

## **Bi-weekly Seismic Call Agenda**

**Date:** 2016-05-03

### **Topics:**

1. RAI 199-8223, Question 03.08.01-11  
KHNP has revised the draft response to include the information provided during the 2016-03-23 teleconference and provided the revised draft on 2016-04-19. Discussion regarding the revised response is to take place.
2. RAI 199-8223, Question 03.08.01-13  
KHNP is to provide to the NRC a markup of DCD Tier 2, Section 3.8.1.6.3 which specifies the manufacturer and product designation of the tendon and anchorage system. KHNP has revised the response to include a change to the DCD which will add the manufacturer and product designation of the tendon and anchorage system in Section 3.8.1.6.3.
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 determination of 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 the 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 the modified DFOT model are found to be reasonable.

Since the EDGB and DFOT structures are adjacent to the 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.

(added for 2016-05-03)

To investigate the aforementioned assumption, KHNP has performed two SSI cases 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. The results of the analyses are lower than the original abnormal results, but these results are not enveloped by the ISRS. KHNP also performed an SSI analysis using a coupled EDGB and DFOT model which changed backfill properties of elements which are located between EDGB and DFOT from structural fill granular to lean concrete properties. The results of the analyses are shown in Attachment 1 to this agenda.

KHNP is continuing to perform SSI analyses to find out the main cause of the abnormal behavior by using a coupled EDGB and DFOT model which has modified mesh configurations.

4. RAI 252-8299, Question 03.07.02-7

KHNP is to determine what slabs have been included in the live load study, re-perform the study if all slabs have not been included, and revise the RAI response to describe the modeling of all slabs and discuss the treatment of live loads with regard to those slabs (justify if excluded).

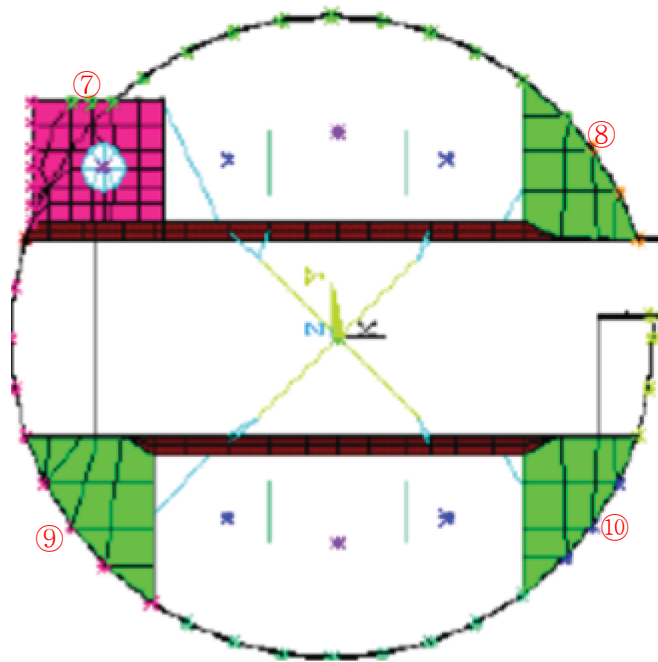
KHNP INPUT

There are some small horizontal surfaces in the reactor containment building other than those horizontal surfaces between the secondary shield wall (SSW) and the containment shell. The small horizontal surfaces which are not between the SSW and the containment shell are modeled in the reactor containment building seismic analysis model. The following figure shows the horizontal surfaces modeled in the reactor containment building seismic analysis model compared to those those horizontal surfaces shown in DCD Tier 2, Figure 1.2-

2, "General Arrangement Reactor Containment Building Section A-A" on page 1.2-48, which was referred to by the NRC staff during the last bi-weekly seismic call.

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In addition to the six horizontal surfaces shown in the figure above, four horizontal surfaces also exist in the reactor containment building, as shown in the figure below.



Since the ten horizontal surfaces labeled above are relatively small, the seismic live loads of those surfaces were ignored in

the last study for evaluation of seismic live load effect on seismic response of the reactor containment building.

Therefore, the revised ISRS comparisons, which show the effect of seismic live loads distributed on all horizontal surfaces as well as those horizontal surfaces between the SSW and the containment shell, are provided below. As shown in the figures below, the comparison results indicate that the variation of ISRS due to the consideration of the seismic live load in the RCB seismic analysis model is negligibly small. Therefore, it can be concluded that the effect of seismic live load on the RCB seismic response is insignificant.

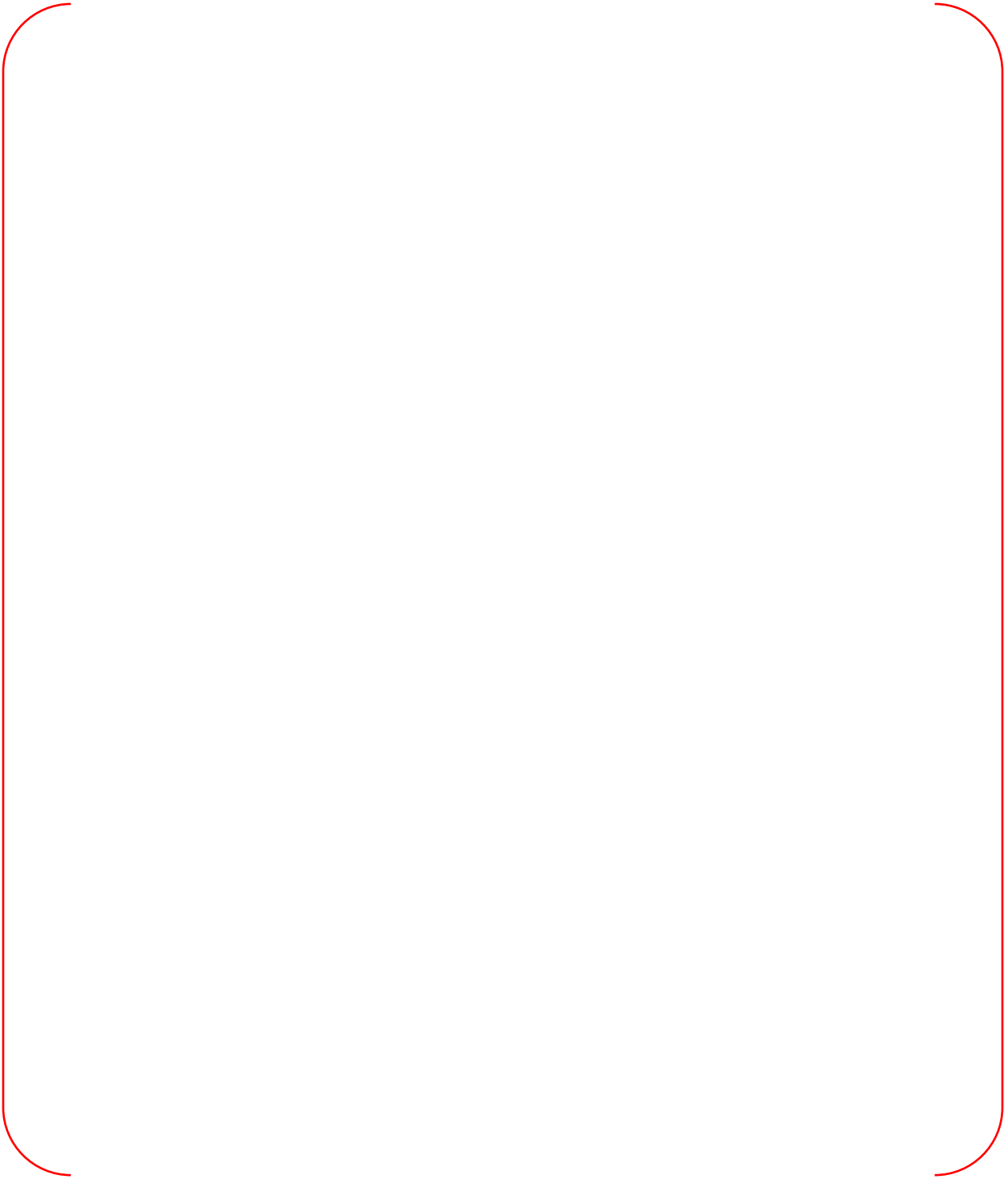
The total weight of the seismic live load which is included in this evaluation is 1,650 kips, while the total weight of the reactor containment building internal structure is 183,000 kips.

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(a) Comparison of ISRS at SSW EL. 114'-0"



(b) Comparison of ISRS at SSW EL. 136'-6"



(c) Comparison of ISRS at SSW EL. 156'-0"

5. RAI 183-8197, Question 03.07.02-4

KHNP is to provide the revised response which includes the EDGB & DFOT.

KHNP INPUT

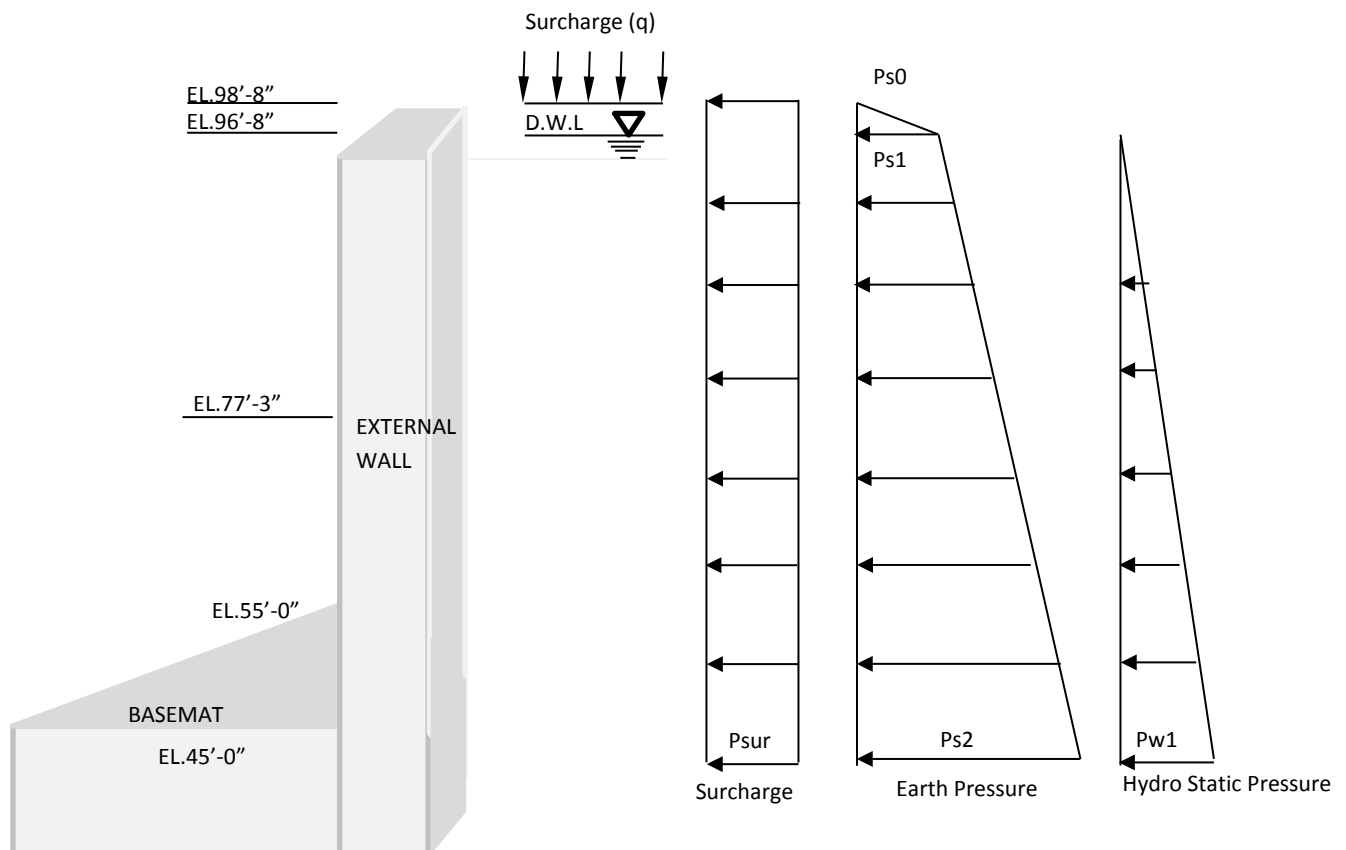
KHNP is experiencing technical challenges. An investigation of how previous applicants have resolved contact ratio issues is underway. KHNP anticipates being able to provide a draft due date during the next bi-weekly call on 2016-05-18.

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 response in RAI 227-8274 Question 03.08.04-4 is focused on the description of the water pressure, so the response explains the height for the hydrostatic pressure. The hydrostatic pressure is applied up to two feet below grade. Earth pressures are applied up to the grade level, as shown in the figure below.



7. RAI 199-8223, Q 03.08.01-9

The draft revised RAI response was provided to the NRC staff on April 19. The markup of DCD Section 3.8.2.7 has been added in the revised response.

8. 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 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.

9. 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 Schedule Slips

KHNP is to determine the level of confidence in a positive outcome and the risks associated with a negative outcome (body of work to be performed and schedule of that work should there be a negative outcome) for RAI 182-8160, Question 03.07.01-3. KHNP is to determine why a revised due date of 2016-06-03 has been provided for RAI 255-8285, Q 03.08.05-16 when a draft was provided to the NRC on 2016-04-19.

KHNP INPUT

KHNP is still evaluating the probability of a favorable outcome to the issues discussed in RAI 182-8160, Question 03.07.01-3, and the impacts of an unfavorable outcome. The draft provided to the NRC in response to RAI 255-8285, Q 03.08.05-16 is considered to be KHNP's final draft response, and no further work is being performed at this time. KHNP requested to move the final due date to 2016-06-03 so that multiple revisions to the final due date would not be necessary. However, KHNP hopes to produce a final response before that date, but finalization will be contingent upon the nature of feedback provided by the NRC staff.

12. RAI 182-8160, Question 03.07.01-1 and 2

Feedback regarding Questions 03.07.01-1 and 2 has been provided by the NRC staff. Discussion regarding the feedback is to take place.

KHNP INPUT

The response to feedback provided by the NRC is described in Attachment 2. The draft revised response has been provided to the NRC staff (2016-04-29).

13. RAI 129-8085, Q 03.08.01-2 and 5

The NRC staff provided feedback regarding Questions 03.08.01-2 and 5. Discussion regarding the feedback is to take place.

KHNP INPUT

The response to the feedback provided by the NRC is described in Attachment 3 and the draft revised response has been provided to the NRC staff (2016-04-29).

**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
182-8160	03.07.01-1	N/A	4/29/16	N	NRC
182-8160	03.07.01-2	N/A	4/29/16	N	NRC
252-8299	03.07.02-7	7/31/2016	N	N/A	KHNP
252-8299	03.07.02-7 item a.)i.)	N/A	4/29/2016	N	NRC
252-8299	03.07.02-9	5/27/2016	N	N/A	KHNP
252-8299	03.07.02-10	5/31/2016	N	4/20/2016	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)
252-8299	03.07.02-14	TBD	N/A	4/21	KHNP
129-8085	03.08.01-1	N/A	2/19/2016	N	NRC
129-8085	03.08.01-4	N/A	4/20/2016	N	NRC
129-8085	03.08.01-5	N/A	4/29/2016	N	NRC
226-8235	03.07.02-5	N/A	4/27/2016	N	NRC
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	4/29/2016	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	N/A	4/28/2016	N	NRC
199-8223	03.08.01-11	N/A	4/19/2016	N	NRC
199-8223	03.08.01-13	N/A	4/28/2016	N	NRC
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	TBD	3/30/2016	4/28/2016	KHNP
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	TBD	3/30/2016	4/28/2016	KHNP
253-8300	03.07.01-8	N/A	4/4/2016	N	NRC