
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

1/31/2013

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

RAI NO.: NO. 854-6088 REVISION 3
SRP SECTION: 03.07.02 – Seismic System Analysis
APPLICATION SECTION: 3.7.2
DATE OF RAI ISSUE: 10/24/11

QUESTION NO. RAI 03.07.02-159:

The last paragraph of Section 4.1.3 in MUAP 11007 (R0) indicates that backfill properties used for the SSI analyses will be taken from the Comanche Peak COL application. However, the applicant did not indicate where such backfill will be used in the SSI response analysis. In addition, it is stated that strain-dependent degradation curves will be used to determine the strain compatible properties for the backfill.

However, it is not clear how such applications will be made since these site response calculations are deterministic with an undetermined seismic environment. If deconvolution of the CSDRS is used, for example, to obtain in-column response with equivalent linear 1D site response methods, this process does not satisfy recommendations in SRP Section 3.7.2. The Applicant is requested to clearly explain (a) what parameters from the Comanche Peak backfill (i.e., soil material properties) will be used and (2) why it is appropriate to use the Comanche Peak backfill properties in the embedment evaluation of the SSI response of standard plant structures.

ANSWER:

The parametric studies on embedment effects are not included in Technical Report MUAP-11007, Rev. 2, because the approach implemented in MUAP-10006, Rev. 3, for the seismic soil-structure interaction (SSI) analyses of the US-APWR standard plant has been updated from utilizing models that considered surface mounted foundation to models capable of capturing embedment effects. The updated SSI analyses utilize finite element (FE) structural models of the reactor building (R/B) complex that have solid elements representing the engineered backfill soil placed around the perimeter of the building as shown in Figures 03.3.4.1-4 through 03.3.4.1-7 of Technical Report MUAP-10006, Rev. 3. These near field backfill elements connect the free field in-situ soils to the elements of the perimeter walls of R/B complex basement through the entire depth of the building embedment.

Section 03.3.1 of Technical Report MUAP-10006, Rev. 3, presents the methodology used to develop the properties assigned to the backfill elements. The two sets of small-strain dynamic properties of typical granular engineered fill materials presented in Tables 03.3.1-8 and 03.3.1-9 of Technical Report MUAP-10006, Rev. 3, were used as input for the development of the backfill properties. As discussed in Section 03.3.1 of Technical Report MUAP-10006, Rev. 3, in order to

cover a wide range of soil-structure frequencies, a backfill with relatively soft properties, represented by lower Vs values, is used in conjunction with the softer soil profiles of the standard plant, and a backfill with relatively stiff properties is used in conjunction with the stiffer profiles. Tables 03.3.1-10 through 03.3.1-15 of Technical Report MUAP-10006, Rev. 3, provide the backfill strain compatible properties used for the SSI analyses of the different generic soil profiles.

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 a Technical/Topical Report.

This completes MHI's response to the NRC's question.