
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

1/31/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 776-5851 REVISION 3
SRP SECTION: 03.07.02 – Seismic Systems Analysis
APPLICATION SECTION: 3.7.2
DATE OF RAI ISSUE: 06/15/11

QUESTION NO. RAI 03.07.02-76:

In Subsection 4.3 of MUAP-11001 (R0), "Results of Dynamic FE Model SSI Analyses," the third paragraph (page 55) states, "These SASSI models are shown in Figure 2.3-1 through Figure 2.3-3 for the 9-ft-mesh model, which is used for the critical 270-500 site profile case, and in Figure 2.3-4 through Figure 2.3-12 for the 13-ft-mesh model, which is used for the critical 900-100, 900-200, and 2032-100 site profile cases."

The data shown in Table 4.2-1 of the report indicate that the maximum wave passage frequency for the 9-ft-mesh model is 27.9 Hz which is less than the ZPA frequency of 50 Hz. The Applicant is requested to provide the technical basis and justification to demonstrate that the contribution from the higher modes is negligible and the result is conservative.

ANSWER:

This answer revises and replaces the previous MHI answer that was transmitted by letter UAP-HF-11281 (ML11243A163).

Technical Report MUAP-11001 has been superseded and the relevant information incorporated into Technical Report MUAP-10006, Rev. 3. The reactor building (R/B), prestressed concrete containment vessel (PCCV), containment internal structure, 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 common basemat to form the R/B complex. Technical Report MUAP-10006, Rev. 3 presents the information relevant to the added A/B and PS/Bs as well as the other buildings that make up the R/B complex.

The cut-off frequencies of the soil-structure interaction (SSI) analyses of different generic soil profiles considered are set at values that ensure that the results of the SSI analyses envelope the response at frequencies up to 50 Hz. See Section 03.3.5 and the below discussion for further explanation.

The discretization of the ACS SASSI dynamic finite element (FE) model of the R/B complex, including mesh size, is discussed in Sections 03.3.3.5 and 03.3.4.1 and Table 03.3.4.1-1 through Table 03.3.4.1-3 and Table 03.3.5-2 of MUAP-10006, Rev. 3. The 3-D FE models have an adequate number of discrete mass degrees of freedom to capture the global and local

translational, rocking, and torsional responses of the structures. The element size is selected such that the dynamic response of the structure and the SSI effects will be adequately captured. The mesh size also ensures that the discretized structures with full (uncracked concrete) stiffness properties is able to capture the local responses and responses of significant modes of vibration with frequencies equal to or below 50 Hz. The dynamic FE model of R/B complex is sufficiently refined to transmit waves with frequencies up to 50 Hz through the soil-foundation interface. The SSI analyses of softer soil profiles for which the wave passage frequencies of dynamic FE model are lower than 50 Hz provide responses that are enveloped in the high frequency range by the responses obtained from analyses of harder soil profiles. Therefore, the SSI analyses of all six generic soil profiles provide an adequate envelope responses up to 50 Hz as required by ISG-01.

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.

Impact on Technical/Topical Report

There is no impact on the Technical/Topical Report.

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