

KHNPDCDRAIsPEm Resource

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Sent: Wednesday, October 14, 2015 8:11 AM
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Cc: Thomas, Vaughn; Xu, Jim; Betancourt, Luis; Umana, Jessica; Lee, Samuel
Subject: APR1400 Design Certification Application RAI 249-8323 (03.08.01 - Concrete Containment)
Attachments: APR1400 DC RAI 249 SEB1 8323.pdf

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, a 45 day response to RAI question 03.08.01-15. We may adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 249-8323

Issue Date: 10/14/2015
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 03.08.01 - Concrete Containment
Application Section: 3.8.1

QUESTIONS

03.08.01-15

10 CFR 50.55a and Appendix A to 10 CFR Part 50, General Design Criteria 1, 2, 4, 16 and 50, provide the regulatory requirements for the design of the concrete containment. Standard Review Plan (SRP) Sections 3.8.1 and 3.8.5, Subsection II.4, discuss the requirements of the computer programs used in the design and analysis of safety-related structures.

APR1400 DCD Tier 2, Section 3.8.1.4.2, "Containment Structure," identifies the use of the computer program ANSYS and DCD Section 3.8A.1.4.2.3, "Analysis and Design Procedures," identifies the use of the computer program DARTEM. The applicant stated that "The calculated design forces and moments are used as input in the concrete section design program DARTEM for the design of flexural reinforcement and shear reinforcement." The staff could not find any description in the DCD that validates and verify the use of this computer program. Therefore, per 10 CFR 50.55a; Appendix A to 10 CFR Part 50, General Design Criteria 1, 2, 4, 16 and 50; and SRP 3.8.1 and 3.8.5, the applicant is requested to identify if any other computer programs are utilized in the analysis and design of all seismic Category I structures, and for all programs utilized describe the computer program, identify what structural evaluations it is used for, and describe how they have been validated.

Additionally, DCD Section 3.8A, Table 3.8A-2, "Section Forces of Containment Wall Design Sections," identifies six member forces used for the containment wall design sections. The applicant is requested to explain why only six member forces are given for design and why the in-plane shear forces are not also presented.

03.08.01-16

The staff reviewed Sections 3.7 and 3.8 of the APR1400 DCD Tier 2, and identified some editorial errors. The applicant is requested to address the following editorial errors:

a. Subsection 3.8.5.4.3, "Design Summary Report," refers to Technical Report APR1400-E-S-NR-14006-P, Rev. 0: Stability Check for NI Common Basemat." The TR should be Revision 1.

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- b. Subsection 3.8.5.7, "Testing and Inservice Inspection requirements," last paragraph, "(COL. 3.8(10)." should read "(COL 3.8(10))."
- c. Subsection 3.8.6, "Combined License Information," in COL 3.8(1), ". condits..." should read "...conduits..."
- d. Subsection 3.8.6, "Combined License Information," COL item COL 3.8(10), "COL 3.8.(10)" should read "COL 3.8(10)"
- e. Table 3.8.A-5, "Critical Sections of RCB Basemat," should be associated with Figure 3.8A-15, "Design Sections for Basemat Reinforcement." Subsection 3.8A.1.4.2.3, "Analysis and Design Procedures," provides the connection. However, in Figure (b) vertical area, between Sections 5 and 6 was not identified.
- f. Subsection 3.8A.1.4.1.3.5, "Design Sections, d2 "Personnel Airlock" should read "2) Personnel Airlocks"
- g. Section 3.8.1.1.3.5.1, 3rd sentence, "Figure 3.8-3" does not show the reinforcement, perhaps this should have been Figure 3.8A-10.
- h. The HRHF report Page 7, "Table 3-4" should be "Table 3-4 of this report." The current wording suggests that it is a table in Appendix C of draft SRP 3.7.1, Rev. 4.
- i. In DCD Table 3.7-1, the 10% damping CSDRS curve at 25 Hz should be 0.447 (instead of 0.464). Table 2-1 of APR1400-E-S-NR-14001-P, Rev. 0, Seismic Design Bases, has the correct value.
- j. In Section 3.5.1 of APR1400-E-S-NR-14004-P, Rev. 1, "Figure 22" should be "Figure 3-16".
- k. In Section 3.7.3.3, the referenced Section 3.7.2.15 should be 3.7.2.14
- l. In Section 3.7.3.9, the statement "...free-standing cylindrical tanks anchored to reinforced concrete pads or directly on a building structure." The term "free-standing" should be deleted because the tanks are anchored.
- m. Section 4.2.11 in APR1400-E-S-NR-14002-P states that "Figure 4-10 is another view looking Section 4.2.11 in APR1400-E-S-NR-14002-P states that "Figure 4-10 is another view looking west into the interior modeling, with a vertical cut at column line 19." In contrast, the description in the figure itself states "... N-S Cutting at Column Line 19 and Looking East"
- n. In step (4) and equation 6-1 in Section 6.1 of APR1400-E-S-NR-14003-P, the seismic inertial load sub-vector is duplicated in both sides of the equation. Please verify whether or not the right side of the equation should refer to a sub-vector of absolute acceleration rather than the seismic inertial load sub-vector.
- o. Step (13) in Section 6.1 of APR1400-E-S-NR-14003-P referenced step (11) as containing the differential maximum building structure (axial and shear) forces and equation 6-6. The correct reference should be step (12).
- p. The paragraph following step (8) in Section 6.3 of APR1400-E-S-NR-14003-P refers to step (5) as providing maximum displacements. However, Step (5) rather than providing maximum displacements, it provides the basemat rotation. Step (8) provides the maximum displacements. Verify whether or not the appropriate step to refer to should be step (8).
- q. Note 11 to some tables in Appendix B in APR1400-E-S-NR-14003-P (e.g. Table B-5, B-9, etc...) refer to Table H-64 which does not exist in this report.
- r. Section 3.5.1 in APR1400-E-S-NR-14004-P, Rev. 1, refer to Figure 3-16 as showing the intensity envelope function plot. However, the plot is shown on Figure 3-15. Therefore, the reference to Figure 3-16 should be changed to Figure 3-15.
- s. The following sentence in Section 6 in APR1400-E-S-NR-14004-P, Rev. 1, as written, describes the opposite of what is shown on Table 6-5. This sentence and Table 6-5 need review to verify and correct any inconsistencies.
 - 1. *Equivalent accelerations from HRHF input ground motion envelop those from the CSDRS except the vertical acceleration of Fuel Handling Area 3 (El. 195'-0" to 213'-0").*
- t. In DCD Section 3.7.2, the information related to Interaction of Non-Seismic Category I Structures with Seismic Category I Structures, is assigned the Subsection number 3.7.2.7.1. Consistent with the SRP format, verify whether this should be a separate subsection (e.g. 3.7.2.8).

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u. Technical Report (TR) APR1400-E-S-NR-14006-P, Rev 1, Section 1, "Introduction," states "The NI common basemat is a reinforced concrete mat foundation with an area of approximately 99,180 ft²." Technical Report (TR) APR1400-E-S-NR-14006-P, Rev 1, Section 1, "Introduction," states "The NI common basemat is a reinforced concrete mat foundation with an area of approximately 99,180 ft² (348 ft x 285 ft)." However, in Table 4-1, "Uplift Area for NI Common Basemat," the area of basemat is tabulated as 113,590 ft². Is this an error? If so, the applicant is requested to correct the error and update the section of the TR accordingly.



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