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3.8 Design of Category I Structures

3.8.5 Foundations

3.8.5.1 Description of Foundations

This section of the DCD Revision 15, along with references to other DCD Revision 15 sections necessary to support the scope of the LWA request, is incorporated by reference.

The scope of the LWA foundation work includes: placing the mud mats, water proofing membrane, concrete forms, drains and other items necessary to prepare the Nuclear Island base slab for the first concrete pour.

After backfill beneath the NI (Nuclear Island) has been placed and compacted to roughly the required elevation for the first mud mat, the construction of the retaining wall will begin. The retaining wall will be a vertical mechanically-stabilized earth (MSE) wall with smooth-faced concrete panels. This wall will function as both a retaining wall as the backfill outside the NI volume is brought up to plant grade and as the exterior concrete form for the outer walls of the NI. Section 2.5.4.5, Excavation and Backfill, provides additional information on the backfill and MSE wall.

The construction of the MSE wall begins with installation of a concrete footer. The top surface of the MSE wall footer will be installed below the bottom elevation of the first mud mat. The size and reinforcement for the concrete footer will be as required by the designer of the MSE wall. The MSE wall footer is a relatively thin concrete structure that provides a stable, level surface for construction of the MSE wall. It provides no structural support for the mud mats or the NI itself.

The first course of the MSE wall will be placed on top of the footer at the surveyed locations required to outline the NI footprint. Inspections will be performed as required to assure that the outer dimensions of the NI are properly set.

Backfill around the outer sides of the MSE wall will commence as required by the designer of the MSE wall, with the standard large compaction equipment being used away from the wall, and smaller equipment providing the required compaction at the edges of the wall. During backfill placement and compaction, the backfill surface will be sloped away from the NI to drain surface water away from the NI excavation volume. Additional courses of the MSE wall will be added until final plant grade is reached.

In parallel with the construction of the MSE wall, work within the NI footprint will continue. Temporary features to provide removal of surface water within the confined area of the NI will be installed as required. These features may include plastic sheeting, temporary sumps and pumps. In addition, the surface may be sloped to provide adequate drainage.

After the first few courses of the MSE wall have been placed, the backfill within the NI volume will be prepared for placement of the mud mat. Temporary drainage features will be removed, and

material will be removed or added as required to establish the final elevation for the mud mat placement.

The first mud mat will consist of a 6-inch layer of non-reinforced concrete placed uniformly within the confines of the MSE wall. No additional formwork will be required. When this lower mud mat slab has reached the specified strength, a layer of waterproof membrane will be applied to the entire top of the slab, and extended vertically up the face of the MSE wall surface. The top portion of the mud mat slab (also a 6-inch layer of non-reinforced concrete) will then be placed, sandwiching the waterproof membrane. Additional detail concerning the waterproof membrane is provided in following Section 3.8.5.1.1. Figure 2.5.4-17 provides an illustration of the location of the waterproof membrane. Rebar and foundation embedments are not incorporated in either of these mud mats; therefore installation of such elements will not puncture the waterproofing membrane.

3.8.5.1.1 Waterproof Membrane

DCD Subsection 3.4.1.1.1 describes protection of seismic Category I structures from external flooding. The DCD indicates that this protection is provided by a waterproofing system that is provided by the introduction of a cementitious crystalline waterproofing additive to the mud mat and to the retention wall. The configuration of this waterproofing is shown in DCD Figure 3.4-3. Alternate waterproofing approaches for MSE and step back configurations using high density polyethylene (HDPE) double-sided textured waterproof membrane are described and presented in DCD Figures 3.4-1 and 3.4-2.

For Vogtle Electric Generating Plant (VEGP) Units 3 and 4 an alternate waterproofing system is presented as a departure from the DCD design. The alternate waterproofing system is an elastomeric “spray-on” waterproof membrane. The membrane is applied as a high-viscosity liquid that cures after exposure to air. This material may be applied by brush, roller or airless spray equipment.

Prior to procurement of the membrane material, a qualification program will be developed to demonstrate that the selected material will meet the waterproofing and friction requirements. This qualification program will address, as a minimum, the following:

- chemical properties of the membrane material,
- physical properties of the membrane material,
- surface finish requirements for the lower mudmat, and
- installation procedures necessary to achieve the required properties and coefficients of friction.

The qualification program will include testing to demonstrate that the ITAAC design commitment in Table 3.8.5.1-1 for friction coefficient has been met. Testing methods will simulate field conditions to demonstrate that a minimum 0.7 coefficient of friction is achieved by the mudmat

waterproof membrane structural interface. A technical report will be provided for the ITAAC to document the basis for determining that the material will meet the required friction factor. Application procedures will be developed based on the results of qualification testing to assure that the conditions and assumptions of the qualification tests are maintained during product application.

Based upon the qualification program requirements, it is concluded that the installed waterproof membrane will provide a level of protection from external flooding and meet the coefficient of friction at the waterproof membrane-mudmat interface that is consistent with that of the existing DCD design.

The elastomeric waterproof membrane will be applied to the entire surface of the lower mudmat and the inner face of the MSE wall. Final thickness of the membrane will be specified based on the physical properties of the selected material but is expected to be on the order of 80 to 120 mils. The membrane may be applied in multiple coats to achieve the required thickness.

The surface of both the mudmat and the MSE wall will be prepared in accordance with procedures that are consistent with the surface preparation requirements determined during the material qualification testing program. At the transition between the lower mudmat and the MSE wall, a small transition (chamfer or fillet) between the mudmat and wall will be provided to allow a smooth transition for the membrane.

The surface of the MSE wall will be prepared as necessary to assure that the waterproof coating application can bridge the small gaps and corners of the MSE blocks. This preparation process will likely include attaching a geo-textile material to the wall prior to application of the membrane material. It should be noted that the cured membrane has a degree of flexibility which allows it to accommodate thermal expansion and other minor movements between substrate members.

The application procedures will address all aspects of the coating application including batch qualification, surface preparation, application techniques, film thickness, cure time, and repair procedures.

The final mudmat will be placed on top of the waterproof membrane. Procedures will address inspection and testing as required to assure that the membrane surface will meet the required coefficient of friction.

After the NI walls are extended above grade, the gap between the MSE wall and the NI wall will be sealed to prevent surface water intrusion.

Table 3.8.5.1-1
Waterproof Membrane Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1) The friction coefficient to resist sliding is 0.7 or higher.	Testing will be performed to confirm that the mudmat-waterproofing-mudmat interface beneath the Nuclear Island basemat has a minimum coefficient of friction to resist sliding of 0.7.	A report exists and documents that the as-built waterproof system (mudmat-waterproofing-mudmat interface) has a minimum coefficient of friction of 0.7 as demonstrated through material qualification testing.