
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

03/29/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 496-3735 REVISION 0
SRP SECTION: 03.08.05 - Foundations
APPLICATION SECTION: 3.8.5
DATE OF RAI ISSUE: 12/01/2009

QUESTION NO. 03.08.05-26:

In its response to Part (a) of Question 3.8.5-5, MHI states that they will revise the DCD to reflect changes made to the DCD, Tier 1, Table 2.1-1, and DCD Tier 2, Table 2.0-1 in accordance with open item RGS 1.2.5.4. A discussion is presented in the response concerning the minimum allowable bearing capacity and the minimum allowable dynamic bearing capacity, including some specific values for the standard plant. For Part (b) MHI explains the choice of 60 ksf for the minimum allowable dynamic bearing pressure. For Part (c) MHI refers to their response to Part (a) above. For Part (d) the response includes the combinations of the seismic responses in three directions of the earthquake. A table is included that summarizes the results from the various load combinations considered, and identifies the critical load combinations. MHI will clarify the choices of allowable static and dynamic bearing pressures.

The applicant is requested to provide the following information:

1. For Part (a) of the response, MHI replaced the terms “average static bearing capacity” and “average dynamic bearing capacity” with “minimum allowable static bearing capacity” and “minimum allowable dynamic bearing capacity”, respectively. The staff considers these changes acceptable. MHI further stated that the minimum allowable static bearing pressure is 15 ksf and the minimum allowable dynamic bearing capacity is 60 ksf. These two values were based on the calculated values of 11.3 ksf for the static case and 53 ksf for the dynamic case. The staff calculates the safety factors associated with these two cases as 1.3 for the static case, and 1.1 for the dynamic case. The applicant is requested to provide the technical rationale and justification for choosing these safety factors.

In Part (d) of the response, MHI used the Highter and Anders equation provided in Section 3.12 of Principle of Foundation Engineering, 6th edition to compute the effective contact area. The staff finds that the Highter and Anders equation is not well-known. The applicant is requested to provide additional technical information to verify the accuracy of the calculations. Was the Highter and Anders equation used to calculate any response quantities that were used in design?

Reference: MHI response to RAI 340-2004, dated 7/3/2009, MHI Ref: UAP-HF-09363, ML091900557.

ANSWER:

This answer revises and replaces the previous MHI answer that was transmitted by letter by MHI letter UAP-HF-10032 (ML100430770).

- (a) The minimum allowable static bearing capacity and the minimum allowable dynamic bearing capacity for the standard plant were obtained by conservatively rounding up the computed maximum static and dynamic bearing pressures. Combined License (COL) Item 3.7(7) requires applicants to determine the site-specific allowable static and dynamic bearing capacities. These are calculated as ultimate bearing capacity (which is site specific) divided by the factor of safety and must be at least as large as the minimum allowable bearing capacities listed in Table 2.0-1 of the Design Control Document (DCD). The COL Applicant determines a factor of safety based upon site conditions. In section 3.7.1.3 the DCD recommends a factor of safety of 2.5 for static bearing capacity and 2.0 for dynamic bearing capacity. The response to RAI 211-1946, Question 03.07.01-7 describes how these factors of safety are determined for the standard plant.

The values of 1.3 and 1.1 mentioned in this RAI question are ratios between the minimum allowable bearing capacities and the maximum allowable bearing pressure demands, not factors of safety. The allowable bearing capacities result from conservatively rounding up the maximum bearing pressure demands. As explained above, the factor of safety represents the ratio between the ultimate bearing capacity and the allowable bearing capacity.

- (d) The Highter and Anders equations are used only for screening the critical time steps to calculate maximum bearing pressure demand. Refer to the response to Question 02.05.04-01 of RAI 94-1491, for the methodology to calculate maximum bearing pressure demand.

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.