

ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Wednesday, September 02, 2009 6:44 PM
To: 'usepr@areva.com'
Cc: Jeng, David; Xu, Jim; Samaddar, Sujit; Miernicki, Michael; Patel, Jay; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 283 (2718, 3611, 3614), FSAR Ch. 3
Attachments: RAI_283_SEB2_2718_3611_3614.doc

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 25, 2009, and on September 2, 31, 2009, 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,
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Hearing Identifier: AREVA_EPR_DC_RAIs
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U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 03.03.02 - Tornado Loads

SRP Section: 03.08.01 - Concrete Containment

SRP Section: 03.08.03 - Concrete and Steel Internal Structures of Steel or Concrete Containments

Application Section: FSAR Ch 3

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

03.03.02-4

Follow-up to RAI Question Number 3.3.2-1

As originally requested in **RAI 3.3.2-1**, provide the basis for the values used in the FSAR for the exposure coefficient K_z and the importance factor I .

03.08.01-37

Follow-up to RAI Question Number 3.8.1-2

The applicant's response provided a description of the sliding and overturning stability analysis carried out for the Reactor Building Internal Structures (RBIS). This analysis indicates that the seismic lateral loads and overturning moments are transferred from the RBIS to the Nuclear Island common basemat through bearing pressure on the haunch walls and on the basemat.

The following additional information is needed to resolve this RAI:

1. The applicant states that the seismic loadings were applied to a finite element model "as static equivalent loadings (i.e., zero period acceleration or ZPA)." Clarify how the accelerations were distributed throughout the RBIS model (e.g., was the ZPA value at each degree of freedom from the seismic analysis utilized and applied to the corresponding node in the RBIS equivalent static analysis?)
2. The applicant mentions that the "U.S. EPR is designed to envelope a total of twelve different soil conditions, which result in twelve different sets of ZPAs. The ZPA values applicable to the RBIS were reviewed, and a total of four sets were determined to be potentially controlling for RBIS stability analysis." Explain the basis for selecting these representative soil cases and corresponding ZPAs.
3. The analysis provided by the applicant is essentially a stability analysis (i.e., overturning does not occur with an appropriate factor of safety). The staff notes that this type of analysis does not specifically address the issue of possible uplift. The applicant indicates that "vertical uplift between the liner plate and the internal structure or basemat is not credible because overturning is resisted by the configuration of the internal structure/haunch and the gravity loads due to the mass of the internal structure is greater than the vertical acceleration." This

statement is not sufficient because preventing overturning of the entire RBIS does not ensure that no separation occurs at one side of the overturning moment. As stated in the original RAI, the applicant is requested to demonstrate that no uplift occurred between the containment internal structure and the containment liner as well as uplift between the containment liner and the NI basemat due to the overturning loads.

03.08.01-38

Follow-up to RAI Question Number 3.8.1-4

In response to item (1) of this RAI, the applicant indicates that the jurisdictional boundary selected for the U.S. EPR, as applicable to the common basemat, is a cylinder aligned with the outside face of the reactor containment building wall (Figure 03.08.01-4-1 Jurisdictional Boundaries).

In response to item (2) of this RAI, the applicant acknowledges that ASCE/SEI 4-98 is not a code and indicates that the reference will be removed from the list of codes in EPR FSAR Sections 3.8.1.2.1 and 3.8.2.2.1. The staff notes that the markup in the RAI deleted references to ASCE/SEI 4-98 from U.S. EPR FSAR, Tier 2, Sections 3.8.3.2.1 and 3.8.4.2.1 in addition to Sections 3.8.1.2.1 and 3.8.2.2.1. However, ASCE 4-98 is still generally referred to for seismic analysis and design in FSAR Sections 3.8.3.4.4 and 3.8.4.4.1. Furthermore, the applicant lists three specific provisions of ASCE/SEI 4-98 (items 2-a, 2-b, and 2-c) utilized in the analysis and provides the technical basis for the use of two of the three provisions (items 2-b and 2-c). Regarding item 2-b, the staff understands that passive resistance of the soil is relied upon for the stability evaluation of plant structures. Therefore, the soil pressures to be used for design of foundations should consider both seismic induced soil pressure loads and soil passive pressures.

The following additional information is needed to resolve this RAI:

Regarding item (1) of this RAI, the staff notes that Interpretation No. 12 (III-2-83-01) of the ASME Code, Section III, states that when the containment foundation is integral with other building foundations: "The portion of the common foundation directly beneath the containment vessel, including any additional peripheral volume for anchoring of the containment shell reinforcing, shall be constructed in accordance with the rules of Section III, Division 2, when required by the Design Specification." Therefore, to complete the response to item (1) of this RAI, the applicant is requested to confirm that an additional peripheral volume for anchoring of the containment shell reinforcing is included within the jurisdictional boundary of the ASME Code Section III, Division 2 basemat. This additional peripheral volume should also be indicated in Figure 03.08.01-4-1 Jurisdictional Boundaries. In addition, the description of the jurisdictional boundary and loading considerations between the ASME containment and the other non-ASME structures, which are discussed in the RAI response, needs to be summarized in the appropriate locations in the EPR FSAR Section 3.8.

Regarding item (2) of this RAI, the applicant is requested to confirm that the foundations of all Seismic Category I structures have been designed for the envelope of seismic induced soil loads and soil passive pressures. In addition, the applicant is requested to delete all discussions and references to ASCE 4-98 (wherever they appear in the FSAR including Sections 3.8.3.4.4 and 3.8.4.4.1) when no technical basis has been provided for their use.

03.08.03-20

Follow-up to RAI Question Number 3.8.3-2

In response to the first part of this RAI, the applicant indicates that the sentence “Limits for allowable loads on concrete embedments and anchors are in accordance with Appendix B of ACI 349-2006 and guidance given in RG 1.199” already appears in EPR FSAR Section 3.8.4.5. However, the staff notes that Section 3.8.4.5 actually references ACI 349-2001 not ACI 349-2006. Furthermore, RG 1.199 endorses ACI 349-2001 subject to certain conditions and limitations.

In the second part of this RAI, the applicant states that ACI 349-2001 adequately addresses the issues of capacity, installation, and testing raised in NRC IE Bulletin 79-02. In addition, the applicant mentions that the issue of base plate flexibility is addressed by AISC design guidelines.

The following additional information is needed to resolve this RAI:

1. To complete the response to item (1) of this RAI, the applicant is requested to clarify which edition of ACI 349 is considered for the design and installation of anchor bolts. If ACI 349-2006 is intended, the applicant is further requested to confirm that none of the provisions in this later document are less stringent than those contained in ACI 349-2001 and RG 1.199, which are applicable to the design and installation of anchors in the EPR plant.
2. To complete the response to item (2) of this RAI, the applicant is requested to: (1) identify the AISC guideline document referred to for base plate design, (2) to confirm that this AISC document and ACI 349-2001 (or 2006 whichever is selected) conforms to all of the provisions of NRC IE Bulletin 79-02, and (3) identify where the key provisions from the IE Bulletin are captured in the AISC/ACI 349 documents. If these documents by themselves do not capture all of the applicable provisions in the IE Bulletin, then the FSAR should be revised to include the need to also satisfy the requirements of IE Bulletin 79-02, or to provide the technical basis for not doing so.