

---

---

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

---

---

**03/29/2013**

**US-APWR Design Certification  
Mitsubishi Heavy Industries  
Docket No. 52-021**

**RAI NO.:** NO. 855-6090 REVISION 3  
**SRP SECTION:** 03.08.05 – Foundations  
**APPLICATION SECTION:** 3.8.5  
**DATE OF RAI ISSUE:** 10/24/2011

---

**QUESTION NO. 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.
- 

**ANSWER:**

- (a) The assumption of a rigid foundation is only used for screening the maximum toe pressures of the R/B complex at each time step, as described in the response to RAI 94-1491, Question 02.05.04-1, Part (a), Step 1. The critical time step with maximum toe pressure is identified for each generalized soil profile. The maximum toe pressures will be investigated using finite element (FE) analysis as described in Part (b) for the most critical cases.
- (b) After identifying the most critical cases, the corresponding loads are applied pseudo-statically on a flexible mat in a FE analysis that includes the subgrade as a continuous medium, with all premises of the Theory of Elasticity and correct modeling of local toe pressures, with non-linear variation of bearing pressure acting on the basemat. For cases where toe pressures calculated in this manner are judged to exceed the elastic range of the subgrade material, permanent (plastic) local settlements and tilt are calculated via FE analyses including plasticity constitutive models for the subgrade.

**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.