

KHNPDCRAIsPEm Resource

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Sent: Thursday, May 14, 2015 5:33 PM
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Cc: Ciocco, Jeff; Lee, Samuel; Rodriguez, Ricardo; Karas, Rebecca
Subject: APR1400 Design Certification Application RAI 8-7847 (2.5.4 Stability of Subsurface Materials & Foundations)
Attachments: image001.jpg; APR1400 DC RAI 8 RGS1 7847.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,

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Subject: APR1400 Design Certification Application RAI 8-7847 (2.5.4 Stability of Subsurface Materials & Foundations)
Sent Date: 5/14/2015 5:33:07 PM
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Request for Additional Information 8-7847

Issue Date: 05/14/2015
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 02.05.04 - Stability of Subsurface Materials and Foundations
Application Section: SRP 2.5.4

QUESTIONS

02.05.04-3

APR 1400 DCD Table 2.0-1 provides the minimum soil angle of internal friction. In accordance with 10 CFR Parts 50, 52.47 and 100, please provide the basis for the selection of this parameter and clarify the applicability of it (i.e. is it for soil below the footprint of the nuclear island at its excavation depth, is it a backfill requirement or both). Please propose changes and/or updates to section 2.5.4.2 and Table 2.0-1.

02.05.04-4

APR 1400 DCD Table 2.0-1 provides the minimum dynamic properties requirements for Structural Fill Granular (SFG). These properties are: backfill density, Poisson's ratio, minimum dynamic shear modulus, minimum damping ratio and strain-compatible minimum shear wave velocity. In accordance with 10 CFR Parts 50, 52.47 and 100, please provide the basis for the selection of these SFG parameters and clarify, for each parameter, its applicability (i. e. is it applicable to backfill on the sides of Seismic Category I structures, underneath Seismic Category I structures and/or in between Seismic Category I structures). Please propose changes and/or updates to section 2.5.4.5 and Table 2.0-1.

02.05.04-5

In meeting the requirements of 10 CFR Part 52.47, the applicant is to provide the site parameters postulated for the design. APR1400 DCD report APR1400-E-S-NR-14003-P indicates that under the Nuclear Island common basemat, a layer of lean concrete approximately 3 ft thick will be backfilled between the bottom of the basemat and the base of the soil/rock excavation pit. In accordance with 10 CFR Parts 50, 52.47 and 100, please provide or cross reference details on the properties of the lean concrete backfill in section 2.5.4.5; and propose changes or updates to Table 2.0-1.

02.05.04-6

Table 2.0-1 lists the Minimum Dynamic Shear Modulus with units of kilograms over squared centimeters (kg/cm²). In accordance with 10 CFR parts 50 and 100 and SRP 2.5.4, please clarify if these values are meant to have the aforementioned units, kg/cm², or if they correspond to Normalized Shear Moduli (G/G_{max}) which are unit-less; and propose changes or updates to Table 2.0-1, if applicable.

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02.05.04-7

APR1400 DCD Section 2.5.4.8 states that no potential for liquefaction is allowed for Seismic Category I Structures and that the potential for liquefaction under non-seismic Category I structure is a site specific issue to be addressed by the COL applicant. In accordance with 10 CFR Parts 50, 52.47 and 100, please address the following and propose changes and updates to section 2.5.4.8 and Table 2.0-1:

- a. For Seismic Category I structures (Nuclear Island, EDG and DFOT structures), clarify the locations where no potential for liquefaction is allowed (i.e. underneath, adjacent, etc.)
- b. Due to the fact that the possible structural failure of Seismic Category II structures could degrade the function of a Seismic Category I SSC to an unacceptable safety level, please provide requirements for liquefaction potential for Seismic Category II Structures.

02.05.04-8

Section 3.7.1.3 of the APR 1400 DCD states that the Emergency Diesel Generator Building (EDG) and the Diesel Fuel Oil Storage Tank room (DFOT) are Seismic Category I structures. The static and dynamic parameters for the aforementioned structures are not included in Table 2.0-1. In accordance with 10 CFR parts 50 and 100 and SRP 2.5.4, please propose changes to section 2.5.4.10 and updates to Table 2.0-1 with the following information:

- a. Static and Dynamic Bearing Capacities for the EDG and DFOT buildings with their respective Factors of Safety (FOS).
- b. Maximum Differential Settlement inside the EDG and DFOT buildings.
- c. Maximum Differential Settlement between the EDG and DFOT buildings; and between the rest of adjacent buildings.

02.05.04-9

Table 2.0-1 lists values for "Minimum Allowable Static Bearing Demand" and "Minimum Allowable Dynamic Bearing Demand". Generally, "demand", as it relates to foundation engineering, refers to the pressure caused by the weight of the structure and the loads (static or dynamic) acting on the foundation exert on the supporting soil. Conversely, "capacity" refers to the pressure at which shear failure in soil can occur. In accordance with 10 CFR Parts 50 and 100 and SRP 2.5.4, please provide the following information and propose changes and updates to sections of 2.5.4.10 and Table 2.0-1:

- a. Clarification on what exactly is meant by the word "demand" in the aforementioned values in Table 2.0-1
- b. Static Bearing Capacity and associated Factor of Safety for the Nuclear Island
- c. Dynamic Bearing Capacity and associated Factor of Safety for the Nuclear Island

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02.05.04-10

Table 2.0-1 lists values for "Maximum Differential Settlement inside Building" and "Maximum Differential Settlement between buildings". In accordance with 10 CFR parts 50 and 100 and SRP 2.5.4, please clarify which buildings these parameters are applicable to and propose changes to Table 2.0-1

02.05.04-11

Throughout APR1400 Section 2.5, there are many sentences that provide information on site specific items in the present tense, for example, the first sentence of Section 2.5.4.2 states "The static and dynamic engineering properties of the foundation soil and rock in the site area **are** provided". In reality, such statement should be written in the future tense, as follows "The static and dynamic engineering properties of the foundation soil and rock in the site area **will be** provided". The latter statement is accurate as any site specific work will be performed in the future by any applicant referencing the APR 1400 design. Please propose changes to Section 2.5 where applicable.