RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

1/31/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.:	**NO. 852-6003 REVISION 3**
SRP SECTION:	**03.07.02 – Seismic System Analysis**
APPLICATION SECTION:	**3.7.2**
DATE OF RAI ISSUE:	**10/24/11**

QUESTION NO. RAI 03.07.02-131:

With respect to Section 5.4 of MUAP-10001(R3), "Dynamic FE Model of the PS/B," staff noticed that the ANSYS dynamic model is translated into ACS SASSI model for the SSI analysis and that there are large differences in the response from both the ANSYS and ACS SASSI models. The applicant is requested to discuss what actions are planned to improve the accuracy of the seismic model translation from ANSYS to ACS SASSI in order to conform to the guidance provided in Section 4.3.3 of the report (page 4-33). The applicant is also requested to provide the following information in order to determine the adequacy of the dynamic model and the results of the SSI analyses of the PS/B.

(i) In Figure 5.4.1.-7, "PS/B Dynamic FE Model (Beams and Columns)," the beams and columns appear to be modeled using solid elements, in a manner that cannot represent flexural behavior. Explain this figure, and describe how flexural behavior of the beams and columns is modeled.

(ii) Figures 5.4.3-12 through 5.4.3-20 present ARS comparisons between the detailed model and the dynamic model, at locations in the PS/B. The spectral acceleration peak in Figure 5.4.3-20 in the vertical (Z) direction is significantly higher for the dynamic model (6.5g), than for the detailed model (5.2g). Explain the large difference in results.

(iii) Figure 5.4.3-20 "PS/B ARS Results – Comparison at Elev. 39'-6" Interior, Z-direction," the dynamic model result has a 6.5g peak at 18.5 Hz. In Figure 5.4.5-9 "PS/B ACS SASSI Results – ARS Comparison at Elev. 39'-6", Z-direction," the dynamic model result has a 4g peak at 18.5 Hz; and there is a double peak not shown in Figure 5.4.3- 20. Explain why there is a large difference in the peak spectral acceleration in the Z-direction and also changes in the spectral shape around 20 Hz.

(iv) Figures 5.4.4-1 through 5.4.4-4 present comparisons between the detailed and dynamic models, for local out-of-plane vibration modes of slabs in the PS/B. It appears that Figures 5.4.4-2 and 5.4.4-4 need to be switched for proper comparison of these dynamic model results to the comparable detailed model results. The applicant is requested to confirm this and make this correction in the next revision of MUAP-10001.

(v) The staff noted that the Sections 5.4.5 through 5.4.8 should be Sections 5.4.1 through 5.4.4. Figures and tables are numbered correctly. Make this correction in the next revision of MUAP-10001.

(vi) Figures 5.4.4-1 through 5.4.4-4 do not demonstrate good correlation of local modes between the detailed model and the dynamic model at the 70 Hz level as stated on page 5-238.The applicant is requested to provide evidence of the good correlation of local modes at the 70 Hz level.

(vii) The last paragraph on page 5-220 states “It is noted that the Detailed PS/B Model utilizes uncracked concrete material properties. Therefore, for comparison and validation purposes, uncracked concrete material properties are also assigned to the Dynamic PS/B Model.” This statement implies that the ISRS developed for design of SSCs attached to the PS/B are based solely on a model with uncracked reinforced concrete stiffness and 4% viscous damping. Confirm this is the correct interpretation, and provide the technical basis for concluding that only the uncracked stiffness case needs to be analyzed, for generating the ISRS and for structural design. Also confirm that the same generic soil profiles are used for SSI analysis of the PS/B as are used for SSI analysis of the RB complex, or explain any differences including technical justification.

(viii) Table 5.4.3-2 PS/B Roof Lateral Displacement Comparison, on page 5-226, compares roof displacements in the NS and EW directions for 1g static loading. The comparison between the detailed model and dynamic model for this simple loading is very good in the EW direction, but less accurate than would be expected in the NS direction. Explain this discrepancy in the NS direction.

(ix) In Figure 5.4.3-14 of MUAP-10001(R3), “PS/B ARS Results – Comparison at Elev. 3’-7” Interior, Z-direction,” (Page 5-232) the curve corresponding to the ARS obtained from the dynamic model misses the second peak (about 18 Hz) of that obtained from the detailed model. The difference of the two curves at about 18 Hz shown in Figure 5.4.3-14 is about 30% in magnitude. Explain why there is a large difference in magnitude.

ANSWER:

Technical Report MUAP-10001, Rev. 3, is superseded by Technical Report MUAP -10006, Rev. 3. The reactor building (R/B), prestressed concrete containment vessel (PCCV), containment internal structure (CIS), east and west power source buildings (PS/Bs), auxiliary building (A/B), and essential service water pipe chase (ESWPC) are now structurally integrated and supported on a combined basemat to form the R/B complex. Technical Report MUAP-10006, Rev. 3, presents the information relevant to the A/B as well as the other buildings that make up the R/B complex.

The validation of the model no longer uses the methodology or acceptance criteria that were stated in Technical Report MUAP-10001. The methodology and validation of the model is presented in Part 2 of Technical Report MUAP-10006, Rev. 3.

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the R-COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

There is no impact on the PRA. MHI to Verify

Impact on Technical/Topical Report

There is no impact on Technical/Topical Report

This completes MHI's response to the NRC's question.