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 03.07.02-111:

In Section 3.3 of MUAP-10001(R3), "Dynamic Finite Element Model of R/B Complex," the third paragraph (Page 3-2) states, "The resulting dynamic FE …to provide input design parameters that appropriately address the effects of … scattering of input ground motion."

The applicant is requested to provide information that shows how the scattering of input ground motion is addressed.

Also, the applicant is requested to clarify the following two sentences and differentiate the specific information that is being conveyed in each sentence in Sections 3.3 and 3.4.

> "The ISRS capture the effects of potential concrete cracking on structural stiffness and local vibration modes as described in Section 3.5. The effects of potential concrete cracking on structural stiffness and local vibration modes are also taken into account in these SSI analyses."

ANSWER:

Technical Report MUAP-10001, Rev. 3 has been superseded and the relevant information related to the soil-structure interaction (SSI) analysis methodology has been incorporated into Technical Report MUAP-10006, Rev. 3.

In Section 02.3.2 of MUAP-10006, Rev. 3, the reference cited regarding scattering effects has been deleted as it is not directly related to the dynamic finite element (FE) model of reactor building (R/B) complex structures. The SASSI methodology for seismic response soil-structure interaction (SSI) analysis appropriately addresses the effects of ground motion scattering by being able to capture the interaction of free field seismic waves with the foundation of the building. Unlike the previously used methodology, where the SSI lumped parameters (soil springs and dampers) were used to model effects of interaction of the foundation with the soil, the SASSI analyses of embedded R/B complex presented in Part 3 of MUAP-10006, Rev. 3 can capture the transmission and the reflection of the seismic waves at soil-structure interfaces.

The first sentence of the two quoted in this question is a cross reference to the information presented in Section 02.3.3 of Technical Report MUAP-10006, Rev. 3 regarding how concrete cracking is considered in the SSI dynamic analyses. The in-structure response spectra (ISRS)

include the effects of potential concrete cracking on structural stiffness by enveloping the results of seismic response analyses of the dynamic FE model for: (1) full (uncracked concrete) stiffness and (2) reduced (cracked concrete) stiffness. The ISRS capture the local vibration modes of the flexible slabs because the dynamic FE model has been validated against the refined detailed model for the out-of-plane high frequency vibration of the local slab. The floor slabs in the model are capable of capturing high frequency responses up to 50 Hz. The second sentence of the two quoted in this question clarifies the explanation that changes in structural stiffness due to assumed concrete cracking is taken into account, and the effect of local natural vibration modes is also taken into account.

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.