

Bi-weekly Seismic Call Minutes

Date: 2016-03-23

NRC Attendance: John Vera, Vaughn Thomas, Robert Roche, Jinsuo Nie, Ata Istar

KHNP Attendance: Erin Wisler, Seokhwan Hur, Sunguk Kwon, Jongbo Lee

KEPCO E&C Attendance: Jinwoo Lee, Jaewan Park, Hoonin Cho, Joohyung Kang, Yoonho Nam, Youngsun Lee, Yoongi Cho

Public Attendance: None

Topics:

1. RAI 129-8085, Question 03.08.01-4:

The NRC is to clarify if there is more feedback regarding the response approach to (two different ASME Code editions and addenda). KHNP provided a comparison of the design provisions of NE code editions and addenda to the NRC on 2016-03-08.

Discussion

The NRC staff asked if KHNP will be revising the RAI response to provide a description of the comparison and its findings, and to include the comparison table as an attachment to the response. KHNP confirmed that the response will be revised to describe the comparison and its findings, and to include the table as an attachment. The NRC staff asked if by when KHNP believed the draft response could be provided. KHNP stated the draft response would be provided by Thursday, 2016-03-31.

ACTION: KHNP is to provide the NRC staff with the draft response by 2016-03-31.

2. RAI 183-8197, Q 03.07.02-1:

Discussion regarding KHNP's response approach took place during the 2016-03-09 bi-weekly call. KHNP is to provide the convergence criteria which will be used for the ACS SASSI analysis for inclusion of higher modes.

KHNP INPUT

The convergence criteria are being prepared.

Discussion

KHNP stated that the convergence criteria were being developed. It was stated that the criteria will be provided during the first half of the week following the call.

ACTION: KHNP is to provide the convergence criteria to the NRC staff by Wednesday, 2016-03-30.

3. RAI 253-8300, Question 03.07.01-5:

Feedback from NRC

The label "CSDRS" in the new figures in the DCD markup should be replaced with "CSDRS anchored at 0.1 g."

The site response transfer functions, at the foundation level relative to the free field surface motions, are generally greater than 1 between 3 Hz and 20 Hz for the S6 and S7 soil cases, indicating that the CSDRS at the foundation level should generally be higher than the CSDRS (at the ground surface) in that frequency range. However, Figure 3.7A-12 shows the opposite (i.e., the $CSDRS_{ff}$ is lower than CSDRS). The staff requests the applicant provide further explanation on which dips in the transfer functions for S6 and S7 would cause the dips in the response spectra shown in Figure 3.7A-12.

KHNP INPUT

The label will be changed from "CSDRS" to "CSDRS anchored at 0.1g" in the DCD mark up.

The site response transfer functions shown in Figures 11 through 14 of the response to the RAI are computed for the soil profiles S6 and S7 from half-space to structure foundation elevations. Because the foundation of the EDGB is located relatively close to the ground surface elevation, the site response transfer functions at the foundation level of the EDGB are similar as the transfer functions at the ground surface, as shown in Figure 5-23 of technical report APR1400-E-S-NR-14001-P/NP, Rev.0. Also, since the CSDRS are defined at the ground surface, $CSDRS_{ff}$ of the EDGB should be similar to the CSDRS. The site response transfer functions of the NI are lower than the transfer functions of the EDGB between 3 Hz and 20 Hz, as shown in Figures 11 through 14 of the response to RAI. Therefore, $CSDRS_{ff}$ of the NI should be lower than the $CSDRS_{ff}$ of the EDGB and the CSDRS.

Discussion

The NRC staff stated that KHNP's acceptance of the suggested change resolves the first portion of the issue (CSDRS anchored at 0.1 g). The NRC staff stated general agreement with the statements KHNP provided in the call agenda, but requested that KHNP provide a draft response which quantitatively compares the layering of the S6 and S7 soil profiles to the other profiles and describes how the elevations of the layering interfaces might affect the transfer functions and response spectra. Any other contributing factors which explain which dips in the transfer functions for S6 and S7 would cause the dips in the response spectra shown in Figure 3.7A-12 should also be discussed in the response. In addition, the NRC staff requested that KHNP provide the soil profiles in a digital format to support the NRC staff's independent evaluation. KHNP stated that the soil profiles can be provided in a digital format.

ACTION: KHNP is to provide the NRC staff with a draft RAI response and the soil profiles in digital format.

4. RAI 253-8300, Question 03.07.01-8:

Feedback from NRC

The RAI response is acceptable to the staff. The markup to the APR1400-E-S-NR-14001-P, Rev.0 is also acceptable. However, since these two groundwater tables are used for calculating different loads, i.e., design groundwater table for hydrostatic load, hydrodynamic load, and the buoyancy load, while the extreme groundwater for seismic analysis of Seismic Category I structures), they should be described in the DCD. Therefore, the applicant is requested to propose a markup to an appropriate DCD section to indicate this important aspect.

KHNP INPUT

The following sentence will be added to DCD Tier 2, Subsection 3.7.1.3, "Supporting Media for Seismic Category I Structures";

"To generate more conservative seismic responses, groundwater table elevation is considered to be at the ground surface in the seismic analyses of the seismic Category I structures."

Discussion

The NRC staff stated that the proposed markup should be revised to use the same terminology as found elsewhere in the DCD. It was stated that the term "extreme groundwater elevation" should be used, since the term appears in DCD Section 3.8A.1.4.2.3.2. KHNP stated that the response will be revised to use consistent terminology. The NRC staff stated that the term "design groundwater table" should be defined in the DCD in an appropriate section, and the analyses/evaluations in which it is used described. KHNP stated that the definition and the description will be added to the DCD.

ACTION: KHNP is to provide a draft RAI response which uses the term "extreme groundwater elevation" in the existing proposed revision and defines and describes the use of "design groundwater table".

5. RAI 199-8223, Question 03.08.01-11

KHNP has revised the RAI response to include the revisions discussed during the bi-weekly call on 2016-03-09 (member forces, development length, and portion beyond RCB).

KHNP compared the load combinations of the ASME and ACI codes applied in the NI common basemat analysis, and found that there are four kinds of loads that exist in the ACI load combination but do not exist in the ASME load combination. The loads which are not in the ASME load combination are the operating pressure, miscellaneous loads, crane and trolley load, and the hydrostatic load. As described in the response to RAI 255-8285, Question 03.08.05-13, operating pressure and miscellaneous loads do not have an effect on the global behavior of the basemat, and these loads were not considered in the NI common basemat analysis. The crane and trolley load is already considered in the NI common basemat analysis as self-weight of the fuel handling overhead crane. The hydrostatic load in the AB tanks was not considered in the analysis due to its minor effect on the basemat. In addition, the effect of the soil pressure on the RCB foundation is negligibly small because the size of the AB foundation is large (348 ft x 353 ft as described in DCD Section 3.8A.2.4.1) and the distance between the RCB foundation and the AB outside wall is long. Most of the soil pressure on the side walls of the AB foundation is transmitted through the AB internal walls and has little effect on the behavior of the RCB foundation.

Discussion

During the call, it was identified that this item was mistakenly labeled as Question 03.08.05-11 instead of 03.08.01-11. The typographical error has been corrected. The NRC staff confirmed the provided draft had been received on 2016-03-18 and stated the material had not been provided on a date which provided sufficient time for the NRC staff to review the response before the call. It was stated that the response would be discussed during the next bi-weekly call.

6. RAI 199-8223, Question 03.08.01-13

KHNP has revised the RAI response by attaching the VSL brochures which show the type of prestressing system used for APR 1400 Design. KHNP has attempted to obtain the historical information regarding the prestressing system by requesting the vendor to provide the information. However, KHNP could not obtain the information from the vendor since such information is considered confidential. Most Korean NPPs in service use the VSL E5-55 prestressing system. The VSL E6-42 system has been applied to Shin-Kori Units 3&4, which is the latest NPP in service in Korea, and is a first of a kind application. Thus, the only NPP which uses the VSL E6-42 system is Shin-Kori Units 3&4. There is no reported degradation or other problems with the prestressing system.

Discussion

The NRC staff confirmed the provided draft had been received on 2016-03-18 and stated the material had not been provided on a date which provided sufficient time for the NRC staff to review the response before the call. It was stated that the response would be discussed during the next bi-weekly call.

7. RAI 255-8285, Question 03.08.05-7

KHNP would like to discuss with the NRC the work scope of structural design considering to the construction sequence.

Based on the soil properties of Table 3.7A-1, the use of construction sequence analysis results is very limited. The limits of the construction sequence analysis due to the uncertainty of the generic geotechnical parameters are below.

1. The analysis will refer to the construction sequence of Shin-Kori units 3&4 for the NI building structures.

2. The variety of uniformity of soil layering will not be Accounted for.
3. Based on the sand soil characteristic, the settlements will occur instantaneously, so the short-term settlement will be checked.
4. The effect of the design of Seismic Category I structures will not accounted for due to the uncertainty of the generic geotechnical parameters if the settlements does not exceed the allowable settlement in Table 2.0-1 of DCD.

Discussion

The NRC staff stated that KHNP's position; that the S1 profile is the worst condition with regards to settlement, that settlement occurs instantaneously, and that it is predicted that the results of the construction sequence evaluation will result in settlements which are within the limiting design value stated in Table 2.0-1 of the DCD, is understood. The NRC staff encouraged KHNP to review the discussion regarding this RAI question which took place during the December, 2015 public meeting, and provide the NRC staff with a draft response which addresses the concerns previously discussed. KHNP stated a draft response will be produced and provided to the NRC staff.

ACTION: KHNP is to provide the NRC staff with a draft response. The provided response should be developed with consideration of the contents of the draft response to RAI 255-8285, Question 03.08.05-18, as discussed below.

8. RAI 255-8285, Question 03.08.05-18
KHNP would like to confirm the NRC's feedback received during the 3.8 public meeting has been appropriately incorporated.

Discussion

The NRC staff stated that the provided response refers to a COL item added by the response to RAI 255-8285, Question 03.08.05-7, and that the response to Question 03.08.05-7 had not been provided ahead of the call. As a result, the NRC staff stated no comments regarding the acceptability of the provided draft response to Question 03.08.05-18 could be provided. KHNP stated that the draft response was referring to the draft of Question 03.08.05-7 which had been provided in support of the December, 2015 meeting. Both parties agreed that no comments could be made, despite the previous draft response to Question 03.08.05-7, due to the transient nature of the response (a new draft response is to be developed as discussed above). The NRC staff stated that consideration of the provided draft response to Question 03.08.05-18 should be taken into account when developing the response to

Question 03.08.05-7. KHNP stated it was understood that the two draft responses are interrelated.

ACTION: KHNP is ensure the contents of the response to Q 03.08.05-7 support the response to Question 03.08.05-18.

9. KHNP to provide updated schedule of drafts to be communicated with NRC

Discussion

The NRC staff stated that the response to RAI 227-8274, Question 03.08.04-3 had not been received on 2016-03-07, as indicated in the table. KHNP stated that a review of provided materials would be performed, the materials sent, and the table adjusted appropriately.

ACTION: KHNP is to ensure the response to RAI 227-8274, Question 03.08.04-3 is provided to the NRC staff and adjust the "Outstanding Draft RAI Responses" table appropriately.

Outstanding Draft RAI Responses

RAI	Question	Draft Due Date	Draft Provided	Feedback Provided	Action With
182-8160	03.07.01-4	N/A	3/15/2016	N	NRC
252-8299	03.07.02-7	7/31/2016	N	N/A	KHNP
252-8299	03.07.02-11	7/31/2016	N	N/A	KHNP
252-8299	03.07.02-12	N/A	3/22/2016	N	NRC
252-8299	03.07.02-14	TBD	N	3/21/2016	KHNP
252-8299	03.07.02-15	TBD	N	3/21/2016	KHNP
129-8085	03.08.01-1	N/A	2/19/2016	N	NRC
129-8085	03.08.01-4	3/31/2016	N	3/24/2016	KHNP
226-8235	03.07.02-5	3/21/2016	N	N/A	KHNP
226-8235	03.07.02-6	10/7/2016	N	N/A	KHNP
183-8197	03.07.02-1	8/12/2016	N	N/A	KHNP

183-8197	03.07.02-4	TBD	N	N/A	KHNP
199-8223	03.08.01-8	4/29/2016	N	N/A	KHNP
199-8223	03.08.01-9	N/A	2/23/2016	N	NRC
199-8223	03.08.01-10	TBD	N	N/A	KHNP
199-8223	03.08.01-11	N/A	3/18/2016	N	KHNP
199-8223	03.08.01-13	N/A	3/18/2016	N	KHNP
200-8225	03.08.02-2	3/25/2016	N	N/A	KHNP
227-8274	03.08.04-1	N/A	3/4/2016	N	NRC
227-8274	03.08.04-3	N/A	3/7/2016	N	NRC
227-8274	03.08.04-4	N/A	3/4/2016	N	NRC
227-8274	03.08.04-9	N/A	3/4/2016	N	NRC
267-8301	03.07.03-1	4/8/2016	N	N/A	KHNP
267-8301	03.07.03-3	3/25/2016	N	N/A	KHNP
255-8285	03.08.05-7	TBD	N	N/A	KHNP
255-8285	03.08.05-18	N/A	3/21/2016	N*	NRC
253-8300	03.07.01-5	TBD	N	N/A	KHNP
253-8300	03.07.01-8	TBD	N	N/A	KHNP

*Contents of the response are dependent upon Question 03.08.05-18