FPL

L-2015-205
10 CFR 52.3

July 30, 2015

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Re: Florida Power & Light Company
Proposed Turkey Point Units 6 and 7
Docket Nos. 52-040 and 52-041
Voluntary Response for FPL COL Application, Part 2, FSAR Chapter 3, Subsection 3.7.2.8 – Interaction of Seismic Category II and Nonseismic Structures with Seismic Category I Structures, Systems, or Components

Florida Power & Light Company (FPL) provides, as an attachment to this letter, its voluntary response for COL Application, Part 2, FSAR Chapter 3, Subsection 3.7.2.8. FPL is providing this voluntary response based on discussions between the NRC staff and FPL during the NRC audit of FSAR Chapter 3 held June 22-25, 2015. This voluntary submittal updates FSAR Chapter 3, Section 3.7 to address the interaction of seismic Category II and nonseismic structures with seismic Category I structures under potential void conditions. The attachment identifies changes that will be made in a future revision of the Turkey Point Units 6 and 7 Combined License Application (if applicable).

If you have any questions, or need additional information, please contact me at 561-691-7490.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 30, 2015.

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

WDM/RFB

Attachment: FPL Voluntary Response for the Interaction of Category II and Nonseismic Structures on Category I Structures

cc:
PTN 6 & 7 Project Manager, AP1000 Projects Branch 1, USNRC DNRL/NRO
Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant 3 & 4

D097
NRO

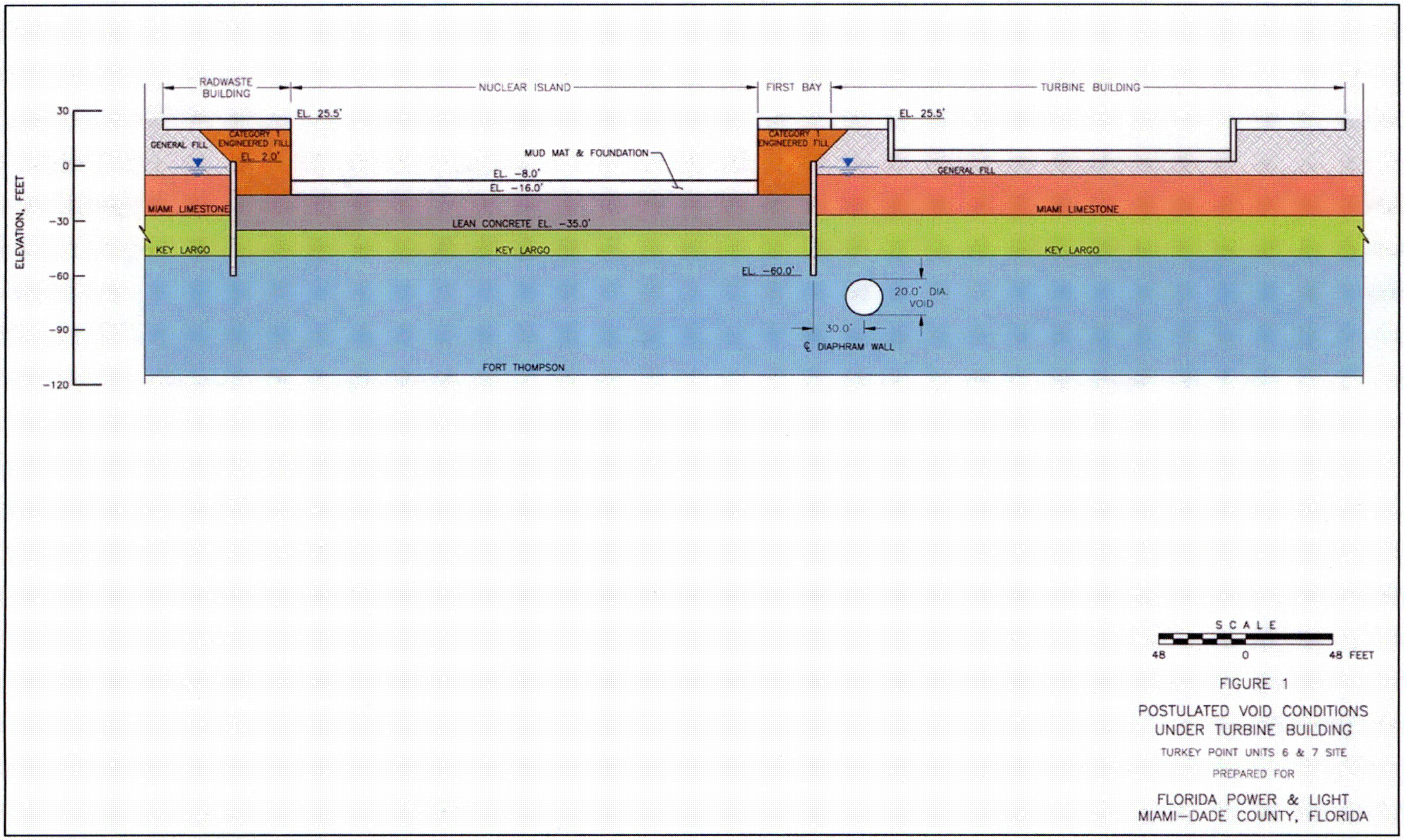
INTRODUCTION:

During the technical audit conducted between June 22, 2015 and June 25, 2015, NRC staff raised the question about the safety evaluation of Category II and non-seismic structures under postulated void conditions from the perspective of the potential impact of collapse of these structures on the Category I structure.

The DCD, Tier 2, Subsection 3.8.5.1 describes the seismic separation gap between the nuclear island and adjacent structures, "Adjoining buildings, such as the turbine building and annex building, are structurally separated from the nuclear island structures by a 2-inch gap at and below grade. A 4-inch minimum gap is provided above grade." The DCD, Tier 2, Figure 3.8.5-1 shows nuclear island and adjacent structures foundation plans and sections.

This voluntary response provides the analysis and engineering evaluation for postulated void conditions from the perspective of potential impact of Category II and non-seismic structures on the Category I structure. The methodology addresses the potential impact of Category II and non-seismic structures on Category I structures considering a postulated void condition under the Category II structure that is similar to the void considered for the Category I structure (as discussed in the Response to RAI 02.05.04-26). The referred postulated void condition is given in Figure 1. For this postulated void condition, the most critical building is considered to be the turbine building given the magnitude of the static and seismic loads for this building.

Figure 1 Postulated Void Conditions under Turbine Building



FPL RESPONSE

Summary of Conclusions on Karstic Structures from Geological Perspective

Before describing the method used to evaluate stability under postulated void conditions, it is important to re-emphasize the geological conclusion (FSAR Appendix 2.5AA, summarized below) that large voids and karst features are not anticipated at the site. The geological evaluation of the site is necessary to confirm if karstic structures are present on site and, if so, to establish the likely size and extent of the karstic structures. In this regard, the following are key points to be considered as outlined in FSAR Appendix 2.5AA and the Response to RAI 02.05.01-37.

- Neither the vegetated depressions nor the zones of secondary porosity are considered to pose a hazard of sinkhole development. The vegetated depressions are surficial solution features formed by a subaerial, epigenic process of dissolution caused by downward seepage of slightly acidic meteoric groundwater. The zones of secondary porosity are microkarst features formed in the subsurface by solution enlargement of touching-vug and moldic porosity within paleomixing zones of fresh groundwater and saltwater. An upper zone of secondary porosity has formed in a zone of touching-vug porosity near the contact of the Miami Limestone and the Key Largo Limestone. A lower zone of secondary porosity has formed in a zone of moldic porosity in the underlying Fort Thompson Formation. Microkarst features are in the order of a few centimeters.
- The process that formed the vegetated depressions at the site and its vicinity is ongoing. However, the stratigraphic interval in which they occur will be completely removed during excavation of the nuclear islands. As discussed below, the structure contour and isopach maps indicate that the surficial vegetated depressions do not persist with depth. In addition, the freshwater/saltwater interface is approximately 6 miles inland from the site, and mean sea level rise trend is low (0.78 foot in 100 years); thus, the carbonate dissolution in a fresh groundwater/saltwater mixing zone by the process of shoreline flow is not likely to develop large underground voids.
- As discussed in the Response to RAI 02.05.01-37, available information related to caves, cover collapse sinkholes, springs, submarine sinkholes, paleo-karst collapses, and sag structures in the site vicinity (and in other areas in southeast Florida) suggests that, while dissolution features are present, most are not currently active. Active dissolution is probably limited at Turkey Point Units 6 & 7, as is the potential for deformation due to collapses within existing (i.e., "paleo") dissolution features. Active dissolution associated with karst conduits at the site, as evident in past submarine groundwater discharges, is also likely to be insignificant. Furthermore, the observed collapse structures at Jewfish Creek/Lake Surprise (17 miles from Turkey Point Units 6 & 7), for example, appears to have occurred in the Pleistocene (coincident with sea level lowstands) and thus is not a particularly relevant analog for potentially active (or possible future) surface collapse at (or near) the site. No structural damage or differential settlement has been reported on the bridge that was constructed on the Jewfish

Creek/Lake Surprise site that was described in the Response to RAI 02.05.01-37. Also, Turkey Point Units 3 & 4 were constructed on the same geologic units and have been operating since 1972 and 1973, respectively. Although substantial in scale and extent, the seismic sag structures described by Cunningham and Walker (FSAR Reference 2.5.1-958) similarly provide no evidence for post-Pliocene deformation. It seems likely then that comparable collapses in similar features, if present below Turkey Point Units 6 & 7, have already occurred (and are now stabilized).

- Finally, structure contour and isopach maps for the Key Largo Limestone and Fort Thompson Formation and cross-sections prepared with data from the site geotechnical subsurface investigation do not suggest the existence of large underground caverns or sinkholes. Specifically, the following conclusions are obtained (as provided in the Response to RAI 02.05.04-01) for the sizes of potential voids and/or voids filled with soft sediments:

  "...The evaluation of all data (MACTEC, Reference 6; RIZZO, Reference 3) indicate that outside the vegetated depressions and drainages (in vertical borings), a total of 20.1 feet of interpreted tool drops (due to voids and/or voids filled with soft sediments) are observed, in a total of 7918.4 feet cored, for a 0.3 percent of the total cored in 93 borings. Individual drops in the vertical borings range from 0.4 feet to 4 feet (1.5 feet max within the Unit 6 & 7 building footprints). Results from the site investigations (MACTEC, Reference 6; RIZZO, Reference 3), show that interpreted tool drops are found more often under the vegetated depressions and drainages. In the three inclined borings, a total of 15.2 feet of tool drops are observed, in a total of 356.4 feet cored, for a 4.3 percent of the total cored length. Individual drops in the inclined borings range from 0.3 feet to 2.5 feet. Boring locations with interpreted tool drops, among all sampling locations, are shown in Figure 1.

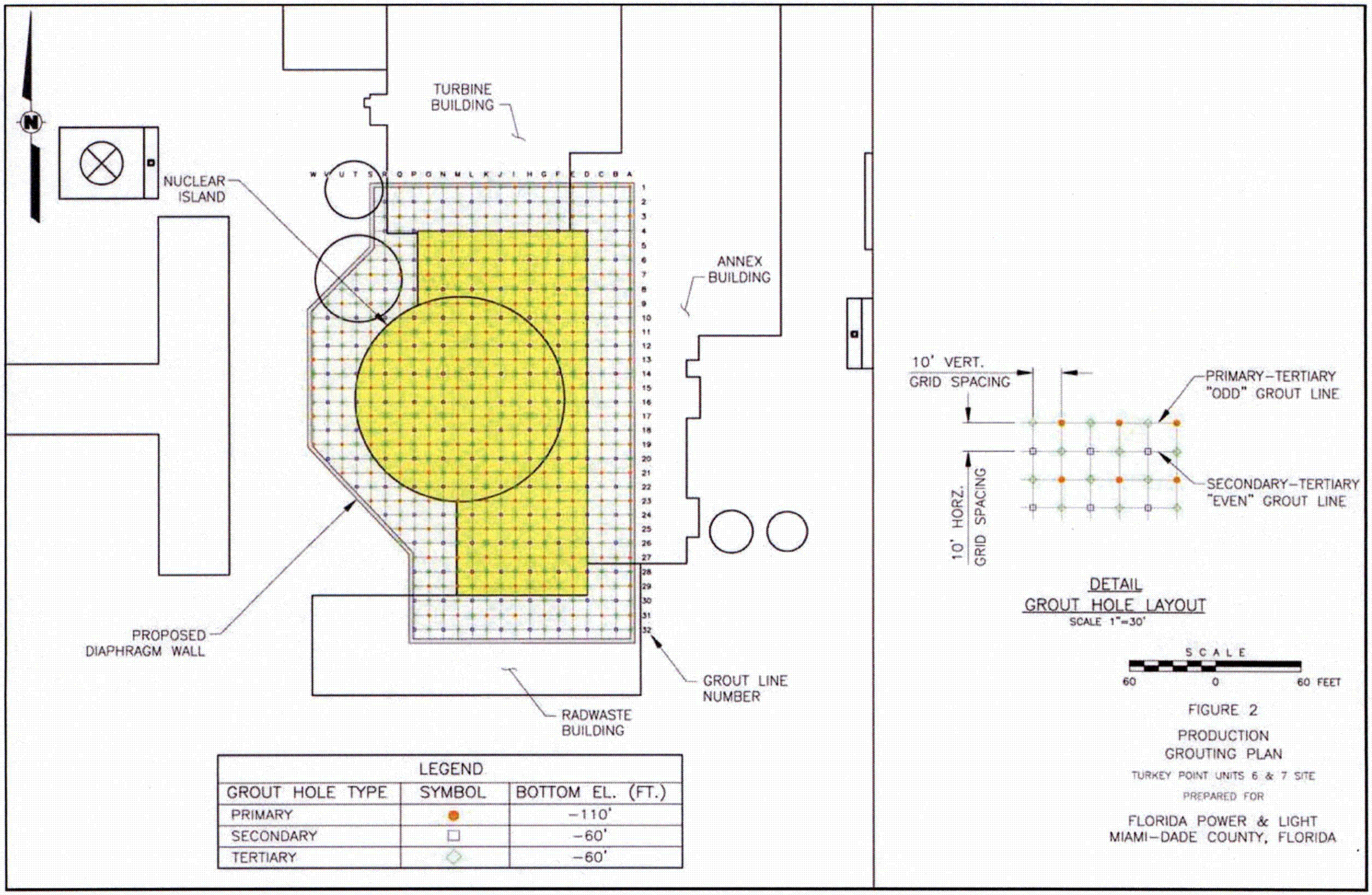
  The maximum length of interpreted tool drop (due to voids and/or voids filled with soft sediments) is limited to 1.5 feet within the Unit 6 & 7 building footprints, and the frequency of encountering an interpreted tool drop is less than 0.5 percent site-wide. These statistics are based on the drilling conducted during both, the initial and supplemental site investigations (MACTEC, Reference 6; RIZZO, Reference 3)..."

<u>Grouting Program</u>

Grouting will be performed at the site for primarily the construction-related groundwater control. As discussed in FSAR Subsection 2.5.4.6.2, grouting will be performed within the excavation area for the nuclear Island. This area covers the nuclear island basemat and part of the adjacent annex, radwaste, and turbine buildings as shown in Figure 2. A grout plug is proposed between the bottom of the excavation for the nuclear island (approximately elevation [El.] –35 feet North American Vertical Datum of 1988 [NAVD 88]) and the bottom of the diaphragm wall (approximately El. –60 feet NAVD 88). The grout plug is also anticipated to remediate any potential voids, if voiding exists at all, in this depth interval.

In general, grouting will be performed in a series of split spaced borings starting with primary order holes, and continuing through secondary holes at a minimum. Primary grout holes will be extended to El. –110 feet in an effort to partially remediate this area for potential voids. Primary grout holes will be spaced less than or equal to 20 feet on center. In doing so, as discussed in the Response to RAI 02.05.04-26, the maximum undetected void size is constrained to approximately 20-feet. In the primary holes, individual grout stages will be grouted to a closure criteria determined from the results of water pressure tests, evaluation of available boring data, and the target residual permeability of the grouted zone. Upon completion of the grout stages in the primary borings, secondary borings will be drilled and grouted to the same closure criteria. Secondary grout holes will be offset from primary grout holes such that a secondary grout hole is at the center of the square formed by four adjacent primary grout boreholes. Tertiary and quaternary grout holes will be drilled as indicated by the results of the grouting of lower order borings.

Figure 2 Proposed Grouting Plan



LEGEND

GROUT HOLE TYPE	SYMBOL	BOTTOM EL. (FT.)
PRIMARY	●	−110'
SECONDARY	□	−60'
TERTIARY	◇	−60'

Analysis for Postulated Void Conditions

As discussed earlier, large voids (>5 feet) are not anticipated to be present under Category II or non-seismic structures. However, an analysis has been conducted to evaluate the safety of these buildings under postulated void conditions that are similar to those considered for the nuclear Island. According to this, a tunnel (cylindrical) shaped void with a 20-foot diameter is considered underneath the Category II and non-seismic structures with the top of the void at El. –60 feet. For this postulated void condition, the most critical building is considered to be the turbine building given the magnitude of the static and seismic loads for this building. The evaluated condition is shown in Figure 1.

The sensitivity analyses reported here consider extremely unlikely and conservative cases that are only reported to show the safety margin provided by the rock mass; these cases are not likely and are not for design purposes.

The finite element model developed as part of the analysis is a derivative of the model used for the Response to RAI 02.05.04-19 and RAI 02.05.04-26. The details of the model are provided below.

Modeling Approach

For the analysis reported here, the 3D finite element model (as presented in the Responses to RAIs 02.05.04-19 and 02.05.04-26) is updated for the void case presented above. Best estimate material properties (FD1 properties for rock layers) are used for this analysis, as described in the Response to RAI 02.05.04-19.

The void is assumed to be water-filled, and is therefore modeled with the same pore pressure distribution (phreatic surface) as the surrounding rock.

The model considers a construction sequence that includes the following activities:

- Initial gravity loading (without the void),
- Gravity loading (with the void),
- Dewatering,
- Excavation and fill placement,
- Loading,
- Rewatering,
- Pseudo-Dynamic Loading (Multiplier of 1 as defined in Table 1), and
- Pseudo-Dynamic Loading (Multiplier of 2 as defined in Table 1).

The void is not considered in the initial gravity loading phase because it would have developed over time; further, inserting the void in the second phase allows for an

evaluation of any points reaching Mohr-Coulomb failure due to the presence of the void independent from the other construction activities.

In the Response to RAI 02.05.04-26, the in situ initial overburden effective vertical stress at the bottom of the model was compared to the effective vertical stress at the bottom of the model for each phase. The changes in effective vertical stresses were less than 10 percent of the effective in situ stress for each phase, demonstrating that the model depth is appropriate.

As discussed in the Response to RAI 02.05.04-19, the plan dimensions considered in the model are 1724 feet by 1396 feet. The total displacement at the corner of the model is less than 0.1 inches. The lateral boundary conditions were also checked in the Response to RAI 02.05.04-26 by confirming that the horizontal stresses at the edge of the model are in agreement with horizontal stresses calculated by hand.

Figures 3 through 5 show the PLAXIS3D model. The 3D mesh is refined to the extent possible in the area surrounding the void. The total number of elements is 104,760.

Figure 3 PLAXIS3D Model

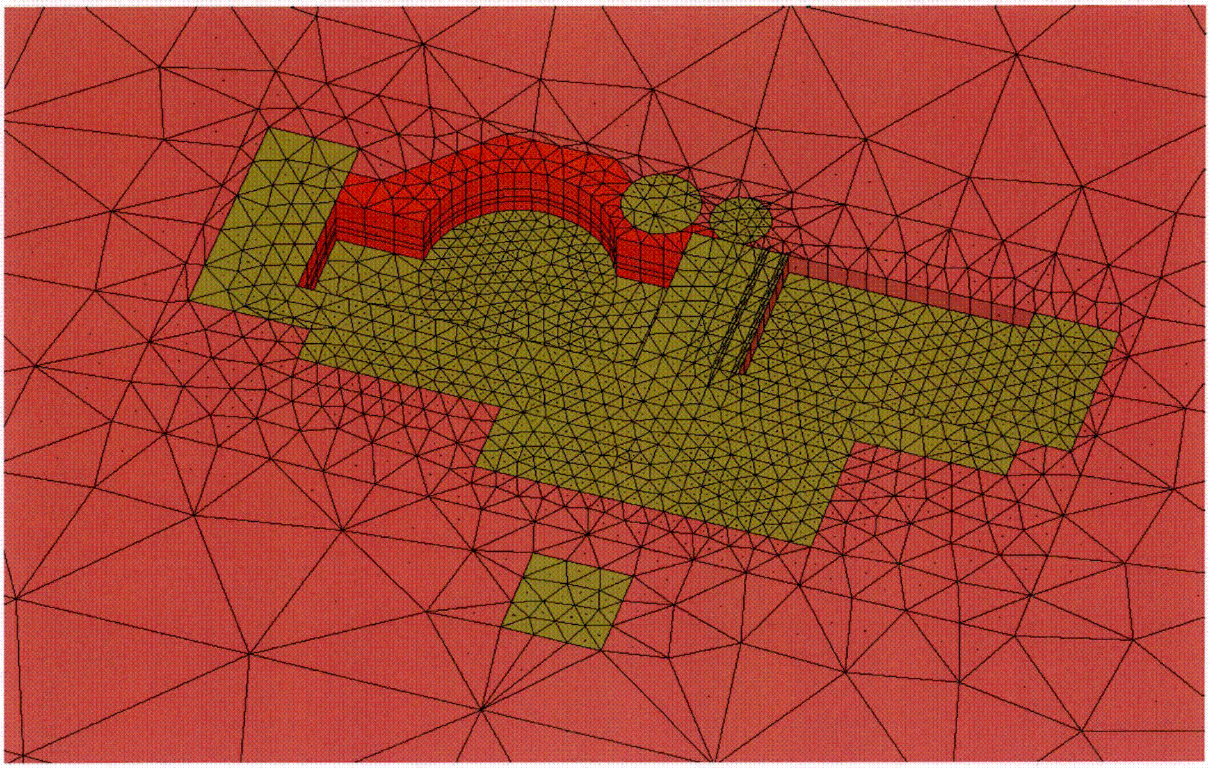


Figure 4 PLAXIS3D Model – Plan View

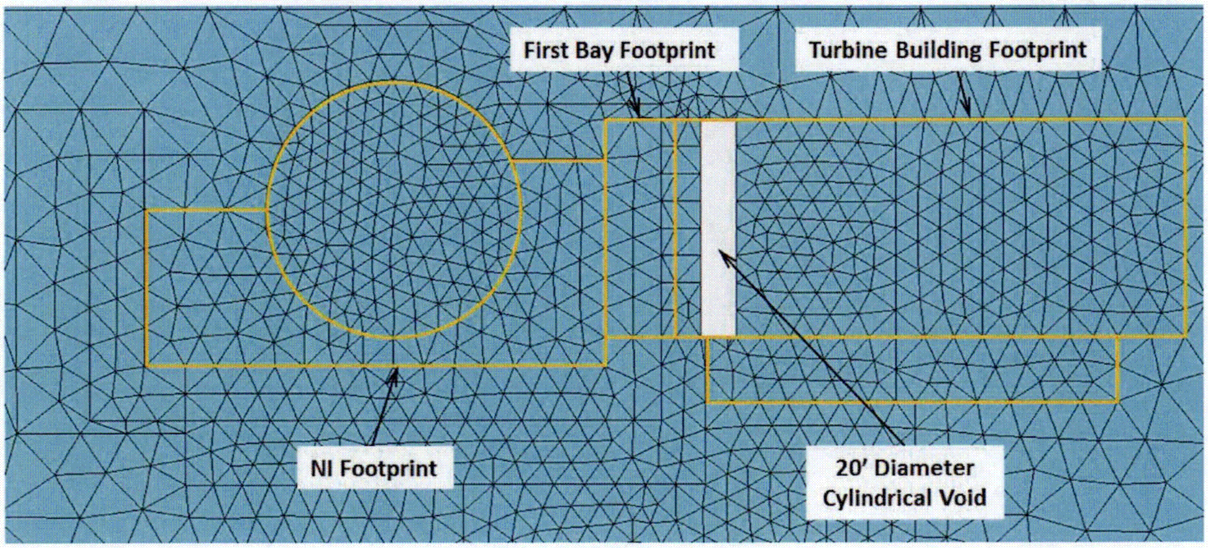
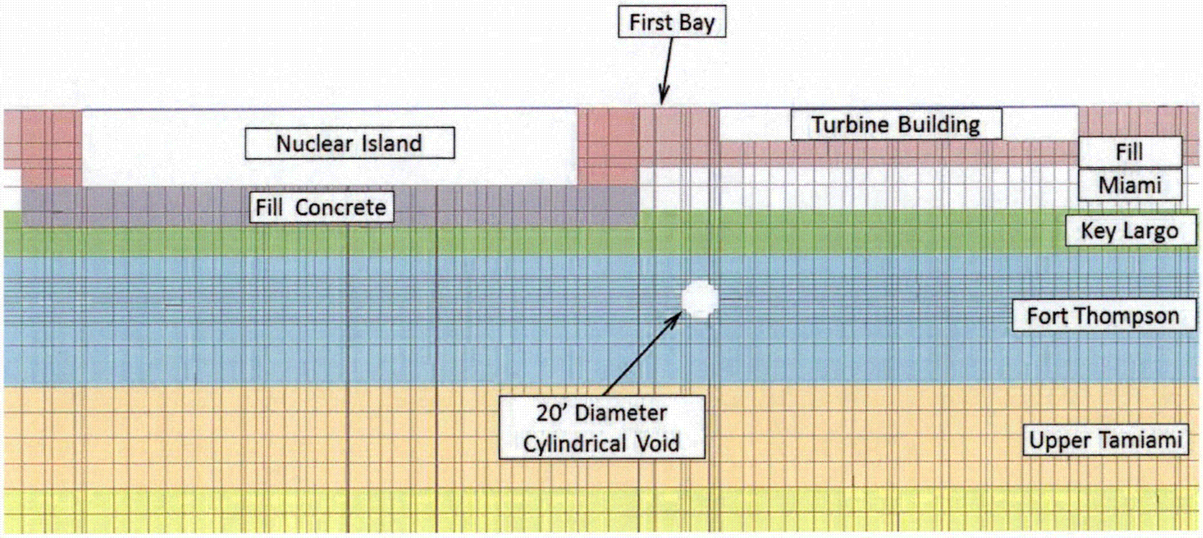


Figure 5 PLAXIS3D Model – Cross-Section



Pseudo-Dynamic

To consider the impact of the potential voids under dynamic conditions, dynamic bearing pressures from the SASSI model are converted to equivalent (approximately) static loads and applied in the PLAXIS 3D model.

The forces from the dynamic bearing pressures are distributed uniformly over areas of the northern half (maximum uplift) and southern half (maximum compression) of the turbine building. The maximum uplift bearing pressure as obtained from the upper bound, lower bound, and best estimate cases are applied on the northern half of the turbine building, whereas the maximum compressive bearing pressure as obtained from the upper bound, lower bound, and best estimate cases are applied on the southern half of the turbine building, as shown in Figure 6, such that the maximum overturning moment is applied in the north-south direction of the turbine building (therefore overturning towards the nuclear island).

This approach is very conservative because maximum compressive pressures and tensile pressures are applied at the same time to maximize the overturning moment.

Additionally, a case is considered where the load combinations are multiplied by a safety factor of 2. Table 1, below shows the total loads considered (static and pseudo-dynamic). The sum of the static load and the seismic uplift pressure is negative, if the overall pressure is compressive.

Figure 6 Dynamic Bearing Pressure Distributed over the Turbine Building

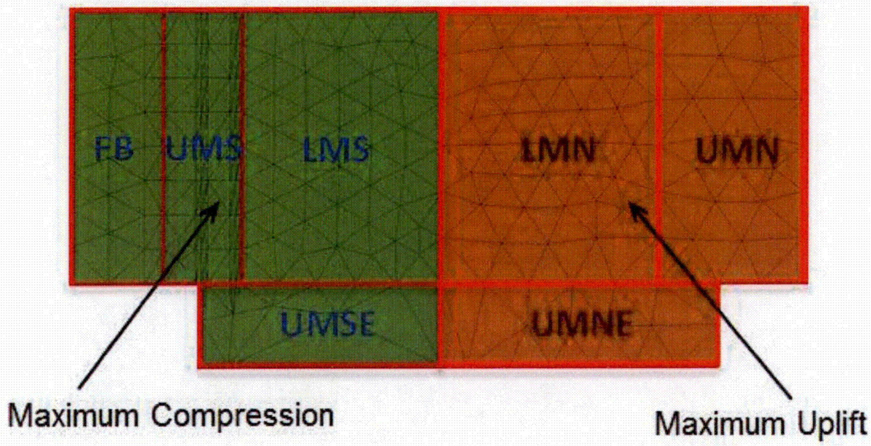


Table 1

Total Static and Pseudo-Dynamic Loads (ksf)

Turbine Building	Multiplier of 1	Multiplier of 2
First Bay (FB)	-5.03	-6.36
Upper Mat South (UMS)	-6.32	-7.54
Lower Mat South (LMS)	-5.12	-6.34
Lower Mat North (LMN)	-2.68	-1.46
Upper Mat North (UMN)	-2.78	-1.56
Upper Mat Southeast (UMSE)	-6.12	-7.34
Upper Mat Northeast (UMNE)	-3.68	-2.46

Note: Negative sign indicates compressive pressure, positive sign indicates uplift pressure.

<u>Response under Dynamic Loads</u>

All model results presented are for the case with a tunnel (cylindrical) shaped void with a 20-foot diameter circular cross-section. The tunnel (cylindrical) shaped void is considered to be more critical than a smaller 20-foot diameter spherical void, or a distribution of spherical voids.

Yield at any point is considered to occur if the stress state reaches the Mohr-Coulomb failure envelope. As shown in Figures 7 and 8, under pseudo-dynamic loading (multiplier of 1 and multiplier of 2) there are no plastic points (indicated by red squares) or tension points (indicated by blue squares) near the void location indicating that the rock mass surrounding the void is not experiencing compressive failure according to Mohr-Coulomb failure envelope or tensile failure.

Figure 7 Plastic Points PLAXIS3D
(Pseudo-Dynamic Loading, Multiplier of 1 as defined in Table 1)

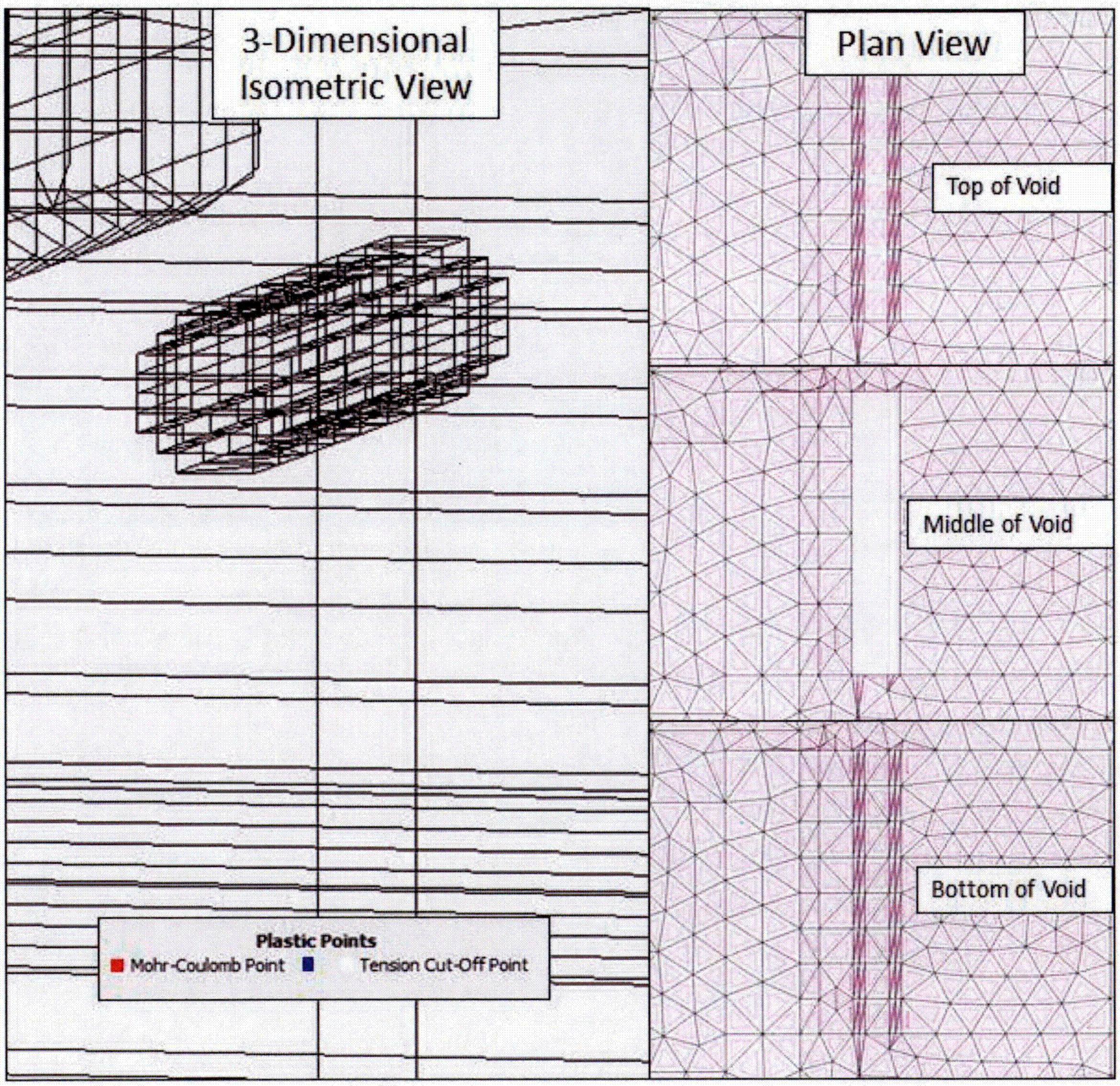
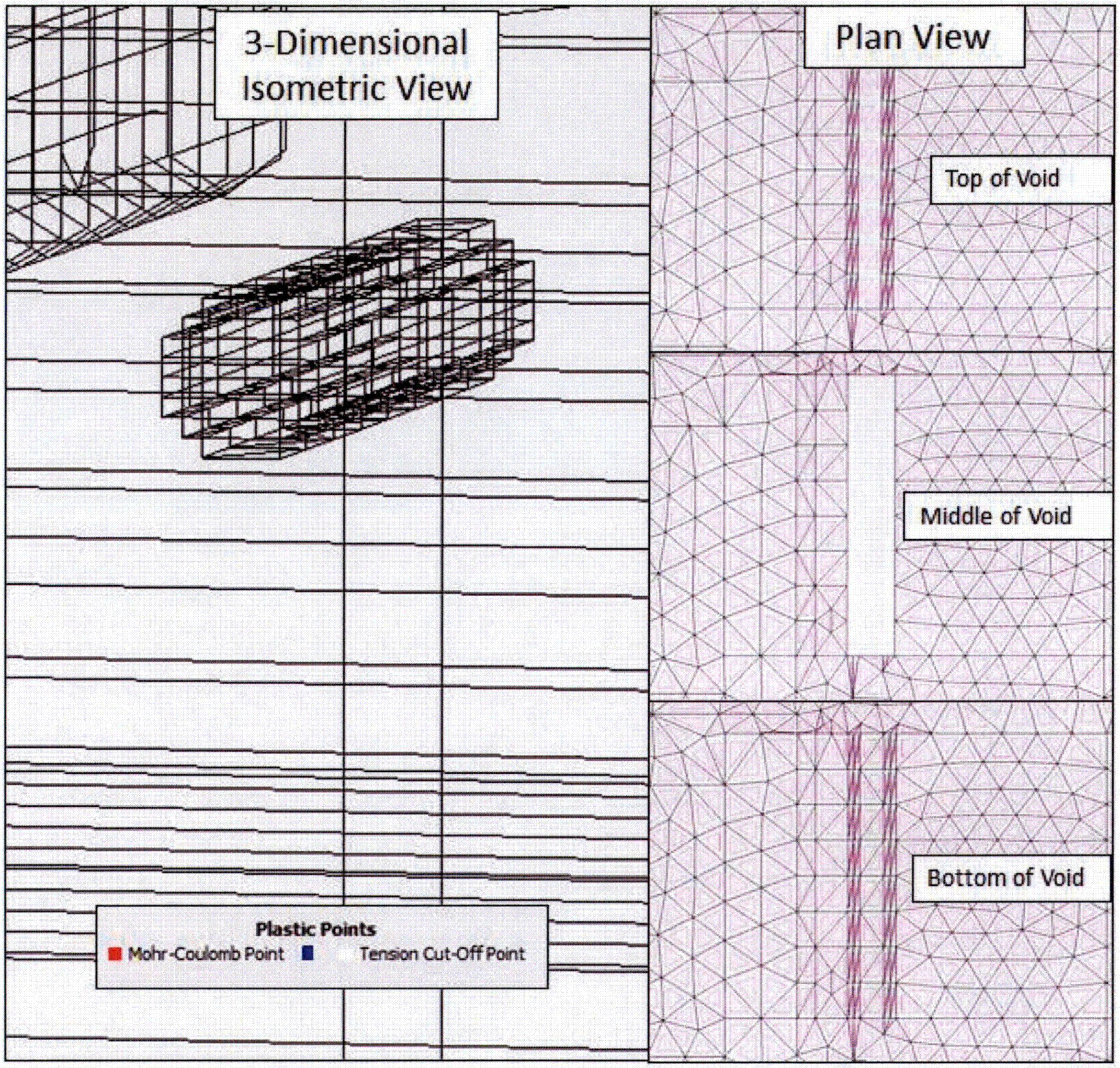


Figure 8 Plastic Points PLAXIS3D
(Pseudo-Dynamic Loading, Multiplier of 2 as defined in Table 1)



Another useful parameter to consider is the relative shear stress, which is a measure to define how close the stress state is to the Mohr-Coulomb failure envelope. Relative shear stresses are defined in Equation 1 (Reference 1).

$$\tau_{rel} = \frac{\tau_{mob}}{\tau_{max}} \qquad \text{Equation 1}$$

Where,

τ_{rel} = relative shear stress,

τ_{mob} = mobilized shear strength (maximum value of shear stress),

and τ_{max} = maximum value of shear stress for the case where the Mohr's circle is expanded to touch the Coulomb failure envelope while keeping the center of Mohr's circle constant.

Based on Equation 1, relative shear stresses provide a measure of margin compared to Mohr-Coulomb failure. For example, if the relative shear stress is equal to 1, then that location is marked with a plastic point. If the relative shear stress is much less than 1, the point is not close to the Mohr-Coulomb failure envelope. As shown by Figures 9 and 10, under pseudo-dynamic loading (multiplier of 1 and multiplier of 2) the rock surrounding the void indicates relative shear stresses much less than 1.

Figure 9 Relative Shear Stresses

(Pseudo-Dynamic Loading, Multiplier of 1 as defined in Table 1)

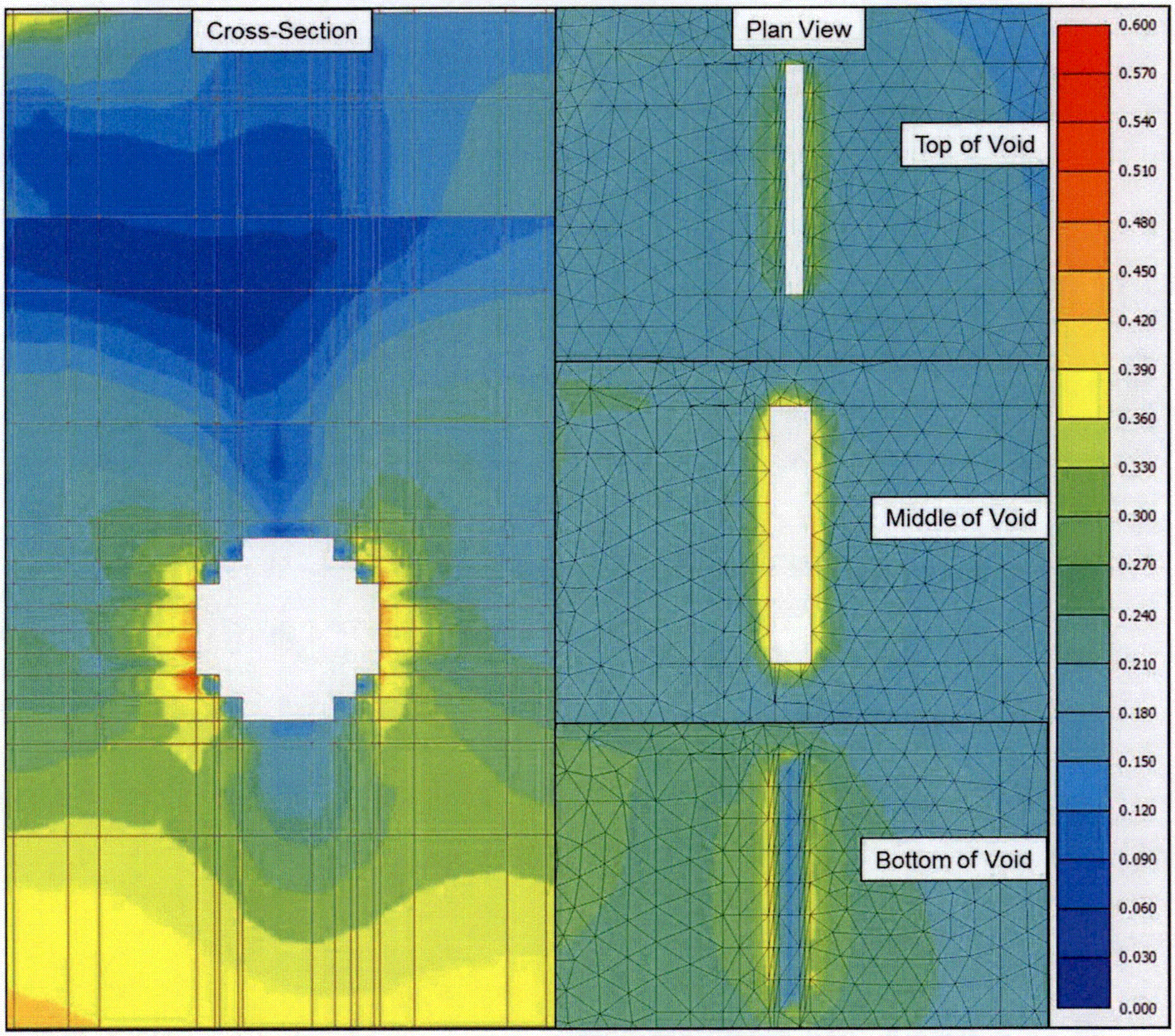
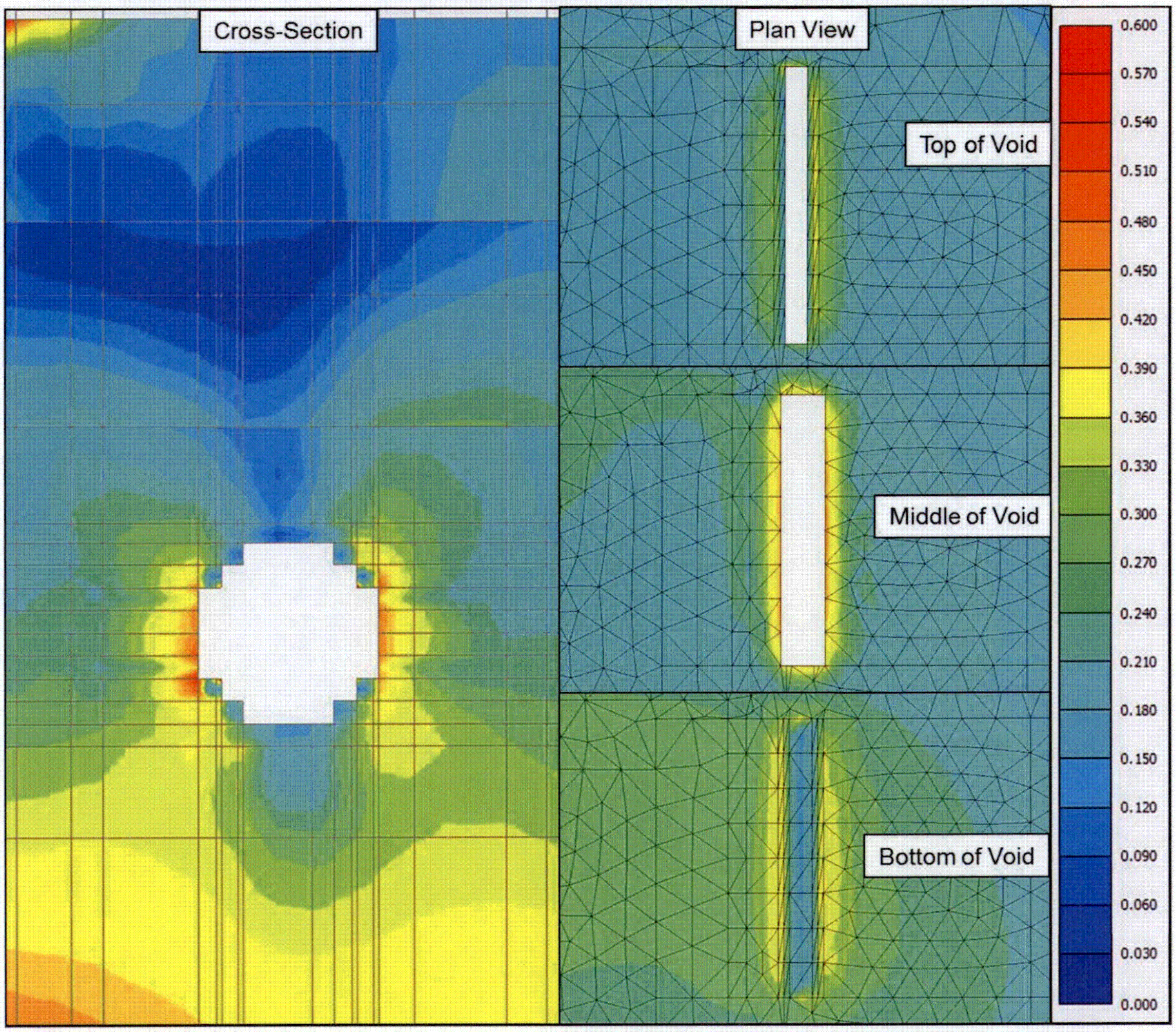


Figure 10 Relative Shear Stresses

(Pseudo-Dynamic Loading, Multiplier of 2 as defined in Table 1)



In conclusion, the presence of 20-foot wide tunnel as modeled here does not present stability concerns under pseudo-dynamic loading (multiplier of 1 and multiplier of 2), i.e., no subsurface collapse is anticipated.

As indicated by the results shown in Figures 7 through 10:

- No plastic points or tension points are observed during the pseudo-dynamic loading conditions, and
- The rock surrounding the void indicates relative shear stresses much less than 1.

The 20-foot diameter tunnel (cylindrical) void has been demonstrated not to be critical to the pseudo-dynamic stability of the turbine building which is considered to be the most critical building given the magnitude of the static and seismic loads. The tunnel (cylindrical) shaped void with a 20-foot diameter circular cross-section is considered to be more critical than a smaller 20-foot diameter spherical void, or a distribution of spherical voids.

In summary, the void size considered has been demonstrated to not be critical to the pseudo-dynamic stability of Category II or non-seismic structures. In other words, subsurface collapse is not anticipated under the combination of static and seismic Category II or non-seismic building loads. Therefore, it has been demonstrated that the Category II or non-seismic structures will not collapse due to the presence of the void considered and there will not be interaction between the Category II or non-seismic structures and the Category I structure.

References:

1. Brinkgreve, R.B.J. and Swolfs, W.M., *PLAXIS 3D Foundation Version 2 Part 2: Reference Manual*, PLAXIS bv, 2007.

ASSOCIATED COL APPLICATION REVISIONS:

The following text will be added to the end of DCD Subsection 3.7.2.8 in a future COLA revision:

Category II/I interaction between the nuclear island and the annex building, radwaste building, and turbine building is documented in the DCD Subsections 3.7.2.8.1, 3.7.2.8.2, and 3.7.2.8.3.

The following text will be added to the end of DCD Subsection 3.7.2.8.1 in a future COLA revision:

3.7.2.8.1 Annex Building

The potential impact of Seismic Category II and non-seismic structures on Seismic Category I structures considering a postulated void condition under the Category II or non-seismic structure is discussed in Subsection 3.7.2.8.3. The turbine building is considered to be the most critical building given the magnitude of the static and seismic loads.

The following text will be added to the end of DCD Subsection 3.7.2.8.2 in a future COLA revision:

3.7.2.8.2 Radwaste Building

The potential impact of Seismic Category II and non-seismic structures on Seismic Category I structures considering a postulated void condition under the Category II or non-seismic structure is discussed in Subsection 3.7.2.8.3. The turbine building is considered to be the most critical building given the magnitude of the static and seismic loads.

The following text will be added to the end of DCD Subsection 3.7.2.8.3 in a future COLA revision:

3.7.2.8.3 Turbine Building

Although large voids and karst features are not considered likely at the site, as described in Appendix 2.5AA, a sensitivity analysis has been conducted to evaluate the safety of these buildings under postulated void conditions that are similar to those considered for the nuclear island. According to this, a tunnel (cylindrical) shaped void with a 20-foot diameter is considered underneath the Category II and non-seismic structures with the top of the void at El. –60 feet. For this postulated void condition, the most critical building is considered to be the turbine building given the magnitude of the static and seismic loads for this building.

The sensitivity analyses reported here consider extremely unlikely and conservative cases that are only reported to show the safety margin provided by the rock mass; these cases are not likely and are not for design purposes.

For the analysis reported here, the 3D finite element model (as presented in Subsections 2.5.4.10.3.2 and 2.5.4.10.8) is updated for the void case presented above. Best estimate material properties (FD1 properties for rock layers) are used for this analysis, as described in Subsection 2.5.4.10.3.

The void is assumed to be water-filled, and is therefore modeled with the same pore pressure distribution (phreatic surface) as the surrounding rock.

The model considers a construction sequence that includes the following activities:

- **Initial gravity loading (without the void),**
- **Gravity loading (with the void),**
- **Dewatering,**
- **Excavation and fill placement,**
- **Loading,**

- **Rewatering,**
- **Pseudo-Dynamic Loading (Multiplier of 1), and**
- **Pseudo-Dynamic Loading (Multiplier of 2).**

The void is not considered in the initial gravity loading phase because it would have developed over time; further, inserting the void in the second phase allows for an evaluation of any points reaching Mohr-Coulomb failure due to the presence of the void independent from the other construction activities.

Figure 3.7-203 shows the PLAXIS3D model. The 3D mesh is refined to the extent possible in the area surrounding the void. The total number of elements is 104,760.

Pseudo-Dynamic

To consider the impact of the potential voids under dynamic conditions, dynamic bearing pressures from the SASSI model are converted to equivalent (approximately) static loads and applied to the PLAXIS 3D model.

The forces from the dynamic bearing are pressures distributed uniformly over areas of the northern half (maximum uplift) and southern half (maximum compression) of the turbine building. The maximum uplift bearing pressure as obtained from the upper bound, lower bound, and best estimate cases are applied on the northern half of the turbine building, whereas the maximum compressive bearing pressure as obtained from the upper bound, lower bound, and best estimate cases are applied on the southern half of the turbine building, such that the maximum overturning moment is applied in the north-south direction of the turbine building (therefore overturning towards the nuclear island).

This approach is very conservative because maximum compressive pressures and tensile pressures are applied at the same time to maximize the overturning moment.

Additionally, a case is considered where the load combinations are multiplied by a safety factor of 2. Table 3.7-202, below shows the total loads considered (static and pseudo-dynamic). The sum of the static load and the seismic uplift pressure is negative, if the overall pressure is compressive.

Response under Dynamic Loads

All model results presented are for the case with a tunnel (cylindrical) shaped void with a 20-foot diameter circular cross-section. The tunnel (cylindrical) shaped void is considered to be more critical than a smaller 20-foot diameter spherical void, or a distribution of spherical voids.

Yield at any point is considered to occur if the stress conditions reach the Mohr-Coulomb failure envelope. Under pseudo-dynamic loading (multiplier of 1 and

multiplier of 2) there are no plastic points or tension points near the void location indicating that the rock mass surrounding the void is not experiencing compressive failure according to Mohr-Coulomb failure envelope or tensile failure.

Another useful parameter to consider is the relative shear stress, which is a measure to define how close the stress condition is to the Mohr-Coulomb failure envelope. Relative shear stresses are defined in Equation 3.7.2-1 (Reference 203).

$$\tau_{rel} = \frac{\tau_{mob}}{\tau_{max}} \qquad \textbf{Equation 3.7.2-1}$$

Where,

τ_{rel} **= relative shear stress,**

τ_{mob} **= mobilized shear strength (maximum value of shear stress),**

and τ_{max} **= maximum value of shear stress for the case where the Mohr's circle is expanded to touch the Coulomb failure envelope while keeping the center of Mohr's circle constant.**

Based on Equation 3.7.2-1, relative shear stresses provide a measure of margin compared to Mohr-Coulomb failure. For example, if the relative shear stress is equal to 1, then that location is marked with a plastic point. If the relative shear stress is much less than 1, the point is not close to the Mohr-Coulomb failure envelope. As shown by Figures 3.7-204 and 3.7-205, under pseudo-dynamic loading (multiplier of 1 and multiplier of 2) the rock surrounding the void indicates relative shear stresses much less than 1.

In conclusion, the presence of 20-foot wide tunnel as modeled here does not present stability concerns under pseudo-dynamic loading (multiplier of 1 and multiplier of 2), i.e., no subsurface collapse is anticipated.

As indicated by the results described above and shown in Figures 3.7-204 and 3.7-205:

- **No plastic points or tension points are observed during the pseudo-dynamic loading conditions, and**
- **The rock surrounding the void indicates relative shear stresses much less than 1.**

The 20-foot diameter tunnel (cylindrical) void has been demonstrated to not be critical to the pseudo-dynamic stability of the turbine building. The turbine building is considered to be the most critical building given the magnitude of the static and seismic loads. The tunnel (cylindrical) shaped void with a 20-foot diameter circular cross-section is considered to be more critical than a smaller 20-foot diameter spherical void, or a distribution of spherical voids.

In summary, the void size considered has been demonstrated to not be critical to the pseudo-dynamic stability of Category II or non-seismic structures. In other words, subsurface collapse is not anticipated under the combination of static and seismic Category II or non-seismic building loads. Therefore, it has been demonstrated that the Category II or non-seismic structures will not collapse due to the presence of the void considered and there will not be interaction between the Category II or non-seismic structures and the Category I structure.

The following reference will be added to Subsection 3.7.6 in a future revision of the COLA:

203. Brinkgreve, R.B.J. and Swolfs, W.M., *PLAXIS 3D Foundation Version 2 Part 2: Reference Manual*, PLAXIS bv, 2007.

The following table will be added to Subsection 3.7 in a future revision of the COLA:

Table 3.7-202
Total Static and Pseudo-Dynamic Loads (ksf)

Turbine Building	Multiplier of 1	Multiplier of 2
First Bay	-5.03	-6.36
Upper Mat South	-6.32	-7.54
Lower Mat South	-5.12	-6.34
Lower Mat North	-2.68	-1.46
Upper Mat North	-2.78	-1.56
Upper Mat Southeast	-6.12	-7.34
Upper Mat Northeast	-3.68	-2.46

Note: Negative sign indicates compressive pressure, positive sign indicates uplift pressure.

The following figures will be added to Subsection 3.7 in a future revision of the COLA:

Figure 3.7-203 PLAXIS3D Sensitivity Model with 20-foot Diameter Cylindrical Void

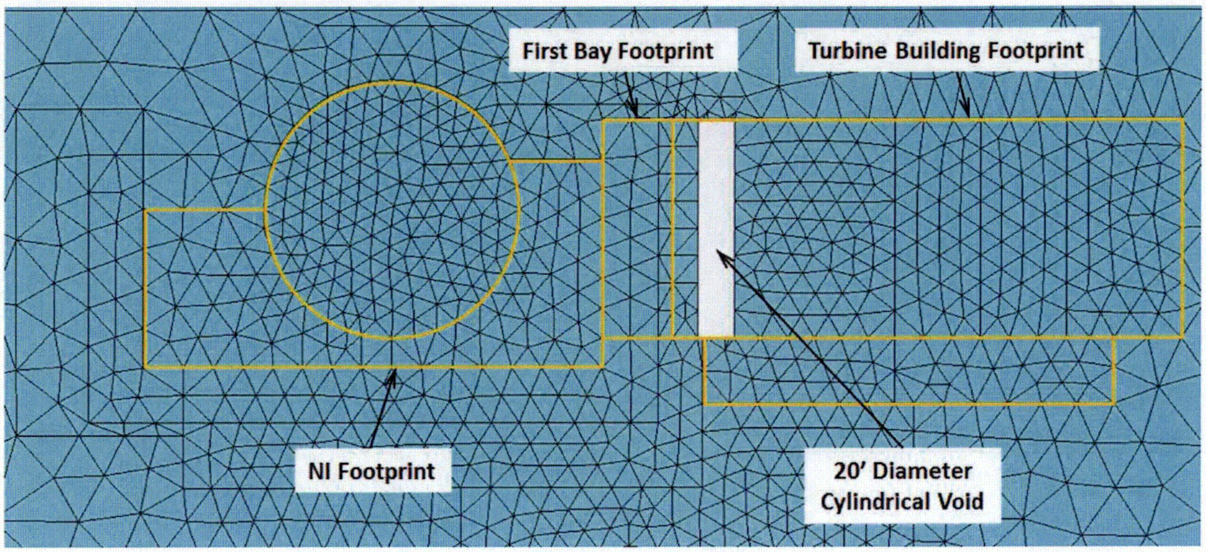


Figure 3.7-204 Relative Shear Stresses (Pseudo-Dynamic Loading, Multiplier of 1 as defined in Table 3.7-202)

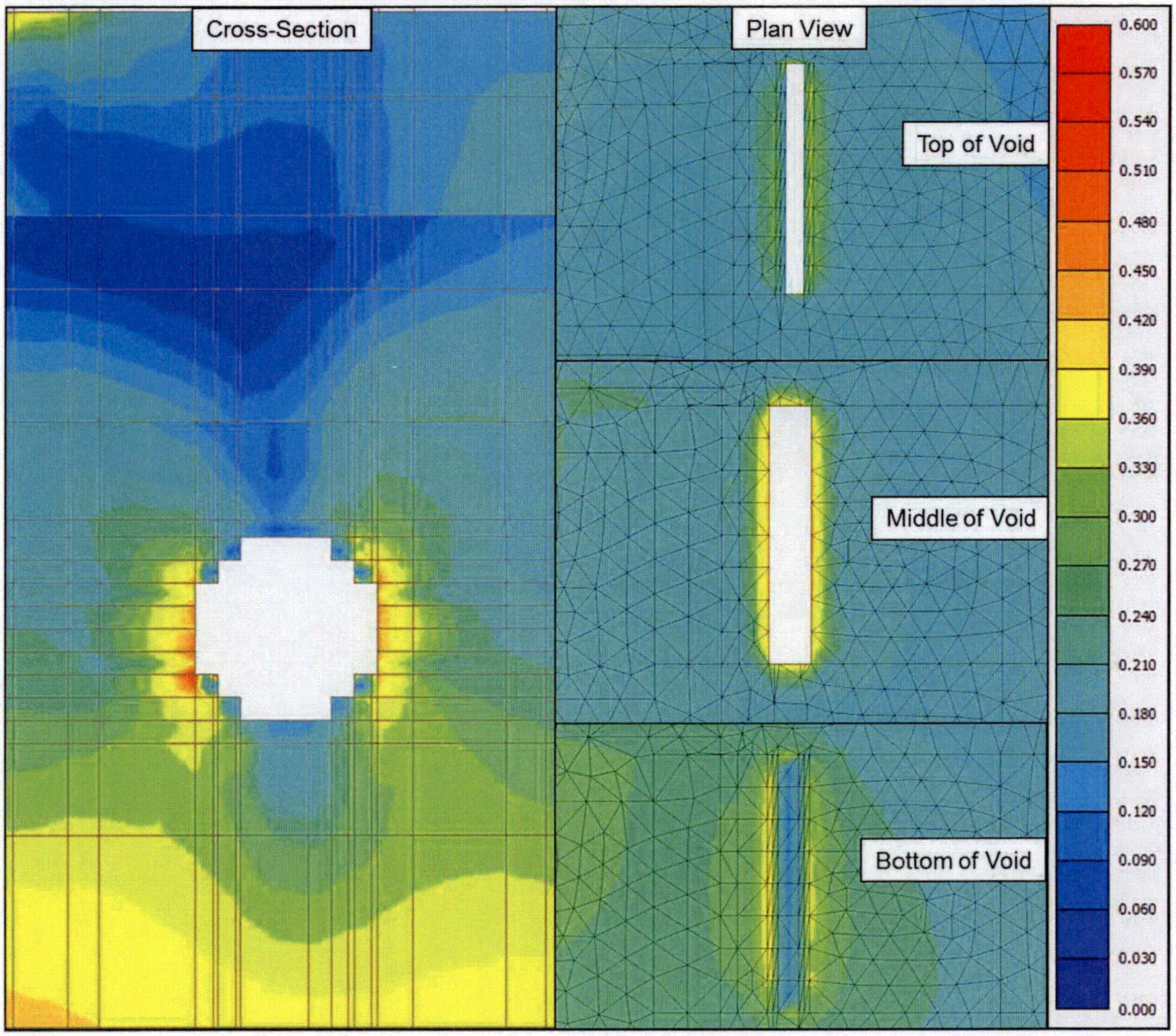
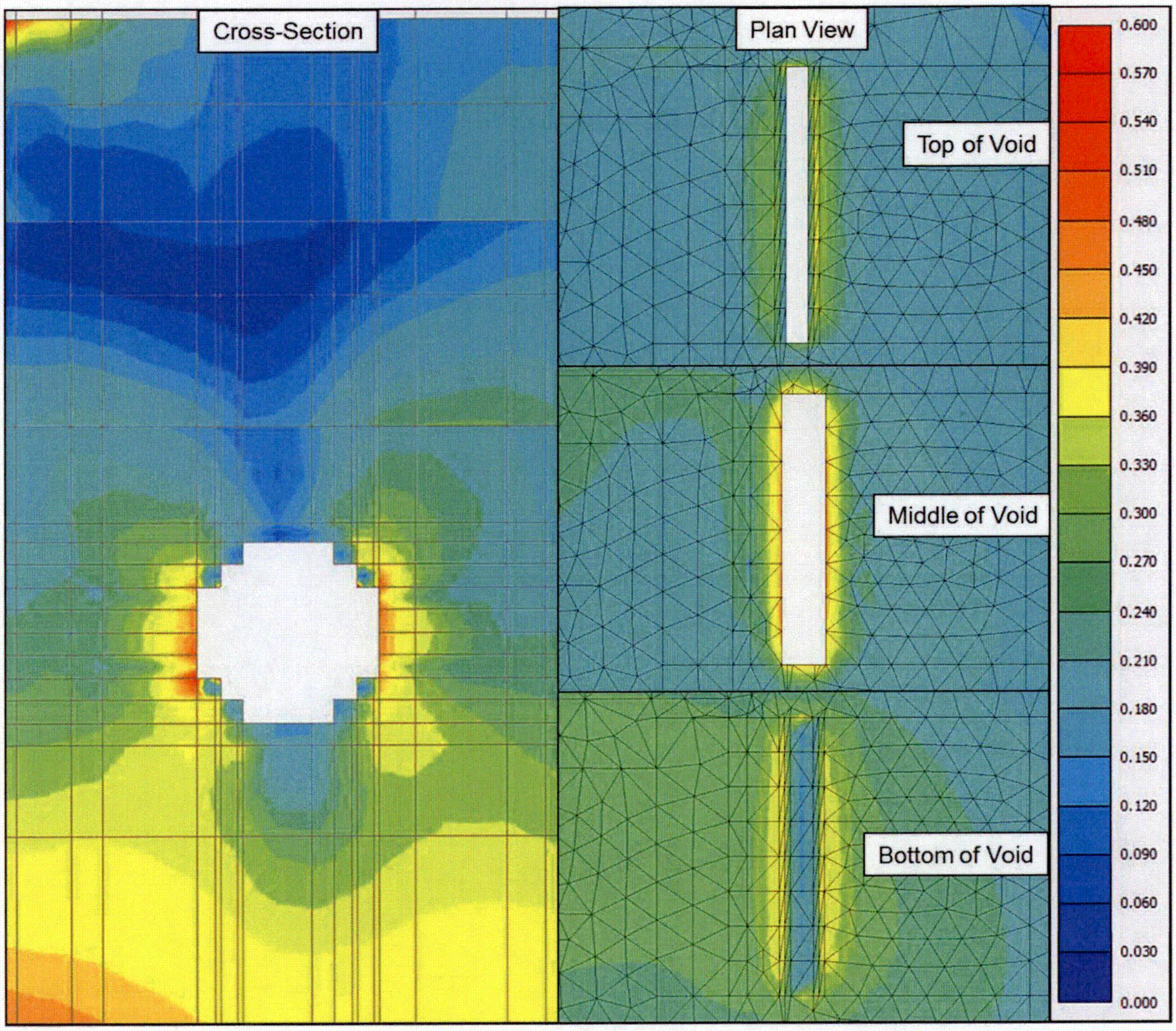


Figure 3.7-205 Relative Shear Stresses (Pseudo-Dynamic Loading, Multiplier of 2 as defined in Table 3.7-202)



ASSOCIATED ENCLOSURES:

None