

46. Section 3.9.2.2.14

KHNP stated that they had performed seismic analysis and stress evaluations using finite element model. The staff would like to know whether the analyses for mechanical tanks (vertical or horizontal) are available for staff review/audit in ERR. The staff would like to see that

- (1) proper FEM is used assuming fully or partially filled of the fluid or empty,
- (2) whether FEM includes the flexible supports such as frame for mechanical tanks;
- (3) whether and how the analyses include the fluid-structure interaction and the slushing effect during seismic.

KHNP INPUT

Refer to the attached analysis report (Attachment 1) for the tank for diesel fuel oil day tank of emergency diesel generator for review/audit.

Attachment 1 is uploaded in ERR as follows;

Folder Address: -1 Calculation – BOP Design → 19 Structures and Seismic Design

File Name: 1 Response to NRC feedback on RAI 8301 Q 3.7.3-1_Section 3.9.2.2.14_Attachment 1.pdf

Also, please address the original issue described in this RAI question that led to the new section in the DCD. Specifically, the RAI question asks the applicant to explain how the correlated building responses will be considered for tanks installed in buildings.

KHNP INPUT

The building responses are applied as an input to the analysis with the form of FRSs which can be confirmed in Section 10.2 "Seismic Loads" in Attachment 1 which refers technical specification.

SEB staff discussed with KHNP during the audit from 06/20 to 06/24, KHNP's use of 33 Hz in Section 3.9.2.2.14 to determine whether a tank is flexible or rigid. The discussion was conducted in the context of KHNP's RAI response. We identified the following NRC action to provide the applicant a feedback on their RAI response. Since SEB will close RAI Q3.7.3-1, this action item belongs to MEB.

NRC will send KHNP a feedback on the revised response to RAI Q 3.7.3-1, which will include a request for justification for the use of 33 Hz as the criterion to determine flexible/rigid tanks. This feedback will also include review comments from NRC MEB. The feedback will be discussed in a Bi-Weekly meeting.

MEB will evaluate the new section and no further update to their response to RAI Q3.7.3-1 will be expected (It is Confirmatory)

KHNP INPUT

Generally, the equipment is considered to be rigid when its natural frequency is higher than the cutoff frequency and ZPA of the relevant FRS is used for the analysis. However, for the qualification of equipment with analysis in APR 1400, cutoff frequency of 33 Hz is applied as a criterion to define the equipment characteristic to be rigid or flexible. The relation of the peak acceleration of the FRS and natural frequency is reviewed prior to the application of acceleration at 33Hz. If the natural frequency is higher than 33 Hz, acceleration value at 33 Hz is applied to the static analysis which will lead more conservative result than applying ZPA of FRS or method of dynamic analysis.