

# REQUEST FOR ADDITIONAL INFORMATION 855-6090 REVISION 3

10/24/2011

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 03.08.05 - Foundations

Application Section: 3.8.5

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

03.08.05-42

In Sections 2.1 and 2.2 of MUAP-11007(R0), the applicant stated that the effects of differential settlement will be considered in the calculation of seismic gap between buildings but did not provide any details of how the differential settlement will be calculated. The applicant is requested to specifically explain its definition of "differential settlement" and describe how the effects of differential settlement are addressed in the standard design. Also describe how differential settlement and tilt settlement have been considered in the specification of seismic gaps between adjacent buildings.

03.08.05-43

(a) Section 4.3.2 in MUAP 11007 (R0) indicates that the coefficient of friction between the basemat and supporting media will be taken as 0.7 for the sliding stability and overturning evaluations. The staff's previous experience has shown that a coefficient of friction value of 0.7 is difficult to achieve at all interfaces between the basemat and the supporting media. Therefore, the applicant is requested to provide a detailed technical basis for assuming a coefficient of friction of 0.7 for standard design.

(b) Section 4.3.2 in MUAP 11007 (R0) does not indicate what lateral pressures will be used to design the below grade walls. Only at-rest pressures are mentioned, which are not appropriate. The staff notes that the DCD (Revision 3), page 3.8-65, indicates that dynamic lateral earth pressures are calculated in accordance with ASCE 4-98 (Wood's methodology); however, the pressures obtained using the Wood's methodology can be substantially different from those obtained from an embedded SSI analysis. The effect of soil-water-structure interaction on the calculation of the lateral force and the overturning moment for the below grade walls could be significant and should be considered. Therefore, the applicant is requested to explain how the lateral pressure on the below grade walls is calculated considering the soil-water-structure interaction effects, and how it is applied in design of the below-grade walls.

03.08.05-44

Section 4.3.3 of MUAP-11007(R0) describes the procedure to calculate soil bearing pressure and makes reference to a "large footing." This reference implies that the simple Terzaghi bearing capacity relation may be used, which is only appropriate for static load conditions. The applicant is requested to describe its methodology for determining the

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dynamic bearing capacity of the foundation soil under seismic Category I structures, including consideration that two sides of the R/B complex are adjoined by the PS/B, Aux Bldg, and Turbine Bldg.

03.08.05-45

Section 4.3.3 in MUAP 11007 (R0) states, "In this calculation, the foundation mat is assumed to be rigid. The soil pressure variation is therefore linear." This approach may produce unconservative peak bearing pressures, as compared to a more realistic nonlinear pressure distribution. Therefore, the applicant is requested to provide a detailed technical basis for the following assumptions:

- (a) The adequacy of the assumption that the foundation is rigid; and
- (b) The adequacy of the assumption of a linear distribution of soil bearing pressure under the foundation, which ignores the Boussinesq effect.