
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

10/11/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: No. 977-6899 Rev. 3
SRP SECTION: 03.08.03 – Concrete and steel internal structures
APPLICATION SECTION: 03.08.03
DATE OF RAI ISSUE: 11/20/2013

QUESTION NO. RAI 03.08.03-98:

The staff reviewed the applicant's response to RAI 894-6270, Question 03.08.03-59, dated April 3, 2012, regarding the use of uncracked property for shear stiffness and the cracked property for flexural stiffness for certain structures under loading conditions A and B. The staff's review of MUAP-11018-P, "Containment Internal Structure, Stiffness and Damping," did not find any assessment of the forces and moments for the flexural stiffness of SC Category 1 members under loading condition A. As indicated in the follow-up RAI for Question 03.08.03-58, the applicant is requested to provide the technical justification for the use of EcIct for SC Category 1 walls under loading condition A. An acceptable technical justification could be either stiffness evaluation/assessment using a structural analysis or experimental tests. Alternatively, a bounding analysis would be acceptable where uncracked properties are used and enveloped with the results for cracked properties.

For the Category 4 reinforced concrete (RC) slabs under loading condition B, the staff understands that the use of cracked flexural stiffness is based on structural analysis results. However, for the in-plane shear stiffness, the discussion referenced in the RAI response on inplane shear force demands is limited to seismic loading, as shown on Page 5-3 of MUAP-11018-P (R0). As mentioned in the RAI response, the Category 4 RC slabs are also exposed to accident thermal loading on both faces. The accident thermal loading may cause concrete cracking in the RC slabs in flexure, as well as in in-plane shear, and consequently reduce the flexural and in-plane shear stiffnesses. Experimental tests referenced in Appendix 7 of MUAP-11019-P (R0) show that temperature induced concrete cracks reduced in-plane shear stiffness of SC specimens. Therefore, the staff requests that the applicant provide the technical justification for the use of uncracked stiffness in in-plane shear for Category 4 RC slabs under loading condition B. An acceptable technical justification could be based on either stiffness evaluation/assessment using a structural analysis or experimental tests. An alternative acceptable approach may be a bounding analysis approach for Category 4 RC slabs under loading condition B could be applied wherein the uncracked stiffness is used in the first analysis and the cracked stiffness is used in the second analysis, as stated on Page 1-2 of MUAP-11018-P.

ANSWER:

Please refer to RAI 977-6899, Question 03.080.3-97, for the response to Question 1 regarding Category 1 Steel concrete (SC) wall upper bound flexural stiffness.

Please refer to RAI 852-6003, Question 03.07.02-137, for the response to Question 2 regarding Category 4 slabs lower bound shear stiffness.

Impact on DCD

There is no impact on the DCD.

Impact on R-COLA

There is no impact on the R-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.