

ArevaEPRDCPEm Resource

From: RYAN Tom (AREVA) [Tom.Ryan@areva.com]
Sent: Wednesday, September 12, 2012 11:10 AM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); LEIGHLITER John (AREVA); ROMINE Judy (AREVA); TOLLEY Tracey (AREVA); VANCE Brian (AREVA); WILLIFORD Dennis (AREVA); RYAN Tom (AREVA); WILLIFORD Dennis (AREVA); ABAYAN Victor (AREVA)
Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 547 (6499, 6359), FSAR Ch. 3 - NEW PHASE 4 RAI - Question 3.7.2-77
Attachments: RAI 547 Question 03.07.02-77 Response US EPR DC - DRAFT.pdf

Getachew,

Attached is a DRAFT response for RAI 547, Question 03.07.02-77 in advance of the final response date of November 14, 2012 shown below.

To keep our commitment to send a final response to these questions by the commitment date, we need to receive all NRC staff feedback and comments no later than **November 7**.

Please let me know if the staff has questions or if the response to these questions can be sent as final.

Sincerely,

**Tom Ryan for
Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.**

7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Wednesday, July 11, 2012 2:52 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); Michael.Miernicki@nrc.gov; WELLS Russell (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 547 (6499, 6359), FSAR Ch. 3 - NEW PHASE 4 RAI

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 547 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the four questions cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 547 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 547 — 03.06.01-14	2	2
RAI 547 — 03.07.02-76	3	4
RAI 547 — 03.07.02-77	5	5
RAI 547 — 03.07.02-78	6	12

The schedule for a technically correct and complete response to these 4 questions is provided below.

Question #	Response Date
RAI 547 — 03.06.01-14	October 17, 2012
RAI 547 — 03.07.02-76	November 29, 2012
RAI 547 — 03.07.02-77	November 14, 2012
RAI 547 — 03.07.02-78	April 30, 2013

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.

7207 IBM Drive, Mail Code CLT 2B
 Charlotte, NC 28262
 Phone: 704-805-2223
 Email: Dennis.Williford@areva.com

From: Tesfaye, Getachew [<mailto:Getachew.Tesfaye@nrc.gov>]
Sent: Friday, June 15, 2012 2:45 AM
To: ZZ-DL-A-USEPR-DL
Cc: Xu, Jim; Thomas, Brian; Miernicki, Michael; Clark, Phyllis; Segala, John; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 547 (6499, 6359), FSAR Ch. 3 - NEW PHASE 4 RAI

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on May 17, 2012, and June 12, 2012, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. 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/LB1
 (301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4038

Mail Envelope Properties (68A588D0DDE96547855C97AF83A8CAFDB1A548)

Subject: DRAFT Response to U.S. EPR Design Certification Application RAI No. 547
(6499, 6359), FSAR Ch. 3 - NEW PHASE 4 RAI - Question 3.7.2-77
Sent Date: 9/12/2012 11:09:53 AM
Received Date: 9/12/2012 11:11:37 AM
From: RYAN Tom (AREVA)

Created By: Tom.Ryan@areva.com

Recipients:

"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"LEIGHLITER John (AREVA)" <John.Leighliter@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"TOLLEY Tracey (AREVA)" <Tracey.Tolley@areva.com>
Tracking Status: None
"VANCE Brian (AREVA)" <Brian.Vance@areva.com>
Tracking Status: None
"WILLIFORD Dennis (AREVA)" <Dennis.Williford@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
Tracking Status: None
"WILLIFORD Dennis (AREVA)" <Dennis.Williford@areva.com>
Tracking Status: None
"ABAYAN Victor (AREVA)" <victor.abayan@areva.com>
Tracking Status: None
"Teschaye, Getachew" <Getachew.Teschaye@nrc.gov>
Tracking Status: None

Post Office: auscharm02.adom.ad.corp

Files	Size	Date & Time	
MESSAGE	3573	9/12/2012 11:11:37 AM	
RAI 547 Question 03.07.02-77 Response US EPR DC - DRAFT.pdf			178091

Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 547(6499, 6359), Question 03.07.02-77

6/15/2012

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

**SRP Section: 03.06.01 - Plant Design for Protection Against Postulated Piping
Failures in Fluid Systems Outside Containment**

SRP Section: 03.07.02 - Seismic System Analysis

Application Section: Tier 2 Table 1.8-2

QUESTIONS for EPR Projects Branch (NARP)

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

Question 03.07.02-77:**Open Item****New Phase 4 RAI**

NRC Information Notice (IN) 2011-20, dated November 18, 2011, identifies the occurrence of alkali-silica reaction (ASR)-induced concrete degradation of a seismic Category I structure at the Seabrook Station NPP. The IN indicates that ASR-induced degradation occurred even though concrete testing per ASTM standards C289 and C295 was specified in the Seabrook Station FSAR. It is explained that the tests described in ASTM C227 and C289 may not accurately predict aggregate reactivity when dealing with late or slow-expanding aggregates containing strained quartz or micro-crystalline quartz; updated ASTM testing standards C1260 and C1293 are more appropriate in this regard.

EPR, FSAR Tier 2 Section 3.8 indicates that the construction of seismic Category I structures is done in accordance with the ASME Code (2004 edition) Section III, Division 2 or ACI 349-01. The ASME Code references the 1987 edition of ASTM C289, while ACI 349-01 references the 1981 edition of ASTM C289. Neither document references ASTM C1260 or C1293.

Therefore, it appears that the EPR FSAR does not reference updated ASTM testing standards C1260 and C1293, either directly or through ACI 349-01 or the ASME code (2004 edition). The applicant is requested to explain the measures that are implemented in the FSAR to prevent the problems described in IN 2011-20. In particular, the applicant is requested to explain whether testing in accordance with updated ASTM C1260 and C1293 will be performed during construction.

Response to Question 03.07.02-77:

U.S. EPR FSAR Tier 2, Sections 3.8.1.6.1, 3.8.3.6.1, and 3.8.6 will be revised to add requirements to perform testing in accordance with ASTM C1260 and C1293 to determine potential alkali-silica reactivity (ASR).

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 3.8.1.6.1, 3.8.3.6.1, and 3.8.6 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

DRAFT

Low-alkali cement, as defined in ASTM C150, is used in concrete with aggregates that are potentially reactive per ASTM C33.

Aggregates

Aggregates used for the RCB meet the requirements specified in ASME Code, Section III, Division 2, Paragraph CC-2222.

Aggregates conform to the requirements of ASTM C33 (Reference 22).

ASTM Standards C1260 and C1293 (References 71 and 72) shall be used in testing aggregates for potential alkali-silica reactivity (ASR).

RAI 547,
Question 03.07.02-77

Admixtures

Air-entraining admixtures conform to the requirements of ASTM C260 (Reference 23).

Chemical admixtures conform to the requirements of ASTM C494 (Reference 24) or ASTM C1017 (Reference 25).

Fly ash and other pozzolanic admixtures conform to the requirements of ASTM C618 (Reference 26).

Grout fluidizers conform to the requirements of ASTM C937 (Reference 27).

Ground-granulated blast furnace slag used as an admixture is in accordance with the requirements of ASTM C989 (Reference 28).

Silica fume used as an admixture conforms to the requirements of ASTM C1240 (Reference 29).

Admixtures used in concrete mixtures in accordance with ASTM C845 (Reference 30) expansive cement is compatible with the cement and produce no deleterious effects.

Mix Water

Mix water used for the RCB is in accordance with the requirements of ASME Code, Section III, Division 2, Paragraph CC-2223.

Placement

Conveying, inspection, placement, and testing of concrete are performed in accordance with the following codes and standards:

- ACI 301-05, Specifications for Structural Concrete for Buildings.

- [Aggregates used for the RB internal structures conform to ACI 349-2001, Section 3.3.]*
- Aggregates conform to ASTM C33.

ASTM Standards C1260 and C1293 (References 71 and 72) shall be used in testing aggregates for potential alkali-silica reactivity (ASR).

Admixtures:

- Air-entraining admixtures conform to ASTM C260.
- Chemical admixtures conform to ASTM C494 or ASTM C1017.
- Fly ash and other pozzolanic admixtures conform to ASTM C618.
- Grout fluidizers conform to ASTM C937.
- Ground-granulated blast furnace slag used as an admixture conform to ASTM C989.
- Silica fume used as an admixture conforms to ASTM C1240.
- Admixtures used in concrete mixtures containing ASTM C845 expansive cement are compatible with the cement and produce no deleterious effects.

RAI 547,
Question 03.07.02-77

Mix Water:

- [Mix water used for the RB internal structures conforms to ACI 349-2001, Section 3.4.]*

Concrete Placement

Site-specific construction specifications address requirements and procedures for concrete placement. Construction specifications address the following:

- Desired volume of concrete pours and rate of deposition.
- Special forming requirements.
- Maximum height of pours.
- Temperature limitations; weather conditions and concrete mix, including methods for temperature control.
- Curing requirements and procedures.

Placement of concrete is performed with consideration given to the following codes:

- ACI 304R-00, Guide for Measuring, Mixing, Transporting, and Placing Concrete.

59. ACI 350.3-06, “Seismic Design of Liquid-Containing Concrete Structures,” American Concrete Institute, 2006.
60. ASME B31.3, “Process Piping, American Society of Mechanical Engineers,” American Society of Mechanical Engineers, 1996.
61. ASME B31.4, “Liquid Transportation System for Hydrocarbon, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols,” American Society of Mechanical Engineers, 1992.
62. ASME B31.8, “Gas Transportation and Distribution Piping Systems,” American Society of Mechanical Engineers, 1995.
63. ACI 349-06/349R-06, “Code Requirements for Nuclear Safety-Related Concrete Structures” and Commentary, American Concrete Institute, 2006.
64. NUREG/CR-5096 - “Evaluation of Seals for Mechanical Penetrations of Containment Buildings,” August 1998.
65. ACI 229R-99, “Controlled Low-Strength Materials,” American Concrete Institute, 1999.
66. ASTM D-1557-09, “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort,” American Society for Testing and Materials, 2009.
67. EM 1110-1-1904, “Settlement Analysis,” U.S. Army Engineering Manual, 1990.
68. Bechtel Power Corporation Topical Report, BC-TOP-1, Containment Building Liner Plate Design Report, Revision 1, December 1972.
69. [CRD C36-73, “Method of Test for Thermal Diffusivity of Concrete,” U.S. Army Engineer Research and Development Center, December 1973.](#)
70. [CRD C44-63, “Method for Calculation of Thermal Conductivity of Concrete,” U.S. Army Engineer Research and Development Center, June 1963.](#)
71. [ASTM C1260-01, “Standard Test Method for Potential Alkali Reactivity of Aggregates \(Mortar-Bar Method\),” American Society for Testing and Materials, 2001.](#)
72. [ASTM C1293-01, “Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction,” American Society for Testing and Materials, 2001.](#)

RAI 547,
Question 03.07.02-77