Figure 2.1.1-14—Safeguard Building 1 Elevation Section A-A

Figure 2.1.1-17—Safeguard Building 2 & 3 Elevation Section B-B

Figure 2.1.1-19—Safeguard Building 4 Elevation Section A-A

Table 2.1.2-3—Emergency Power Generating Building ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.4	The EPGB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety-related functions. • Normal plant operation (including dead loads, live loads, lateral earth pressure loads, hydrostatic loads, hydrodynamic loads, and temperature loads). • Internal Events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads – including reaction loads, jet impingement loads, and missile impact loads). • External events (including rain, snow, flood, tornado, tornado-generated missiles, and earthquake).	~~a.~~ An analysis of the EPGB structures for the design basis loads will be performed. ~~b.~~ During construction, deviations from the approved design will be analyzed for design basis loads.	A report exists which reconciles deviations during construction and concludes that the as-built EPGB structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety-related functions.~~a.~~ ~~The design of the EPGB will withstand the design basis loads without loss of structural integrity and safety related functions.~~ ~~b. Deviations from the design during construction are reconciled.~~
3.5	Portions of EPGB structures located below grade elevation are protected from external flooding by waterstops, watertight seals, and waterproofing.	An inspection of the EPGB structures will be performed.	Portions of EPGB structures located below grade elevation are protected from external flooding by waterstops, watertight seals, and waterproofing.

14.03.02-28 & 14.03.02-29

Figure 2.1.2-3—EPGB Elevation ~~Facing North~~Section A-A

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2.1.3 Nuclear Auxiliary Building

1.0 Description

The Nuclear Auxiliary Building (NAB) is a reinforced-concrete structure that houses non-safety related auxiliary systems required for normal power operation. There are no structures, systems, or components (SSC) required for safe shutdown located in the NAB. The NAB is located adjacent to the Fuel Building (FB), Safeguard Building (SB) Division 4, and Radioactive Waste Building (RWB), as shown on Figure 2.1.3-1. Information in tables and figures in this section are for information only with the exception of the specific features listed in the ITAAC for verification.

2.0 Arrangement

2.1 The NAB is located adjacent to the FB, SB Division 4, and the RWB as shown on Figure 2.1.3–1.

3.0 Key Design Features

14.03.02-38

3.1 The NAB is designed to prevent failure onto the adjacent FB or SB Division 4 under design basis SSE and tornado wind loading conditions.

3.2 Seismic separations are provided between the NAB and the NI common basemat structures as shown on Figure 2.1.3-1 with sufficient clearance to preclude seismic interaction between the NAB and NI common basemat structures.

4.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.3-1 lists the NAB ITAAC.

Table 2.1.3-1—Nuclear Auxiliary Building ITAAC

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The NAB is located adjacent to the FB, SB Division 4, and the RWB as shown on Figure 2.1.3–1.	An inspection of the NAB will be performed. 14.03.02-38	The as-installed NAB location is as shown on Figure 2.1.3-1.
3.1	The NAB is designed to prevent failure onto the adjacent FB or SB Division 4 under design basis SSE and tornado wind loading conditions.	An analysis will be performed to confirm the NAB is designed to prevent failure onto the adjacent FB or SB Division 4 under design basis SSE and tornado wind loading conditions. During construction, deviations from the approved design will be reconciled with the building analysis.~~analyzed~~.	The as-installed NAB is designed to prevent failure onto the adjacent FB or SB Division 4 under design basis SSE and tornado wind loading conditions.
3.2	Seismic separations are provided between the NAB and the NI common basemat as shown on Figure 2.1.3-1 with sufficient clearance to preclude seismic interaction between the NAB and NI common basemat structures.	An inspection of the NAB will be performed. a. An analysis will be performed based on site specific conditions to define the minimum acceptable separation. b. An inspection of the site layout for the building (prior to construction) will be performed to verify that the minimum acceptable separation is provided.	The as-installed NAB location is as shown on Figure 2.1.3-1. a. A report exists that defines the minimum acceptable separation prior to any settlement occurring. b. The site layout of the buildings provides the minimum separation required.

Next File

Table 2.1.5-3—Essential Service Water Building ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		c. Inspections of as-installed conditions of wallsbarriers, doors, dampers, and penetrations through the barriers identified in Figure 2.1.5-6, versus construction drawings of barriers, doors, dampers, and penetrations as determined in the part (b) analysis, will be performed.	c. The as-installed configuration of walls, doors, dampers and penetrations through the barriers listed in Figure 2.1.5-6 agrees with the associated construction drawings.
3.5	The ESWB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety related functions. • Normal plant operation (including dead loads, live loads, lateral earth pressure loads, hydrostatic loads, hydrodynamic loads, and temperature loads). • Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reaction, and pipe break loads – including reaction loads, jet impingement loads, and missile impact loads). • External events (including rain, snow, flood, tornado, tornado-generated missiles, and earthquake).	a. An analysis of the ESWB structures for the design basis loads will be performed. b. During construction, deviations from the approved design will be analyzed for design basis loads.	A report exists which reconciles deviations during construction and concludes that the as-built ESWB structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety-related functions.a. The design of the ESWB will withstand the design basis loads without loss of structural integrity and safety related functions. b. Deviations from the design during construction are reconciled.

14.03.02-28 & 14.03.02-29

Figure 2.1.5-4—ESWB Elevation Facing WestSection A-A

Figure 2.1.5-5—ESWB Elevation Section B-B~~Facing North~~

~~pressure capacity reported is the median pressure capacity for the vertical plane section.~~

~~The equipment hatch cover and cylinder, shown inFigure 3.8-25—Equipment Hatch General Assembly has a cover ultimate pressure capacity based on ASME Section II, Part D material specification minimum required strengths and an elastic, perfectly plastic stress-strain relationship at 400°F. The internal pressure from containment is applied to the convex surface of the cover and non-embedded portion of the cylinder. The ultimate pressure capacity reported corresponds to ASME Service Level C stress limits for the hatch cover and cylinder.~~

3.8.1.4.12 Design Report

Design information and criteria for Seismic Category I structures are provided in Sections 2.0, 2.4, 2.5, 3.3, 3.5, 3.8.1, 3.8.2, 3.8.3, 3.8.4, and 3.8.5. Design results are presented in Appendix 3E for Seismic Category I structure critical sections.

3.8.1.5 Structural Acceptance Criteria

The limits for RCB allowable stresses, strains, deformations and other design criteria are in accordance with the requirements of Subsection CC-3400 of the ASME BPV Code, Section III, Division 2 and RG 1.136 (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50). This applies to the overall containment vessel and subassemblies and appurtenances that serve a pressure retaining function, except as noted in Section 3.8.2. Specifically, allowable concrete stresses for factored loadings are in accordance with Subsection CC-3420 and those for service loads are in accordance with Subsection CC-3430.

The limits for stresses and strains in the liner plate and its anchorage components are in accordance with ASME BPV Code, Section III, Division 2, Tables CC-3720-1 and CC-3730-1.

Limits for allowable loads on concrete embedments and anchors are in accordance with Appendix B of ACI-349-2006 and guidance given in RG 1.199.

Section 3.8.1.6 describes minimum requirements for concrete, reinforcing, post-tensioning tendons, and the liner plate system for the RCB.

A SIT is performed as described in Section 3.8.1.7.1.

The RCB is stamped to signify compliance with the ASME BPV Code Section III, Division 2.

14.03.02-28 & 14.03.02-29

<u>An as-built report is prepared to summarize deviations from the approved design and confirm that the as-built RCB is capable of withstanding the design basis loads</u>

described in Section 3.8.1.3 without loss of structural integrity or safety-related functions.

14.03.02-28 &
14.03.02-29

3.8.1.6 Materials, Quality Control, and Special Construction Techniques

This section contains information relating to the materials, quality control program, and special construction techniques used in the fabrication and construction of the RCB. Materials and quality control satisfy the following requirements (GDC 1):

- ASME BPV Code – 2004 Edition, Section III, Division 2, Code for Concrete Containments/ACI Standard 359, Articles CC-2000, CC-4000, CC-5000, CC-6000, and CC-9000.
- RG 1.107, Qualifications for Cement Grouting for Prestressing Tendons in Containment Structures, Revision 1, February 1977.
- RG 1.136, Design Limits, Loading Combinations, Materials, Construction, and Testing of Concrete Containments, Revision 3, March 2007.

Concrete and reinforcement forming and placement tolerance not specifically addressed in these references are in accordance with ACI 349-01 and ACI 117-90.

3.8.1.6.1 Concrete Materials

Concrete Mix Design

The concrete mix design for the RCB conforms to the requirements specified in Subarticle CC-2230 of the ASME BPV Code, Section III, Division 2.

Structural concrete used in the construction of the RCB shell wall and dome has a minimum compressive strength (i.e., f'_c) of 7000 psi at 90 days.

Concrete mix design is determined based on field testing of trial mixtures with actual materials used. Testing evaluates:

- Ultimate concrete strength, as well as early strength in support of an aggressive construction schedule.
- Creep and shrinkage characteristics.
- Concrete workability and consistency.
- Required concrete admixtures.
- Heat of hydration and required temperature control for large or thick concrete pours.
- Special exposure requirements when identified on design drawings.

Limits for allowable stresses, strains, and deformations on steel RCS component and pipe supports, including the base plates for these supports at the face of concrete structures, are in accordance with ASME Section III Division 1, Subsection NF.

The design of RB internal structures is generally controlled by load combinations containing SSE seismic loads. Stresses and strains are within the ACI 349-2001 and ANSI/AISC N690-1994 limits.

14.03.02-28 &
14.03.02-29

Appendix 3E provides design results for critical areas of the RB internal structures.

An as-built report is prepared to summarize deviations from the approved design and confirm that the as-built RB internal structures are capable of withstanding the design basis loads described in Section 3.8.3.3 without loss of structural integrity or safety-related functions.

3.8.3.6 Materials, Quality Control, and Special Construction Techniques

This section contains information relating to the materials, quality control programs, and special construction techniques used in the fabrication and construction of concrete and steel internal structures of the RB internal structures (GDC 1).

3.8.3.6.1 Concrete Materials

Concrete materials for the RB internal structures conform to ACI 349-2001, Chapter 5, as supplemented by RG 1.142, and ACI 301-05 (GDC 1). Where required for radiation shielding, concrete conforms to RG 1.69.

Concrete Mix Design

Structural concrete used in the construction of the RB internal structures has a minimum compressive strength (i.e., f'_c) of 6000 psi at 90 days. The concrete density is between 140 pounds per cubic foot and 160 pounds per cubic foot. Poisson's ratio for the concrete is 0.17, unless otherwise justified.

Concrete mix design is determined based on field testing of trial mixtures with actual materials used.

Testing:

- Ultimate concrete strength, as well as early strength in support of an aggressive construction schedule.
- Concrete workability and consistency.
- Concrete admixtures.
- Heat of hydration and temperature control for large or thick concrete pours.

Limits for the allowable stresses, strains, deformations, and other design criteria for other structural steel Seismic Category I structures are in accordance with ANSI/AISC N690-1994 (R2004) including Supplement 2 (GDC 1, GDC 2, and GDC 4).

Allowable settlements for other Seismic Category I structures are described in Section 2.5.

The design of other Seismic Category I structures is generally controlled by load combinations containing SSE seismic loads. Stresses and strains are within the ACI 349-2001 limits, with the exceptions previously listed, and ANSI/AISC N690-1994 limits.

Appendix 3E provides design results for critical sections of other Seismic Category I structures.

14.03.02-28 &
14.03.02-29

An as-built report is prepared to summarize deviations from the approved design and confirm that the as-built other Seismic Category I structures (RSB, SB, FB, EPGB, and ESWB) are capable of withstanding the design basis loads described in Section 3.8.4.3 without loss of structural integrity or safety-related functions.

Structural acceptance criteria for buried Seismic Category I pipe are addressed in the AREVA NP Inc., U.S. Piping Analysis and Pipe Support Design Topical Report.

A COL applicant that references the U.S. EPR design certification will confirm that site-specific Seismic Category I buried conduit, electrical duct banks, pipe, and pipe ducts satisfy the criteria specified in Section 3.8.4.4.5 and those specified in the AREVA NP Inc., U.S. Piping Analysis and Pipe Support Design Topical Report.

3.8.4.6 Materials, Quality Control, and Special Construction Techniques

This section contains information relating to the materials, quality control programs, and special construction techniques used in the fabrication and construction of concrete and steel Seismic Category I structures other than the RCB and the RB internal structures.

Construction of concrete radiation shielding structures and certain elements of design that relate to problems unique to this type of structure is in accordance to RG 1.69. The requirements and recommended practices contained in ANSI/ANS-6.4-2006, are generally acceptable for the construction of radiation shielding structures, as amended by the applicable exceptions noted in RG 1.69.

3.8.4.6.1 Materials

Concrete, reinforcing steel, and structural steel materials for other Seismic Category I structures are the same as described in Section 3.8.3.6 (GDC 1), except as follows:

foundation basemat that support the RCB are within the limits in accordance with ASME BPV Code, Section III, Division 2.

Seismic Category I foundations are required to satisfy the factors of safety against overturning, sliding, and flotation defined in Table 3.8-11. The calculated minimum factors of safety for the NI Common Basemat Structure are provided in Table 3.8-12—Minimum Factors of Safety Against Overturning, Sliding, and Flotation for Foundations – NI Common Basemat Structure. ~~For the load combination containing seismic loads, the calculated minimum factors of safety are less than the values provided in NUREG-0800, for overturning and sliding of the NI Common Basemat Structure. The acceptability of these calculated values is further addressed in the following section for the NI Common Basemat Structure foundation basemat.~~

Acceptance criteria for soil conditions for the media supporting Seismic Category I foundations are addressed in Section 2.5.

Acceptance criteria for settlement for Seismic Category I foundations are addressed in Section 2.5.

14.03.02-28 & 14.03.02-29

Additional acceptance criteria for critical areas of these structures are described in Appendix 3E.

An as-built report is prepared to summarize deviations from the approved design and confirm that the as-built Seismic Category I foundations are capable of withstanding the design basis loads described in Section 3.8.5.3 without loss of structural integrity or safety-related functions.

A COL applicant that references the U.S. EPR design certification will evaluate site-specific methods for shear transfer between the foundation basemats and underlying soil for soil parameters that are not within the envelope specified in Section 2.5.4.2.

3.8.5.5.1 Nuclear Island Common Basemat Structure Foundation Basemat

Appendix 3E provides details of the design of the NI Common Basemat Structure foundation basemat critical areas.

Maximum soil bearing pressures under the NI Common Basemat Structure foundation basemat are 22,000 pounds per square foot for static loading conditions, and ~~34,560~~26,000 pounds per square foot for dynamic loading conditions.

The NI Common Basemat Structure foundation basemat for the U.S. EPR plant design can accommodate tilt settlements up to 0.5 inches in 50 feet in any direction across the basemat, as described in Section 2.5.4.10.2. Differential settlements and local settlements within the perimeter of the foundation, are not likely to affect the structure, systems, or components due to the extremely thick foundation stiffened by