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Your ref: Docket No. 52-006
Our ref: DCP_NRC_003163

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Subject: Wording change for DCD Chapter 2 Editorial Correction

The purpose of this letter is to document an editorial wording change in support of the AP1000® Design Certification Amendment Application (Docket No. 52-006). The information included in these responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

The agreed upon editorial correction is made to wording in Tier 2 DCD Subsection 2.5.4.1.3 as shown in Enclosure 1.

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

R. F. Ziesing
Director, U.S. Licensing

Enclosure

1. Markup of DCD Revision 18, Tier 2 DCD Subsection 2.5.4.1.3

D063
NRO

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ENCLOSURE 1

Markup of DCD Revision 18, Tier 2 DCD Subsection 2.5.4.1.3

As each increment of the nuclear island excavation is completed, nominal eight to ten inch diameter holes are drilled horizontally through the vertical face of the excavation into adjacent undisturbed soil. These "nail" holes, spaced horizontally and vertically on five to six feet centers, are drilled slightly downward to the horizontal. A "nail", normally a metal bar/rod, is center located for the full length of the hole. The nominal length of soil nails is 60 percent to 70 percent of the wall height, depending upon soil conditions. The hole is filled with grout to anchor the rod to the soil. A metal face plate is installed on the exposed end of the rod at the excavated wall vertical surface. Welded wire mesh is hung on the wall surface for wall reinforcement and secured to the soil nail face plates for anchorage. A 4,000 psi to 5,000 psi non-expansive pea gravel shotcrete mix is blown onto the wire mesh to form a nominal four to six inch thick soil retaining wall. Installation of the soil retaining wall closely follows the progress of the excavation and is from the top down, with each wire mesh-reinforced, shotcreted wall section being supported by the soil "nails" and the preceding elevations of soil nailed wall placements.

Soil nailing as a method of soil retention has been successfully used on excavations up to 55 feet deep on projects in the U.S. Soils have been retained for up to 90 feet in Europe. The state of California CALTRANS uses soil nailing extensively for excavations and soil retention installations. Soil nailing design and installation has a successful history of application which is evidenced by its excellent safety record.

The soil nailing method produces a vertical surface down to the bottom of the excavation and is used as the outside forms for the exterior walls below grade of the nuclear island. Concrete is placed directly against the vertical concrete surface of the excavation.

For methods of soil retention other than soil nailing, such as for excavation in rock, four to six inches of shotcrete are blown on to the vertical surface. The concrete for the exterior walls is placed against the shotcrete.

2.5.4.1.2 Vertical Face Using Mechanically Stabilized Earth Walls

Mechanically stabilized earth walls (MSE) are flexible retaining wall systems that use strip, grid, or sheet type of tensile reinforcements in the soil mass, and a discrete modular pre-cast concrete, which is vertical. MSE walls function like, and are generally more economical than, conventional retaining walls. The tensile strength of the reinforcements and the slip at the interface of the reinforcement and the soil provide great internal stability to MSE walls. These walls may be used where the side soils have to be removed or the grade elevation needs to be raised. The walls and backfill are placed prior to construction of the nuclear island.

2.5.4.1.3 Mudmat

The mudmat provides a working surface prior to initiating the placement of reinforcement for the foundation mat structural concrete. The lower and upper mudmats are as follows:

- Lower mudmat – (minimum 6 inches thick) of un-reinforced concrete, with a minimum compressive strength of 2,500 psi. The lower mudmat will be used as the final dental concrete layer on the underlying foundation media.

Comment [tlw1]: 35
Deleted: , as discussed in subsection 2.5.4.6.3

- Upper mudmat – (minimum 6 inches thick) of un-reinforced concrete with a minimum compressive strength of 2,500 psi. This upper mudmat will support the chairs that, in turn, support the reinforcing steel.

The waterproofing system is described in subsection 2.5.4.6.12.

2.5.4.2 Bearing Capacity

The maximum bearing reaction determined from the 3D SASSI analyses described in Appendix 3G is less than 35,000 lb/ft^2 under all combined loads, including the safe shutdown earthquake. The maximum dynamic bearing demand of 35 ksf occurs under the west edge of the shield building and is primarily due to the response to the east-west component of the earthquake. The east edge of the nuclear island lifts off the soil. The Combined License applicant will verify that the site-specific allowable soil bearing capacities for static and dynamic loads at the site will exceed the static and dynamic bearing demand given in Table 2-1.

The evaluation of the allowable capacity of the soil is based on the properties of the underlying materials (see subsection 2.5.4.5.2), including appropriate laboratory test data to evaluate strength, and considering local site effects, such as fracture spacing, variability in properties, and evidence of shear zones. The allowable bearing capacity should provide a factor of safety appropriate for the design load combination, including safe shutdown earthquake loads.

If the shear wave velocity or the allowable bearing capacity is outside the range evaluated for AP1000 design certification, a site-specific evaluation can be performed using the AP1000 basemat model and methodology described in subsection 3.8.5. The safe shutdown earthquake loads are those from the AP1000 analyses described therein. Alternatively, bearing pressures may be determined from a site-specific analysis using site-specific inputs as described in subsection 2.5.2.3. For the site to be acceptable, the bearing pressures from the site-specific analyses, including static and dynamic loads, need to be less than the capacity of each portion of the basemat.

2.5.4.3 Settlement

The Combined License applicant will address short-term (elastic) and long-term (heave and consolidation) settlement for soil sites for the history of loads imposed on the nuclear island foundation and adjacent buildings consistent with the construction sequence. The resulting time-history of settlements includes construction activities such as dewatering, excavation, bearing surface preparation, placement of the basemat, and construction of the superstructure.

The AP1000 does not rely on structures, systems, or components located outside the nuclear island to provide safety-related functions. Differential settlement between the nuclear island foundation and the foundations of adjacent buildings does not have an adverse effect on the safety-related functions of structures, systems, and components. Differential settlement under the nuclear island foundation could cause the basemat and buildings to tilt. Much of this settlement occurs during civil construction prior to final installation of the equipment. Differential settlement of a few inches across the width of the nuclear island would not have an adverse effect on the safety-related functions of structures, systems, and components. Table 2.5-1 provides guidance to the Combined License applicant on predictions of absolute and differential