
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

1/31/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 791-5864 REVISION 3
SRP SECTION: 03.07.02 – Seismic System Analysis
APPLICATION SECTION: 3.7.2
DATE OF RAI ISSUE: 07/26/11

QUESTION NO. RAI 03.07.02-85:

Clarification RAIs for MUAP-11001 (R0)

1. In Subsection 1.1 of MUAP-11001 (R0), “Description of the A/B,” the 6th sentence states “Steel Girder beams are used to provide additional support to the part of the roof slab and the third floor slab.” This sentence does not describe which part of the roof slab is supported by the steel girder beams, and what kind of support is used for the rest of the roof slab. The Applicant is requested to clarify this sentence.
2. In Subsection 2.4 of MUAP-11001 (R0), “Detailed FE Structural Model,” the second paragraph (page 24) states, “The seismic design demands are obtained from a response spectrum analysis of the detailed FE model as described in Section 4.2 below.” The Section 4.2 is entitled “Results of Lumped Mass Stick Model SSI Analyses”. The staff is not able to find any descriptions for the response spectrum analysis of the detailed FE model in Section 4.2 of the Report. The staff, however, finds the descriptions in Sections 5.2 and 5.3. The Applicant is requested to correct this apparent mistake.
3. In Subsection 3.3 of MUAP-11001 (R0), “Validation of Model Translation from ANSYS to SASSI,” the paragraph (page 37) states, “Figure 3.3-1 and Figure 3.3-2 present the results of the validation SASSI analyses for acceleration transfer functions at selected locations. These figures show that the peak amplifications of the transfer functions occur at or close to the values of the dominant frequencies shown in Table 3.3-1 and Figure 3.2-1 and Figure 3.2-2, which indicates that the translation of the A/B dynamic FE model into SASSI format is accurate.” The Applicant is requested to provide legends for the dots and solid curves shown in Figures 3.3-1 and 3.3-2 indicating which one represents the ANSYS results and which one represents the SASSI results. Also, there is no Table 3.3-1. It should be Table 3.2-1. The Applicant is requested to correct this mistake.
4. In Subsection 4.2.1 of MUAP-11001 (R0), “Maximum Forces and Moments,” the first paragraph (page 42) states, “The combined maximum seismic response axial, NS and EW shear forces and the maximum torsional and bending moments about the NS and EW axes obtained from SRSS combinations of the maximum seismic responses generated from the three individual directions (horizontal NS and EW and vertical) of seismic input for all eight generic site profile cases considered are shown in Figures 4.2-1

through 4.2-6.” The labels for the vertical axis of Figures 4.2-1 through 4.2-6 are not legible. The Applicant is requested to make the labels legible. This request applies to all figures in Chapter 4.

5. In Subsection 5.1.2 of MUAP-11001 (R0), “Live Loads (L),” the second paragraph (page 58) states, “The roof is conservatively designed for uniform snow live load of 75 50 psf per Table 1 of the SDC (Reference 7.9).” It appears that ‘75 50 psf’ in the sentence is a typo. The Applicant is requested to clarify the meaning and correct any mistake.
6. In Subsection 5.1.5 of MUAP-11001 (R0), “SSE Loads (E_{ss}),” the second paragraph (page 59) states, in part, “Dynamic soil pressures are taken from Table 4-12 of MHI TR MUAP-10006 (Reference 7.2).” The staff is aware that the Applicant is preparing extensive revisions to TR MUAP-10006, and therefore the dynamic soil pressures may be significantly affected by these changes. The Applicant is requested to describe how these changes will be factored into the seismic stability evaluation of the A/B.
7. In Section 6.0 of MUAP-11001 (R0), “Conclusion,” the second paragraph (page 79) states, “The detailed FE models used for static and RSA are described and validated as presented in Section 2.4.” In Section 2.4, the Applicant refers to Section 4.2 for the detailed FE model. The staff did not find the description and validation of the detailed FE model used for RSA in Section 4.2 (see question number 2 above). The staff, however, finds the FEM model description in Section 2.3 and the validations in Sections 3.1, 3.2 and 3.3. The Applicant is requested to correct this mistake.

ANSWER:

This answer revises and replaces the previous MHI answer that was transmitted by letter UAP-HF-11282 (ML11243A162).

Technical Report MUAP-11001, Rev. 0 has been superseded and the relevant information on the auxiliary building (A/B) has been incorporated into Technical Report MUAP-10006, Rev. 3. The seismic design basis for the US-APWR has been updated to perform soil-structure interaction (SSI) analyses using dynamic finite element (FE) models of the reactor building (R/B) complex, which consists of the R/B, prestressed concrete containment vessel (PCCV), containment internal structure, east and west power source buildings, A/B and essential service water pipe chase (ESWPC) supported on a combined basemat. Technical Report MUAP-10006 presents the information relevant to the A/B as well as the other buildings that make up the R/B complex. Technical Report MUAP-10006 reflects the responses to the above questions as discussed below.

1. The quoted detailed description of the steel girders and roof slabs of the A/B has been deleted from the description of the A/B in Technical Report MUAP-10006, Rev. 3.
2. The design-basis seismic demands for the A/B are no longer computed using response spectrum analyses. Seismic demands are obtained by developing quasi-static loads from the SSI analyses results.
3. Technical Report MUAP-10006 Rev. 3, Table 02.5.1.3.6.1-1, Figures 02.5.1.3.6.1-1 through 02.5.1.3.6.1-4 and Figures 02.5.1.3.6.2-1 through 02.5.1.3.6.2-3 support the validation of the A/B model translation from ANSYS to SASSI. Appropriate legends are provided for the figures and table numbering has been verified.
4. All graphs, figures, tables, text and inserts from Technical Report MUAP-11001 used in Rev. 3 of Technical Report MUAP-10006 have been reviewed and corrected for legibility.

5. Subsection 02.4.1.1.4 of MUAP-10006 corrects the typographical error from MUAP-11001 and identifies that in the SSI analyses, the roof is conservatively analyzed using 75% of the roof design snow load from DCD Table 2.0-1.
6. The updated seismic closure plan for the US-APWR seismic and structural analyses (ML12290A009) references Calculations SPS-13-03-113-019 and NIC-13-05-205-002, which provide the determination of the lateral earth pressures and the evaluation of the seismic stabilities (overturning and bearing pressure) of the standard plant reactor building complex, respectively.
7. The validation methodology for the dynamic FE model of the R/B complex, which includes the A/B, is described in Subsection 02.4.1.2 of MUAP-10006. The results of this validation is contained in Subsection 02.5.1.3 of MUAP-10006.

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the COLA.

Impact on S-COLA

There is no impact on the 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.