
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 03.07.02-70:

In Subsection 2.3.1 of the MUAP-11001 (R0), "Structural Discretization and Finite Element Types," the third paragraph (page 7) states, "In order to ensure an appropriate transfer of high frequency seismic waves through the soil-structure interface, two dynamic FE models are developed with maximum element sizes in the horizontal direction of 9 feet and 13 feet."

In MHI technical report, MUAP-10006 (R1), the Applicant presents Equation (1b) on p.4 for the size of the FE mesh. For the cut-off frequency chosen to be that of the ZPA (50 Hz), the element size of 9 feet and 13 feet does not meet this equation for the 270-200 soil profile. The Applicant is requested to provide a technical basis and justification for not satisfying the element size requirement of equation (1b), in MUAP-10006(R1) in the current analysis for the A/B.

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Technical Report MUAP-11001 has been superseded and the relevant information incorporated into Technical Report MUAP-10006, Rev. 3.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 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 Tables 03.3.4.1-1 through Table 03.3.4.1-3, and Table 03.3.5-2 of MUAP-10006, Rev. 3.

As described in Technical Report MUAP-10006, Section 03.3.4.1, the mesh size in the horizontal direction at the bottom of the foundation level ranges from 6.0 to 9.0 ft, with an average of 6.62 ft in the NS direction and 7.32 ft in the EW direction. In the vertical direction, excavated soil volume mesh sizes are consistent with the soil layering as shown in Tables 03.3.1-1 through 03.3.1-6.

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 soil-structure interaction (SSI) effects will be adequately captured. Technical Report MUAP-10006, Section 03.3.5 explains why it is acceptable for the cut-off frequency of profile 270-200 (and 270-500) to be below 50 Hz, since the relative soft soil will filter out high frequency content of the earthquake input motion.

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 a Technical/Topical Report

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