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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application - Design of Structures, Components, Equipment, and Systems - RAI Numbers 3.4-10 and 3.4-11**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated June 21, 2007. GEH response to RAI Numbers 3.4-10 and 3.4-11 are addressed in Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Vice President, ESBWR Licensing

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NRO

Reference:

1. MFN 07-357, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, Senior Vice President, Regulatory Affairs, Request for Additional Information Letter No. 101 Related to the ESBWR Design Certification Application, June 21, 2007

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 101 Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment, and Systems – RAIs 3.4-10 and 3.4-11

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	eDRF	0000-0076-1056

Enclosure 1

MFN 07-597

Response to Portion of NRC Request for

Additional Information Letter No. 101

Related to ESBWR Design Certification Application

Design Of Structures, Components, Equipment, and Systems

RAI Numbers 3.4-10 and 3.4-11

NRC RAI 3.4-10

Referring to Table 3.4-1 of the ESBWR DCD Tier 2, Rev. 3, provide a listing of penetrations below design flood level that go through the reactor, fuel and control buildings (including the access opening at control building access to reactor building at tunnel), and typical sketches of the penetrations/access opening depicting how the water-leak tight function of the seals is ensured against the hydrostatic pressure head due to the design flood or ground water. Also indicate if bellows are used for some large diameter penetrations to accommodate for the potential differential displacement effects.

GEH Response

Locations of penetrations below design flood level that go through the reactor, fuel, and control buildings are determined during the detailed design. Personnel Access opening at control building access to reactor building at tunnel is provided in DCD Tier 2, Rev. 4, Figure 1.2-3.

Figure 3.4-10 (1) shows a sketch of the personnel access opening. The water-leak tight function is ensured by the membrane waterproofing applied on exterior concrete surfaces and waterstops installed between two adjoining buildings.

Typical detail of a non-Seismic Category I piping penetration below grade through an exterior wall is shown in Figure 3.4-10 (2). Seismic Category I piping below grade is located in reinforced concrete trenches located near the surface. The waterproofing details at the interface between these trenches and Seismic Category I structures are similar to that provided in Figure 3.4-10 (1).

There is no plan to use bellows at piping penetrations.

DCD Impact

No DCD change will be made in response to this RAI.

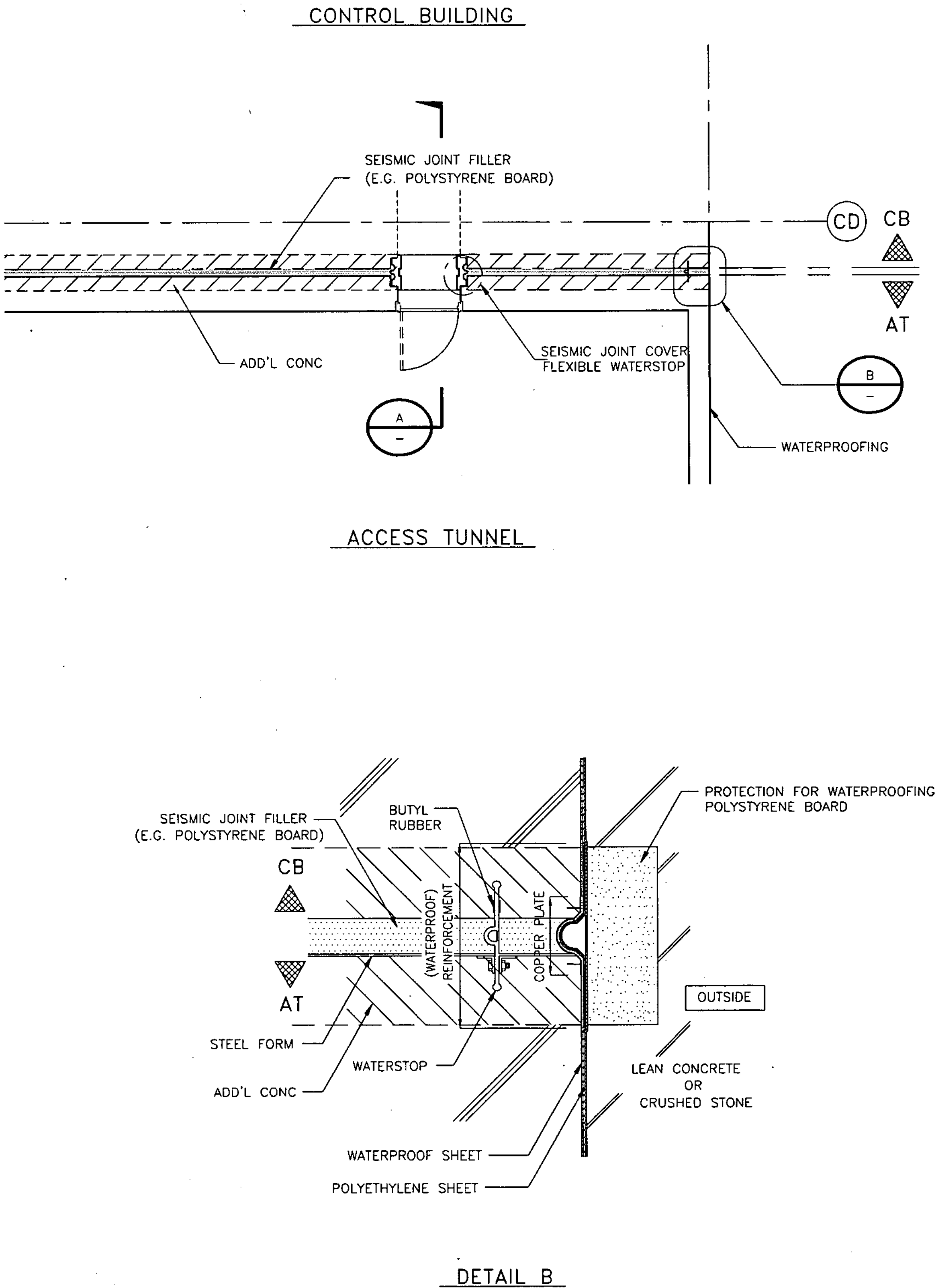

Figure 3.4-10 (1) Typical Sketch of Waterproofing at Personnel Access Opening

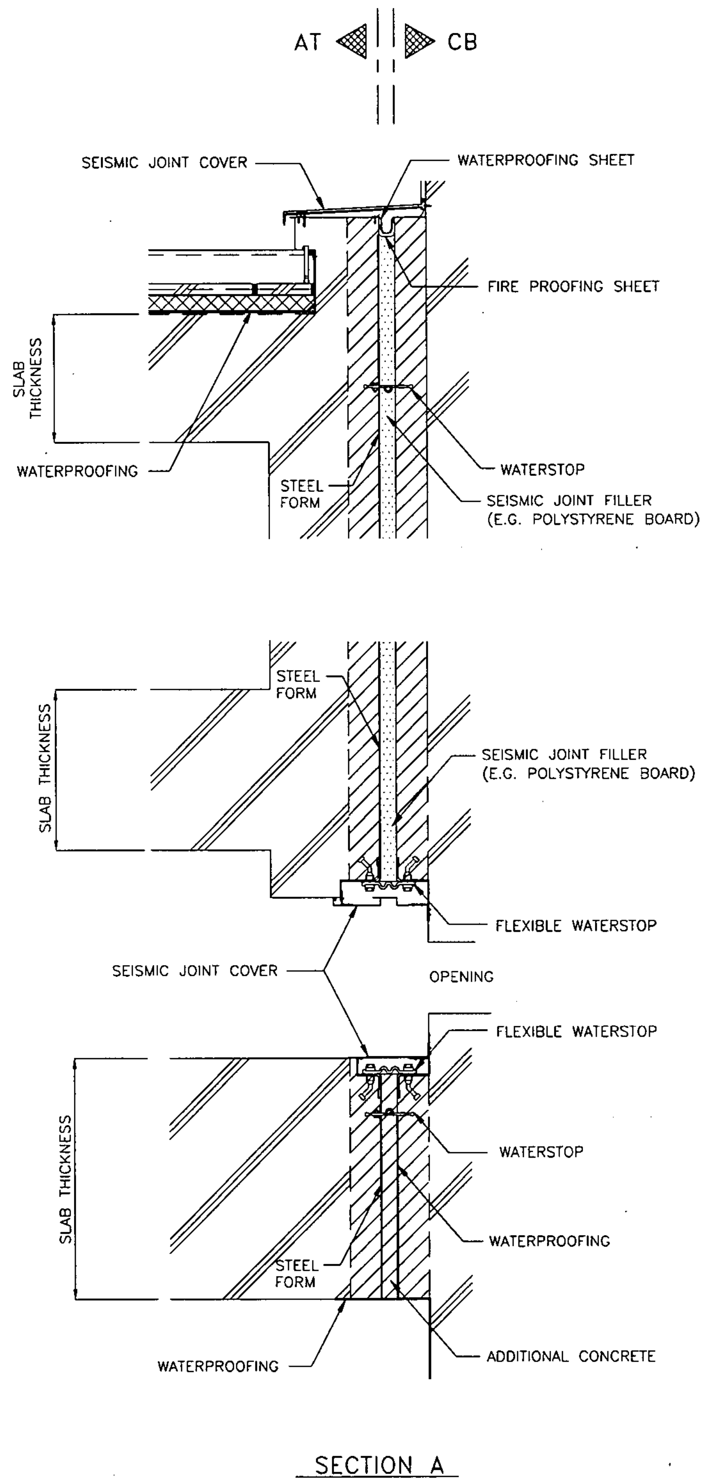

Figure 3.4-10 (1) Typical Sketch of Waterproofing at Personnel Access Opening (Continued)

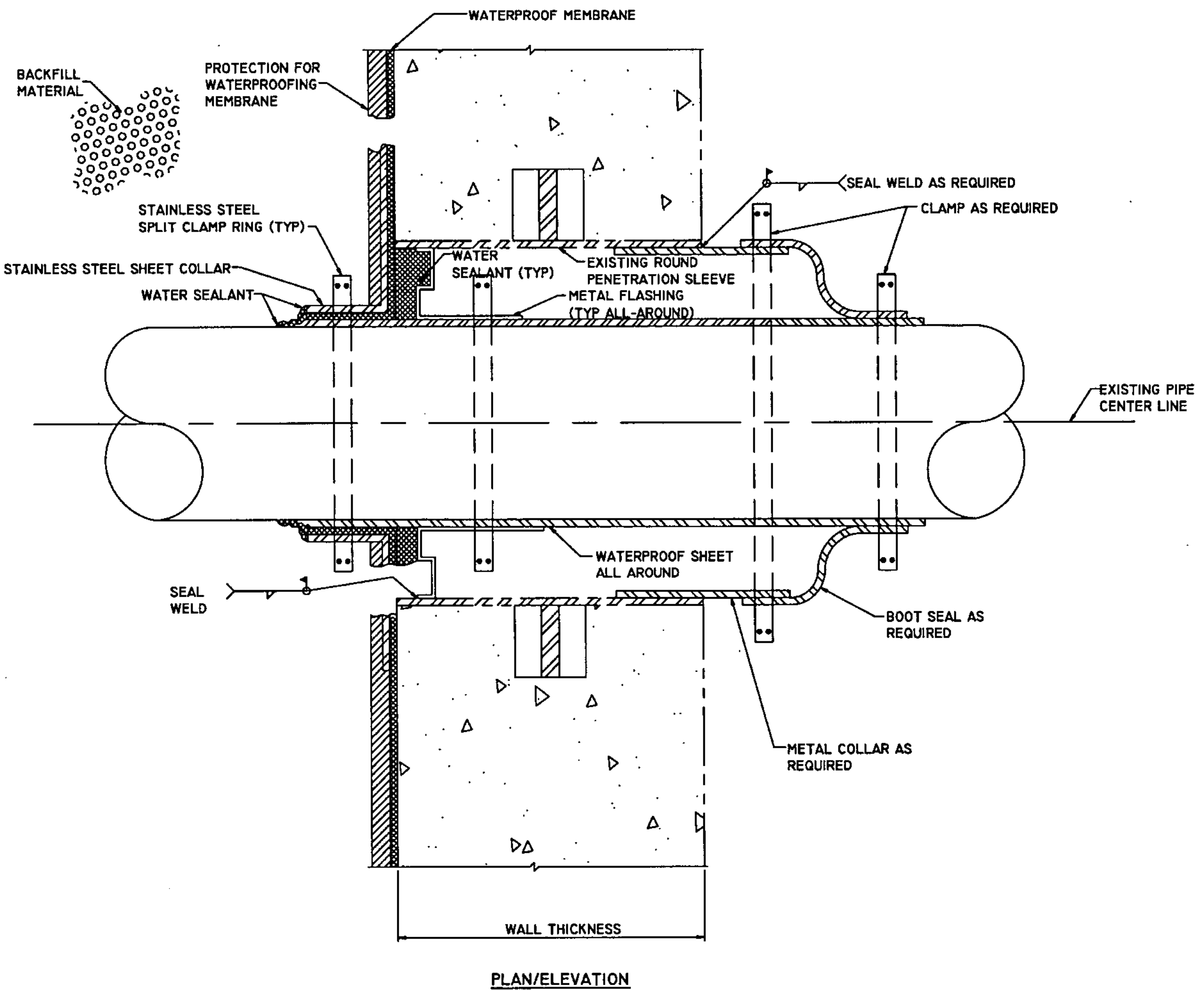

Figure 3.4-10 (2) Typical non-Seismic Category I Piping Penetration Below Grade Through Exterior Wall

NRC RAI 3.4-11

The last paragraph of ESBWR DCD Tier 2, Rev. 3, Section 3.4.2 states that the lateral hydrostatic pressure on the structures due to the design flood level, as well as ground water and soil pressure, are factored into the structural design in accordance with SRP 3.4.2. The paragraph further refers to DCD Tier 2, Appendix 3G, Design Details and Evaluation Results of Seismic Category I Structures, for more specific design information. Provide a discussion of the specific steps adopted in accounting for the lateral hydrostatic pressure due to the design flood level, as well as ground water and soil pressure for the embedded areas of the reactor and fuel buildings including references to pertinent quantitative analysis results of Appendix 3G to DCD Tier 2.

GEH Response

The design flood level and design groundwater level are provided in DCD Tier 2, Rev. 4, Table 2.0-1 and Table 3.4-1. As stated in DCD Tier 2, Rev. 4, Subsection 3.4.2 (3), the flood level is below the finished ground level and only the hydrostatic effects need to be considered.

The loads and load combinations used for the design of Seismic Category I concrete structures are provided in DCD Tier 2, Rev. 4, Subsection 3.8.4.3 and Table 3.8-15. The Load, H, refers to lateral pressure due to soil and water in the soil. DCD Tier 2, Rev. 4, Subsections 3G.1.5.2.1.3, 3G.2.5.2.1.3, 3G.3.5.2.1.3, Figure 3G.1-19, and Figure 3G.2-12 provide details about the magnitude of this loading used in the structural design.

The design flood level is 310 mm (1ft.) higher than design groundwater level. Figure 3.4-11 (1) shows the static soil pressure (including hydrostatic pressures) for the design groundwater level (610 mm (2 ft.) below design plant grade) during the normal operation and design flood level (310 mm (1 ft.) below design plant grade) for flood conditions. The difference between the two conditions is very small. According to Article 9.2.7 of ACI 349-01, to which the design of the Safety-Related concrete structures conforms, the design flood is considered in Nos. 6 or 7 combinations in DCD Tier 2, Rev. 4, Table 3.8-15. In the load combinations including E', dynamic increments of soil pressures need to be considered together with the static soil pressures (including design ground water hydrostatic pressures) during the normal operation. The distribution of the dynamic increment of soil pressure is also indicated in Figure 3.4-11 (1), and its magnitude is much larger than the differences between the static soil pressures during normal operation and flood conditions. Because soil pressures during flood conditions are enveloped by those due to the SSE, they do not govern the design.

The description for load, H, provided in DCD Tier 2, Rev. 4, Subsection 3.8.4.3.1.1 will be clarified.

DCD Impact

DCD Tier 2 Subsection 3.8.4.3.1.1 will be revised in the next update as noted in the attached markup.

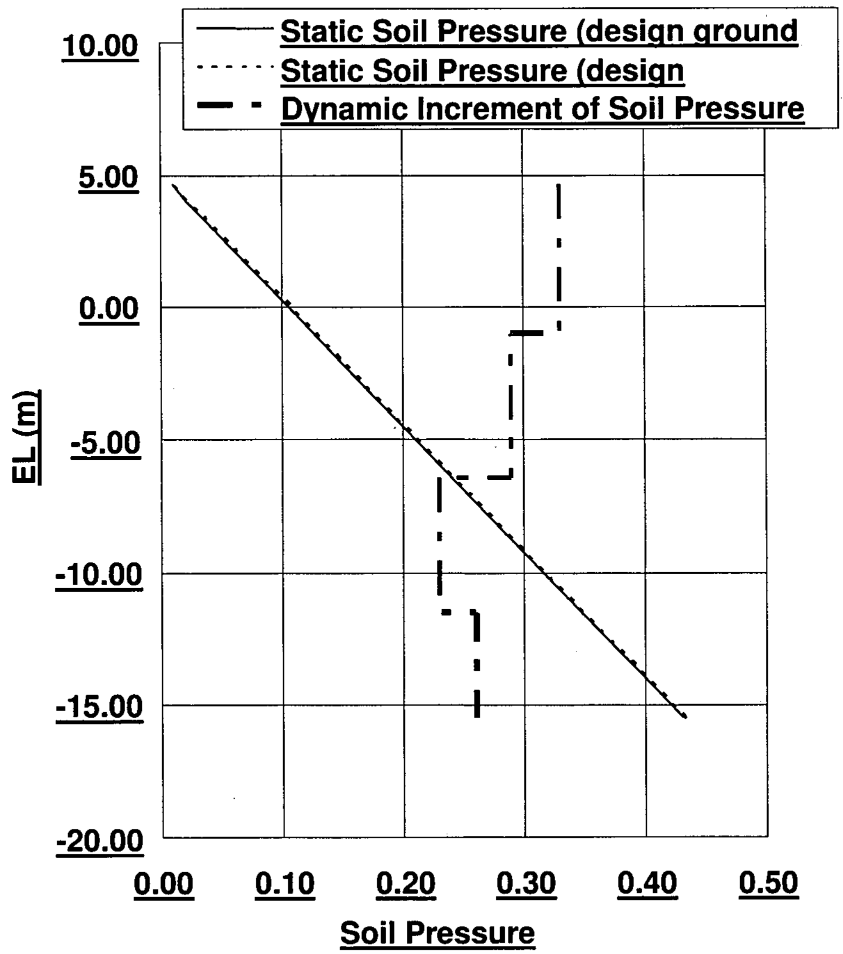

Figure 3.4-11 (1) Comparison of Distributions of Soil Pressures

Y_r = Equivalent static load on a structure generated by the reaction on the broken high-energy pipe during the postulated break and including a calculated dynamic factor to account for the dynamic nature of the load.

Y_j = Jet impingement equivalent static load on a structure generated by the postulated break and including a calculated dynamic factor to account for the dynamic nature of the load.

Y_m = Missile impact equivalent static load on a structure generated by or during the postulated break, like pipe whipping, and including a calculated dynamic factor to account for the dynamic nature of the load.

W = Wind force (Subsection 3.3.1)

W_t = Tornado load (Subsection 3.3.2) (tornado-generated missiles are described in Subsection 3.5.1.4, and barrier design procedures in Subsection 3.5.3.)

P_a = Accident pressure at main steam tunnel due to high energy line break.

F = Internal pressures resulting from flooding of compartments.

E' = Safe shutdown earthquake (SSE) loads as defined in Section 3.7 including SSE-induced hydrodynamic pressures in pools. The impulsive and convective pressures may be combined by the SRSS method.

T_o = Thermal effects — load effects induced by normal thermal gradients existing through the RB wall and roof. Both summer and winter operating conditions are considered. In all cases, the conditions are considered of long enough duration to result in a straight line temperature gradient. The temperatures are listed in Table 3.8-10. The stress free temperature for the design is 15.5°C (59.9°F).

T_a = Thermal effects (including T_o) which may occur during a design accident.

H = Loads caused by static or seismic earth pressures and water in soil.

3.8.4.3.1.2 Load Combinations for Concrete Members

For the load combinations in this subsection, where any load reduces the effects of other loads, the corresponding coefficient for that load is taken as 0.9, if it can be demonstrated that the load is always present or occurs simultaneously with the other loads. Otherwise, the coefficient for that load is taken as zero.

The safety-related concrete structure is designed using the loads, load combinations, and load factors listed in Table 3.8-15. The maximum co-directional responses to each of the excitation components for seismic loads are combined by the 100/40/40 method as described in Subsection 3.8.1.3.6.

3.8.4.3.1.3 Load Combinations for Steel Members

The safety-related steel structure is designed using the loads, load combinations, and load factors listed in Table 3.8-16. The maximum co-directional responses to each of the excitation components for seismic loads are combined by the 100/40/40 method as described in Subsection 3.8.1.3.6.