

## Bi-weekly Seismic Call Agenda

Date: 2016-04-20

### Topics:

1. RAI 199-8223, Question 03.08.01-11

KHNP is to determine if the information included in the 2016-03-23 teleconference agenda can be included in the RAI response and the DCD, and communicate a new draft due date.

#### KHNP Input

The information included in the 2016-03-23 teleconference agenda has been reflected in the revised RAI response and the DCD markup, as shown in the materials provided on April 19.

2. RAI 199-8223, Question 03.08.01-13

The NRC staff is to comment on the acceptability of the draft response provided on 2016-03-18 and the appropriateness of using the prestressing system's vendor name in the DCD. KHNP is to translate the Korean version of the VSL brochure into English and describe what information is applicable to the APR1400.

#### KHNP Input

The translation of the VSL Korea brochure was provided on April 19. The English version of the VSL brochure is summarized in the Korean version. The Korean version provides only one option of material properties without any other options. In this process, the different material was used to consider the local conditions.

The dimensions in certain anchorage types may vary with material properties including concrete compressive strength, yield strength of reinforcing steel and tendon stressing force. The dimensions which do not match between the VSL International and Korean brochures come from the difference of material properties applied in both brochures.

In general, dimensions of anchorage assemblies in the VSL brochures are standard detailing recommended by VSL. However, the dimensions of anchorage assemblies used in APR 1400 are calculated by the supplier to consider the actual material properties applied in the APR 1400. The actual material properties are described in DCD 3.8A.1.2.

3. RAI 252-8299, Question 03.07.02-9

KHNP is still examining the cause of the abnormal ISRS for the S05 profile. KHNP anticipates the supplemental response can be produced by 2016-05-27. KHNP is to report any progress regarding determining the cause of the EDGB & DFOT S5 behavior.

KHNP Input

KHNP has investigated whether numerical error exists in the EDGB and DFOT SSI analysis model for the S5 soil case, but no numerical error has been identified.

KHNP has performed the SSI analyses using separated superstructure models for the EDGB and DFOT, respectively, to find the cause of abnormal responses in the ISRS for S5 soil case. The results of the separated SSI analysis using only the EDGB model are reasonable, but the results using only the DFOT model are still abnormal. Thus, KHNP has performed an additional SSI analysis using only the DFOT model with some modifications. These modifications include changing of backfill properties from structural fill granular to lean concrete and changing of the mesh configuration of the entire backfill from irregular to regular. The results of the additional SSI analyses using modified DFOT model are found to be reasonable.

Since EDGB and DFOT structures are adjacent to NI structure and their embedment depths are different from each other, the backfill mesh configurations of the coupled EDGB and DFOT model are irregular and complex, while the backfill mesh configuration of the NI structure model is regular and simple. Therefore, KHNP assumed that mesh configuration and properties of the backfill model in the coupled model are the major causes of the abnormal ISRS.

According to this assumption, KHNP is first performing two cases of SSI analyses for the DFOT model (by itself) with partially changed backfill. One is a model using lean concrete as properties of EDGB side backfill. The other is a model using a modified mesh configuration for the backfill. KHNP expects that a main cause of the abnormal response can be identified after those two analyses are completed. Then, KHNP will perform SSI analyses using a coupled EDGB and DFOT model which has modified backfill properties or mesh configurations of backfill, according to the above results of the SSI analyses.

#### 4. RAI 252-8299, Question 03.07.02-7 and 10

##### Question 03.07.02-7

KHNP is to revise the response to address the concerns expressed by the NRC staff during the 2016-04-06 call regarding the exclusion of 25% of the live loads and to provide a detailed description of slab modeling in the seismic and structural design models. KHNP is to provide a summary of the response approach and a proposed draft due date.

##### KHNP Input

The response to the concerns expressed by the NRC staff during the 2016-04-06 call have been provided to the NRC staff (April 19) in support of this call. Item 2 of the provided information (2. Seismic Live Load and Slab Modeling in RCB Seismic Analysis Model) will be added to the revised response to RAI 252-8299, Question 03.07.02-7. However, KHNP proposes that Item 1 (1. Slab Modeling in RCB Structural Analysis Model), which is not related to RAI 252-8299, Question 03.07.02-7, such as slab modeling in the structural analysis model and the connection details of structural steel beam supporting the slabs, not be added to the revised response. The draft revised response will be provided by April 29, if the response approach is accepted by NRC staff.

##### Question 03.07.02-10

During the 2016-04-06 call, the NRC staff stated that KHNP's response approach was not satisfactory. KHNP is to provide a summary of the response approach and a proposed draft due date.

##### KHNP Input

To provide additional information, a study will be performed as follows:

1. The auxiliary building walls, which have fundamental frequencies lower than 50 Hz, will be identified using classical plate vibration formulas.
2. For identified walls, which have fundamental frequencies lower than 50 Hz, the modal analyses will be performed using ANSYS fine and coarse partial wall models.
3. Frequencies, dimensions, and the mesh sizes of those partial wall models will be summarized.

The draft revised response will be provided by May 31, if the response approach is accepted by NRC staff.

5. RAI 183-8197, Question 03.07.02-4

KHNP is to provide a date by which the response will be revised to include the EDGB & DFOT and provided to the NRC.

KHNP Input

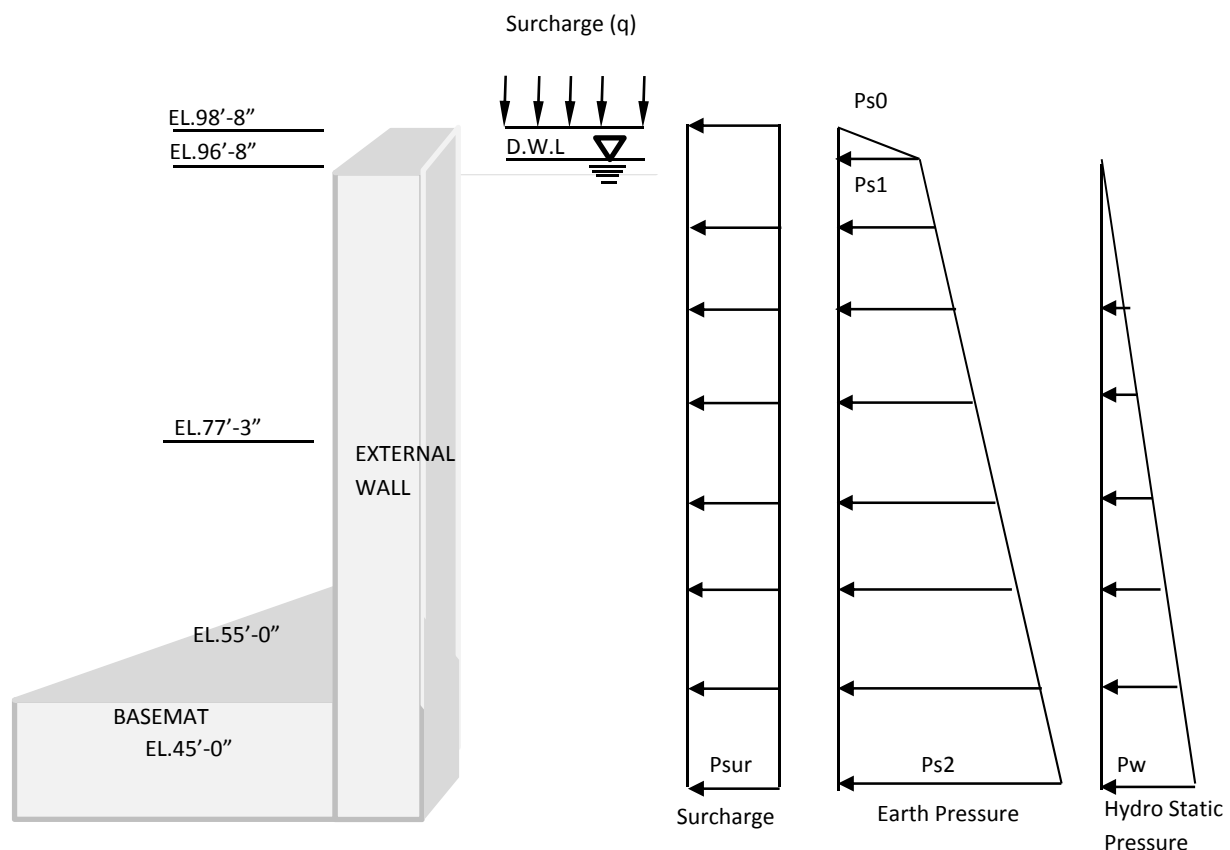
The revised response will be provided by April 29.

6. RAI 227-8274, Q 03.08.04-4

KHNP is to explain why  $L_g$  is only applied up to two feet below grade.

KHNP Input

The soil and surcharge load ( $L_g$ ) include hydrostatic pressure, surcharge load and earth pressure.



The hydrostatic pressure is applied up to two feet below grade. Earth pressures are applied up to the grade level.

7. RAI 199-8223, Q 03.08.01-9

During the 2016-04-06 the NRC staff stated that the response should provide a markup for DCD Section 3.8.2.7 which provides similar information to what had already been included in the response. KHNP stated the feedback would be considered. KHNP is to communicate if the NRC staff's feedback will be incorporated and provide a date by which the revised draft response will be provided.

KHNP Input

As shown the draft revised RAI response (April 19), the markup of DCD section 3.8.2.7 has been added in the revised response.

8. Time History Seed Records

KHNP is to provide the NRC staff with the time history seed records for Northridge and Nahanni.

KHNP Input

The time histories of the seed motion for the CSDRS and HRHF have been provided via e-mail (April 19).

**KHNP Added**

9. RAI 255-8285, Question 03.08.05-7

KHNP INPUT

KHNP would like to discuss the response approach for RAI 255-8285 Question 03.08.05-7 regarding the work scope of the evaluation of settlement due to construction sequences.

1. Under the site properties in DCD Table 3.7A-1, the construction sequence analysis will not affect the design of the basemat and superstructure. Because the settlement is dependent on the amount of applied load when considering sand characteristics, the settlement during construction will be smaller than the settlement under the as-built condition described in the technical report.
2. If the construction sequence is necessary to check the item 1, KHNP plans to execute the construction sequence analysis based on the following assumptions. Confirmation that the NRC staff agrees that the assumptions are reasonable before work begins is desired.

- 1) The site properties described in DCD 3.7A-1 are used in the construction sequence analysis.
- 2) Based on assumption 1), the short-term settlement will be checked and considered.
- 3) The analysis will use the construction sequence of Shin-Kori units 3,4 instead of the actual construction sequence which would be specified by a COLA.
- 4) If the settlement for the construction sequence does not exceed the allowable settlement presented in DCD Table 2.0-1, the effects on the design for the seismic category I structures due to the construction sequence analysis will not be accounted for.

10. RAI 255-8285, Question 03.08.05-16

KHNP INPUT

KHNP has provided a draft revised response to address issues regarding the static elastic modulus, as discussed during the December 2015 meeting. KHNP would like to hear any feedback the NRC staff might have to offer.

11. RAI 182-8160, Question 03.07.01-3 and RAI 255-8285, Questions 03.08.05-8, 11, 12 schedules.

RAI	Question	Due Date	Revised Due Date	Reason of change
182-8160	03.07.01-3	2016-04-30	2016-06-30	At this time, KHNP anticipates the re-evaluation of the PSD will take approximately 12 weeks.
255-8285	03.08.05-8	2016-04-22	2016-05-13	KHNP anticipates the foundation re-analysis to reflect required changes discussed in the public meeting will take until the end of this month. Accordingly, KHNP will need to revise RAI responses to describe the changes in the foundation re-analysis.
255-8285	03.08.05-11	2016-03-18	2016-05-13	
255-8285	03.08.05-12	2016-04-15	2016-05-13	
255-8285	03.08.05-16	2016-04-15	2016-06-03	KHNP needs more time to consider the approach to be taken to calculate the soil elastic modulus.

### Outstanding Draft RAI Responses

RAI	Question	Draft Due Date	Draft Provided	Feedback Provided	Action With
182-8160	03.07.01-4	N/A	4/6/2016	N	NRC
252-8299	03.07.02-7	7/31/2016	N	N/A	KHNP
252-8299	03.07.02-7 item a.)i.)	4/29/2016	N	4/6/2016	KHNP
252-8299	03.07.02-9	5/27/2016	N	N/A	KHNP
252-8299	03.07.02-10	5/31/2016	N	4/6/2016	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	3/31/2016	KHNP (to be submitted)
129-8085	03.08.01-1	N/A	2/19/2016	N	NRC
129-8085	03.08.01-4	N/A	3/29/2016	N	NRC
226-8235	03.07.02-5	4/18/2016	N	N/A	KHNP
226-8235	03.07.02-6	8/12/2016	N	N/A	KHNP
183-8197	03.07.02-1	8/12/2016	N	N/A	KHNP
183-8197	03.07.02-4	4/22/2016	N	4/6/2016	KHNP
199-8223	03.08.01-8	4/29/2016	N	N/A	KHNP
199-8223	03.08.01-9	N/A	4/19/2016	N	NRC
199-8223	03.08.01-10	4/18/2016	N	N/A	KHNP
199-8223	03.08.01-11	N/A	4/19/2016	N	NRC
199-8223	03.08.01-13	TBD	N/A	4/6/2016	KHNP
200-8225	03.08.02-2	N/A	4/4/2016	N	NRC
227-8274	03.08.04-1	N/A	3/4/2016	4/6/2016	KHNP (to be submitted)
227-8274	03.08.04-3	N/A	3/23/2016	N	NRC
227-8274	03.08.04-4	TBD	N	4/6/2016	KHNP
227-8274	03.08.04-9	N/A	3/4/2016	4/6/2016	KHNP (to be submitted)
267-8301	03.07.03-1	4/18/2016	N	N/A	KHNP
267-8301	03.07.03-3	N/A	3/30/2016	N	NRC
255-8285	03.08.05-7	N/A	4/4/2016	N	NRC
255-8285	03.08.05-16	N/A	4/19/2016	N	NRC
255-8285	03.08.05-18	N/A	3/21/2016	N*	NRC
253-8300	03.07.01-5	N/A	3/30/2016	N	NRC
253-8300	03.07.01-8	N/A	4/4/2016	N	NRC