

ArevaEPRDCPEm Resource

From: WELLS Russell (AREVA) [Russell.Wells@areva.com]
Sent: Monday, April 18, 2011 10:04 AM
To: Tesfaye, Getachew
Cc: CORNELL Veronica (EXTERNAL AREVA); BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 21
Attachments: RAI 354 Supplement 21 Response US EPR DC - PUBLIC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 14, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011. In Supplement 15, AREVA NP submitted a revised schedule for Question 03.08.05-22 on January 13, 2011. On February 11, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.08.02-11, 03.08.02-12, 03.08.02-13, 03.08.05-22 and 03.08.05-23. On March 3, 2011, AREVA NP submitted Supplement 17 to provide a technically correct and complete FINAL response to Question 03.08.02-12 and a revised schedule for Questions 03.08.02-11 and Question 03.08.02-13. In Supplement 18, AREVA NP submitted a revised schedule for Questions 03.06.02-33 through 03.06.02-40 on March 17, 2011. On March 29, 2011, AREVA NP submitted Supplement 19 to provide revised schedules for Question 03.08.05-22 and Question 03.08.05-23. On April 18, 2011, AREVA NP submitted Supplement 20 to provide a technically correct and complete FINAL response to Question 03.08.05-22.

The attached file, "RAI 354 Supplement 21 Response US EPR DC - PUBLIC.pdf" provides a technically correct and complete response to question 03.08.02-11, as committed. Because the response file contains security-related sensitive information that should be withheld from public disclosure in accordance with 10 CFR 2.390, a public version is provided with the security-related sensitive information redacted. This email and attached file do not contain any security-related information. An unredacted security-related 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 354 Question 03.08.02-11.

The following table indicates the respective pages in the response document, "RAI 354 Supplement 21 Response US EPR DC - PUBLIC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 — 03.08.02-11	2	5

The schedule for the technically correct and complete responses to the remaining questions is unchanged and provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-13		June 14, 2011
RAI 354 - 03.08.05-23		May 10, 2011
RAI 354 - 03.06.02-33		April 29, 2011
RAI 354 - 03.06.02-34		April 29, 2011
RAI 354 - 03.06.02-35		April 29, 2011
RAI 354 - 03.06.02-36		April 29, 2011
RAI 354 - 03.06.02-37		April 29, 2011
RAI 354 - 03.06.02-38		April 29, 2011
RAI 354 - 03.06.02-39		April 29, 2011
RAI 354 - 03.06.02-40		April 29, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Monday, April 18, 2011 9:55 AM

To: 'Tesfaye, Getachew'

Cc: CORNELL Veronica (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 20 (Part 3 of 3)

Getachew

Attached is part 3 of 3 for a response of RAI No. 354, FSAR Ch 3, Supplement 20

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Monday, April 18, 2011 9:54 AM

To: 'Tesfaye, Getachew'

Cc: CORNELL Veronica (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 20 (Part 2 of 3)

Getachew

Attached is part 2 of 3 for a response of RAI No. 354, FSAR Ch 3, Supplement 20

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Monday, April 18, 2011 9:52 AM

To: 'Tesfaye, Getachew'

Cc: CORNELL Veronica (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 20 (Part 1 of 3)

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement

13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 14, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011. In Supplement 15, AREVA NP submitted a revised schedule for Question 03.08.05-22 on January 13, 2011. On February 11, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.08.02-11, 03.08.02-12, 03.08.02-13, 03.08.05-22 and 03.08.05-23. On March 3, 2011, AREVA NP submitted Supplement 17 to provide a technically correct and complete FINAL response to Question 03.08.02-12 and a revised schedule for Questions 03.08.02-11 and Question 03.08.02-13. In Supplement 18, AREVA NP submitted a revised schedule for Questions 03.06.02-33 through 03.06.02-40 on March 17, 2011. On March 29, 2011, AREVA NP submitted Supplement 19 to provide revised schedules for Question 03.08.05-22 and Question 03.08.05-23.

The attached file, "RAI 354 Supplement 20 Response US EPR DC (1 of 3).pdf" provides a technically correct and complete response to question 03.08.05-22, as committed. Due to file size, the remaining parts will be provided in subsequent e-mails.

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 354 Question 03.08.05-22.

The following table indicates the respective pages in the response document, "RAI 354 Supplement 20 Response US EPR DC (1 of 3).pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 — 03.08.05-22	2	9

The schedule for the technically correct and complete responses to the remaining questions is unchanged and provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		April 28, 2011
RAI 354 - 03.08.02-13		June 14, 2011
RAI 354 - 03.08.05-23		May 10, 2011
RAI 354 - 03.06.02-33		April 29, 2011
RAI 354 - 03.06.02-34		April 29, 2011
RAI 354 - 03.06.02-35		April 29, 2011
RAI 354 - 03.06.02-36		April 29, 2011
RAI 354 - 03.06.02-37		April 29, 2011
RAI 354 - 03.06.02-38		April 29, 2011
RAI 354 - 03.06.02-39		April 29, 2011
RAI 354 - 03.06.02-40		April 29, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)
Sent: Tuesday, March 29, 2011 10:11 AM
To: 'Tesfaye, Getachew'
Cc: CORNELL Veronica (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 19

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 14, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011. In Supplement 15, AREVA NP submitted a revised schedule for Question 03.08.05-22 on January 13, 2011. On February 11, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.08.02-11, 03.08.02-12, 03.08.02-13, 03.08.05-22 and 03.08.05-23. On March 3, 2011, AREVA NP submitted Supplement 17 to provide a technically correct and complete FINAL response to Question 03.08.02-12 and a revised schedule for Questions 03.08.02-11 and Question 03.08.02-13. In Supplement 18, AREVA NP submitted a revised schedule for Questions 03.06.02-33 through 03.06.02-40 on March 17, 2011.

The schedule for Question 03.08.05-22 is being revised to allow AREVA NP additional time to interact with the NRC. In addition, Question 03.08.05-23 is being revised to allow AREVA NP additional time to address NRC audit comments. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		April 28, 2011
RAI 354 - 03.08.02-13		June 14, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010 (Actual)	May 10, 2011
RAI 354 - 03.08.05-23		May 10, 2011
RAI 354 - 03.06.02-33		April 29, 2011
RAI 354 - 03.06.02-34		April 29, 2011
RAI 354 - 03.06.02-35		April 29, 2011
RAI 354 - 03.06.02-36		April 29, 2011
RAI 354 - 03.06.02-37		April 29, 2011

Question #	Interim Response Date	Response Date
RAI 354 - 03.06.02-38		April 29, 2011
RAI 354 - 03.06.02-39		April 29, 2011
RAI 354 - 03.06.02-40		April 29, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Thursday, March 17, 2011 4:46 PM

To: 'Tesfaye, Getachew'

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 18

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 14, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011. In Supplement 15, AREVA NP submitted a revised schedule for Question 03.08.05-22 on January 13, 2011. On February 11, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.08.02-11, 03.08.02-12, 03.08.02-13, 03.08.05-22 and 03.08.05-23. On March 3, 2011, AREVA NP submitted Supplement 17 to provide a technically correct and complete FINAL response to Question 03.08.02-12 and a revised schedule for Questions 03.08.02-11 and Question 03.08.02-13.

The schedule for Questions 03.06.02-33 through 03.06.02-40 has been revised In order to allow time for interaction with the NRC. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		April 28, 2011
RAI 354 - 03.08.02-13		June 14, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010 (Actual)	March 31, 2011
RAI 354 - 03.08.05-23		March 31, 2011
RAI 354 - 03.06.02-33		April 29, 2011
RAI 354 - 03.06.02-34		April 29, 2011
RAI 354 - 03.06.02-35		April 29, 2011
RAI 354 - 03.06.02-36		April 29, 2011
RAI 354 - 03.06.02-37		April 29, 2011
RAI 354 - 03.06.02-38		April 29, 2011
RAI 354 - 03.06.02-39		April 29, 2011
RAI 354 - 03.06.02-40		April 29, 2011

Sincerely,

Russ Wells

*U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.*

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Thursday, March 03, 2011 6:10 PM

To: 'Tesfaye, Getachew'

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 17

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17

questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 14, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011. In Supplement 15, AREVA NP submitted a revised schedule for Question 03.08.05-22 on January 13, 2011. On February 11, 2011, AREVA NP submitted Supplement 16 to provide a revised schedule for Questions 03.08.02-11, 03.08.02-12, 03.08.02-13, 03.08.05-22 and 03.08.05-23.

The attached file, "RAI 354 Supplement 17 Response US EPR DC.pdf" provides a technically correct and complete FINAL response to the Question 03.08.02-12, as committed.

The following table indicates the page in the response document, "RAI 354 Supplement 17 Response US EPR DC.pdf" that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 – 03.08.02-12	2	3

The schedule for Question 03.08.02-11 and Question 03.08.02-13 is being revised to allow AREVA NP additional time to address NRC audit comments. The schedule for the remaining question is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		April 28, 2011
RAI 354 - 03.08.02-13		June 14, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010 (Actual)	March 31, 2011
RAI 354 - 03.08.05-23		March 31, 2011
RAI 354 - 03.06.02-33		March 31, 2011
RAI 354 - 03.06.02-34		March 31, 2011
RAI 354 - 03.06.02-35		March 31, 2011
RAI 354 - 03.06.02-36		March 31, 2011
RAI 354 - 03.06.02-37		March 31, 2011
RAI 354 - 03.06.02-38		March 31, 2011
RAI 354 - 03.06.02-39		March 31, 2011
RAI 354 - 03.06.02-40		March 31, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)
Sent: Friday, February 11, 2011 1:20 PM
To: 'Tesyfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 16

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 14, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011. In Supplement 15, AREVA NP submitted a revised schedule for Question 03.08.05-22 on January 13, 2011.

The schedule for Questions 03.08.02-11, 03.08.02-12, 03.08.02-13, and 03.08.05-22 has changed. The schedule for Question 03.08.05-23 is being revised to allow AREVA NP additional time to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		March 4, 2011
RAI 354 - 03.08.02-12		March 4, 2011
RAI 354 - 03.08.02-13		March 4, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010 (Actual)	March 31, 2011
RAI 354 - 03.08.05-23		March 31, 2011
RAI 354 - 03.06.02-33		March 31, 2011
RAI 354 - 03.06.02-34		March 31, 2011
RAI 354 - 03.06.02-35		March 31, 2011
RAI 354 - 03.06.02-36		March 31, 2011

Question #	Interim Response Date	Response Date
RAI 354 - 03.06.02-37		March 31, 2011
RAI 354 - 03.06.02-38		March 31, 2011
RAI 354 - 03.06.02-39		March 31, 2011
RAI 354 - 03.06.02-40		March 31, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)

Sent: Thursday, January 13, 2011 5:34 PM

To: 'Tefaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 15

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on January 7, 2011.

The schedule for Question 03.08.05-22 is being revised to allow AREVA NP additional time for to address NRC feedback. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		February 15, 2011
RAI 354 - 03.08.02-12		February 15, 2011
RAI 354 - 03.08.02-13		February 15, 2011

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010	March 17, 2011
RAI 354 - 03.08.05-23		February 15, 2011
RAI 354 - 03.06.02-33		March 31, 2011
RAI 354 - 03.06.02-34		March 31, 2011
RAI 354 - 03.06.02-35		March 31, 2011
RAI 354 - 03.06.02-36		March 31, 2011
RAI 354 - 03.06.02-37		March 31, 2011
RAI 354 - 03.06.02-38		March 31, 2011
RAI 354 - 03.06.02-39		March 31, 2011
RAI 354 - 03.06.02-40		March 31, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)

Sent: Friday, January 07, 2011 2:57 PM

To: Tesfaye, Getachew

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 14

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23. On November 22, 2010, AREVA NP submitted Supplement 13 to provide an INTERIM response to Question 03.08.05-22 and a new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12.

The schedule for Question 03.08.05-23 is being revised to allow additional time for AREVA NP to interact with the NRC. The schedule for the remaining questions is unchanged. Please note that in Supplement 13 the information for Questions 03.06.02-33 through 40 was inadvertently not included in the table, but it has been now been added back.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		February 15, 2011
RAI 354 - 03.08.02-12		February 15, 2011
RAI 354 - 03.08.02-13		February 15, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010	January 13, 2011
RAI 354 - 03.08.05-23		February 15, 2011
RAI 354 - 03.06.02-33		March 31, 2011
RAI 354 - 03.06.02-34		March 31, 2011
RAI 354 - 03.06.02-35		March 31, 2011
RAI 354 - 03.06.02-36		March 31, 2011
RAI 354 - 03.06.02-37		March 31, 2011
RAI 354 - 03.06.02-38		March 31, 2011
RAI 354 - 03.06.02-39		March 31, 2011
RAI 354 - 03.06.02-40		March 31, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)

Sent: Monday, November 22, 2010 7:40 PM

To: 'Tefaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 13

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5,

2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13. On November 17, 2010, AREVA NP submitted Supplement 12 to provide a revised schedule for Questions 03.06.02-33 through 03.06.02-40 and 03.08.05-23.

The attached file, "RAI 354 Supplement 13 Response US EPR DC-INTERIM.pdf" provides a technically correct and complete INTERIM response to question 03.08.05-22, as committed.

Appended to this file are the affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 354 Supplement 13 question 03.08.05-22.

The following table indicates the respective pages in the response document, "RAI 354 Supplement 13 Response US EPR DC-INTERIM.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 — 03.08.05-22	2	11

A new schedule for supplemental responses to Questions 03.08.02-11 and 03.08.02-12 is added. The supplemental responses will address open items identified during the NRC October 28-29, 2010, containment appurtenances audit. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-11		February 15, 2011
RAI 354 - 03.08.02-12		February 15, 2011
RAI 354 - 03.08.02-13		February 15, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010 (Actual)	January 13, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Wednesday, November 17, 2010 11:35 AM
To: 'Tsfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); WELLS Russell (RS/NB); 'Miernicki, Michael'
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 12

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010 and Supplement 11 on November 1, 2010 to provide a revised schedule for the response to Question 03.08.02-13.

A meeting with NRC regarding Questions 03.06.02-33 through 03.06.02-40 was held on November 1, 2010. As a result of that meeting the schedule for the final response to Questions 03.06.02-33 through 03.06.02-40 is being revised to allow additional time for AREVA NP to address NRC comments. Additionally, AREVA plans to prepare a technical report to be submitted with the final response to reflect the information on jet impingement that has been provided to NRC in the RAI responses and the meeting on November 1, 2010. The schedule for Question 03.08.05-23 is also being revised to allow additional time for AREVA NP to interact with the NRC. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-13		February 15, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010	January 13, 2011
RAI 354 - 03.08.05-23		January 7, 2011
RAI 354 - 03.06.02-33		March 31, 2011
RAI 354 - 03.06.02-34		March 31, 2011
RAI 354 - 03.06.02-35		March 31, 2011
RAI 354 - 03.06.02-36		March 31, 2011
RAI 354 - 03.06.02-37		March 31, 2011
RAI 354 - 03.06.02-38		March 31, 2011
RAI 354 - 03.06.02-39		March 31, 2011
RAI 354 - 03.06.02-40		March 31, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, November 01, 2010 5:39 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 11

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010. AREVA NP submitted Supplement 10 on October 7, 2010, to provide a revised schedule for the response to Question 03.08.02-13.

The schedule for Question 03.08.02-13 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-13		February 15, 2011
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010	January 13, 2011
RAI 354 - 03.08.05-23		November 18, 2010
RAI 354 - 03.06.02-33		November 18, 2010
RAI 354 - 03.06.02-34		November 18, 2010
RAI 354 - 03.06.02-35		November 18, 2010
RAI 354 - 03.06.02-36		November 18, 2010
RAI 354 - 03.06.02-37		November 18, 2010
RAI 354 - 03.06.02-38		November 18, 2010
RAI 354 - 03.06.02-39		November 18, 2010
RAI 354 - 03.06.02-40		November 18, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)

Sent: Thursday, October 07, 2010 2:41 PM

To: 'Tesfaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 10

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8. In Supplement 9, AREVA NP submitted a revised schedule for Question 03.08.05-23 on October 1, 2010.

The attached file, "RAI 354 Supplement 10 Response US EPR DC.pdf" provides a technically correct and complete FINAL response to Question 03.08.05-21, as committed. The following table indicates the respective pages in the response document, "RAI 354 Supplement 10 Response US EPR DC.pdf," that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 - 03.08.05-21	2	3

The schedule for a revised INTERIM response to Question 03.08.05-22 is added to provide the NRC additional information on AREVA NP's settlement approach. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-13		November 1, 2010
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010) November 22, 2010	January 13, 2011
RAI 354 - 03.08.05-23		November 18, 2010
RAI 354 - 03.06.02-33		November 18, 2010
RAI 354 - 03.06.02-34		November 18, 2010
RAI 354 - 03.06.02-35		November 18, 2010
RAI 354 - 03.06.02-36		November 18, 2010
RAI 354 - 03.06.02-37		November 18, 2010

Question #	Interim Response Date	Response Date
RAI 354 - 03.06.02-38		November 18, 2010
RAI 354 - 03.06.02-39		November 18, 2010
RAI 354 - 03.06.02-40		November 18, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)

Sent: Friday, October 01, 2010 2:31 PM

To: 'Tefsaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 9

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21. On September 13, 2010, AREVA NP provided an INTERIM response to Question 03.08.05-22 in Supplement 8.

The schedule for Question 03.08.05-23 is being revised to allow additional time for AREVA NP to interact with the NRC. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-13		November 1, 2010
RAI 354 - 03.08.05-21		October 7, 2010
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010)	January 13, 2011
RAI 354 - 03.08.05-23		November 18, 2010
RAI 354 - 03.06.02-33		November 18, 2010
RAI 354 - 03.06.02-34		November 18, 2010
RAI 354 - 03.06.02-35		November 18, 2010
RAI 354 - 03.06.02-36		November 18, 2010
RAI 354 - 03.06.02-37		November 18, 2010
RAI 354 - 03.06.02-38		November 18, 2010

Question #	Interim Response Date	Response Date
RAI 354 - 03.06.02-39		November 18, 2010
RAI 354 - 03.06.02-40		November 18, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, September 13, 2010 5:09 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 8

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010, AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. AREVA NP submitted Supplement 6 on August 31, 2010, to provide final responses to 5 of the remaining 17 questions. On September 8, 2010, AREVA NP submitted Supplement 7 to provide a revised schedule for the response to Question 03.08.05-21.

AREVA NP recently notified the NRC of its intent to submit an INTERIM response to Question 03.08.05-22. The attached file, "RAI 354 Supplement 8 Response US EPR DC-INTERIM.pdf" provides a technically correct and complete INTERIM response to Question 03.08.05-22, as committed. The schedule for the remaining questions is unchanged.

The following table indicates the respective pages in the response document, RAI 354 Supplement 8 Response US EPR DC - INTERIM.pdf," that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 - 03.08.05-22	2	3

The revised schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Interim Response Date	Response Date
RAI 354 - 03.08.02-13		November 1, 2010
RAI 354 - 03.08.05-21		October 7, 2010
RAI 354 - 03.08.05-22	September 15, 2010 (Actual September 13, 2010)	January 13, 2011
RAI 354 - 03.08.05-23		October 1, 2010

Question #	Interim Response Date	Response Date
RAI 354 - 03.06.02-33		November 18, 2010
RAI 354 - 03.06.02-34		November 18, 2010
RAI 354 - 03.06.02-35		November 18, 2010
RAI 354 - 03.06.02-36		November 18, 2010
RAI 354 - 03.06.02-37		November 18, 2010
RAI 354 - 03.06.02-38		November 18, 2010
RAI 354 - 03.06.02-39		November 18, 2010
RAI 354 - 03.06.02-40		November 18, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Wednesday, September 08, 2010 6:09 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); 'Miernicki, Michael'; CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 7

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010 AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5. On August 31, 2010, AREVA NP submitted final responses to 5 of the remaining 17 questions.

The schedule for Question 03.08.05-21 is being revised to allow additional time for AREVA NP to interact with the NRC on the draft response. The schedule for the remaining questions is unchanged.

The schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Response Date
RAI 354 - 03.08.02-13	November 1, 2010
RAI 354 - 03.08.05-21	October 7, 2010
RAI 354 - 03.08.05-22	January 13, 2011
RAI 354 - 03.08.05-23	October 1, 2010
RAI 354 - 03.06.02-33	November 18, 2010
RAI 354 - 03.06.02-34	November 18, 2010
RAI 354 - 03.06.02-35	November 18, 2010

Question #	Response Date
RAI 354 - 03.06.02-36	November 18, 2010
RAI 354 - 03.06.02-37	November 18, 2010
RAI 354 - 03.06.02-38	November 18, 2010
RAI 354 - 03.06.02-39	November 18, 2010
RAI 354 - 03.06.02-40	November 18, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Tuesday, August 31, 2010 4:28 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 6

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40. On August 5, 2010 AREVA NP provided a revised schedule for Questions 03.06.02-42 and 03.08.05-23 in Supplement 5.

The attached file, "RAI 354 Supplement 6 Response US EPR DC.pdf" provides technically correct and complete FINAL responses to Questions 03.06.02-42 and 03.08.02-11 to 03.08.02-15, as committed. Because the response file contains security-related sensitive information that should be withheld from public disclosure in accordance with 10 CFR 2.390, a public version is provided with the security-related sensitive information redacted. This email and attached file do not contain any security-related information. An unredacted security-related 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 354 Supplement 6.

The schedule for Question 03.08.02-13 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining questions is unchanged.

The following table indicates the respective pages in the response document, RAI 354 Supplement 6 Response US EPR DC.pdf," that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 354 - 03.08.02-11	2	4
RAI 354 - 03.08.02-12	5	6
RAI 354 - 03.08.02-14	7	8

RAI 354 - 03.08.02-15	9	10
RAI 354 - 03.06.02-42	11	12

The revised schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Response Date
RAI 354 - 03.08.02-13	November 1, 2010
RAI 354 - 03.08.05-21	September 8, 2010
RAI 354 - 03.08.05-22	January 13, 2011
RAI 354 - 03.08.05-23	October 1, 2010
RAI 354 - 03.06.02-33	November 18, 2010
RAI 354 - 03.06.02-34	November 18, 2010
RAI 354 - 03.06.02-35	November 18, 2010
RAI 354 - 03.06.02-36	November 18, 2010
RAI 354 - 03.06.02-37	November 18, 2010
RAI 354 - 03.06.02-38	November 18, 2010
RAI 354 - 03.06.02-39	November 18, 2010
RAI 354 - 03.06.02-40	November 18, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Thursday, August 05, 2010 6:23 PM
To: 'Tefaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (EXT); WELLS Russell (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 5

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions. AREVA NP submitted Supplement 4 on July 30, 2010, to provide final responses to Questions 03.06.02-32, 03.06.02-41 and 03.08.02-16 and a revised schedule for Questions 03.06.02-33 through 03.06.02-40.

The schedule for Questions 03.06.02-42 and 03.08.05-23 is being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining 15 questions is unchanged.

The revised schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Response Date
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Question #	Response Date
RAI 354 - 03.08.02-11	August 31, 2010
RAI 354 - 03.08.02-12	August 31, 2010
RAI 354 - 03.08.02-13	August 31, 2010
RAI 354 - 03.08.02-14	August 31, 2010
RAI 354 - 03.08.02-15	August 31, 2010
RAI 354 - 03.08.05-21	September 8, 2010
RAI 354 - 03.08.05-22	January 13, 2011
RAI 354 - 03.08.05-23	October 1, 2010
RAI 354 - 03.06.02-33	November 18, 2010
RAI 354 - 03.06.02-34	November 18, 2010
RAI 354 - 03.06.02-35	November 18, 2010
RAI 354 - 03.06.02-36	November 18, 2010
RAI 354 - 03.06.02-37	November 18, 2010
RAI 354 - 03.06.02-38	November 18, 2010
RAI 354 - 03.06.02-39	November 18, 2010
RAI 354 - 03.06.02-40	November 18, 2010
RAI 354 - 03.06.02-42	August 31, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Thursday, July 29, 2010 7:40 PM
To: 'Tefaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); ROMINE Judy (AREVA NP INC); CORNELL Veronica (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions. Supplement 2 was submitted on June 24, 2010, and included a revised schedule for Questions 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23. AREVA NP submitted Supplement 3 on July 7, 2010, responding to 1 of the remaining 21 questions.

The attached file, "RAI 354 Supplement 4 Response U.S. EPR DC.pdf" provides technically correct and complete responses to Questions 03.06.02-32, 03.06.02-41, and 03.08.02-16. Because the response file contains security-related sensitive information that should be withheld from public disclosure in accordance with 10 CFR 2.390, a public version is provided with the security-related sensitive information redacted. This email and attached file do not contain any security-related information. An unredacted security-related version is provided under separate email.

The schedules for Questions 03.06.02-33 through 03.06.02-40 are being revised to allow additional time for AREVA NP to address NRC comments. The schedule for the remaining 9 questions is unchanged.

The following table indicates the respective pages in the response document, "RAI 354 Supplement 4 Response U.S. EPR DC," that contain the AREVA NP response to the subject questions.

Question #	Start Page	End Page
RAI 354 - 03.06.02-32	2	3
RAI 354 - 03.06.02-41	4	6
RAI 354 - 03.08.02-16	7	7

The revised schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Response Date
RAI 354 - 03.08.02-11	August 31, 2010
RAI 354 - 03.08.02-12	August 31, 2010
RAI 354 - 03.08.02-13	August 31, 2010
RAI 354 - 03.08.02-14	August 31, 2010
RAI 354 - 03.08.02-15	August 31, 2010
RAI 354 - 03.08.05-21	September 8, 2010
RAI 354 - 03.08.05-22	January 13, 2011
RAI 354 - 03.08.05-23	August 10, 2010
RAI 354 - 03.06.02-33	November 18, 2010
RAI 354 - 03.06.02-34	November 18, 2010
RAI 354 - 03.06.02-35	November 18, 2010
RAI 354 - 03.06.02-36	November 18, 2010
RAI 354 - 03.06.02-37	November 18, 2010
RAI 354 - 03.06.02-38	November 18, 2010
RAI 354 - 03.06.02-39	November 18, 2010
RAI 354 - 03.06.02-40	November 18, 2010
RAI 354 - 03.06.02-42	August 5, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Wednesday, July 07, 2010 5:27 PM
To: 'Teshfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); CORNELL Veronica (EXT); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 on June 3, 2010, to provide a schedule for the remaining 21 questions.

On June 9, 2010, AREVA NP submitted draft Supplement 2 responses to questions 03.08.05-20, 03.08.05-21, 03.06.02-32, 03.06.02-41 and 03.06.02-42. Supplement 2 was submitted on June 24, 2010, and included a revised schedule to reflect the civil/structural re-planning activities and time allowance to interact with the NRC on the responses for 03.08.02-11, 12, 13, 14, 15, 16; 03.08.05-22 and 03.08.05-23.

The attached file, "RAI 354 Response U.S. EPR DC.pdf" provides a technically correct and complete response to Question 03.08.05-20.

The schedule for Question 03.08.05-21 is being revised to accommodate development of a revised response and to allow time to interact with the NRC on the response. The schedule for Questions 03.06.02-32, 03.06.02-41 and 03.06.02-42 is also being revised to provide additional time to interact with the NRC on the responses. The schedule for the remaining 16 questions is unchanged.

The following table indicates the respective pages in the response document, "RAI 354 Response U.S. EPR DC," that contain the AREVA NP response to the subject questions.

Question #	Start Page	End Page
RAI 354 — 03.08.05-20	2	3

The revised schedule for the technically correct and complete responses to the remaining questions is provided below.

Question #	Response Date
RAI 354 - 03.08.02-11	August 31, 2010
RAI 354 - 03.08.02-12	August 31, 2010
RAI 354 - 03.08.02-13	August 31, 2010
RAI 354 - 03.08.02-14	August 31, 2010
RAI 354 - 03.08.02-15	August 31, 2010
RAI 354 - 03.08.02-16	August 10, 2010
RAI 354 - 03.08.05-21	September 8, 2010
RAI 354 - 03.08.05-22	January 13, 2011
RAI 354 - 03.08.05-23	August 10, 2010
RAI 354 - 03.06.02-32	August 5, 2010
RAI 354 - 03.06.02-33	July 30, 2010
RAI 354 - 03.06.02-34	July 30, 2010
RAI 354 - 03.06.02-35	July 30, 2010
RAI 354 - 03.06.02-36	July 30, 2010
RAI 354 - 03.06.02-37	July 30, 2010
RAI 354 - 03.06.02-38	July 30, 2010
RAI 354 - 03.06.02-39	July 30, 2010
RAI 354 - 03.06.02-40	July 30, 2010
RAI 354 - 03.06.02-41	August 5, 2010
RAI 354 - 03.06.02-42	August 5, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Thursday, June 24, 2010 12:29 PM
To: 'Tesfaye, Getachew'
Cc: ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); CORNELL Veronica (EXT); VAN NOY Mark (EXT); RYAN Tom (AREVA NP INC); GARDNER George Darrell (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. AREVA NP submitted Supplement 1 to the response on June 3, 2010, to provide a schedule for the remaining 21 questions, one of which was affected by the work underway to address NRC comments from the April 26, 2010, audit.

Based upon the civil/structural re-planning activities and revised RAI response schedule presented to the NRC during the June 9, 2010, Public Meeting, and to allow time to interact with the NRC on the responses, the schedule for questions 03.08.02-11, 12, 13, 14, 15, 16, 03.08.05-22 and 03.08.05-23 has been changed. The schedule for the remaining 13 questions remains unchanged.

The revised schedule for the technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 354 - 03.08.02-11	August 31
RAI 354 - 03.08.02-12	August 31
RAI 354 - 03.08.02-13	August 31
RAI 354 - 03.08.02-14	August 31
RAI 354 - 03.08.02-15	August 31
RAI 354 - 03.08.02-16	August 10, 2010
RAI 354 - 03.08.05-20	July 7, 2010
RAI 354 - 03.08.05-21	July 7, 2010
RAI 354 - 03.08.05-22	January 13, 2011
RAI 354 - 03.08.05-23	August 10, 2010
RAI 354 - 03.06.02-32	July 7, 2010
RAI 354 - 03.06.02-33	July 30, 2010
RAI 354 - 03.06.02-34	July 30, 2010
RAI 354 - 03.06.02-35	July 30, 2010
RAI 354 - 03.06.02-36	July 30, 2010
RAI 354 - 03.06.02-37	July 30, 2010
RAI 354 - 03.06.02-38	July 30, 2010
RAI 354 - 03.06.02-39	July 30, 2010
RAI 354 - 03.06.02-40	July 30, 2010
RAI 354 - 03.06.02-41	July 7, 2010
RAI 354 - 03.06.02-42	July 7, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Thursday, June 03, 2010 6:39 PM
To: 'Tefaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT); CORNELL Veronica (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a response to 1 of the 22 questions of RAI No. 354 on April 15, 2010, and a schedule for the remaining 21 questions. The schedule for questions 03.08.02-11 through 15 is not being changed by this supplement. To allow time to interact with the NRC, the schedule for 16 questions is being changed. The date provided below for question 03.08.05-22 will be revised based on the information that will be presented at the June 9, 2010 public meeting and subsequent NRC feedback.

Question #	Response Date
RAI 354 - 03.08.02-11	July 30, 2010
RAI 354 - 03.08.02-12	July 30, 2010
RAI 354 - 03.08.02-13	July 30, 2010
RAI 354 - 03.08.02-14	July 30, 2010
RAI 354 - 03.08.02-15	July 30, 2010
RAI 354 - 03.08.02-16	July 30, 2010
RAI 354 - 03.08.05-20	July 7, 2010
RAI 354 - 03.08.05-21	July 7, 2010
RAI 354 - 03.08.05-22	July 30, 2010
RAI 354 - 03.08.05-23	July 30, 2010
RAI 354 - 03.06.02-32	July 7, 2010
RAI 354 - 03.06.02-33	July 30, 2010
RAI 354 - 03.06.02-34	July 30, 2010
RAI 354 - 03.06.02-35	July 30, 2010
RAI 354 - 03.06.02-36	July 30, 2010
RAI 354 - 03.06.02-37	July 30, 2010
RAI 354 - 03.06.02-38	July 30, 2010
RAI 354 - 03.06.02-39	July 30, 2010
RAI 354 - 03.06.02-40	July 30, 2010
RAI 354 - 03.06.02-41	July 7, 2010
RAI 354 - 03.06.02-42	July 7, 2010

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Thursday, April 15, 2010 5:46 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 354 Response US EPR DC.pdf" provides technically correct and complete responses to 1 of the 22 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 354 Question 03.08.05-19.

The following table indicates the respective pages in the response document, "RAI 354 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 354 - 03.08.02-11	2	2
RAI 354 - 03.08.02-12	3	3
RAI 354 - 03.08.02-13	4	4
RAI 354 - 03.08.02-14	5	5
RAI 354 - 03.08.02-15	6	6
RAI 354 - 03.08.02-16	7	7
RAI 354 - 03.08.05-19	8	8
RAI 354 - 03.08.05-20	9	9
RAI 354 - 03.08.05-21	10	10
RAI 354 - 03.08.05-22	11	11
RAI 354 - 03.08.05-23	12	12
RAI 354 - 03.06.02-32	13	13
RAI 354 - 03.06.02-33	14	14
RAI 354 - 03.06.02-34	15	15
RAI 354 - 03.06.02-35	16	16
RAI 354 - 03.06.02-36	17	17
RAI 354 - 03.06.02-37	18	18
RAI 354 - 03.06.02-38	19	19
RAI 354 - 03.06.02-39	20	20
RAI 354 - 03.06.02-40	21	21
RAI 354 - 03.06.02-41	22	22
RAI 354 - 03.06.02-42	23	24

A complete answer is not provided for 21 of the 22 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 354 - 03.08.02-11	July 30, 2010
RAI 354 - 03.08.02-12	July 30, 2010
RAI 354 - 03.08.02-13	July 30, 2010
RAI 354 - 03.08.02-14	July 30, 2010
RAI 354 - 03.08.02-15	July 30, 2010
RAI 354 - 03.08.02-16	June 3, 2010
RAI 354 - 03.08.05-20	June 3, 2010
RAI 354 - 03.08.05-21	June 3, 2010
RAI 354 - 03.08.05-22	June 3, 2010
RAI 354 - 03.08.05-23	June 3, 2010
RAI 354 - 03.06.02-32	June 3, 2010
RAI 354 - 03.06.02-33	June 3, 2010
RAI 354 - 03.06.02-34	June 3, 2010
RAI 354 - 03.06.02-35	June 3, 2010
RAI 354 - 03.06.02-36	June 3, 2010
RAI 354 - 03.06.02-37	June 3, 2010
RAI 354 - 03.06.02-38	June 3, 2010
RAI 354 - 03.06.02-39	June 3, 2010
RAI 354 - 03.06.02-40	June 3, 2010
RAI 354 - 03.06.02-41	June 3, 2010
RAI 354 - 03.06.02-42	June 3, 2010

Sincerely,

Martin (Marty) C. Bryan
Licensing Advisory Engineer
AREVA NP Inc.
Tel: (434) 832-3016
Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]

Sent: Tuesday, March 16, 2010 12:29 PM

To: ZZ-DL-A-USEPR-DL

Cc: Xu, Jim; Hawkins, Kimberly; Ng, Ching; Dixon-Herrity, Jennifer; Miernicki, Michael; Patel, Jay; Colaccino, Joseph; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 354 (4106,4107,4220), FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on January 8, 2010, and discussed with your staff on February 25, 2010. Drat RAI Questions 03.08.05-23 was 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: 2860

Mail Envelope Properties (1F1CC1BBDC66B842A46CAC03D6B1CD41043EE153)

Subject: Response to U.S. EPR Design Certification Application RAI No. 354, FSAR Ch. 3, Supplement 21
Sent Date: 4/18/2011 10:03:39 AM
Received Date: 4/18/2011 10:03:57 AM
From: WELLS Russell (AREVA)

Created By: Russell.Wells@areva.com

Recipients:

"CORNELL Veronica (EXTERNAL AREVA)" <Veronica.Cornell.ext@areva.com>

Tracking Status: None

"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>

Tracking Status: None

"DELANO Karen (AREVA)" <Karen.Delano@areva.com>

Tracking Status: None

"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>

Tracking Status: None

"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>

Tracking Status: None

"Tsfaye, Getachew" <Getachew.Tsfaye@nrc.gov>

Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	Size	Date & Time
MESSAGE	77749	4/18/2011 10:03:57 AM
RAI 354 Supplement 21 Response US EPR DC - PUBLIC.pdf		1399596

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

Response to
Request for Additional Information No. 354, Supplement 21

3/16/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.08.02 - Steel Containment
SRP Section: 03.08.05 - Foundations
SRP Section: 03.06.02 - Determination of Rupture Locations and Dynamic Effects
Associated with the Postulated Rupture of Piping

Application Section: FSAR Ch 3

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

Question 03.08.02-11:**Follow-up to RAI 155, Question Nos. 03.08.02-1, 03.08.02-2, and 03.08.02-5**

The containment structure is the most important structure for mitigating the consequences of an accident and protecting the public from radiation exposure. Of all the safety-related structures, the design of the containment structure is the most critical, and requires the highest level of staff review. For the staff to complete its assessment of the containment structure, the design details and design calculations for the equipment hatch, the air locks, the closure for the construction opening, and the high energy piping penetrations need to be completed. In addition, the preliminary design should be developed for the steel components of the fuel transfer tube and representative penetrations (electrical and mechanical) that fall within the jurisdictional boundary of ASME Section III, Subsection NE.

Since the responses to RAIs 03.08.02-1, -2, and -5 did not provide a sufficient description summarizing the design of penetrations, the staff requests that the applicant submit the following information for the equipment hatch, the air locks, the closure for the construction opening, and the high energy piping penetrations that fall within the jurisdictional boundary of ASME Section III, Subsection NE:

- (1) material(s) of construction and detailed geometry;
- (2) description of the design-basis analyses conducted;
- (3) summary of the analysis results; and
- (4) comparison of results to ASME Section III, Subsection NE acceptance criteria.

This information should also be included in FSAR Section 3.8.2. The applicable detailed calculations should be available for staff review at a future audit.

Response to Question 03.08.02-11:

The containment penetrations for the personnel and emergency airlocks, closure for the construction opening, equipment hatch, main steam and feedwater piping, and fuel transfer tube have been evaluated to verify the integrity of the containment pressure boundary. The U.S. EPR design also includes a 36-inch diameter spare containment penetration that is dedicated for post-accident conditions as described in U.S. EPR FSAR Tier 2, Section 19.2.3.3.8. Additional discussion of the dedicated spare penetration will be added to U.S. EPR FSAR Tier 2, Section 3.8.2.4.1, and Figure 3.8-119 is revised to show the detail of the dedicated spare penetration.

The portions of the spare penetration for containment filtered pressure release that fall under the jurisdiction of ASME BPV, Subsection NE are bounded by the construction opening closure. The spare penetration has the same cap thickness, but a smaller opening size compared to the construction opening closure. Therefore, the stresses in the NE portions of the spare penetration are bounded by the stresses calculated for the construction closure opening.

The portions of the spare penetration for containment filtered pressure release that fall under the jurisdiction of ASME BPV, Subsection CC are bounded by the main steam line penetration. The spare penetration is located at a similar elevation, has the same thickness, but a smaller opening size compared to the main steam line penetration. Therefore, the strains induced in the CC portions of the spare penetration are bounded by the strains calculated for the main steam line.

The main steam and main feedwater lines are the largest high energy containment penetrations. These lines are the controlling process pipe penetrations for qualification from the perspective of energy content, buckling, seismic loading, and concrete loading on the penetration. There are four (4) each of the main steam and main feedwater lines. One main steam penetration and one main feedwater penetration are analyzed. The loading selected for each of the analyses is the maximum of the four lines.

A pipe break hazards analysis has been performed for the U.S. EPR design and local dynamic impact loads, such as pipe whip, missile impact, and jet impingement, are not applicable to the containment penetrations. The COL applicant is required to perform an as-built pipe break hazards analysis which will ensure the containment penetrations are protected from dynamic loads per COL Information Items 3.6-1 and 3.6-2. U.S. EPR FSAR Tier 1, Section 3.8 includes an ITAAC item that addresses the dynamic and environmental effects of piping systems.

SA-516, Grade 70 material is used for the major components, such as the shell and containment liner sleeve penetration assemblies, that interface with containment. Dimensional information used in the evaluations is based on U.S. EPR FSAR Tier 2, Figures 3.8-25 3.8-26, 3.8-27, 3.8-31, 3.8-119, 3.8-120 and 3.8-123, and information supported by AREVA NP design specifications.

Analysis methods use finite element modeling techniques to represent the penetration assemblies and interfaces at the containment boundary. Figure 03.08.02-11-1 is used to evaluate the personnel and emergency airlocks. Loads and load combinations for design, testing, and Service Levels A, B, C, and D are evaluated. Load cases consider conditions of operations, such as inner hatch closed or open, loadings associated with ancillary equipment of the penetration such as hatch doors, and built-up floors.

The stresses induced by the concrete displacements on ASME, Subsection NE, Class MC components are displacement limited and hence secondary in nature. Therefore, the qualification of the design for primary stress criteria does not consider the effects of concrete displacement. Also, the concrete displacements are non-cyclical. Ratcheting and fatigue failure of the penetrations due to concrete displacements are therefore not evaluated. Since the containment is tensioned prior to the installation of the penetrations with exception of the personnel airlocks and the penetration sleeves, the concrete displacements are not included in the evaluation of the Class MC components. There is adequate flexibility in the connection of the personnel airlock so that the concrete displacements do not affect the airlock penetration. The concrete displacements are considered for the qualification of the ASME, Subsection CC sleeve components. U.S. EPR FSAR Tier 2, Section 3.8.2.4 is revised to describe the stresses induced by concrete displacements.

The combustible gas loads identified in U.S. EPR FSAR Tier 2, Sections 3.8.1 and 3.8.2 are considered in the stress analysis of the penetrations. U.S. EPR FSAR Tier 2, Table 1.9-2 will

be revised to add RG 1.216. The design and analysis discussion about combustible gas loading in U.S. EPR FSAR Tier 2, Section 3.8.1.3 will be moved to U.S. EPR FSAR Tier 2, Section 3.8.1.4. The combustible gas load combination will be added to U.S. EPR FSAR Tier 2, Section 3.8.1.3. U.S. EPR FSAR Tier 2, Sections 3.8.1.2.5, 3.8.1.4.11, 3.8.2.2.5, and 3.8.2.5 will be revised to add a reference to R.G. 1.216. The design and analysis discussion about combustible gas loading in U.S. EPR FSAR Tier 2, Section 3.8.2.3.1 will be moved to U.S. EPR FSAR Tier 2, Section 3.8.2.4 and RG 1.216.

The US EPR design does not include a carbon dioxide inerting gas system. Therefore, the reference to carbon dioxide will be removed from the combustible gas load description in U.S. EPR FSAR Tier 2, Section 3.8.1.3.1 and Section 3.8.2.3.1.

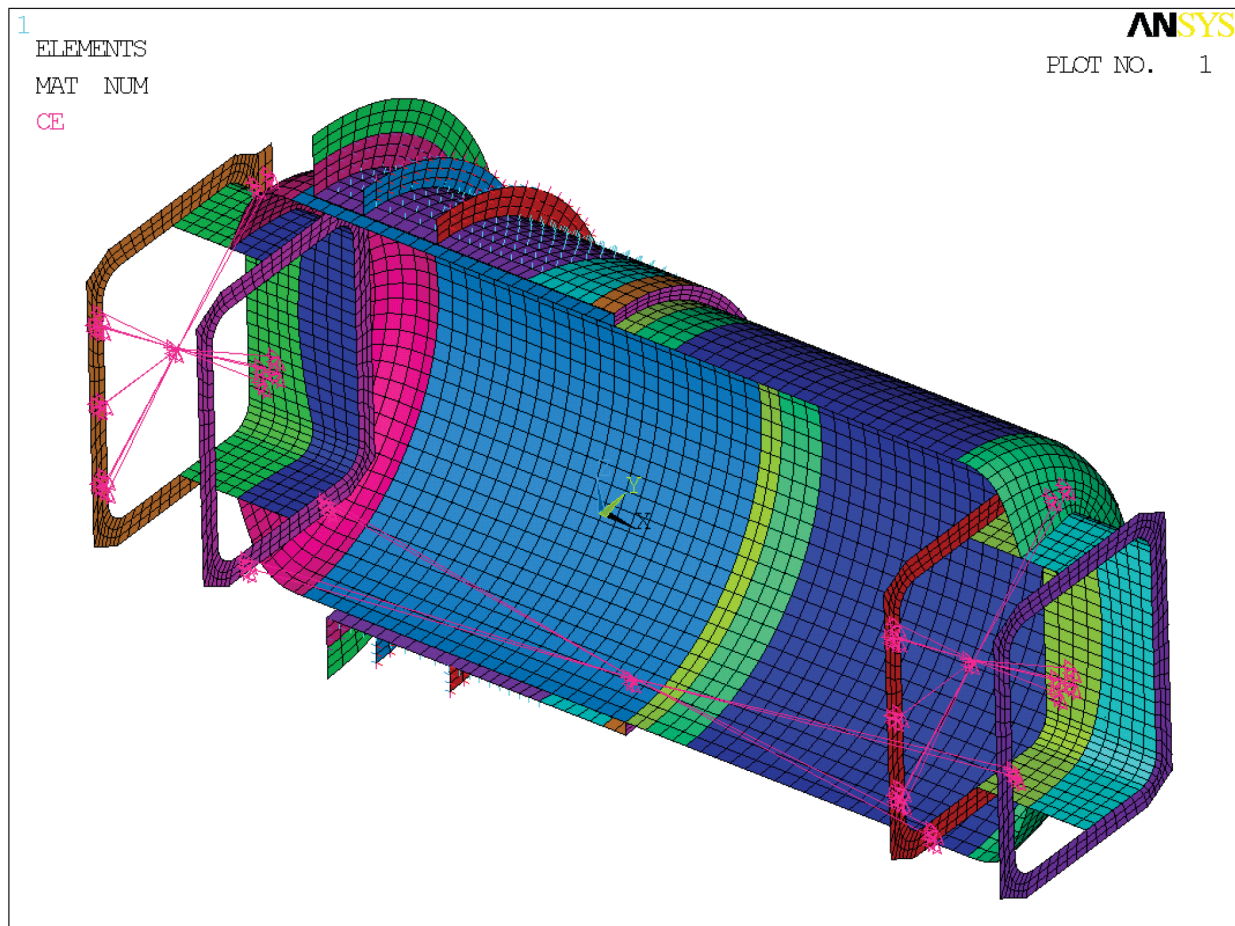
The stresses resulting from the evaluations are tabulated and compared to the stress limits determined in accordance with ASME Boiler and Pressure Vessel Code 2004, Section III, Division 1, Subsection NE (Class MC Components) for each loading condition and verified for compliance.

U.S. EPR FSAR Tier 2, Sections 3.8.2.1.1, 3.8.2.1.2, 3.8.2.4, 3.8.2.6; Figures 3.8-25, 3.8-26, 3.8-27, 3.8-31, 3.8-120 and 3.8-123 and Table 6.1-1 provide additional information related to the containment penetrations.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.9-2; Sections 3.8.1.2, 3.8.1.3, 3.8.1.4, 3.8.2.1.1, 3.8.2.2, 3.8.2.3, 3.8.2.4, and 3.8.2.5 will be revised as described in the above response and indicated on the enclosed markup.

Figure 03.08.02-11-1—ANSYS Model (Personnel and Emergency Airlocks)



U.S. EPR Final Safety Analysis Report Markups

Table 1.9-2—U.S. EPR Conformance with Regulatory Guides
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RG / Rev	Description	U.S. EPR Assessment	FSAR Section(s)
1.206, 06/2007	Combined License Applications for Nuclear Power Plants (LWR Edition)	Y	1.1.6.1
1.207, 03/2007	Guidelines for Evaluating Fatigue Analyses Incorporating the Life Reduction of Metal Components Due to the Effects of the Light-Water Reactor Environment for New Reactors	Y	3.12.5
1.208, 03/2007	A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion	Y	2.5 3.7.1
1.209, 03/2007	Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants	Y	3.11.2 7.1.2.4
1.216, 08/2010	<u>Containment Structural Integrity Evaluation for Internal Pressure Loadings Above Design-Basis Pressure</u>	<u>Y</u>	<u>3.8.1.2.5</u> <u>3.8.2.2.5</u>
Division 4 Regulatory Guides			
4.1, R1	Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants	N/A-COL	N/A
4.2, R2	Preparation of Environmental Reports for Nuclear Power Stations	N/A-COL	N/A
4.2S1, 09/2002	Supplement 1 to Regulatory Guide 4.2, Preparation of Supplemental Environmental Reports for Applications To Renew Nuclear Power Plant Operating Licenses	N/A-COL	N/A
4.4, 05/1974	Reporting Procedure for Mathematical Models Selected To Predict Heated Effluent Dispersion in Natural Water Bodies	N/A-COL	N/A
4.7, R2	General Site Suitability Criteria for Nuclear Power Stations	N/A-COL	N/A
4.8, 12/1975	Environmental Technical Specifications for Nuclear Power Plants	N/A-COL	N/A
4.11, R1	Terrestrial Environmental Studies for Nuclear Power Stations	N/A-COL	N/A
4.15, R2	Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) -- Effluent Streams and the Environment	Y	11.5.1 and 14.2.12
Division 5 Regulatory Guides			

- RG 1.136, Revision 3 (exception described in 3.8.1.3).
- RG 1.199, November 2003 (exception described in 3.8.1.4).

- [RG 1.216, August 2010.](#)

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3.8.1.3

Loads and Load Combinations

The U.S. EPR standard plant design loads envelope includes the expected loads over a broad range of site conditions. Loads and load combinations for the RCB are in accordance with the requirements of Article CC-3000 of the ASME Code, Section III, Division 2, Code for Concrete Containments and ACI Standard 359, and RG 1.136 (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50). RG 1.136 endorses the 2001 Edition of the ASME Code with the 2003 addenda (including exceptions taken in RG 1.136). The U.S. EPR standard plant design is based on the 2004 Edition of the Code, inclusive of the exceptions taken in RG 1.136. Design loads and loading combinations for the concrete RCB are described in Sections 3.8.1.3.1 and 3.8.1.3.2.

A COL applicant that references the U.S. EPR design certification will confirm that site-specific loads lie within the standard plant design envelope for the RCB, or perform additional analyses to verify structural adequacy.

3.8.1.3.1

Design Loads

The concrete RCB is designed for the following loads:

Service Loads

- Normal Loads – Normal loads are those loads encountered during normal plant operation and shutdown (GDC 4). This load category includes:
 - Dead Loads (D) – Dead loads include the weight of the structure and any permanent equipment or material weights. Dead load effects also refer to internal moments and forces due to dead loads.
 - Live Loads (L) – Live loads include any normal loads that vary with intensity or point of application, including moveable equipment. Live load effects also refer to internal moments and forces due to live loads. Live loads are applied, removed, varied from zero to full value, or shifted in location to obtain the worst-case loading conditions. Impact forces due to moving loads are applied as appropriate for the loading condition.
 - Soil Loads or Lateral Earth Pressure (H) – There are no soil or lateral earth pressure loads on the RCB because it is surrounded by other Seismic Category I structures that shield it from these loads.
 - Hydrostatic Loads (F) – Hydrostatic loads due to water stored in pools and tanks are considered in the design of RB internal structures that exert reaction loads on the RCB and NI Common Basemat Structure foundation basemat.

evaluation of this loading condition is considered as part of the plant safeguard and security measures. Explosion pressure wave loads are not applicable on the RCB because it is surrounded by other Seismic Category I structures that provide a shield.

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- Combustible Gas (C) – Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment ~~inerted by carbon dioxide~~ (Refer to Section 6.2.5). ~~RG 1.136, Regulatory Position C.5 provides the loads and load combinations acceptable for analysis and design of containment when exposed to the loading conditions associated with combustible gas. The principal combustible gas for the U.S. EPR is hydrogen. The U.S. EPR design does not include an inerting gas system. Containment maximum pressure is 75 psig based on pressure load time histories due to the hydrogen released by assuming 100-percent fuel-clad reaction with reactor coolant followed by hydrogen burning. RG 1.136, Regulatory Position C.5 and RG 1.7 specify a minimum pressure of 45 psig combined with dead load (D) as a minimum design condition. U.S. EPR calculated maximum pressure is greater than the regulatory required minimum pressure. ANSYS computer code was used to perform a structural analysis of the Reactor Containment Building (RCB) to calculate maximum liner strain. The elastic model of containment described in Section 3.8.1.4.1 is employed. The elements associated with the liner plate, containment wall, ring girder, dome, foundation, and RBIS foundation are isolated from the overall static model. Additionally, a nonlinear model created from a 6° slice of the RCB liner, wall, ring girder, and dome, which implements axisymmetric boundary conditions, is also analyzed. This nonlinear model allows for concrete cracking and the tensile capability of the reinforcing bars. A separate analysis is performed to determine the effects of the pressure load on containment penetrations. These analyses consider dead loads, pre-stressing loads, and the internal pressure load from the hydrogen burn event, and considered degradation of material properties due to the higher temperature resulting from hydrogen burn. RCB liner strains calculated for the pressure time histories during this hydrogen burn are within strain limits described by RG 1.7 and ASME Code Section III, Division 2, Subarticle CC—3720.~~

Missile Loads other Than Wind- or Tornado-Generated Missiles

There are no missile loads on the RCB resulting from activities of nearby military installations, turbine failures, or other causes. The RCB is surrounded by other Seismic Category I structures that shield it from missiles.

3.8.1.3.2 Design Load Combinations

Loading combinations used for the design of the RCB, including its steel liner plate, are in accordance with guidance provided in NUREG-0800, Standard Review Plan, Section 3.8.1 (Reference 3) (GDC1, GDC 2, GDC 4, GDC 16, and GDC 50).

The NI Common Basemat Structure is a monolithic concrete structure. However, various portions of the structure have different classifications (i.e., RCB, RB internal structures, and other Seismic Category I structures) and correspondingly different

- Factored load combinations (abnormal or extreme environmental loads).

$$U_F = D + L + H + F + F_b + J + G + E' + P_a + T_a + R_a + R_r$$

$$U_F = D + J + P_g1 + P_g2$$

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3.8.1.4

Design and Analysis Procedures

The analysis and design of the post-tensioned RCB comply with the requirements of Article CC-3300 of the ASME Code, Section III, Division 2 and RG 1.136 (GDC 1 and GDC 16).

Computer programs perform many of the computations required for the RCB analysis and design. In many cases, classical methods and manual techniques are also used for the analysis of localized areas of the containment structure and its subassemblies. Manual calculations are generally used for:

- Initial proportioning of the dome, wall, and base slab and determining tendon layout.
- Evaluation of the effects of locally applied loads, such as crane loads and pipe reaction loads.
- Preparation of input for the computer analyses.
- Design of the liner plate and its anchorage to the concrete containment shell.

The analysis and design methods incorporate several phases. Overall analysis and design are performed for structures using computer models of the NI Common Basemat Structure, Seismic Category I structures. Then, localized design evaluations account for local loadings and discontinuities in structures (e.g., openings and local changes in member cross-sections). Results from the local analyses are combined with the overall global analysis results to produce the final design.

An ultimate capacity analysis is performed, as described in Section 3.8.1.4.11, to determine the ultimate internal pressure load capability of the containment for use in probabilistic risk assessment and severe accident analyses. The ultimate capacity analysis evaluates the concrete containment structure (including the liner plate), as well as large containment penetrations, such as the equipment hatch and airlocks.

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Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment (Section 6.2.5). Combustible gas loads are evaluated per the requirements of RG 1.216 and RG 1.136. RG 1.136, Regulatory Position C.5 provides the loads and load combinations acceptable for analysis and design of containment when exposed to the loading conditions associated with combustible gas. The

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principal combustible gas for the U.S. EPR is hydrogen. The U.S. EPR design does not include an inerting gas system. Containment maximum pressure is 75 psig based on pressure load time histories due to the hydrogen released by assuming 100 percent fuel-clad reaction with reactor coolant followed by hydrogen burning. RG 1.136, Regulatory Position C.5 and RG 1.7 specify a minimum pressure of 45 psig combined with dead load (D) as a minimum design condition. U.S. EPR calculated maximum pressure is greater than the regulatory required minimum pressure. ANSYS computer code was used to perform a structural analysis of the RCB to calculate maximum liner strain. The elastic model of containment described in Section 3.8.1.4.1 is employed. The elements associated with the liner plate, containment wall, ring girder, dome, foundation, and RBIS foundation are isolated from the overall static model. Additionally, a nonlinear model created from a six-degree slice of the RCB liner, wall, ring girder, and dome, which implements axisymmetric boundary conditions, is also analyzed. This nonlinear model allows for concrete cracking and the tensile capability of the reinforcing bars. A separate analysis is performed to determine the effects of the pressure load on containment penetrations. These analyses consider dead loads, pre-stressing loads, and the internal pressure load from the hydrogen burn event, and considered degradation of material properties due to the higher temperature resulting from hydrogen burn. RCB liner strains calculated for the pressure time histories during this hydrogen burn are within strain limits described by RG 1.7 and ASME Code Section III, Division 2, Subarticle CC-3720.

Gaps are provided between the RCB and adjoining interior and exterior structures to accommodate deformation during pressurization and as a result of seismic movements.

Appendix 3E provides details of the design and reinforcement for the containment wall to foundation connection.

Appendix 3E provides details of the design and reinforcement for the containment cylinder wall and buttresses.

The following sections provide details of design and analysis of the RCB.

3.8.1.4.1 Computer Programs

The containment structure is included in an overall model developed for analysis of the NI Common Basemat Structure, which includes the RCB with the RB internal structures, the RSB, the SBs, the FB, and the NI Common Basemat Structure foundation basemat. The RCB is modeled and analyzed using the ANSYS computer program. ANSYS is a validated and verified, quality-controlled computer program that has been used for a number of years in the nuclear power industry. Refer to Chapter 17 for a description of the quality assurance program for the U.S. EPR design certification.

RG 1.199, which endorses Appendix B to ACI 349-01 for concrete anchorage design. Use of Appendix D to ACI 349-06 (with exception stated in Section 3.8.1.2.1) is acceptable as it results in an equivalent or conservative anchorage design when compared to that of Appendix B to ACI 349-01.

Steel liner plate penetration assemblies, including nozzles, reinforcing plates, and penetration anchors are designed to accommodate design loads and deformations without loss of structural or leak-tight integrity (GDC 16). Effects such as temperature, concrete creep, and shrinkage are considered. Temporary and permanent brackets and attachments to the steel liner plate are designed to resist the design loads without loss of the liner integrity due to excessive deformation or load from the brackets or attachments.

Design of the steel liner plate and anchorage system is based on minimum strengths for the materials that are specified for fabrication of the steel components and their interface with the concrete containment. Deviations in the geometry of the liner plate due to fabrication and erection tolerances are considered in the design.

The materials of the liner and its stiffening and anchorage components that are exposed to the internal environment of containment are selected, designed, and detailed to withstand the effects of imposed loads and thermal conditions during design basis conditions.

3.8.1.4.11 Containment Ultimate Capacity

The Ultimate Pressure Capacity Deterministic Analyses for the RCB is performed in accordance with RG 1.136, RG 1.216 and guidance provided in SRP 3.8.1.II.4.K (Rev. 2)

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Analysis results for the various containment elements are summarized in Table 3.8-6. These results are based on ANSYS non-linear finite element containment model with nominal stress-strain elasto-plastic materials properties under accident temperature and with cracked concrete section behavior.

The Ultimate Nominal Pressure Capacities for the cylinder and dome sections are calculated using the ~~2~~two degree-~~slice~~ finite element model with simulated axisymmetric boundary conditions. The ultimate conditions in these cases are 0.8 percent strain level in tendon areas located away from discontinuities (according to SRP 3.8.1.II.4.K). The simplified cross-checking hand calculation confirms the finite element model results.

The Ultimate Nominal Pressure Capacities for the ring and gusset sections are evaluated using the same finite element model as above with non-linear analysis run until the first 0.8 percent strain level in the rebars in the critical sections.

Non-Linear 3-D Finite Element Model is used for the hatch Ultimate Nominal Pressure Capacities evaluation. The non-linear steel properties for hatch, flanges, and sleeves are based on elastic-perfectly plastic model with bilinear kinematic hardening according to Von Mises yield criteria. Geometric nonlinearity is accounted for in the large displacement (stability) calculation. The results of calculations are summarized in Table 3.8-6.

Since the hatch performs a leak tightness role, the allowable strain criteria in accordance with ASME Code, Section III, Div. 2, Subsection CC, Article CC-3720 is conservatively used for the hatch ultimate pressure capacity evaluation. These allowable strains are: membrane strain of $\epsilon_C=0.5\%$, $\epsilon_T=0.3\%$ and combined membrane + bending strain of $\epsilon_C=1.4\%$, $\epsilon_T=1\%$.

The estimated Ultimate Pressure Capacities are determined from the principal strain levels, which approach ultimate in the protruding sleeves while remaining below yield in the hatch and flange areas.

3.8.1.4.12 Design Report

Design information and criteria for Seismic Category I structures are provided in Sections 2.4, 2.5, 3.3, 3.5, 3.7, 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. A cross-reference between U.S. EPR FSAR sections and information required by SRP Section 3.8.4, Appendix C is provided in Table 3.8-17.

3.8.1.5 Structural Acceptance Criteria

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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 Code, Section III, Division 2, ~~and~~ RG 1.136, ~~and~~ RG 1.216 (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 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 D of ACI-349-06 (with exceptions stated in Section 3.8.1.2.1, Codes) and guidance given in RG 1.199 (with exception described in Section 3.8.1.4.10).

The RCB is fully enclosed by the RSB; therefore, the potential for corrosion of the tendon system is significantly reduced.

Section 6.2.6 contains a description of the associated leak-rate test procedure, Containment Integrated Leakage Rate Test (CILRT). Containment pressure testing will occur in conjunction with the CILRT.

Sufficient physical access is provided in the annulus between the RCB and the RSB to perform inservice inspections on the outside of the containment. Space is available inside of the RCB to perform inservice inspections of the liner plate. Gaps are provided between the liner and RB internal structures concrete structural elements, which provide space necessary to inspect the liner at wall and floor locations inside containment. Inservice inspection of the embedded portion of the containment liner and the surface of the concrete containment structure covered by the liner are exempted in accordance with Section III of the ASME Code for Class CC components.

3.8.2 Steel Containment

The steel containment section describes major RCB penetrations and portions of penetrations not backed by structural concrete that are intended to resist pressure. Section 3.8.1 describes the concrete RCB.

3.8.2.1 Description of the Containment

Steel items that are part of the RCB pressure boundary and are not backed by concrete include the equipment hatch, airlocks, construction opening, piping penetration sleeves, electrical penetration sleeves, and fuel transfer tube penetration sleeve. Section 3.8.1.1 describes RCB steel items that are backed by concrete, such as the liner plate.

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3.8.2.1.1 Equipment Hatch, Dedicated Spare Penetration, Airlocks, and Construction Opening

The equipment hatch, illustrated in Figure 3.8-25 is a welded steel assembly with a double-sealed, flanged, and bolted cover. The cover for the equipment hatch attaches to the hatch sleeve from inside of the RCB. The cover seats against the sealing surface of the penetration sleeve mating flange when subjected to internal pressure inside the RCB. The RCB penetration sleeve and the RSB penetration sleeve are connected by an expansion joint to allow for differential movement between the two walls, as shown in Figure 3.8-25. The equipment hatch opens into the Seismic Category I FB, which provides protection of the hatch from external environmental hazards (e.g., high wind, tornado wind and missiles, and other site proximity hazards, including aircraft hazards and blasts). The equipment hatch sleeve has an inside diameter of approximately 27 feet, 3 inches.

The containment penetrations also include a 36-inch diameter spare containment penetration as shown in Figure 3.8-119. This penetration is dedicated for post-accident conditions as described in Section 19.2.3.3.8.

One personnel airlock and one emergency airlock are provided for personnel to access the RCB. Figure 3.8-26—Personnel Airlock, Emergency Airlock General Overview illustrates a typical arrangement for the airlocks. Each airlock is a welded steel assembly that has two doors, each with double seals. The airlocks open into containment so that internal pressure inside the RCB seats the doors against their sealing surfaces. The personnel airlock and emergency airlock are connected to the RSB wall by expansion joints to allow for differential movement.

The doors mechanically interlock so that one door can not be opened unless the second door is sealed during plant operation. Provisions are made for deliberately overriding the interlocks by the use of special tools and procedures for ease of access during plant maintenance. Each door is equipped with valves for equalizing the pressure across the doors. The doors are not operable unless the pressure is equalized. Pressure equalization is possible from the locations at which the associated door can be operated. The valves for the two doors interlock so that only one valve can open at a time and only when the opposite door is closed and sealed. Each door is designed to withstand and seal against design and testing pressures of the containment vessel when the other door is open. A visual indication outside each door shows whether the opposite door is open or closed. In the event that one door is accidentally left open, provisions outside each door allow remote closing and latching of the opposite door.

The personnel airlock at [] opens into a [] which is a Seismic Category I structure. The emergency airlock opens into the [], which is a Seismic Category I structure. Therefore, both airlocks are protected from external environmental hazards (e.g., high wind, tornado wind and missiles, and other site proximity hazards, including aircraft hazards and blasts). The personnel airlock and the emergency airlock have inside diameters of approximately 10 feet, 2 inches.

The construction opening is located at [] and opens to the heavy load operating floor level from []

[] This passage serves as personnel and material access into the RB during construction. The construction opening has an outside diameter of approximately 9 feet, 6 inches. Upon completion of construction work, the cavity in the RCB is permanently sealed with a metal closure cap welded to an embedded sleeve.

The construction opening is shown in Figure 3.8-123.

The equipment hatch, dedicated spare penetration, two airlocks, and construction opening closure cap and sleeve are designated as Class MC components in compliance

containment embedded pipe sleeve. There is no guard pipe, but an expansion joint attached to the pipe and sleeve allows differential movement and minimizes load transfer between the RCB and RSB. These penetrations consist of:

- Process pipe and flued head – Process pipes are welded or seamless and are made of carbon or stainless steel. The pipes are welded to the flued head. Flued heads are made from forged carbon or stainless steel. Process pipes and flued heads conform to Subsection NC of the ASME Code, Section III, Division 1, and meet the requirements of the piping system they serve as described in Section 3.6.
- Pipe Sleeve – Pipe sleeves are made from carbon or stainless steel and consist of the portion of the penetration that projects into the RCB and supports the flued head. Pipe sleeves conform to ASME Code Section III, Division 1, Subsection NE (GDC 16).

- Spare penetrations:

Spare penetrations are reserved for future use. Spare penetrations consist of the following major items:

- Solid closure plate or pipe cap – Closure plates and pipe caps are made from carbon or stainless-steel and conform to the requirements of Subsection NC of the ASME Code, Section III, Division 1, Subsection NC.
- Pipe sleeve – Pipe sleeves are made from carbon or stainless-steel and consist of the portion of the penetration that projects into the RCB. Pipe sleeves conform to ASME Code Section III, Division 1, Subsection NE (GDC 16).

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Typical details of piping penetrations are illustrated in Figure 3.8-27—Containment Penetrations for Feedwater Pipes, Figure 3.8-28—Containment Penetrations for High Energy Pipes, Figure 3.8-29—Containment Standard Piping Penetrations – Single Pipe, Figure 3.8-30—Containment Standard Piping Penetrations – Multiple Pipes, and Figure 3.8-120—Containment Penetration for Main Steam Pipe.

3.8.2.1.3 Electrical Penetration Sleeves

Sleeves for electrical penetrations consist of the portion of penetrations that projects into the RCB and supports the electrical assembly. Sleeves conform to ASME Code Section III, Division 1, Subsection NE (GDC 16).

Typical details of electric penetrations are illustrated in Figure 3.8-121—Low Voltage Penetration Sleeve and in Figure 3.8-122—Medium Voltage Penetration Sleeve.

3.8.2.1.4 Fuel Transfer Tube Penetration Sleeve

The fuel transfer tube penetration is provided to transfer fuel between the refueling canal and the spent fuel pool during the refueling operations of the reactor. The penetration consists of an approximately 20 inch diameter stainless steel pipe installed

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- RG 1.136, Revision 3 (exception described in 3.8.1.3).
- RG 1.193, Revision 1.
- RG 1.216, August 2010.

3.8.2.3

Loads and Load Combinations

The U.S. EPR standard plant design loads envelope includes the expected loads over a broad range of site conditions. Design loads and loading combinations for steel portions of the RCB that are not backed by concrete are described in the following sections (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50). Section 3.8.1.3 addresses loads and loading combinations for design of the steel liner plate.

3.8.2.3.1

Design Loads

Steel portions of the RCB that are not backed by concrete are designed for the following loads:

The effects of missiles and external events such as hurricanes, tornados, aircraft hazards, and explosion pressure waves are not considered because the containment is protected from these effects by the RSB. RCB and RSB penetrations are protected by other Seismic Category I structures (i.e., Safeguards or FB).

Service Loads

- Normal loads – Normal loads are those loads encountered during normal plant operation and shutdown (GDC 4). This load category includes:
 - Dead loads (D) – Dead loads include the weight of the structure and any permanent equipment or material weights. Dead load effects also refer to internal moments and forces due to dead loads.
 - Live loads (L) – Live loads include any normal loads that vary with intensity or point of application, including moveable equipment. Live load effects also refer to internal moments and forces due to live loads. Live loads are applied, removed, varied from zero to full value, or shifted in location to obtain the worst-case loading conditions. Impact forces due to moving loads are applied as appropriate for the loading condition.
 - Thermal loads (T_o) – Thermal loads consist of thermally induced forces and moments resulting from normal plant operation and environmental conditions. These are described in Section 3.8.1.3.1.
 - Pipe reactions (R_o) – Pipe reactions are those loads applied by piping system supports during normal operating or shutdown conditions based on the critical transient or steady state conditions. The dead weight of the piping and its contents are included. Appropriate dynamic load factors are used when applying transient loads, such as water hammers.

- Pipe break missile impact loads (R_{rm}) – R_{rm} is defined as the missile impact equivalent static load on the structure generated by or during the postulated break, such as pipe whipping.

Other Loads

Other loads refer to postulated events or conditions that are not included in design basis (GDC 4). The loading conditions and effects are evaluated without regard to the bounding conditions under which SSC are required to perform design basis functions. This load category includes:

- Aircraft hazard (A) – Aircraft hazard refers to the loads on a structure resulting from the impact of an aircraft. The evaluation of this loading condition is considered as part of the plant safeguards and security measures. Aircraft hazard loads are not applicable to steel portions of the RCB because it is surrounded by other Seismic Category I structures that provide a shield.
- Explosion pressure wave (B) – Explosion pressure wave refers to the loads on a structure resulting from an explosion in the vicinity of the structure. The evaluation of this loading condition is considered as part of the plant safeguards and security measures. Explosion pressure wave loads are not applicable to steel portions of the RCB because it is surrounded by other Seismic Category I structures that provide a shield.

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- Combustible gas loads (P_{g1} and P_{g2}) – Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment (refer to Section 6.2.5). ~~inerted by carbon dioxide. RG 1.136, Regulatory Position C.5 provides acceptable loads and load combinations for use in reactor containment analysis and design of containments exposed to combustible gas loading conditions. U.S. EPR design does not include an inerting gas system. Hydrogen is the principal combustible gas considered in U.S. EPR design. The maximum containment pressure calculated for the U.S. EPR RCB is 75 psig. This pressure is taken from pressure load time histories of calculations that assume 100 percent fuel-clad-coolant reaction followed by burning the hydrogen released by this reaction. RG 1.136, Regulatory Position C.5 and RG 1.7 specify a pressure of 45 psig combined with dead load (D) as a minimum design condition.~~
- Missile loads other than wind or tornado-generated missiles – Missile loads are not applicable to steel portions of the RCB resulting from activities of nearby military installations, turbine failures, or other causes. RCB and RSB penetrations are protected by other Seismic Category I structures (i.e., Safeguards or FBs).

3.8.2.3.2 Design Load Combinations

Loading combinations for steel items of the RCB that are not backed by concrete and are in accordance with Subsection NE of the ASME Code, Section III, Division 1, as augmented by the applicable provisions of RG 1.57 (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50).

Level D Service Limits

These service limit load combinations include other applicable service limits and dynamic loads for which containment function is required (GDC 2, GDC 4, and GDC 50).

$$P^* = D + L + T_a + R_a + P_a + R_{rr} + R_{rj} + R_{rm} + E'$$

$$P^* = D + L + F_a + E.$$

3.8.2.4 Design and Analysis Procedures

The steel items described in Section 3.8.2.1 are designed and analyzed in accordance with Article NE-3000 of Subsection NE of the ASME Code, Section III, Division 1, and as augmented by the applicable provisions of RG 1.57 (GDC 1 and GDC 16).

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Containment penetrations, or portions thereof, within the jurisdictional boundaries defined by ASME Code, Section III, Division 1, Subsection NE do not exceed the stress intensity limits defined by Articles NE-3221.1, NE-3221.2, NE-3221.3, and NE-3221.4

of the ASME BPV Code. The stresses induced by the concrete displacements on ASME Subsection NE, Class MC components are displacement limited and hence secondary in nature. Therefore, the qualification of the design for primary stress criteria does not consider the effects of concrete displacement. The concrete displacements are non-cyclical. Therefore, ratcheting and fatigue failure of the penetrations due to concrete displacements are not evaluated. The concrete displacements are considered for the qualification of the ASME Subsection CC sleeve components. ~~Code class shell components are evaluated for buckling under earthquake, thermal, and pressure loads. The method of analysis involves performing a linear buckling analysis using the Eigen value method to predict the theoretical buckling load, a non-linear buckling analysis considering large deflections and plasticity of the material to obtain a buckling pressure, and hand calculations per ASME Section III, Subsection NE-3133 to obtain a maximum allowable pressure. The calculated pressure is compared to 1/3 of the buckling pressure, and the smaller value is conservatively used as the allowable buckling pressure.~~

~~Simple geometries, e.g., piping penetrations, are qualified in accordance with NE-3133 or ASME Code Case N-284-1. The calculated stresses are compared to the allowable buckling limits for the particular design condition, e.g., design, testing, and Service Level A, B, C, D. More complex geometries (e.g., air locks) are analyzed using rigorous finite element buckling analyses.~~

Buckling analyses are performed for the equipment hatch, airlocks, construction opening, and high energy piping penetrations (main steam and feedwater). The equipment hatch was qualified in accordance with NE-3222 and Code Case N-284-1. The airlocks were qualified in accordance with NE-3222. The construction opening is

geometric imperfections in the airlock hatch assembly were conservatively simulated in the model based on the tolerances of the assembly.

In the analysis, the steel liner and ring plate were fixed while constant increments of pressure were applied on the external surface. The full magnitude of the other loads, such as seismic, dead weight, and live, was applied at the first load step. This is conservative since the application of a full magnitude of non-symmetric loads results in a lower critical buckling stress value. The applied pressure was increased until the solution began to diverge. At this point, the analysis was stopped and the critical buckling stress was considered to have been reached.

The maximum allowable buckling stress for design and Levels A and B service limits was determined as one-third the value of the critical buckling stress per NE-3222.1(a). In accordance with NE-3222.2, the allowable limits for Level C and D service limits are 120 percent and 150 percent of the value given in NE-3222.1, respectively. The applied pressure in each load condition was compared to the allowable limit to verify that the criterion was met.

Construction Opening

Due to the simple geometry, the buckling analysis for the construction opening was performed in accordance with NE-3133, and an evaluation according to code Case N-284-1 is not required.

Main Steam Line and Feedwater Line Penetration

Buckling is not a failure mechanism for the main steam and feedwater line penetrations. These penetrations were analyzed using classical analysis where the slenderness ratio (KL/r) must be large enough for buckling to occur. For short columns (or piers) with a KL/r less than 89 (structural steel), the columns will reach yield before buckling occurs. The main steam line (MSL) and feedwater line penetrations are defined as short columns (or piers). The calculated slenderness ratio is below 89, and therefore buckling will not occur.

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Combustible gas loads are pressure loads that result from a fuel-clad metal-water reaction followed by an uncontrolled hydrogen burn during a post-accident condition in a reactor containment (refer to Section 6.2.5). Combustible gas loads are evaluated according to the requirements of RG 1.216 and RG 1.136. RG 1.136, Regulatory Position C.5 provides acceptable loads and load combinations for use in reactor containment analysis and design of containments exposed to combustible gas loading conditions. U.S. EPR design does not include an inerting gas system. Hydrogen is the principal combustible gas considered in U.S. EPR design. The maximum containment pressure calculated for the U.S. EPR RCB is 75 psig. This pressure is taken from pressure load time histories of calculations that assume 100 percent fuel clad-coolant reaction followed by burning the hydrogen released by this reaction. RG 1.136,

Regulatory Position C.5 and RG 1.7 specify a pressure of 45 psig combined with dead load (D) as a minimum design condition.

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Evaluation of the containment penetrations use 3-D finite element modeling techniques (ANSYS) using loads and load combinations discussed in Sections 3.8.2.3.1 and 3.8.2.3.2, respectively.

Code class MC components are screened for cyclic service analysis according to the criteria in Article NE-3221.5 of the ASME Code.

Refer to Section 3.5.3 for a description of requirements for missile barrier design and ductility requirements applicable to the design of steel portions of the RCB.

The following sections provide individual descriptions of the design and analysis procedures performed to verify the structural integrity of the steel items. Section 3.8.1 addresses the design and analysis procedures used to qualify the RCB concrete structure for openings provided through the containment pressure boundary for these items. Containment ultimate capacity analysis results are described in Section 3.8.1.4.11, which includes evaluation of major containment steel penetrations.

3.8.2.4.1

Equipment Hatch, Dedicated Spare Penetration, Airlocks, and Construction Opening

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The equipment hatch described in Section 3.8.2.1.1 is supported entirely by the concrete shell of the RCB. The sleeve of the equipment hatch is embedded in the concrete containment shell and welded at the periphery to the liner plate. Expansion joints, located in the annulus, allow for differential movement and minimize load transfer between the RCB and RSB walls. The expansion joints maintain the pressure boundary for the annulus ventilation system. The liner plate is thickened in the vicinity of the equipment hatch penetration. The equipment hatch cover is dished and stiffened by a reinforcing ring where it interfaces with the sleeve of the equipment hatch.

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The 36-inch diameter dedicated containment spare penetration for containment filtered pressure release is shown in Figure 3.8-119. The portions of the penetration that fall under the jurisdiction of ASME BPV, Subsection NE are bounded by the construction opening closure. The spare penetration has the same cap thickness, but smaller opening size compared to the construction opening closure. Therefore, the stresses in the NE portions of the spare penetration are bounded by the stresses calculated for the construction closure opening. The portions of the penetration that fall under the jurisdiction of ASME BPV, Subsection CC are bounded by the main steam line penetration. The spare penetration is located at a similar elevation, has the same thickness, but smaller opening size compared to the main steam line penetration. Therefore, the strains induced in the CC portions of the spare penetration are bounded by the strains calculated for the main steam line.

The two airlocks described in Section 3.8.2.1.1 are supported by attachment to penetration sleeves embedded in the concrete shell of the RCB. Expansion joints provide for differential movements and minimize load transfer between containment and shield walls. The doors for both ends of the airlocks are flat, and the bulkhead ends of the components are dished.

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The construction opening closure cap described in Section 3.8.2.1.1 is attached to and supported by a sleeve embedded in the concrete shell of the RCB. The closure cap is a dish shaped metal structure welded to the embedded sleeve flange.

The equipment hatch, airlocks, and construction opening closure cap and sleeve ~~will be~~are evaluated for the combinations of loads described in Section 3.8.2.3.2. Analyses and limits for the resulting stress intensities in the equipment hatch, airlocks, and the construction opening closure cap and sleeve ~~will be~~are designed in accordance with Articles NE-3130, NE-3200, NE-3325, and NE-3326 of Section III, Division 1 of the ASME Code.

3.8.2.4.2 Piping, Electrical, and Fuel Transfer Tube Penetration Sleeves

The penetration sleeves are welded to the containment liner plate and are anchored to the RCB concrete shell. Penetration sleeves are subjected to various combinations of mechanical, thermal, and seismic loadings and will be evaluated for the combination of loads described in Section 3.8.2.3.2.

If the penetration sleeves are subjected to cyclic service, the associated peak stress intensities will be evaluated. The required analysis and associated stress intensity limits will be in accordance with Articles NE-3130 and NE-3200 of Section III, Division 1 of the ASME Code.

3.8.2.4.3 Design Report

Design information and criteria for Seismic Category I structures are provided in Sections 2.4, 2.5, 3.3, 3.5, 3.7, 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. A cross-reference between U.S. EPR FSAR sections and information required by SRP Section 3.8.4, Appendix 3C is provided in Table 3.8-17.

3.8.2.5 Structural Acceptance Criteria

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Structural acceptance criteria for steel containment items described in Section 3.8.2.1 are in accordance with Subsection NC and NE of the ASME Code, Section III, Division 1, including allowable stress limits, strain limits, deformation limits, and factors of safety. These are augmented by the requirements of RG 1.57 and RG 1.216 (GDC 1, GDC 2, GDC 4, GDC 16, and GDC 50). Containment steel items not backed by

concrete that are intended to resist pressure will be designed to meet the acceptance criteria for the load combinations listed in Section 3.8.2.3.2.

Steel items that are an integral part of the RCB pressure boundary will be designed to meet minimum leakage rate requirements. The leakage rate must not exceed the acceptable value indicated in the applicable technical specification.

The design and analysis methods, as well as the type of construction materials, are chosen to allow assessment of the capability of steel items to function properly throughout the plant life.

A SIT is performed as described in Section 3.8.2.7. Surveillance testing provides assurance of the continuing ability of each item to meet its design functions. Surveillance requirements are addressed in Section 3.8.2.7.

Items that form part of the containment pressure boundary are stamped in accordance with the applicable section of the ASME Code used for their design or fabrication.

3.8.2.6 Materials, Quality Control, and Special Construction Techniques

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Steel items that are not backed by concrete that are part of the containment pressure boundary are fabricated from materials that meet the requirements specified in Article NE-2000 of Section III, Division 1 of the ASME Code, except as modified by applicable and acceptable ASME Code cases (GDC 1). SA-516 Grade 70 material is used for major steel components of the penetration assemblies. The materials are defined in Table 6.1-1.

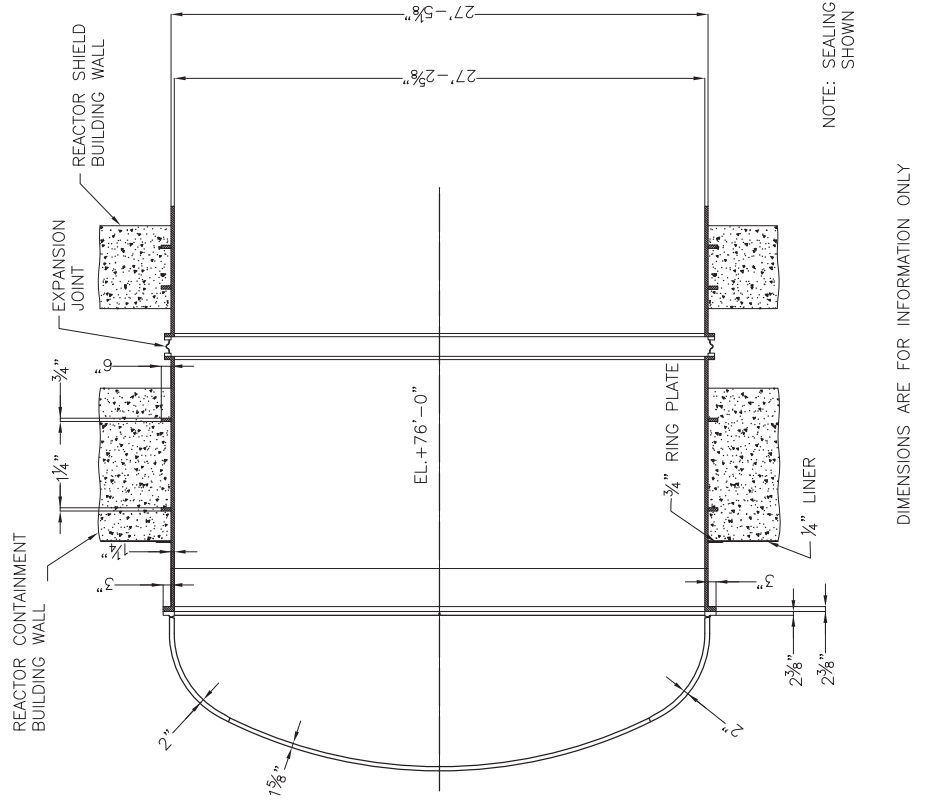
Quality control for containment steel items conforms to Articles NE-2000, NE-4000, and NE-5000 of Section III, Division 1 of the ASME Code (GDC 1).

Section 3.8.1.6 provides a description of welding requirements for steel items for the RCB, quality control for steel items for the RCB, and materials used for penetration sleeves, steel embedments, and corrosion retarding compounds.

Use of neoprene-based seals are kept to a minimum because of the presence of fluoride or chloride ions and the increased potential for stress corrosion cracking.

The seals for the airlocks and the equipment hatch make use of elastomer seal material (Dupont Viton®, or equal) which is compressed by the action of the mechanical closure devices associated with each of the components. This material is recessed into two concentric grooves (double seals) around the perimeter of the airlock doors and around the equipment hatch flange penetration mating flange. This material is selected based on its ability to maintain elasticity at elevated temperatures for extended durations and to be in compliance with the materials tested for severe accident conditions as specified in NUREG/CR-5096.

Figure 3.8-25—Equipment Hatch General Assembly

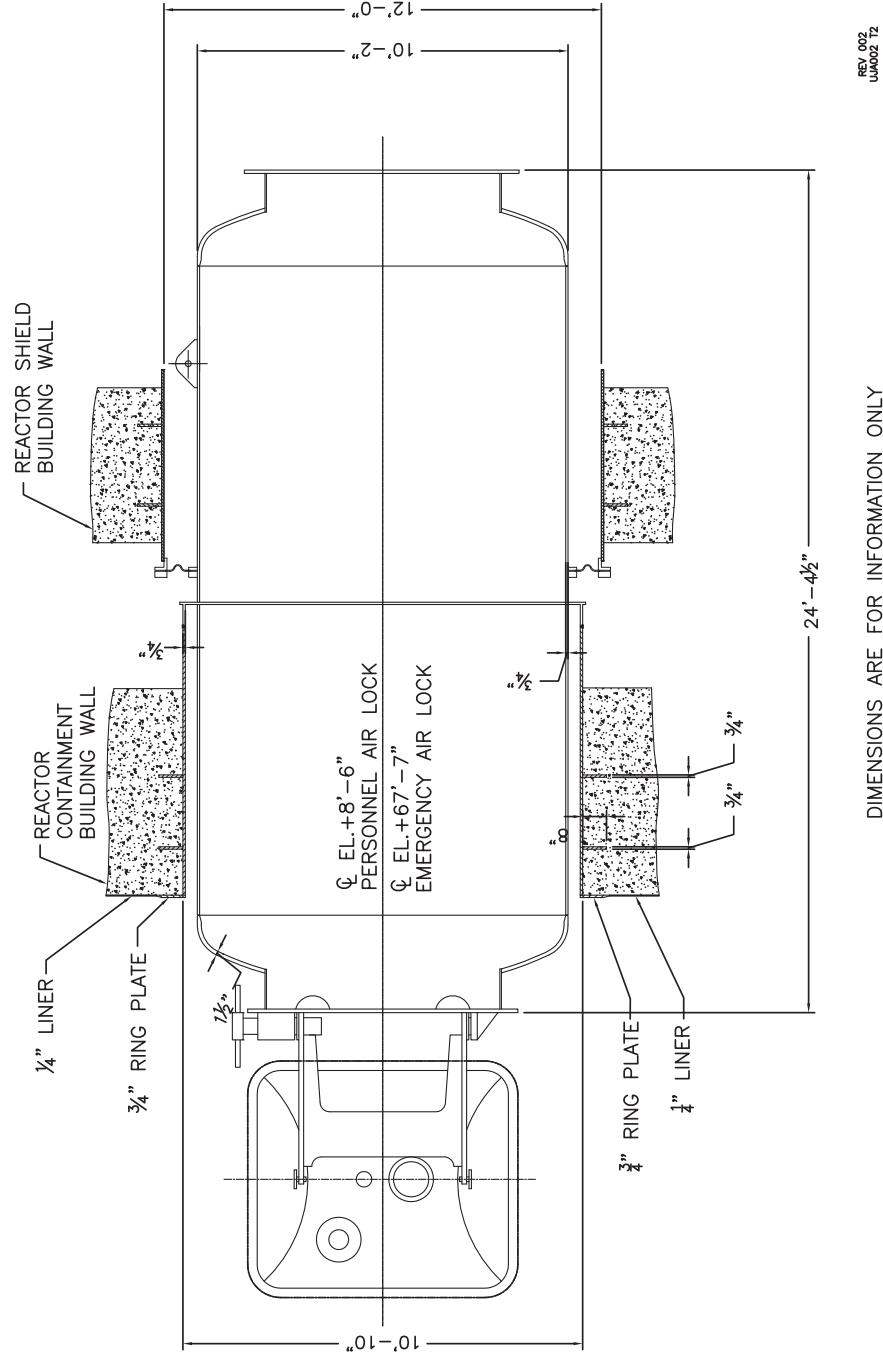


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NOTE: SEALING CLAMPS NOT SHOWN FOR CLARITY

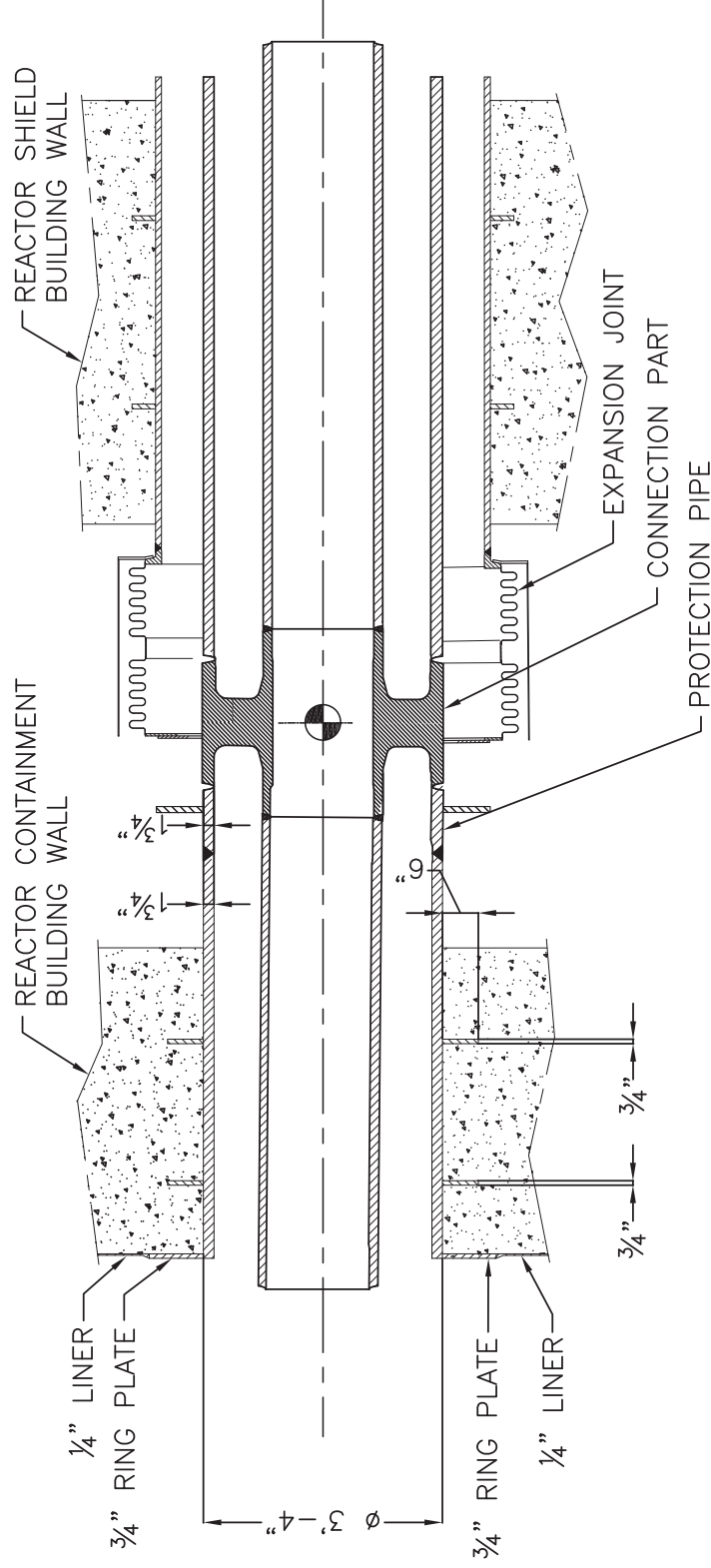
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Figure 3.8-26—Personnel Airlock, Emergency Airlock General Overview

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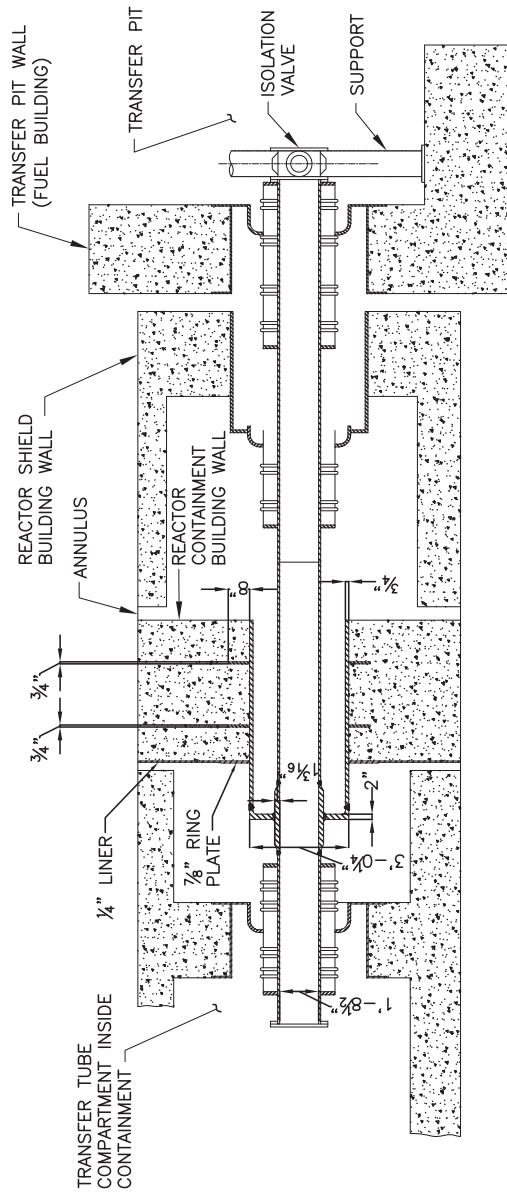
Figure 3.8-27—Containment Penetration for Feedwater Pipe



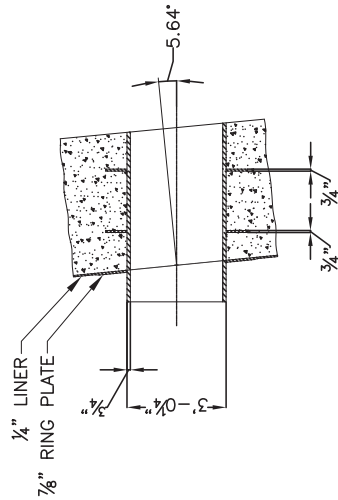
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Figure 3.8-31—Fuel Transfer Tube Penetration (Conceptual View)



ELEVATION



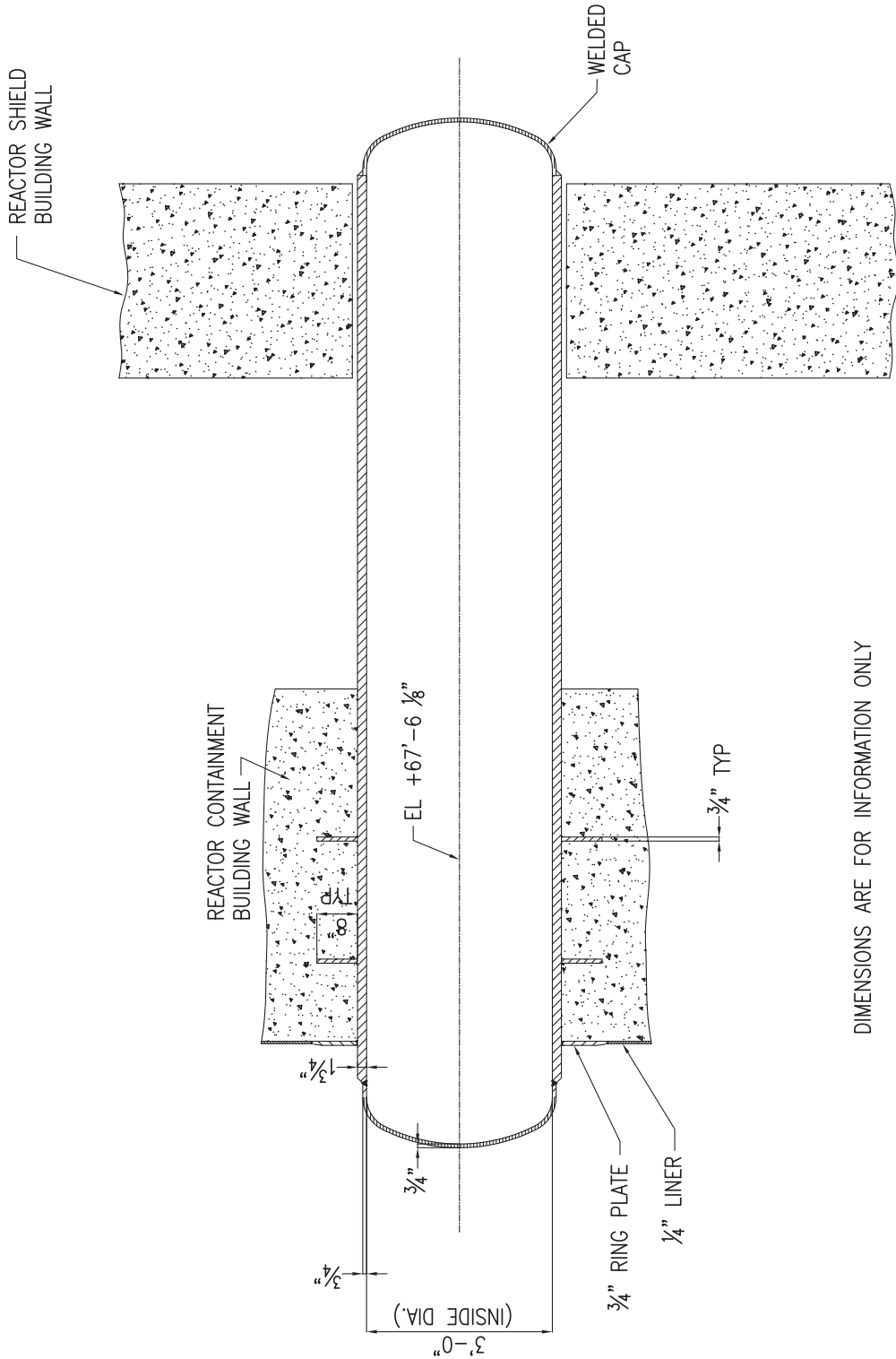
PLAN OF PENETRATION SLEEVE

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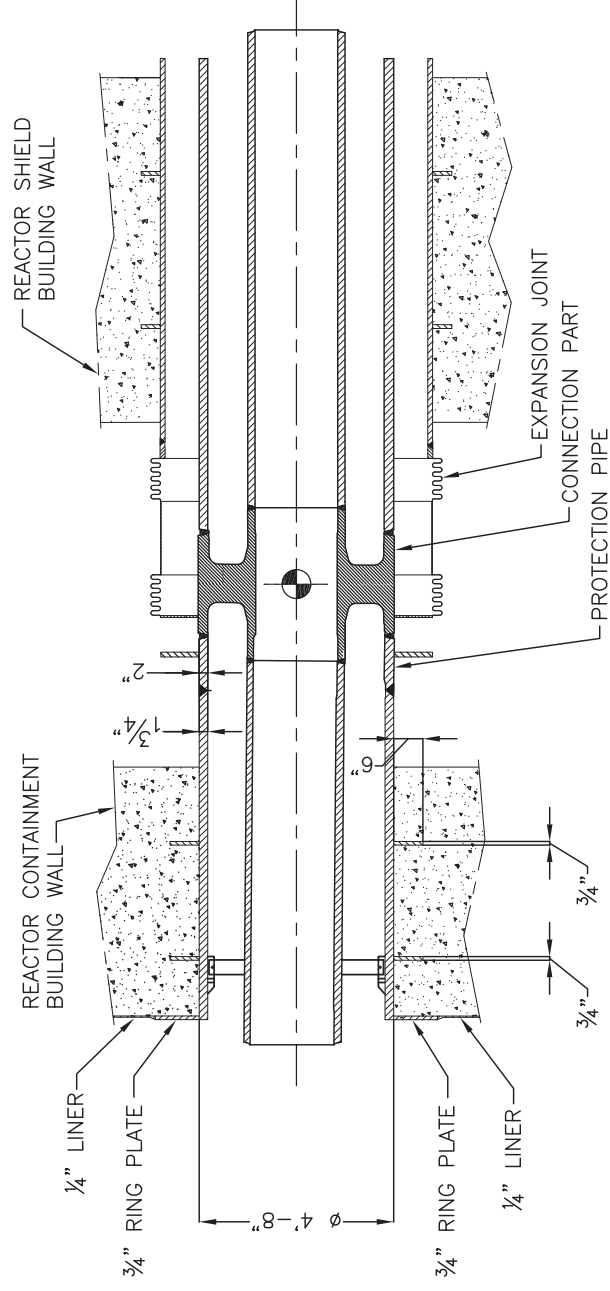
Figure 3.8-119—Containment Dedicated Spare Piping Penetrations ~~(Typical)~~



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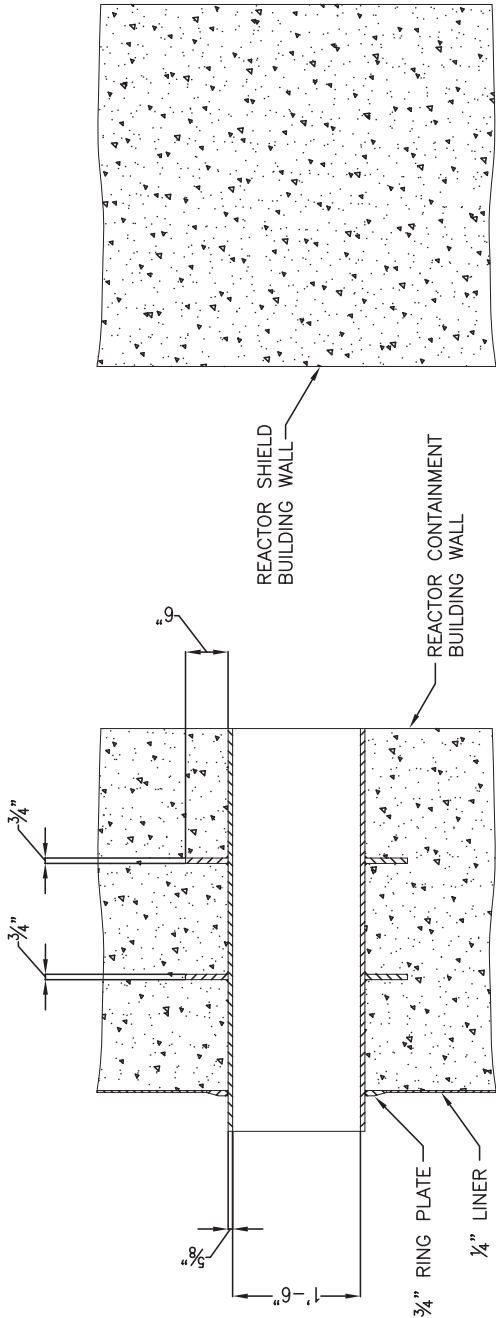
Figure 3.8-120—Containment Penetration for Main Steam Pipe



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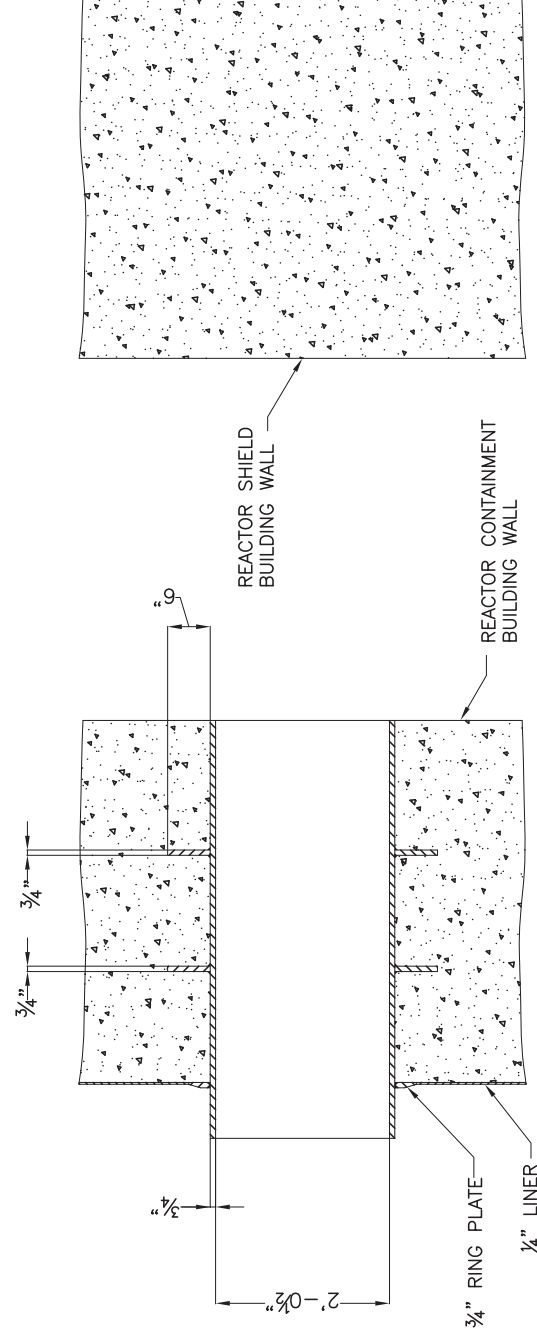
Figure 3.8-121—Low Voltage Electrical Penetration Sleeve



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Figure 3.8-122—Medium Voltage Electrical Penetration Sleeve



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Figure 3.8-123—Construction Opening

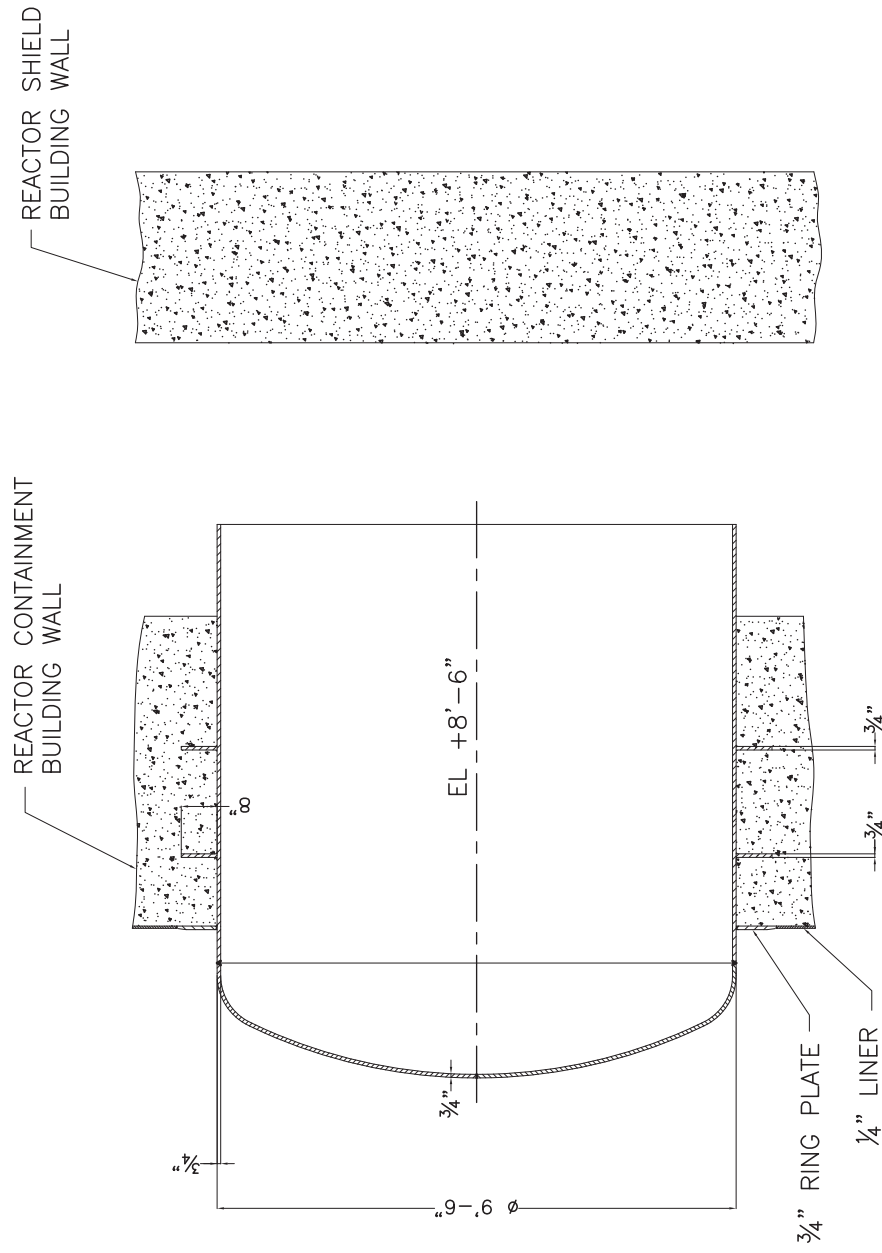


Table 6.1-1—Pressure-Retaining Material Specifications for Engineered Safety Features
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Component	Material
Annulus Ventilation System	
Nuclear grade filtration housing (not in annulus)	ASTM A-240 Type 304 ^{1, 2}
Ducts, structural steel supports (inside the annulus)	ASTM A-36
Ducts (inside the annulus) stainless steel sheet	ASTM A-167 ASTM A-480
Main control room air conditioning system	
All	Refer to Section 9.4.1
Reactor Building Liner and Penetration Sleeves	
Liner Plate	Carbon Steel SA-516 Grades 55, 60, 65 or 70 (ASME Section III, Division 2, Subsection CC)
Penetration Sleeves <ul style="list-style-type: none"> Pipe Material Plate Material 	<ul style="list-style-type: none"> Carbon Steel SA-333 Grade 6, SA-106 Grades A, B or C Austenitic Stainless Steel SA-312 Grades TP304 or TP 304L (ASME Section III, Division 1, Subsection NE) Carbon Steel SA-516, Gr. 55, 60, 65 or 70, and SA-537 Class 1 or 2 (ASME Section III, Division 1, Subsection NE)
Welding Material <ul style="list-style-type: none"> Carbon Steel Low Alloy Steel Stainless Steel 	<ul style="list-style-type: none"> E70XX (SFA-5.1) ER70S-X⁵ or E70C-XC (SFA-5.18)⁵ E7XT-X (SFA-5.20)⁵ E80XX-X (SFA-5.5)⁵ ER80S-XXX⁵ or E80C-XXX (SFA-5.28)⁵ E8XTX-X⁵ (SFA-5.29)⁵ E308L-XX, E309L-XX or E316L-XX (SFA-5.4) ER308L, ER309L or ER316L (SFA-5.9) E308LTX-X⁵, E309LTX-X⁵ or E316LTX-X (SFA-5.22)⁵
ASME Class MC Components	
<u>Equipment Hatch, Dedicated Spare Penetration, Airlocks, and Construction Opening</u>	<u>Carbon Steel SA-516, Grade 70</u>
<u>Fuel Transfer Tube</u>	

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Table 6.1-1—Pressure-Retaining Material Specifications for Engineered Safety Features
Sheet 7 of 7

Component	Material
<ul style="list-style-type: none"> Tube 	<ul style="list-style-type: none"> SA-240 Type 304² SA-240 Type 304L SA-240 Type 304LN SA-240 Type 316² SA-240 Type 316L SA-240 Type 316LN
<ul style="list-style-type: none"> Tube Flange 	<ul style="list-style-type: none"> SA-336 Class F304² SA-336 Class F316² SA-336 Class F304LN SA-336 Class F316LN SA-182 Class F304² SA-182 Class F304L SA-182 Class F304LN
<ul style="list-style-type: none"> Flange for RB transfer pits expansion bellows 	<ul style="list-style-type: none"> SA-240 Type 304² SA-240 Type 304L SA-240 Type 304LN SA-240 Type 316² SA-240 Type 316L SA-240 Type 316LN
<ul style="list-style-type: none"> Flange at the containment wall 	<ul style="list-style-type: none"> SA-266 Class 1 SA-266 Class 2
<ul style="list-style-type: none"> Cover for flange at the containment wall 	<ul style="list-style-type: none"> SA-336 Class F304² SA-336 Class F304LN SA-336 Class F316² SA-336 Class F316LN
<ul style="list-style-type: none"> Tube portion connected with the anchoring flange 	<ul style="list-style-type: none"> SA-336 Class F304² SA-336 Class F304LN SA-336 Class F316² SA-336 Class F316LN

Notes:

1. Solution annealed and rapidly cooled.
2. Carbon not exceeding 0.03 wt%.
3. Quenched and tempered.
4. Piping is seamless.
5. Electrodes with “G” classification are excluded.

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