
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

03/29/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 905-6311 REVISION 3

SRP SECTION: 03.08.03 – Concrete and Steel Internal Structures of Steel or Concrete Containments

APPLICATION SECTION: 3.8.3

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QUESTION NO. 03.08.03-68:

As indicated in the MHI Technical Report (TR) MUAP-11019-P (R0), another potential SC specific failure mode is interfacial shear failure of the connectors used to anchor the steel faceplates to the concrete infill. Section 2.3 of the subject TR states that "... the limit state associated with concrete pryout in shear for the groups of shear studs with spacing of 8 inches will be evaluated using ACI 349-06 Section D.6.3." The excerpt of the code is shown in Figure 2.3-2 of the TR. However, the calculation which followed in the same section of the TR for the design shear strength of the shear studs only considers the shear strength of the shear stud steel material, not the effect of the concrete pryout in shear as stated in the TR. The calculated design shear strength of the shear studs was then used to determine the steel faceplate development length in Section 2.4 of the TR and the interfacial shear strength of SC walls in Section 2.5.

Explain why the effect of the concrete pryout was not included in the calculations of the design shear strength of the shear studs. Also explain how the effects due to spacing and embedment depth of the shear studs, and the effects of concrete cracking are considered in the design using ACI 349-06 Appendix D. If tensile forces perpendicular to the faceplate occur (e.g., equipment attachment loads, local (in-plane shear) induced faceplate buckling, concrete delamination/splitting forces which may occur between the ties), then explain how these tensile loads acting on the studs are considered, including interaction effects between the shear and tensile loads acting on the stud.

Technical Report MUAP-11019, Rev. 1 Section 2.10 provides the attachment load design methodology discussed in this answer.

ANSWER:

This answer revises and replaces the previous MHI answer that was transmitted by letter UAP-HF-12108 (ML12138A217).

Section 2.3 of Technical Report MUAP-11019, Rev. 1, discusses why concrete pryout in shear is not an applicable limit state for the shear studs anchoring the continuous steel

faceplates of steel concrete (SC) walls. The Technical Report MUAP-11019, Rev. 1, includes Figures 2.3-3 and 2.3-4 which show that concrete pryout in shear is applicable for discrete steel baseplates anchored to concrete with shear studs and is not applicable to the shear studs that anchor continuous steel faceplates to the concrete infill of SC walls.

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.