

## **KHNPDCDRAIsPEm Resource**

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**Sent:** Friday, December 01, 2017 6:39 PM  
**To:** 'apr1400rai@khnp.co.kr'; KHNPDCDRAIsPEm Resource; 'daegeun.ahn@gmail.com'; 'Andy Jiyong Oh'; 'Jungho Kim (jhokim082@gmail.com)'; 'Wagner, David'  
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**Subject:** APR1400 Design Certification Application RAI 557-9199 [3.8.5 - Foundations]  
**Attachments:** APR1400 DC RAI 557 SEB 9199.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.

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

Thank you,

**William R. Ward, P.E.**  
**APR1400 DCA Lead Project Manager**  
**U.S. Nuclear Regulatory Commission**  
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**Washington, DC, 20555-0001**  
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**Sent Date:** 12/1/2017 6:39:10 PM  
**Received Date:** 12/1/2017 6:39:14 PM  
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## REQUEST FOR ADDITIONAL INFORMATION 557-9199

Issue Date: 12/01/2017  
Application Title: APR1400 Design Certification Review – 52-046  
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.  
Docket No. 52-046  
Review Section: 03.08.05 - Foundations  
Application Section: Tier 2, Section 3.8.5, and Tier 1

### QUESTIONS

03.08.05-20

10 CFR Part 52, Section 52.54, "Issuance of standard design certification," paragraph (a) states that the Commission may issue a standard design certification in the form of a rule for the design if the Commission determines that, among other things, "There is reasonable assurance that the standard design conforms with the provisions of the Act, and the Commission's regulations." When certified, the Appendix to Part 52 that constitutes the standard design certification will include or reference information that is approved and certified by the staff. This information, designated as Tier 1, generally includes, but is not limited to, design descriptions for significant aspects of the design. Tier 1 information is derived from the broader set of information contained in Tier 2 the Design Control Document (DCD), but is generally limited to the subset of the most safety significant information needed to support the staff's approval basis. Therefore, the staff's reasonable assurance finding for design certification relies, on the applicant's DCD Tier 1 and DCD Tier 2 information.

10 CFR 52.47(a)(2) requires, in part, that a design certification application include a description and analysis of the structures of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished. When evaluating the acceptability of this information for seismic Category I structures, the staff's review focuses on a subset of structural information that includes seismic analysis methods, key dimensions of seismic Category I structures, and design of "critical sections." The use of critical sections in the design of safety-related structures is a risk-informed graded approach to achieve the reasonable assurance of safety. In lieu of the safety review of a large number of structural component designs, the staff performs a detailed review of a limited number of critical sections described in Section 3.8 of the DCD that contributed to the overall risk significance of the structures. This approach provides the staff with reasonable assurance of the overall safety performance of the structures based on the successful performance of these limited but critical risk significant locations. However, even minor changes to these critical sections could, when applied to the entire safety-related structure, result in significant changes to the overall performance of the structure, and therefore, invalidate the basis for the staff's approval.

Therefore, the applicant is requested to incorporate as DCD Tier 1 Design Descriptions, certain characteristic of the seismic analysis and design of "critical sections" for seismic Category I structures. This information needs to be designated as Tier 1 information to support the staff's reasonable assurance finding. The additional information to be included in APR1400 DCD Tier 1, based on DCD Tier 2, Rev. 1, is given below. This list provides examples and does not constitute a complete set of items to be included in DCD Tier 1. The information to be included in DCD Tier 1 may be in the form of text, tables, and/or figures, which are based on the design presented in DCD Tier 2.

## REQUEST FOR ADDITIONAL INFORMATION 557-9199

- Identification of the ASME Code(s), Concrete Code, and Structural Steel Code with editions used in the design of safety related structures (e.g., ASME Section III, Division 1, Subsection NE and Division 2, Subsection CC; ACI-349, and ANSI/AISC-690; with the applicable editions/dates identified).
- Key dimensions of seismic Category I structures (e.g., for the containment - DCD Figures 3.8-1, 2, 4, and 5).
- Design details for critical sections corresponding to reinforced concrete members and structural steel members for safety-related structures (e.g., reactor building, auxiliary building, and emergency diesel generator building). For critical sections, the information to be included is essentially the list of critical sections, locations of the critical sections, and the design details showing what design parameters are provided. An example of design parameters for concrete members is the reinforcement (either the location, direction, size, and spacing; or area of steel per unit length), concrete compressive strength, and wall/floor thickness. For structural steel members, this would typically consist of either the type and size (e.g., W21 X 147) or the equivalent steel member properties. For connections, this would typically consist of key details of the welds or bolts, and if applicable, plate/stiffening elements). The information on demand forces (e.g., FX, MX, etc.) calculated for the design of the sections, calculated stresses, and the available margins are not required. What is required is the design that is provided as described above. Examples of design parameters for critical sections of reinforced concrete and steel members in DCD Tier 2, Rev. 1, to be included in DCD Tier 1 may be obtained from the following:
  - For reinforced concrete members - Tables 3.8A-3, 5, 11, 12, 13, 21, 23, 24, 27, 29, 33, 36, 37, and 44, or alternatively, comparable design parameters presented in Figures 3.8A-6 through 10, 15 through 17, 25 through 28, 36 through 39, and 40 through 57.
  - For structural steel members - steel beams and connections supporting the concrete slabs inside containment as shown in the markups for DCD Figure 3.8A-60.
  - Along with the above information, the material types/designations should be provided (e.g., for concrete - the compressive strength and for steel - the type and grade).
- A summary description of the seismic analysis method(s) (e.g., equivalent static, response spectra, time history) that was used for each of the seismic Category I structures. In addition, DCD Tier 1 should identify the in-structure response spectra for the key locations that would be needed by a COL applicant if a site-specific dynamic analysis evaluation is required.