REQUEST FOR ADDITIONAL INFORMATION 489-3516 REVISION 0

11/23/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 03.04.02 - Analysis Procedures
Application Section: 3.4.2 Analysis Procedures

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

03.04.02-5

Supplemental RAI Text:

The staff requests the applicant to provide more information on the base/soil interface shear resistance evaluation and further response on the subject regarding passive earth pressure in the dynamic lateral resistance force evaluation.

Staff Assessment of Response to RAI 3.4.2-03 (No. 219-1908 Revision 0):

According to the Applicant's response to RAI 3.4.2-03 dated 4/29/2009 (see Reference below) , the Foundation Sliding for the deeply-embedded mat foundations for the RB/FB and CB mat foundations (or others) was analyzed assuming that the resistance to sliding is provided by shear resistance along the base of the mat, and if necessary, from passive soil resistance in front of the mat in the direction of sliding.

However, no detail guidance was provided in evaluating the shear resistance (along the base) in the DCD. The staff would like the applicant to provide more detailed methodology on shear resistance evaluation at interface, such as what are the criteria used to determine the allowable friction coefficient at the soil and base interface? And provide statement on whether such friction coefficient at base/soil interface is strongly dependent on the interfacial property, such as the moisture or water content at the soil-structure interface.

In general, the type of earth pressures to the walls depends solely on the inclination of the wall tilt angle. For example, during the seismic event, the passive (and active) earth pressure is needed to be considered due to the lateral vibration response of the wall structure. Therefore, the staff concurs with the applicant's response of using the passive earth pressure for the initial safety factor evaluation to against slide.

However, in reality, due to seismic cyclic loading (dynamic shear deformation oscillation) induced compaction of the backfill or soil around the walls (in the laterally back and forth excitation displacement of the foundation walls), the subsequence passive earth pressure induced by seismic loading is expected to be significantly reduced within a few cycles. Therefore, from the conservative/safety point, it will be sensible not to include the resistance contributed by the passive earth pressure to the analysis of safety factor

against sliding caused by the earthquake. Furthermore, in a saturated soil condition (or high water table), the pore pressure will likely carry most of the stress induced by the high strain rate of the seismic dynamic loading.

Reference:

Mitsubishi Heavy Industries, Ltd. "MHI's Response to US-APWR DCD RAI No. 219-1908" MHI Ref: UAP-HF-09151, April 9, 2009, ML091040320.