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U.S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Revised Request for License Amendment:
Reconciliation of Environmental Conditions Inputs to Civil Structural Design Licensing Basis (LAR-19-019R1)

Ladies and Gentlemen:

On December 13, 2019 pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, Southern Nuclear Operating Company (SNC) requested an amendment to the combined licenses (COLs) for Vogtle Electric Generating Plant (VEGP) Units 3 and 4 (License Numbers NPF-91 and NPF-92, respectively) [ADAMS Accession Number ML19347C046]. The requested amendment proposes to depart from Tier 2* and associated Tier 2 information in the Updated Final Safety Analysis Report (UFSAR) (which includes the plant-specific DCD Tier 2 information).

The requested license amendment (LAR-19-019) proposes to revise the normal thermal loads for the passive containment cooling system (PCS) tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, and update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the spent fuel pool (SFP) west wall in the Updated Final Safety Analysis Report (UFSAR).

The requested amendment is herein revised in response to NRC Staff feedback that was provided during the January 16, 2020 public call (ML19322C790). In addition, during NRC audit discussion of the technical information supporting LAR-19-019, clarifications were identified for the submittal based on the design analyses which support the request. The material identified is revised or added in the description of the changes to the licensing basis, and in the licensing basis markups provided in Enclosures 1 and 2 respectively. Therefore, this letter replaces SNC LAR-19-019 in its entirety.

This revision does not impact the Significant Hazards Consideration Determination, or Environmental Considerations of the original submittal.

Enclosure 1 provides the description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration Determination) and environmental considerations for the proposed changes.

Enclosure 2 identifies the requested changes and provides markups depicting the requested changes to the VEGP Units 3 and 4 licensing basis documents.

This letter contains no regulatory commitments. This letter has been reviewed and determined not to contain security-related information.

SNC requests NRC staff approval of the license amendment by June 12th, 2020 to support completion of the applicable as-built structural reconciliation reports. Delayed approval of this license amendment could result in a delay in completion of the associated ITAAC and subsequent construction completion activities. SNC expects to implement this proposed amendment within 30 days of approval of the requested changes.

In accordance with 10 CFR 50.91, SNC is notifying the State of Georgia by transmitting a copy of this letter and its enclosures to the designated State Official.

Should you have any questions, please contact Amy Chamberlain at (205) 992-6361.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 20th of March 2020.

Respectfully submitted,

Amy C. Chamberlain for BHW

Director, Regulatory Affairs
Southern Nuclear Operating Company

Enclosures

1) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Request for License Amendment Regarding Reconciliation of Environmental Conditions Inputs to Civil Structural Design Licensing Basis (LAR-19-019R1)

2) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Proposed Changes to Licensing Basis Documents (LAR-19-019R1)

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Southern Nuclear Operating Company

ND-20-0266

Enclosure 1

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Revised Request for License Amendment Regarding

Reconciliation of Environmental Conditions Inputs to Civil Structural Design Licensing Basis

(LAR-19-019R1)

(This Enclosure consists of 42 pages, including this cover page)

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Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, Southern Nuclear Operating Company (SNC) hereby requests an amendment to Combined License (COL) Nos. NPF-91 and NPF-92 for Vogtle Electric Generating Plant (VEGP) Units 3 and 4, respectively.

1. SUMMARY DESCRIPTION

The proposed changes would revise the normal thermal loads for the passive containment cooling system (PCS) tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the spent fuel pool (SFP) west wall in the Updated Final Safety Analysis Report (UFSAR). The proposed changes impact UFSAR Tier 2 and Tier 2* information in UFSAR Subsections 3H.3.3 and 3H.5.1.1, and Tables 3.8.5-3, 3H.5-1, 3H.5-2, 3H.5-3, 3H.5-4 3H.5-5, 3H.5-6, 3H.5-7, 3H.5-8, 3H.5-9, 3H.5-11, 3H.5-12, and 3H.5-15.

This enclosure requests approval of the license amendment necessary to implement this change.

2. DETAILED DESCRIPTION

Design Function Related to the Activity

As described in COL Appendix C, Section 3.3, the nuclear island structures include the containment and the shield and auxiliary buildings. The primary functions of the nuclear island structures are to provide support, protection, and separation for the seismic Category I mechanical and electrical equipment located in the nuclear island. The nuclear island structures are structurally designed to meet seismic Category I requirements. The nuclear island structures provide protection for the safety-related equipment against the consequences of either a postulated internal or external event. The nuclear island structures are designed to withstand the effects of natural phenomena such as hurricanes, floods, tornados, tsunamis, and earthquakes without loss of capability to perform safety functions. The nuclear island structures are designed to withstand the effects of postulated internal events such as fires and flooding without loss of capability to perform safety functions. The nuclear island structures include the containment (the steel containment vessel and the containment internal structures) and the shield and auxiliary buildings. The containment, shield and auxiliary buildings are structurally integrated on a common basemat which is embedded below the finished plant grade level.

The shield building is the structure that surrounds the containment vessel. The shield building cylinder is a composite steel and concrete (SC) structure except for the portion surrounded by the auxiliary building, which is reinforced concrete (RC). During normal operations, a primary function of the shield building is to provide shielding of the containment vessel and the radioactive systems and components located in the containment vessel. The shield building, in conjunction with the internal structures of the containment, provides the required shielding for the reactor coolant system and the other radioactive systems and components housed in the containment. The shield building also protects the containment vessel from external events. The shield building protects the containment vessel and the reactor coolant system from the effects of tornados and tornado produced missiles, and from other external events, such as aircraft impact.

The shield building is an integral part of the passive containment cooling system. The passive containment cooling system air baffle is located in the upper annulus area. It is attached to the cylindrical section of the containment vessel. The air inlets in the shield building provide the air

flow for the passive containment cooling system. The passive containment cooling water storage tank (PCCWST), located on the roof of the shield building, provides water for external cooling of the containment.

The auxiliary building is RC and houses the safety-related mechanical and electrical equipment located outside the containment and shield buildings. The primary function of the auxiliary building is to provide protection and separation for the seismic Category I mechanical and electrical equipment located outside the containment building. The auxiliary building provides protection for the safety-related equipment against the consequences of either a postulated internal or external event. The auxiliary building also provides shielding for the radioactive equipment and piping that is housed within the building.

The auxiliary building is a seismic Category I reinforced concrete structure. It shares a common basemat with the containment building and the shield building. The auxiliary building wraps around approximately 70 percent of the circumference of the shield building. Floor slabs and the structural walls of the auxiliary building are structurally connected to the cylindrical section of the shield building.

As identified in UFSAR subsection 6.2.2, the PCS is an engineered safety features system. Its function is to reduce the containment temperature and pressure following a loss of coolant accident (LOCA) or main steam line break (MSLB) accident inside the containment by removing thermal energy from the containment atmosphere. The passive containment cooling system also serves as the means of transferring heat to the safety-related ultimate heat sink for other events resulting in a significant increase in containment pressure and temperature. The passive containment cooling system also provides a source of safety-related makeup water to the spent fuel pool in the event of a prolonged loss of normal spent fuel pool cooling.

As identified in UFSAR Subsection 6.2.2.2.3, the PCS tank is incorporated into the shield building structure above the containment vessel and is filled with demineralized water for the passive containment cooling function.

Background and Description of the Activity

Change 1 – Design Temperature for Thermal Gradient

The thermal loads are design basis loads in the AP1000 licensing basis for seismic Category I (SC-I) structures. The design temperatures (both normal and accident) for thermal gradient for the nuclear island critical sections are defined in UFSAR Table 3H.5-1.

Change 1A – PCS Tank Wall Normal Temperature

There is an inconsistency of normal temperature in the PCS tank between the UFSAR Subsection 3H.3.3 & Table 3H.5-1 and other sections of the licensing basis. UFSAR Subsection 3H.3.3 identifies that the water in the PCS tank is assumed to be at 70°F when the outside air temperature is 115°F for normal thermal loading. Similarly, UFSAR Table 3H.5-1 specifies a PCS tank wall inside design temperature of 70°F and outside temperature of 115°F for determining the thermal gradient across the PCS tank walls. However, the Technical Specifications show that the minimum PCS tank water temperature is 40°F and the maximum PCS water temperature is 120°F as identified in the Technical Specification Surveillance Requirement (SR) 3.6.6.1. UFSAR Table 6.2.2-1, Passive Containment Cooling System Performance Parameters, also identifies that the minimum PCS tank water temperature is 40°F and the maximum water temperature is 120°F. The structural design of the PCS tank walls takes a conservative deterministic

assumption to the maximum thermal gradient across the walls by using thermal gradient of 40°F (inside) / 115°F (outside) and 40°F (inside) / -40°F (outside). Therefore, the temperature for normal thermal loading in the PCS tank needs to be changed from 70°F to 40°F on the inside in UFSAR Subsection 3H.3.3 and Table 3H.5-1.

Change 1B – Auxiliary Building Exterior Walls Below Grade and Basemat Accidental Thermal

UFSAR Table 3H.5-1 defines temperatures for the auxiliary building exterior walls below grade and basemat. There is an inconsistency of accident thermal loads for the exterior walls below grade and basemat in the auxiliary building between UFSAR Table 3H.5-1 and UFSAR Table 3D.5-4, which identifies abnormal accident environment. As identified in UFSAR Table 3D.5-5, the accident environments are the same as the abnormal environments for the auxiliary building rooms with exterior walls below grade. UFSAR Table 3H.5-1 currently does not require considering accident thermal in the exterior walls below grade and basemat in auxiliary building. However, UFSAR Table 3D.5-4 and Table 3D.5-5 define the abnormal and accident environments outside containment as a function of equipment location and show that accident thermal temperatures exist in auxiliary building rooms, including rooms next to exterior walls below grade and the basemat. Per UFSAR Table 3D.5-1 and UFSAR Figures 1.2-4, 1.2-5, and 1.2-6, the auxiliary building exterior walls below grade and basemat are in environmental Zones 2, 6 and 7. Per UFSAR Tables 3D.5-4 and 3D.5-5, the governing accident temperature in Zones 2, 6 and 7 is 140°F for rooms with exterior walls below grade due to either a loss of heating, ventilation and air-conditioning (HVAC) or loss of AC power. Since the loss of HVAC and loss of AC power are considered events in the auxiliary building, the exterior walls below grade and basemat in auxiliary building need to be designed for the accident thermal gradient as result of those events. For the purposes of determining thermal gradients, an outside temperature (below grade) of 50°F is considered in accordance with America Society of Heating, Refrigerating and Air- Conditioning Engineer (ASHRAE) requirements. Therefore, UFSAR Table 3H.5-1 needs to be updated to show accident temperature of 140°F on the inside of the below grade exterior walls and basemat and 50°F on the outside of the below grade exterior walls and basemat. In addition, since the temperatures defined in this row of UFSAR Table 3H.5-1 are specifically for the auxiliary building exterior walls below grade and basemat, it is proposed to add "Auxiliary Building" in the remark column of the table.

As a result of the change of accident thermal gradient on exterior walls below grade and basemat in the auxiliary building, the governing load combinations and demands for the auxiliary building basemat critical sections identified in UFSAR Table 3.8.5-3, and for Wall 1 in UFSAR Tables 3H.5-2 and 3H.5-3 are impacted. The changes to basemat in UFSAR Table 3.8.5-3 are discussed in detail in Change 2A below. The changes to Wall 1 in UFSAR Tables 3H.5-2 and 3H.5-3 affecting Wall 1 are discussed in detail in Change 2B below.

Change 2 – Critical Section Tables Update for Auxiliary Building Basemat, Concrete Walls, and Shield Building Roof

UFSAR Section 3.8 and Appendix 3H list critical sections of SC-I structures in the nuclear island. The critical section tables in the UFSAR show demands and/or capacities of the critical sections. During AP1000 design certification, a thermal note was added to some of the critical section tables. The thermal note clarifies that the design of the critical section tables considered thermal loads even though the required reinforcement in the tables does not reflect values under combined seismic and normal thermal loads. The combination of seismic loads and normal/accident thermal loads was evaluated in the design calculations to confirm the design meets ACI 349-01 requirements. However, the critical section tables did not reflect demands under combined seismic and thermal loads when the AP1000 design was certified. As part of efforts of updating temperatures in UFSAR Table 3H.5-1 for structural design as discussed in Change 1, the critical section tables for the walls and basemat are revisited and are proposed to remove the thermal note to show demands under combined seismic and thermal loads. The revised tables with inclusion of combined seismic and thermal load combinations provide quantification of that load combination within the UFSAR to clearly demonstrate compliance with load combinations in ACI 349-01 and UFSAR Table 3.8.4-2. The proposed changes to the tables by removing the thermal note can also simplify the presentation of the critical section designs in the licensing basis and can facilitate future understanding of how the loads are applied. Therefore, it is proposed to update the critical section tables of auxiliary building walls and basemat to reflect the demands under the load combinations with inclusion of combined seismic and thermal load combinations, and to delete the corresponding thermal note.

In addition, the demand changes in the critical section tables are also caused by refined meshing of local finite element models, localized detailing changes, and expanded load combinations. The capacities are also updated to match the latest design for some of the critical sections as discussed below.

Change 2A – Basemat Critical Section Table Update (Table 3.8.5-3)

UFSAR Table 3.8.5-3 shows the required reinforcement and provided reinforcement in the basemat at two critical locations. UFSAR Table 3.8.5-3 does not reflect the demands under load combinations with seismic and thermal loads combined as identified in the thermal note (Note 6). The basemat is in the rooms which are subject to 140°F of accident thermal in the loss of AC power or loss of HVAC, and the basemat is exposed to soil/rock which has a temperature of 50°F. Therefore, the basemat is subject to accident thermal gradient. The combined seismic and thermal loads impact the demands of the basemat in UFSAR Table 3.8.5-3.

In addition to the combined seismic and thermal loads, the following changes in the design documents contribute to the demand changes in UFSAR Table 3.8.5-3:

- Updated basemat design based on the revised liftoff and basic stress analyses utilizing the updated nuclear island finite element model
- Update of top reinforcement clear cover due to construction requirements
- The current calculation has a criterion of keeping a minimum of 20% margin in the reinforcement design of the basemat. The revised design calculation only keeps the criteria of 20% margin to the reinforcement design at areas specified in UFSAR Figure 3.8.5-3 and calculates minimum required reinforcement in rest of locations in accordance with ACI 349-01 to remove unnecessary conservatism.

Furthermore, the demands in current UFSAR Table 3.8.5-3 do not include a small portion of basemat (between column line L to 5' east of column line L and shield building to column line 9.2) as shown in UFSAR Figure 3.8.5-3 Sheet 6 and as illustrated in the Image 1 below. However, the table does not identify this exception. Therefore, it is proposed to clarify this information through a note in the table. The proposed markup of UFSAR Table 3.8.5-3 is consistent with the scope of the current UFSAR Table 3.8.5-3, which does not include the small region of basemat.

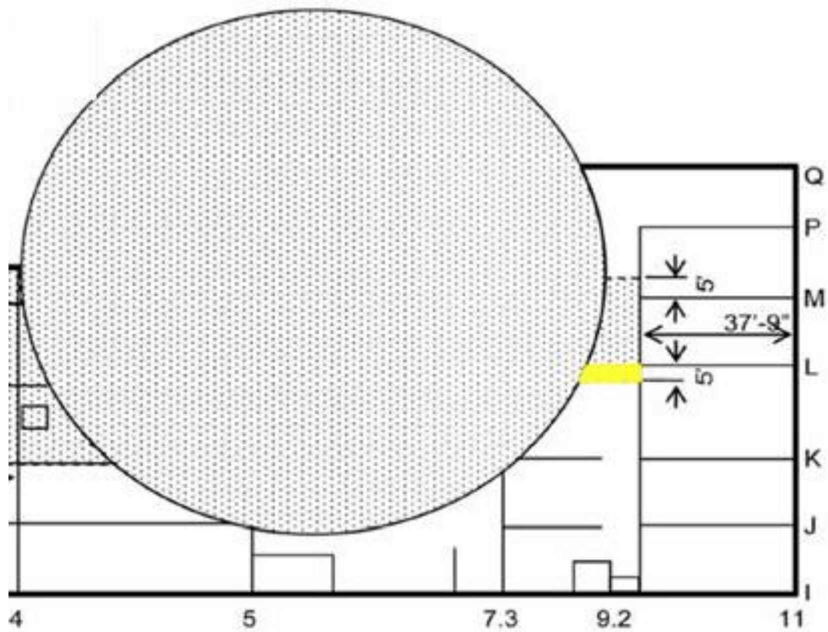

Image 1: Area Excluded from UFSAR Table 3.8.5-3 as Highlighted in Yellow

<u>Change 2B – Wall 1 Critical Section Table Update (Tables 3H.5-2 and 3H.5-3)</u>
There are two critical section tables for Wall 1 in the licensing basis, UFSAR Tables 3H.5-2 and 3H.5-3. UFSAR Table 3H.5-2 for Wall 1 shows the moments and forces in different segments along the height from EL. 66'-6" to 180'-0". UFSAR Table 3H.5-3 identifies both the provided and required reinforcement in Wall 1 under various load combinations without seismic and thermal loads combined as identified in the thermal note (Note 2). The required reinforcement in UFSAR Table 3H.5-3 is calculated based on the demands in UFSAR Table 3H.5-2. Wall 1 is an exterior wall and is next to the spent fuel pool. Therefore, Wall 1 is subject to both normal and accident thermal loads. The combined seismic and thermal loads impact the demands of Wall 1 in UFSAR Tables 3H.5-2 and 3H.5-3.

In addition to the combined seismic and thermal loads, the following changes in the design documents contribute to the changes in values in UFSAR Tables 3H.5-2 and 3H.5-3:

- Change of accident thermal for auxiliary building walls below grade from "Not Required" to 140°F on the inside surface and 50°F on the outside surface of the wall, as discussed in Change 1B above
- The current calculations use the basic load combinations for SC-I structures as defined in UFSAR Tables 3.8.4-1 and 3.8.4-2. The updated calculations expand the basic load combinations by considering the directionality of the seismic loads combined with thermal accident pressure, and PRHA loads. The expanded load combinations were performed to document explicit quantification of the possible combinations and to simplify explanation for future reference.
- The current tables are based on calculations that divide the wall into segments to determine the required reinforcement shown by contour plots by means of a finite element analysis path operation. In some locations, localized regions of some walls were updated with refined meshing in the finite element analysis. The refined meshing was performed to simplify the assessment of peak demand from localized loading conditions. The updated calculations use design forces and moments taken from the global finite element model and calculate the required area of steel by considering the load combinations for each wall element, which provide more accurate results.
- The current calculations use a conservative representative thermal reduction factor. The updated calculations utilize a thermal reduction factor by elevation, considering reinforcement specific to each wall zone. The local thermal reduction factors better represent the level of cracking in the wall section and provide a more accurate thermal demand.

Furthermore, as a result of revised design calculations mentioned above, the required shear reinforcement in UFSAR Table 3H.5-3 is changed from Not Required (NR) to 0.17 in^2/ft between EL. 100'-0" and EL. 135'-3". Accordingly, the shear reinforcement of #4@6"x6" is added to Wall 1 between EL. 100'-0" and EL. 135'-3". Since the current UFSAR Table 3H.5-3 shows that there is no shear reinforcement provided between EL. 100'-0" and EL. 135'-3", UFSAR Table 3H.5-3 is revised to show the provided shear reinforcement EL. 100'-0" and EL. 135'-3".

It is also proposed to revise the required reinforcement of 2.81 in^2/ft in Note 4 of UFSAR Table 3H.5-3 to 3.09 in^2/ft to reflect combined seismic and accident thermal loads. Additionally, for further clarification purposes, it is proposed to change UFSAR Subsection 3H.5.1.1 to clarify that UFSAR Table 3H.5-2 provides the listing and magnitude of various design loads under governing load combinations.

<u>Change 2C – Wall 7.3 Critical Section Table Update (Tables 3H.5-4 and 3H.5-5)</u>

There are two critical section tables for Wall 7.3 in the licensing basis, including UFSAR Tables 3H.5-4 and 3H.5-5. UFSAR Table 3H.5-4 for Wall 7.3 shows the moments and forces in different segments along the height from EL. 66'-6" to roof. UFSAR Table 3H.5-5 for Wall 7.3 shows the required reinforcement under governing load combinations without seismic and thermal loads combined as identified in the thermal note (Note 1) and provided reinforcement. The required reinforcement in UFSAR Table 3H.5-5 is calculated based on the demands in UFSAR Table 3H.5-4. Even though there is no thermal load on Wall 7.3, thermal loads are applied at other locations in the nuclear island, and the thermal

induced deformation in the nuclear island can cause thermal stresses in Wall 7.3. The latest Wall 7.3 calculation includes the load combinations with combined seismic and thermal loads. Therefore, UFSAR Tables 3H.5-4 and 3H.5-5 are revised to show those load combinations and their results.

In addition to the combined seismic and thermal loads, the following changes in the design documents contribute to the changes in values in UFSAR Tables 3H.5-4 and 3H.5-5:

- The current calculations use the basic load combinations for SC-I structures as defined in UFSAR Tables 3.8.4-1 and 3.8.4-2. The updated calculations expand the basic load combinations by considering the directionality of the seismic loads combined with thermal, accident pressure, and PRHA loads. The expanded load combinations were performed to document explicit quantification of the possible combinations and to simplify explanation for future reference.
- The current tables are based on calculations that divide the wall into segments to determine the required reinforcement shown by contour plots by means of a finite element analysis path operation. In some locations, localized regions of some walls were updated with refined meshing in the finite element analysis. The refined meshing was performed to simplify the assessment of peak demand from localized loading conditions. The updated calculations use design forces and moments taken from the global finite element model and calculate the required area of steel by considering the load combinations for each wall element, which provide more accurate results.
- The current calculations use a conservative representative thermal reduction factor. The updated calculations utilize a thermal reduction factor by elevation, considering reinforcement specific to each wall zone. The local thermal reduction factors better represent the level of cracking in the wall section and provide a more accurate thermal demand.
- Change of concrete reinforcement cover from 1 ½" to 2" to accommodate embedment plates

Furthermore, the current design of Wall 7.3 has T headed shear reinforcement of #6@12"x12" between EL. 155'-6" and the roof. The corresponding provided area of reinforcement is 0.44 in^2/ft and is larger than the required reinforcement of 0.38 in^2/ft. The design proposes to change the #6@12"x12" T headed shear reinforcement #4@6"x6" conventional shear reinforcement between EL. 155'-6" and the roof to accommodate the construction need. The corresponding provided area of reinforcement in the revised design is 0.80 in^2/ft. UFSAR Table 3H.5-5 currently shows the shear reinforcement is 0.44 in^2/ft. Therefore, UFSAR Table 3H.5-5 is revised to show shear reinforcement area of 0.80 in^2/ft between EL. 155'-6" and the roof.

<u>Change 2D – Wall L Critical Section Table Update (Tables 3H.5-6 and 3H.5-7)</u>
There are two critical section tables for Wall L in the licensing basis, including UFSAR Tables 3H.5-6 and 3H.5-7. UFSAR Table 3H.5-6 for Wall L shows the moments and forces in different segments along the height from EL. 117'-6" to 154'-2". UFSAR Table 3H.5-7 for Wall L shows both the provided and required reinforcement under governing load combinations without seismic and thermal loads combined as identified in the thermal note (Note 1). The required reinforcement in UFSAR Table 3H.5-7 is calculated based on the demands in UFSAR Table 3H.5-6. Wall L is the east wall of the east MSIV compartment

which is subject to high temperature during accident. The combined seismic and thermal loads impact the demands of Wall L in UFSAR Tables 3H.5-6 and 3H.5-7.

In addition to the combined seismic and thermal loads, the following changes in the design documents can also impact the values in UFSAR Tables 3H.5-6 and 3H.5-7:

- The current calculations use the basic load combinations for SC-I structures as defined in UFSAR Tables 3.8.4-1 and 3.8.4-2. The updated calculations expand the basic load combinations by considering the directionality of the seismic loads combined with thermal, accident pressure, and PRHA loads. The expanded load combinations were performed to document explicit quantification of the possible combinations and to simplify explanation for future reference.
- The current tables are based on calculations that divide the wall into segments to determine the required reinforcement shown by contour plots by means of a finite element analysis path operation. In some locations, localized regions of some walls were updated with refined meshing in the finite element analysis. The refined meshing was performed to simplify the assessment of peak demand from localized loading conditions. The updated calculations use design forces and moments taken from the global finite element model and calculate the required area of steel by considering the load combinations for each wall element, which provide more accurate results.
- The current calculations use a conservative representative thermal reduction factor. The updated calculations utilize a thermal reduction factor by elevation, considering reinforcement specific to each wall zone. The local thermal reduction factors better represent the level of cracking in the wall section and provide a more accurate thermal demand.
- Change of concrete reinforcement cover from 1 ½" to 2" to accommodate embedment plates
- Update of MSIV accident pressure and steam generator accident pressure as result of previous licensing amendment request LAR-17-028.

Furthermore, the current design of Wall L has T headed shear reinforcement of #3@12"x12" between EL. 135'-3" and EL. 154'-2". The corresponding provided area of reinforcement is 0.11 in^2/ft and is larger than the required reinforcement of 0.01 in^2/ft. As result of revised design calculations mentioned above, the required shear reinforcement is changed from 0.01 in^2/ft to 0.13 in^2/ft between EL. 135'-3" and EL. 154'-2". Therefore, the shear reinforcement is changed from #3@12"x12" T headed shear reinforcement to #4@6"x6" conventional shear reinforcement between EL. 135'-3" and EL. 154'-2. The corresponding provided area of #4@6"x6" shear reinforcement in the revised design is 0.80 in^2/ft. UFSAR Table 3H.5-7 currently shows the shear reinforcement is 0.11 in^2/ft. Therefore, UFSAR Table 3H.5-7 is revised to show shear reinforcement area of 0.80 in^2/ft between EL. 135'-3" and EL. 154'-2.

<u>Change 2E – Shield Building Roof Critical Section Table Update (Tables 3H.5-9 and 3H.5-15)</u>

There are two critical section tables for the shield building roof in the licensing basis, including UFSAR Tables 3H.5-9 and 3H.5-15. UFSAR Table 3H.5-9 Sheets 1-2c show the demands and capacities of the air inlet and tension ring of the shield building under load combinations without seismic and thermal combined as identified in the thermal note

(Note 2). UFSAR Table 3H.5-9 Sheet 3 and UFSAR Table 3H.5-15 show the demands and capacities of the PCS tank exterior wall and conical roof of the shield building under load combinations with seismic and normal thermal combined. The shield building roof structures are adjacent to the PCS tank and upper annulus. The PCS tank has a minimum water temperature of 40°F and maximum water temperature of 120°F during normal operation. The PCS tank exterior wall is also subject to atmosphere temperature of -40 °F in winter and atmosphere temperature of 115 °F in summer. The tension ring and air inlet are next to the upper annulus interior, which is on the outside of the air baffle, are subject to 165 °F of air temperature on the inside and 115 °F of atmosphere temperature on the outside during accident. The conical roof is above the containment vessel and is subject to air which can be heated up after passing through the bottom of the air baffle and beginning to rise. Therefore, the shield building roof structures are subject to both normal and accident thermal loads. The combined seismic and thermal loads impact the demands of shield building roof in UFSAR Tables 3H.5-9 and 3H.5-15. It is proposed to revise Tables 3H.5-9 and 3H.5-15 with inclusion of combined seismic and normal/accident thermal load combinations, and remove the thermal note (Note 2) in Table 3H.5-9 for the purpose of:

- Providing quantification of that load combination within the licensing basis
- Simplifying the presentation of the critical section designs in the licensing basis.

In addition, the following notes are proposed to be revised or removed from UFSAR Tables 3H.5-9 and 3H.5-15:

- It is proposed to revise the wording in Note 1 of Table 3H.5-9 Sheets 1, 2a, and 2c to improve reader understanding.
- It is proposed to remove a reference to Note 1 from the last column under the Axial Force and Bending Verification section and add Note 1 to the last column under the Shear Force and Torsion Verification section in Table 3H.5-9 Sheet 1.
- It is proposed to remove Note 1 from Table 3H.5-9 Sheet 2b and replace with, “Not used.”
- It is proposed to add a reference to Note 3 to Table 3H.5-9 Sheet 2b that clarifies that the required values reflect averaged results between the upper and lower sections.
- It is also proposed to add a Note 3 to UFSAR Table 3H.5-15 to clarify that the value of the required radial reinforcement in the knuckle region reflects the averaging result between different angles of the stress line.

It is also proposed to change “Horizontal Section” to “Circumferential Section” for all sections and angles in Table 3H.5-9 Sheet 2c.

<u>Change 3 – Spent Fuel Pool West Wall Critical Section Table Update (Table 3H.5-8)</u>
The west wall of Spent Fuel Pool (SFP) (along column line L-2) is a critical section in the licensing basis. UFSAR Figure 3H.5-10 shows an elevation of the west wall of the SFP and element numbers in the finite element model. UFSAR Table 3H.5-8 shows the demands and capacities of the SFP west wall at seven critical locations. Revision of the design calculations to clarify detail and document explicit quantification of the load combinations resulted in the following changes which impact the demands in UFSAR Table 3H.5-8:

- The accident thermal loads are combined with seismic loads in the load combinations for SFP wall to provide quantification of that load combination within the UFSAR to clearly demonstrate compliance with load combinations in ACI 349-01 and UFSAR Tables 3.8.4-1 and 3.8.4-2.
- The SFP finite element analysis (FEA) model is refined by changing the element size from 5' x 5' to 1' x 1' to allow the averaging of elements to occur to aid in realistic representations of stress at discontinuities such as corners. The refined meshes are averaged back out to elements shown in UFSAR Figure 3H.5-10.
- The boundary conditions in the SFP FEA model are refined. In addition to the current model with fixed-fixed boundary condition, a new model with fixed-pined boundary condition was created to accommodate the changes of floor to wall connections as approved in LAR-16-009. The fixed-pinned model can capture the slight rotation occurred at floor to wall connection due to the position of the floor dowel in relation to floor bottom liner plate and its ability to transfer force via a non-contact lap splice type mechanism. The results from the two models are enveloped to conservatively capture potential behavior of the floor to wall connection.

<u>Change 4 – Critical Section Tables Update for Auxiliary Building Floors</u>

<u>Change 4A – Composite Floor Critical Section Table Update (Table 3H.5-11)</u>
UFSAR Table 3H.5-11 shows the demands and capacities of the composite floor between column lines M and P at EL. 135'-3". The floor design considers the dead, live, construction, extreme environmental and other applicable loads. Revision of the design calculations to clarify detail and document explicit quantification of the load combinations resulted in the following changes are made which impact the demands in UFSAR Table 3H.5-11:

- Modified seismic mass by counting 25% of live load instead of 100% of the live load,
- Refined floor vertical seismic acceleration,
- Account for air handling unit loads.

<u>Change 4B – Tagging Room Ceiling Critical Section Table Update (Table 3H.5-12)</u>
UFSAR Table 3H.5-12 shows the demands and capacities of the tagging room ceiling floor, which is a cast-in-place concrete placed on precast concrete floor. Revision to the design calculations to better capture the behavior of the structure and to incorporate revised design changes as discussed below results in impact on the demands in UFSAR Table 3H.5-12:

- Refined analysis to more accurately account for 2-way behavior of the slab
- Change as approved in LAR-14-003.

Therefore, it is proposed to revise UFSAR Table 3H.5-11 to match the latest design documents.

Licensing Basis Change Descriptions:

Proposed Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
UFSAR Subsection 3H.3.3	The second paragraph under subheading "Operating Thermal Loads (To)" is proposed to be revised to identify that the structural design of PCS tank also conservatively assumes that the temperature on the inside of the PCS tank walls is 40°F when the outside air temperature is postulated to be at 115°F.
UFSAR Subsection 3H.5.1.1	The second paragraph under subheading "Exterior Wall at Column Line 1" is proposed to be revised to clarify that Table 3H.5-2 provides the listing and magnitude of various design loads under governing load combinations.
UFSAR Table 3.8.5-3	In the critical location between column lines K to L and shield building to column line 11: • UFSAR Table 3.8.5-3 shows the required top reinforcement along east-west direction is 1.5 in^2/ft. It is proposed to change the top reinforcement from 1.5 in^2/ft to Note 5 because the governing locations for the design is in other segments as shown in UFSAR Figure 3.8.5-3 Sheets 3-6. • UFSAR Table 3.8.5-3 shows the required bottom reinforcement along east-west direction is 1.6 in^2/ft. It is proposed to change the top reinforcement from 1.6 in^2/ft to 1.85 in^2/ft. • UFSAR Table 3.8.5-3 shows the required shear reinforcement in this critical section is 0.23 in^2/ft. It is proposed to change the shear reinforcement from 0.23 in^2/ft to 0.24 in^2/ft. In the critical location between column lines 1 to 2 and column lines K-2 to N: • UFSAR Table 3.8.5-3 shows the required top reinforcement along north-south direction in central zone is 2.72 in^2/ft. It is proposed to change the top reinforcement from 2.72 in^2/ft to 3.11 in^2/ft. • UFSAR Table 3.8.5-3 shows the required bottom reinforcement along north-south direction is 2.25 in^2/ft. It is proposed to change the bottom reinforcement from 2.25 in^2/ft to Note 5 because the governing locations for the design is in other segments as shown in UFSAR Figure 3.8.5-3 sheets 3-6. • UFSAR Table 3.8.5-3 shows the amount of bottom reinforcement required along east-west direction is low per Note 5 in the table. The required bottom reinforcement along east-west direction becomes 1.85 in^2/ft in design finalization. It is proposed to replace Note 5 with 1.85 in^2/ft in the table for the required bottom reinforcement.

Proposed Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
	It is also proposed to remove Note 6 from Table 3.8.5-3 because the demands in the table reflect load combinations with seismic and thermal loads combined. The superscript of Note 6 on top of the table next to “Required” is removed. It is proposed to add a clarification note (Note 6) in current UFSAR Table 3.8.5-3 to clarify that the demands in the table do not include a small portion of basemat (between column line L to 5' east of column line L and shield building to column line 9.2) as shown in UFSAR Figure 3.8.5-3 Sheet 6. The superscript of the new Note 6 is added next to “Column line K to L and from Shield Building to Col. Line 11” in the table. F
UFSAR Table 3H.5-1	It is proposed to revise to identify that the water in the PCS tank is assumed to be 40°F when the outside air temperature is 115°F for determining normal thermal loading on the PCS tank and affected structures for summer conditions. It is proposed to revise to show 140°F accident thermal on the inside surface of the auxiliary building exterior walls below grade and basemat to correspond with the accident temperatures for equipment qualification. It is proposed to revise to show 50°F accident thermal on the outside surface of the auxiliary building exterior walls below grade and basemat to correspond with the ASHRAE requirements
UFSAR Table 3H.5-2	In Table 3H.5-2 between EL. 135'-3" and EL. 180'-0": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from “D + L + H + Ta” to “0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym”. • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from “1.05D + 1.3L + 1.3H + 1.2To” to “D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym” and “0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym”. In Table 3H.5-2 between EL. 100'-0" and EL. 135'-3": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from “D + L + H + Ta” to “0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym”. • It is proposed to change the load combinations and corresponding demands which governs required horizontal

Proposed Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
	reinforcement from "D + L + H + Ta" to "D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". In Table 3H.5-2 between EL. 82'-6" and EL. 100'-0": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "1.05D + 1.3L + 1.3H + 1.2To" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "D + L + Es" to "0.9D+0.9F+1.3L+1.2To+1.3H+1.3Ro" and "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". In Table 3H.5-2 between EL. 66'-6" and EL. 82'-6": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "D + L - Es" and "0.9D + Es" to "0.9D+F+H+Ro+To+Es" • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "0.9D + Es" to "0.9D+F+H+Ro+To+Es".
UFSAR Table 3H.5-3	In Table 3H.5-3 between EL. 135'-3" and EL. 180'-0": • It is proposed to change the required vertical reinforcement from 3.48 in^2/ft to 3.65 in^2/ft on the outside face, and from 1.94 in^2/ft to 2.76 in^2/ft on the inside face of the wall. • It is proposed to change the required horizontal reinforcement from 2.65 in^2/ft to 3.08 in^2/ft on the outside face, and from 1.52 in^2/ft to 2.51 in^2/ft on the inside face of the wall. In Table 3H.5-3 between EL. 100'-0" and EL. 135'-3": • It is proposed to change the required vertical reinforcement from 1.88 in^2/ft to 2.96 in^2/ft on the outside face, and from 1.77 in^2/ft to 2.96 in^2/ft on the inside face of the wall. • It is proposed to change the required horizontal reinforcement from 3.04 in^2/ft to 1.98 in^2/ft on the outside face, and from 2.23 in^2/ft to 2.10 in^2/ft on the inside face of the wall. • It is proposed to change the required shear reinforcement from NR to 0.17 in^2/ft, and provided shear reinforcement from None to 0.80 in^2/ft.

Proposed Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
	In Table 3H.5-3 between EL. 82'-6" and EL. 100'-0": • It is proposed to change the required vertical reinforcement from 1.42 in^2/ft to 3.04 in^2/ft on the outside face, and from 1.01 in^2/ft to 3.04 in^2/ft on the inside face of the wall. • It is proposed to change the required horizontal reinforcement from 0.70 in^2/ft to 1.55 in^2/ft on the outside face, and from 0.70 in^2/ft to 1.25 in^2/ft on the inside face of the wall. • It is proposed to change the required shear reinforcement from 0.003 in^2/ft to 0.03 in^2/ft. In Table 3H.5-3 between EL. 66'-6" and EL. 82'-6": • It is proposed to change the required vertical reinforcement from 2.29 in^2/ft to 3.37 in^2/ft on the outside face, and from 1.87 in^2/ft to 2.68 in^2/ft on the inside face of the wall. • It is proposed to change the required horizontal reinforcement from 0.87 in^2/ft to 0.95 in^2/ft on the outside face, and from 0.87 in^2/ft to 0.95 in^2/ft on the inside face of the wall. • It is proposed to change the required shear reinforcement from 0.27 in^2/ft to 0.56 in^2/ft. It is also proposed to remove the content of Note 2 and change it to “Not used.” in Table 3H.5-3 because the demands in the table reflect load combinations with seismic and thermal loads combined. It is also proposed to revise the required reinforcement of 2.81 in^2/ft to 3.09 in^2/ft in Note 4 to reflect combined seismic and accident thermal loads.
UFSAR Table 3H.5-4	In Table 3H.5-4 between EL. 155'-6" and roof: • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from “1.05D + 1.3L + 1.2To” to “0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym”. • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from “1.05D + 1.3L + 1.2To” to “0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym. In Table 3H.5-4 between EL. 135'-3" and EL. 155'-6": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from “0.9D - Es” to “0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym”.

Proposed Licensing Basis Changes	
Text, Table, or Figure	**Description of the Proposed Change**
	• It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "D + L - Es" to "D+F+L+H+Ro+To+Es". In Table 3H.5-4 between EL. 117'-6" and EL. 135'-3": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "0.9D - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "D + L - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". In Table 3H.5-4 between EL. 100'-0" and EL. 117'-6": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "0.9D - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "D + L - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". In Table 3H.5-4 between EL. 82'-6" and EL. 100'-0": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "0.9D - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "D + L - Es" to "D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". In Table 3H.5-4 between EL. 66'-6" and EL. 82'-6": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "0.9D - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "D + L - Es" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym".

UFSAR Table 3H.5-5	In Table 3H.5-5 between EL. 155'-6" and roof: • It is proposed to change the required horizontal reinforcement from 3.96 in^2/ft to 4.06 in^2/ft. • It is proposed to change the required vertical reinforcement from 3.60 in^2/ft to 3.52 in^2/ft. • It is proposed to change the required shear reinforcement from 0.44 in^2/ft to 0.80 in^2/ft. • It is proposed to change the provided shear reinforcement from 0.38 in^2/ft to 0.22 in^2/ft. In Table 3H.5-5 between EL. 135'-3" and EL. 155'-6": • It is proposed to change the required horizontal reinforcement from 2.80 in^2/ft to 2.52 in^2/ft. • It is proposed to change the required vertical reinforcement from 3.59 in^2/ft to 3.64 in^2/ft. In Table 3H.5-5 between EL. 117'-6" and EL. 135'-3": • It is proposed to change the required horizontal reinforcement from 2.03 in^2/ft to 2.10 in^2/ft. • It is proposed to change the required vertical reinforcement from 2.63 in^2/ft to 3.10 in^2/ft. In Table 3H.5-5 between EL. 100'-0" and EL. 117'-6": • It is proposed to change the required horizontal reinforcement from 2.29 in^2/ft to 2.34 in^2/ft. • It is proposed to change the required vertical reinforcement from 2.98 in^2/ft to 2.97 in^2/ft. In Table 3H.5-5 between EL. 82'-6" and EL. 100'-0": • It is proposed to change the required horizontal reinforcement from 1.69 in^2/ft to 1.38 in^2/ft. • It is proposed to change the required vertical reinforcement from 2.08 in^2/ft to 2.33 in^2/ft. In Table 3H.5-5 between EL. 66'-6" and EL. 82'-6": • It is proposed to change the required horizontal reinforcement from 0.85 in^2/ft to 0.63 in^2/ft. • It is proposed to change the required vertical reinforcement from 0.98 in^2/ft to 1.52 in^2/ft. It is also proposed to remove the content of Note 1 and change it to “Not used.” in Table 3H.5-5 because the demands in the table reflect load combinations with seismic and thermal loads combined.
UFSAR Table 3H.5-6	In Table 3H.5-6 between EL. 135'-3" and EL. 154'-2": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from “0.9D + Es + Pa + Yj” to “0.9D+F+L+H+Ro+To+Es”.

	• It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "0.9D + Es + Pa + Yj" to "0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym". In Table 3H.5-6 between EL. 117'-6" and EL. 135'-3": • It is proposed to change the load combinations and corresponding demands which governs required vertical reinforcement from "0.9D + Es + Pa + Yj" to "0.9D+F+L+H+Ro+To+Es". • It is proposed to change the load combinations and corresponding demands which governs required horizontal reinforcement from "0.9D + Es + Pa + Yj" to "0.9D+F+L+H+Ro+To+Es".
UFSAR Table 3H.5-7	In Table 3H.5-7 between EL. 135'-3" and EL. 154'-2": • It is proposed to change the required horizontal reinforcement from 2.08 in^2/ft to 2.09 in^2/ft. • It is proposed to change the required vertical reinforcement from 2.59 in^2/ft to 2.38 in^2/ft. • It is proposed to change the required shear reinforcement from 0.01 in^2/ft to 0.13 in^2/ft, and provided reinforcement from 0.11 in^2/ft to 0.80 in^2/ft. In Table 3H.5-7 between EL. 117'-6" and EL. 135'-3": • It is proposed to change the required horizontal reinforcement from 1.36 in^2/ft to 1.46 in^2/ft. • It is proposed to change the required vertical reinforcement from 2.02 in^2/ft to 2.37 in^2/ft. • It is proposed to change the required shear reinforcement from 0.33 in^2/ft to 0.55 in^2/ft. It is also proposed to remove the content of Note 1 and change it to "Not used." in Table 3H.5-7 because the demands in the table reflect load combinations with seismic and thermal loads combined.
UFSAR Table 3H.5-8	It is proposed to update the forces and moments under the same load cases and load combinations at each critical location to match the latest calculations. The changes of moments and forces are marked up on pages 46-59 of this document. In addition to the existing load combinations, it is proposed to add the forces and moments under the load combinations with seismic and accident thermal loads combined, which is shown as LC(6a), D + L + F + Es + Ta and LC(6b), D + L + F + E's + Ta in the markups of Table 3H.5-8. In the Notes of UFSAR Table 3H.5-8 it is proposed to change "Maximum principal stress for load combination 5 including thermal" to "Maximum principal stress for load combinations including thermal" and change "Maximum stress intensity range for load combination 5

	including thermal" to "Maximum stress intensity range for the load combinations including thermal" for all sheets. It is proposed to change the values of plate thickness required for load combinations excluding thermal from 0.42 to 0.24 inches on Sheet 1, 0.47 to 0.26 inches on Sheet 2, 0.31 to 0.16 inches on Sheet 3, 0.32 to 0.27 inches on Sheet 4, 0.28 to 0.20 inches on Sheet 6, and 0.14 to 0.11 inches on Sheet 7. It is proposed to change the values of maximum principal stress from 46.33 ksi to 35.8 ksi on Sheet 1, 40.3 ksi to 48.2 ksi on Sheet 2, 46.95 ksi to 51.3 ksi on Sheet 3, 42.1 ksi to 39.6 ksi on Sheet 4, 20.6 ksi to 18.0 ksi on Sheet 5, and from 25.1 ksi to 28.2 ksi on Sheet 6, and 22.1 ksi to 27.2 ksi on Sheet 7. It is proposed to change the values of maximum stress intensity range from 46.3 ksi to 74.2 ksi on Sheet 1, from 50.8 ksi to 70.1 ksi on Sheet 2, from 84.9 ksi to 97.4 ksi on Sheet 3, from 72.6 ksi to 74.3 ksi on Sheet 4, from 20.6 ksi to 23.0 ksi on Sheet 5, from 31.3 ksi to 34.2 ksi on Sheet 6, and from 22.1 ksi to 35.0 ksi on Sheet 7.
UFSAR Table 3H.5-9	In UFSAR Table 3H.5-9 Sheet 1 for axial force and bending verification: • At Section 2 lower, it is proposed to change the Seismic L/C from 9 to 33 and corresponding stress from 14.31 ksi to 28.11 ksi at 5.625° angle and change the Seismic L/C from 17 to 41 and corresponding stress from 13.15 ksi to 27.59 ksi at 84.375° angle. • At Section 1 lower, it is proposed to change the Seismic L/C from 9 to 34 and corresponding stress from 15.35 ksi to 30.07 ksi at 0° angle and change the Seismic L/C from 17 to 43 and corresponding stress from 14.46 ksi to 29.48 ksi at 90° angle. • The maximum stress among the two sections is changed from 15.35 ksi to 30.07 ksi, and maximum required reinforcement is changed from 9.21 in^2/ft to 18.00 in^2/ft. The demand to capacity ratio is changed from 0.51 + 2% to 1.00. In UFSAR Table 3H.5-9 Sheet 1 for shear force and torsion verification: • At Section 2 lower, it is proposed to change the Seismic L/C from 18 to 42 and corresponding stress from 4.83 ksi to 4.58 ksi at 5.625° angle and change the Seismic L/C from 11 to 35 and corresponding stress from 5.52 ksi to 4.24 ksi at 84.375° angle. • At Section 1 lower, it is proposed to change the stress from 6.28 ksi to 7.27 ksi at 0° angle and change the stress from 5.80 ksi to 6.78 ksi at 90° angle. • The maximum stress among the Section 2 lower and Section 1 lower is changed from 6.28 ksi to 7.27 ksi, and maximum

	required reinforcement is changed from 5.65 in^2/ft to 6.54 in^2/ft. The demand to capacity ratio is changed from 0.31 to 0.36. It is proposed to revise the wording in Note 1 to improve reader understanding. It is also proposed to remove the reference to Note 1 from the last column under the Axial Force and Bending Verification section and add the reference to Note 1 to the last column under the Shear Force and Torsion Verification section in Table 3H.5-9 Sheet 1. It is also proposed to remove Note 2 from Table 3H.5-9 Sheet 1 and replace with "Not used." because the demands in the table reflect load combinations with seismic and thermal loads combined. In UFSAR Table 3H.5-9 Sheet 2a (horizontal sections): • At Section 5 + 6, it is proposed to change the Seismic L/C from 8 to 32 and corresponding required reinforcement from 1.91 in^2/ft to 2.43 in^2/ft at 0° - 5.625° angle and change the Seismic L/C from 8 to 32 and corresponding required reinforcement from 1.89 in^2/ft to 2.31 in^2/ft at 84.375° - 90° angle. • At Section 7, it is proposed to change the required reinforcement from 2.38 in^2/ft to 4.19 in^2/ft at 0° - 5.625° angle and change the Seismic L/C from 8 to 24 and corresponding required reinforcement from 2.15 in^2/ft to 4.27 in^2/ft at 84.375° - 90° angle. • At Section 9, it is proposed to change the required reinforcement from 2.26 in^2/ft to 5.02 in^2/ft at 0° - 5.625° angle and change the required reinforcement from 2.27 in^2/ft to 5.03 in^2/ft at 84.375° - 90° angle. • At Section 11, it is proposed to change the required reinforcement from 1.73 in^2/ft to 3.55 in^2/ft at 0° - 5.625° angle and change the required reinforcement from 1.53 in^2/ft to 3.57 in^2/ft at 84.375° - 90° angle. • The maximum required reinforcement of the Sections 5 + 6, 7 and 9 is changed from 2.38 in^2/ft to 5.03 in^2/ft. The demand to capacity ratio is changed from 0.20 to 0.42. • The maximum required reinforcement of Section 11 is changed from 1.73 in^2/ft to 3.57 in^2/ft. The demand to capacity ratio is changed from 0.15 to 0.30. It is also proposed to revise the wording in Note 1 to improve reader understanding It is also proposed to remove Note 2 from Table 3H.5-9 Sheet 2a and replace with "Not used." because the demands in the table reflect load combinations with seismic and thermal loads combined. In UFSAR Table 3H.5-9 Sheet 2b (vertical sections): • At Section 3 Upper, it is proposed to change the Seismic L/C from 9 to 33 and the corresponding required reinforcement from

	9.97 in^2/ft to 11.66 in^2/ft at 0° angle and change the Seismic L/C from 17 to 41 and corresponding required reinforcement from 9.25 in^2/ft to 11.00 in^2/ft at 90° angle. • At Section 3 Lower, it is proposed to change the Seismic L/C from 9 to 33 and the corresponding required reinforcement from 8.45 in^2/ft to 11.66 in^2/ft at 0° angle and change the Seismic L/C from 17 to 41 and the corresponding required reinforcement from 7.75 in^2/ft to 11.00 in^2/ft at 90° angle. • At Section 4 Upper, it is proposed to change the Seismic L/C from 9 to 33 and the corresponding required reinforcement from 10.53 in^2/ft to 11.91 in^2/ft at 5.625° angle and change the Seismic L/C from 17 to 41 and the corresponding required reinforcement from 9.75 in^2/ft to 11.16 in^2/ft at 84.375° angle. • At Section 4 Lower, it is proposed to change the Seismic L/C from 10 to 33 and the corresponding required reinforcement from 8.26 in^2/ft to 11.91 in^2/ft at 5.625° angle and change the Seismic L/C from 19 to 41 and the corresponding required reinforcement from 7.54 in^2/ft to 11.16 in^2/ft at 84.375° angle. • The maximum required reinforcement of the Sections 3 Upper, 3 Lower, 4 Upper and 4 Lower is changed from 10.53 in^2/ft to 11.91 in^2/ft. The demand to capacity ratio is changed from 0.88 +2% to 0.99. It is proposed to remove Note 1 from Table 3H.5-9 Sheet 2b and replace with, “Not used.” It is proposed to remove Note 2 from Table 3H.5-9 Sheet 2b and replace with, “Not used.” because the demands in the table reflect load combinations with seismic and thermal loads combined. It is also proposed to add a Note 3 to Table 3H.5-9 Sheet 2b that clarifies that the required values reflect averaged results between the upper and lower sections. In UFSAR Table 3H.5-9 Sheet 2c (out of plane shear reinforcement): • It is proposed to change “Horizontal Section” to “Circumferential Section” for all sections and angles in Table 3H.5-9 Sheet 2c. • At 0° - 5.625° angle, it is proposed to change the Seismic L/C from 1 to 25 and the corresponding required reinforcement from 0.13 in^2/ft to 0.16 in^2/ft at maximum of vertical Sections 3 upper to 4 upper. The sum of the required reinforcement in maximum of vertical Sections 3 upper to 4 upper and in Circumferential Section 5+6 is changed from 0.13 in^2/ft to 0.16 in^2/ft. • At 84.375° - 90° angle, it is proposed to change the Seismic L/C from 1 to 25 and the corresponding required reinforcement from 0.12 in^2/ft to 0.16 in^2/ft at maximum of vertical Sections 3 upper to 4 upper. The sum of the required reinforcement in maximum

	of vertical Sections 3 upper to 4 upper and in Circumferential Section 5+6 is changed from 0.12 in^2/ft to 0.16 in^2/ft. • At 0° - 5.625° angle, it is proposed to change the Seismic L/C from 1 to 25 and the corresponding required reinforcement from 0.10 in^2/ft to 0.16 in^2/ft at maximum of vertical Sections 3 upper to 4 upper, and from 0.24 in^2/ft to 0.00 in^2/ft at Circumferential Section 7. The sum of the required reinforcement in maximum of vertical Sections 3 upper to 4 upper and in Circumferential Section 7 is changed from 0.34 in^2/ft to 0.16 in^2/ft. • At 84.375° - 90° angle, it is proposed to change the Seismic L/C from 1 to 25 and the corresponding required reinforcement from 0.10 in^2/ft to 0.16 in^2/ft at maximum of vertical Sections 3 upper to 4 upper, and from 0.20 in^2/ft to 0.00 in^2/ft at Circumferential Section 7. The sum of the required reinforcement in maximum of vertical Sections 3 upper to 4 upper and in Circumferential Section 7 is changed from 0.30 in^2/ft to 0.16 in^2/ft. • At 0° - 5.625° angle, it is proposed to change the required reinforcement from 0.21 in^2/ft to 0.22 in^2/ft at maximum of vertical Sections 3 lower to 4 lower. The sum of the required reinforcement in maximum of vertical Sections 3 lower to 4 lower and in Circumferential Section 9 is changed from 0.21 in^2/ft to 0.22 in^2/ft. • At 84.375° - 90° angle, it is proposed to change the required reinforcement from 0.21 in^2/ft to 0.22 in^2/ft at maximum of vertical Sections 3 lower to 4 lower and from 0.000 in^2/ft to 0.00 in^2/ft at Circumferential Section 9. The sum of the required reinforcement in maximum of vertical Sections 3 lower to 4 lower and in Circumferential Section 9 is changed from 0.21 in^2/ft to 0.22 in^2/ft. • At 0° - 5.625° angle, it is proposed to change the required reinforcement from 0.21 in^2/ft to 0.22 in^2/ft at maximum of vertical Sections 3 lower to 4 lower, and from 0.000 in^2/ft to 0.00 in^2/ft at Circumferential Section 11. The sum of the required reinforcement in maximum of vertical Sections 3 lower to 4 lower and in Circumferential Section 11 is changed from 0.21 in^2/ft to 0.22 in^2/ft. • At 84.375° - 90° angle, it is proposed to change the required reinforcement from 0.21 in^2/ft to 0.22 in^2/ft at maximum of vertical Sections 3 lower to 4 lower. The sum of the required reinforcement in maximum of vertical Sections 3 lower to 4 lower and in Circumferential Section 11 is changed from 0.21 in^2/ft to 0.22 in^2/ft. • The maximum required reinforcement is changed from 0.34 in^2/ft to 0.22 in^2/ft.

	It is proposed to revise the wording in Note 1 to improve reader understanding It is also proposed to remove Note 2 from Table 3H.5-9 Sheet 2c and replace with "Not used." because the demands in the table reflect load combinations with seismic and thermal loads combined. In UFSAR Table 3H.5-9 Sheet 3: • It is proposed to change the maximum required vertical reinforcement from 1.49 in^2/ft to 1.53 in^2/ft and change the corresponding demand to capacity ratio from 0.54 to 0.56 at the bottom segment of the wall. • It is proposed to change the maximum required hoop reinforcement from 0.80 in^2/ft to 1.22 in^2/ft and change the corresponding demand to capacity ratio from 0.40 to 0.61 at the bottom segment of the wall. • It is proposed to change the maximum required shear reinforcement from 0.15 in^2/ft to 0.11 in^2/ft and change the corresponding demand to capacity ratio from 0.16 to 0.12 at the bottom segment of the wall. • It is proposed to change the maximum required vertical reinforcement from 0.64 in^2/ft to 0.69 in^2/ft and change the corresponding demand to capacity ratio from 0.23 to 0.25 at the mid-height segment of the wall. • It is proposed to change the maximum required hoop reinforcement from 1.93 in^2/ft to 1.99 in^2/ft and change the corresponding demand to capacity ratio from 0.97 to 0.99 at the mid-height segment of the wall. • It is proposed to change the maximum required vertical reinforcement from 0.52 in^2/ft to 0.34 in^2/ft and change the corresponding demand to capacity ratio from 0.19 to 0.12 at the top segment of the wall. • It is proposed to change the maximum required hoop reinforcement from 0.79 in^2/ft to 0.58 in^2/ft and change the corresponding demand to capacity ratio from 0.40 to 0.29 at the top segment of the wall.
UFSAR Table 3H.5-11	For the steel beams: • It is proposed to change the bending moment from -63.9 kips-ft to -41.1 kips-ft, and the corresponding stress from 17.0 ksi to 13.9 ksi. • It is proposed to change the allowable stress from 33.26 ksi to 38.0 ksi • It is proposed to change the shear force from 30.7 kips to 22.1 kips, and the corresponding stress from 8.7 ksi to 6.2 ksi. For concrete slabs parallel to the beams:

	• It is proposed to change the governing load combinations from "3 – Extreme Environmental Condition" to "6 - Abnormal Condition". • It is proposed to change the bending moment from -16.0 kips-ft/ft to -7.6 kips-ft/ft • It is proposed to change the in-plan shear forces from 20.0 kips to 31.0 kip. • It is proposed to change the required reinforcement from 0.41 in^2/ft to 0.43 in^2/ft. For concrete slabs perpendicular to the beams: • It is proposed to change the governing load combinations from "Normal Condition" to "6 - Abnormal Condition". • It is proposed to change the bending moment from (+) 6.66 kips-ft/ft to (-) 1.42 kips-ft/ft. • It is proposed to change the required reinforcement from 0.28 in^2/ft to 0.43 in^2/ft. It is also proposed to remove Note 1 from Table 3H.5-11 because the composite floor has been evaluated under the load combinations with seismic thermal loads combined and the evaluations demonstrated that the load combinations are not governing.
UFSAR Table 3H.5-12	For the design of precast concrete panels: • It is proposed to change the design bending moment at the midspan from 14.53 kip-ft/ft to 12.07 kip-ft/ft. • It is proposed to change the required bottom reinforcement along E/W Direction from 0.58 in^2/ft to 0.49 in^2/ft. For the design of the 24- inch slab: • It is proposed to change the governing load combination from "Extreme Environmental Condition (SSE)" to "Abnormal Condition". • It is proposed to change the design bending moment at the midspan along E/W direction from 14.40 kips ft/ft to 16.23 kips ft/ft. • It is proposed to change the design in-plane shear (E/W Direction) from 31.9 kips/ft to 30.19 kips/ft. • It is proposed to change the design in-plane tension (E/W Direction) at midspan and at support from 21.9 kips/ft to 37.1 kips/ft. • It is proposed to change the required bottom reinforcement along E/W direction from 0.53 in^2/ft to 0.71 in^2/ft. • It is proposed to change the design bending moment at support along E/W direction from 28.81 kips-ft/ft to 17.75 kips-ft/ft.

	• It is proposed to change the design in-plane shear (E/W Direction) from 31.9 kips/ft to 30.19 kips/ft. • It is proposed to change the design in-plane tension (E/W Direction) at midspan and at support from 21.9 kips/ft to 37.1 kips/ft. • It is proposed to change the required top reinforcement along E/W direction from 0.93 in^2/ft to 0.73 in^2/ft. • It is proposed to change the design bending moment along N/S direction from 8.47 kips-ft/ft to 21.55 kips-ft/ft. • It is proposed to change the design in-plane shear (N/S Direction) from 31.9 kips/ft to 30/19 kips ft. • It is proposed to change the design in-plane tension (N/S Direction) at midspan and at support from 27.2 kip/ft to 24.65 kip/ft. • It is proposed to change the required top and bottom reinforcement along N/S direction from 0.59 in^2/ft to 0.65 in^2/ft. It is also proposed to revise the content of Note 1 in Table 3H.5-12 because the demands in the table reflect load combinations with seismic and thermal loads combined.
UFSAR Table 3H.5-15	It is proposed to change the reinforcement ratio from 1.33 to 1.65 at the conical roof beams for the axial + bending stress component. It is proposed to change the reinforcement ratio from 8.33 to 3.85 at the conical roof beam for the shear stress component. It is proposed to change the required radial reinforcement from 1.80 in^2/ft to 1.81 in^2/ft and change the corresponding reinforcement ratio from 1.30 to 1.29 at the conical roof near tension ring. It is proposed to change the required hoop reinforcement from 4.31 in^2/ft to 4.01 in^2/ft and change the corresponding reinforcement ratio from 1.09 to 1.16 at the conical roof near tension ring. It is proposed to change the required vertical reinforcement from 1.49 in^2/ft to 1.53 in^2/ft and change the corresponding reinforcement ratio from 1.85 to 1.80 at the knuckle region. It is proposed to change the required radial reinforcement from 2.85 in^2/ft to 3.48 in^2/ft and change the corresponding reinforcement ratio from 1.25 to 1.02 at the knuckle region. It is proposed to change the required hoop reinforcement from 2.64 in^2/ft to 2.67 in^2/ft and change the corresponding reinforcement ratio from 1.18 to 1.16 at the knuckle region. It is proposed to change the required vertical reinforcement from 1.24 in^2/ft to 1.09 in^2/ft and change the corresponding reinforcement ratio from 1.94 to 2.20 at the compression ring.

	It is proposed to change the required vertical reinforcement from 3.09 in^2/ft to 2.08 in^2/ft and change the corresponding reinforcement ratio from 1.15 to 1.71 at the compression ring. It is proposed to change the required hoop reinforcement from 2.49 in^2/ft to 2.50 in^2/ft at the compression ring. It is also proposed to add a Note 3 to UFSAR Table 3H.5-15 to clarify that the value of the required radial reinforcement in the knuckle region reflects the averaging result between different angles of the stress line.

3. TECHNICAL EVALUATION

Change 1 – Changes of Design Temperature for Thermal Gradient

The proposed changes update temperatures related to thermal loadings and through-wall gradient used in the civil/structural design in UFSAR Subsection 3H.3.3 and Table 3H.5-1. The proposed changes in temperatures do not adversely affect the design specifications for the physical design, qualification, and operation of any system and component including piping, piping supports, pumps, and valves as described in the UFSAR. The proposed changes align the impacted sections with the temperature inputs used in the physical design, qualification, and operation of systems and components, such as those in Appendix 3D of the UFSAR for Equipment Qualification.

Change 1A – PCS Tank Wall Normal Temperature Change

As discussed, UFSAR Subsection 3H.3.3 and UFSAR Table 3H.5-1 are proposed to be revised to identify a temperature of 40°F (in lieu of 70°F) for the PCS tank water for determining normal thermal loading on the PCS tank and affected structures when the outside air temperature is 115°F. The PCS recirculation heater is provided to maintain water contents inside the PCS tank above 40°F during normal operation. The recirculation heater automatically turns on when the heater inlet temperature gets down to approximate 47°F and turns off when it reaches approximate 52°F. When the outside air temperature is 115°F in summer, the PCS tank water temperature can reach 120°F. Even though the PCS tank water temperature cannot get down to 40°F when outside air temperature is 115°F, the structural design of the PCS tank walls takes a conservative deterministic assumption to maximum the thermal gradient across the walls by using thermal gradient of 40°F on the inside and 115°F on the outside. The PCS tank walls are also designed for thermal gradient of 40°F on the inside and -40°F on the outside during winter normal operation. The use of a PCS tank water temperature of 40°F for determining the design thermal gradient across the PCS tank walls during summer conditions is conservative and consistent with the requirements of the AP1000 civil/structural design criteria, and is based on the minimum PCS tank water temperature allowed in the Technical Specifications of 40°F as identified in surveillance requirement SR 3.6.6.1.

UFSAR Table 3H.5-9 Sheet 3 currently shows demands under combined seismic and normal thermal loads for the PCS tank exterior wall. UFSAR Figure 3H.5-11 shows reinforcement details of the PCS tank. The PCS tank structure has been evaluated with the revised PCS tank water temperature of 40°F for normal thermal loading during summer

conditions. The results of that evaluation conclude that the values currently specified in UFSAR Table 3H.5-9, Sheet 3, which identify the maximum reinforcement required, the reinforcement provided, and the ratio of reinforcement provided/reinforcement required for the PCS tank, remain bounding. Accordingly, no change to the PCS tank reinforcement physical design is required. The proposed change does not impact UFSAR Table 3H.5-9 Sheet 3 or Figure 3H.5-11. The PCS tank design continues to meet the requirements of ACI-349 and AISC N690.

<u>Change 1B -Auxiliary Building Exterior Walls Below Grade and Basemat Accidental Thermal Change</u>

The proposed activity revises the accident temperatures for auxiliary building exterior walls below grade and basemat in UFSAR Table 3H.5-1 to match the accident temperatures for equipment qualification in UFSAR Tables 3D.5-4 and 3D.5-5 which are supported by design analyses. The current UFSAR Table 3H.5-1 shows that the accident thermal does not need to be considered for the exterior walls below grade and basemat in the auxiliary building. However, the accident temperatures in rooms that are adjacent to exterior walls below grade and basemat in the auxiliary building can cause an accident thermal gradient on the walls and basemat per UFSAR Tables 3D.5-4 and 3D.5-5. Per UFSAR Table 3D.5-1 and UFSAR Figures 1.2-4/5/6, the auxiliary building exterior walls below grade and basemat are in environmental Zones 2, 6 and 7. The maximum accident temperatures for exterior walls below grade and basemat are 120°F in Zone 2, 140°F in Zone 6, and 114°F in Zone 7. For conservatism, it is assumed that the accident temperature for the inside of exterior walls below grade and basemat in the auxiliary building is 140°F when determining thermal gradient for those structures. The temperature on the outside of exterior walls below grade and basemat in the auxiliary building is assumed to be 50°F in accordance with ASHRAE requirements. The auxiliary building exterior walls below grade and basemat are re-evaluated for the accident thermal gradient of 50°F to 140°F. The effect of the new thermal gradient is evaluated for the impacted walls using thermal behavior fundamentals. The moment due to the thermal gradient is calculated based on a plate with a clamped edge. Because the moment is generated due to the restraint at the edges preventing deflection, no out-of-plane shear is developed. The moment due to the thermal gradient is calculated using the cracked section properties. The structures continue to be evaluated in accordance with ACI 349-01. The design of exterior walls below grade in auxiliary building using the revised temperature satisfies ACI 349-01.

There are two critical sections of the auxiliary building in the licensing basis that show demands below grade, including the auxiliary building wall along column line 1 (Wall 1) as shown in UFSAR Tables 3H.5-2 and 3H.5-3, and the auxiliary building basemat as shown in UFSAR Table 3.8.5-3. UFSAR Table 3.8.5-3 shows the required reinforcement and provided reinforcement in the basemat at two critical locations. As discussed in Change 2, the critical section tables for the walls and basemat are revisited and are proposed to remove the thermal note to show demands under combined seismic and thermal loads. This is because the revised tables with inclusion of combined seismic and thermal load combinations provide quantification of that load combination within the UFSAR to clearly demonstrate compliance with load combinations in ACI 349-01 and UFSAR Table 3.8.4-2. The proposed changes of accident temperatures in auxiliary building exterior walls below

grade and basemat impact UFSAR Tables 3.8.5-3, 3H.5-2 and 3H.5-3. The impacts are evaluated in Change 2A and Change 2B in this document.

The proposed changes do not impact the structural behaviors of basemat and Wall 1. The proposed activity does not impact the equipment qualifications because the equipment is qualified in accordance UFSAR Appendix 3D and there is no change to the information in UFSAR Appendix 3D. The proposed activity does not impact the radiation shielding because the physical design of the concrete structures does not change.

Change 2 – Critical Section Tables Update for Auxiliary Building Basemat, Concrete Walls and Shield Building Roof

Even though the demands (i.e. forces, moments, and required reinforcement) in critical section tables of auxiliary building walls and basemat do not reflect combined seismic and thermal loads, the design of those structures were evaluated to confirm that the demands under combination of mechanical loads (i.e. dead loads, live loads, seismic loads) and thermal loads met ACI 349-01 and UFSAR Table 3.8.4-2 requirements. The behavior of mechanical loading and thermal loading are different. The thermal demand in most cases is self-relieving due to concrete cracking and localized yielding of reinforcement as described in Appendix A of ACI 349-01. The combination of SSE and thermal load results in a structural demand that is less than the ACI 349 capacity of the building structures. Thermally induced forces do not reduce the plastic collapse strength of the structure. The margin of the structure with respect to review level earthquake is not compromised by consideration of this load combination. The accurate calculation of thermal demand is complex, as described in the ACI 349-01 commentary to Appendix. Thermal demand generated for combination with SSE is typically generated in a conservative manner, so that the combination of SSE and thermal does not reflect the actual demand under thermal condition due to the self-relief mechanisms described above. The margin in the AP1000 building design between mechanical loading demand vs. capacity allows for a conservative approach in development of thermal demand. As such, the significance of the thermal demand has not changed. The thermal demand in the SSE plus thermal load combinations is a conservative representation of the thermal demand. Removal of the note and inclusion of the SSE plus thermal load combination provides quantification of that load combination within the UFSAR to clearly demonstrate compliance with the ACI 349 load combinations. As such, the note is no longer needed. The inclusion of the SSE plus thermal load combinations in the tables does not change the design.

Change 2A – Basemat Critical Section Table Update (Table 3.8.5-3)

The nuclear island structures, consisting of the containment vessel, shield building, and auxiliary building are founded on the 6-foot-thick, cast-in-place, reinforced concrete basemat foundation. The basemat provides the interface between the nuclear island structures and the supporting soil or rock. The basemat transfers the load of nuclear island structures to the supporting soil or rock. The basemat transmits seismic motions from the supporting soil or rock to the nuclear island. Resistance to sliding of the concrete basemat foundation is provided by soil friction.

The demands in UFSAR Table 3.8.5-3 do not include the loads combinations with seismic and thermal loads combined due to the thermal note. This activity proposes to delete the thermal note in Note 6 and show the required reinforcement under load combinations with seismic and thermal combined. As discussed in Change No. 1B above, the accident

thermal gradient for the basemat is changed from NR to 140°F inside/50°F outside in UFSAR Table 3H.5-1. The revised accident thermal gradient is accounted in the basemat design and is reflected in the markup of UFSAR Table 3.8.5-3. The revised liftoff analysis is consistent with methods used in the previous analysis and is in compliance with the licensing basis requirements in UFSAR Appendix 3G. The change of concrete cover is in compliance with ACI 349-01. The revised criteria of margin continue to be in compliance with requirements in UFSAR Subsection 3.8.5.4.1. The basemat design with the revised demands remains in compliance with ACI 349-01. No increase in provided reinforcement in the basemat is needed. The proposed changes do not have adverse impact on the global structural analysis of the nuclear island. The proposed changes do not impact the interactions between the basemat and soil or rock. The proposed changes have no impact of the analysis of the nuclear island to sliding or overturning.

The addition of the new Note 6 is to clarify that the demands in current UFSAR Table 3.8.5-3 does not include a small portion of basemat (between column line L to 5' east of column line L and shield building to column line 9.2) as shown on UFSAR Figure 3.8.5-3 Sheet 6. This change does impact the intent of the table and does not impact the design of the basemat.

<u>Change 2B – Wall 1 Critical Section Table Update (Tables 3H.5-2 and 3H.5-3)</u>
Wall 1 at the south end of the auxiliary building is a SC-I reinforced concrete wall extended from EL. 66'-6" to EL. 180'-0” and is designed in accordance with ACI 349-01. Wall 1 provides protection to equipment and components inside the auxiliary building from tornado missile impact. Wall 1 is designed to withstand the strike from the adjacent non-seismic radwaste building in seismic event.

UFSAR Table 3H.5-2 for Wall 1 shows the moments and forces in different segments along the height from EL. 66'-6" to 180'-0". UFSAR Table 3H.5-3 for Wall 1 shows the required reinforcement under various load combinations without seismic and thermal loads combined due to the thermal note and shows provided reinforcement as well. The required reinforcement in UFSAR Table 3H.5-3 is calculated based on the demands in UFSAR Table 3H.5-2. This activity proposes to delete the thermal note and show the required reinforcement under load combinations with seismic and thermal combined in UFSAR Table 3H.5-3. This activity proposes to update the corresponding moment and forces in UFSAR Table 3H.5-2 as well. Wall 1 is next to the SFP and can be subject to 212°F of accident temperature above EL. 135'-3" in the event of spent fuel pool boiling. Wall 1 is also an exterior wall and can be subject to atmosphere temperature as low as -40°F in winter. Wall 1 is designed for combined seismic and this type of accident thermal. The thermal induced deformation on the upper elevation also results in thermal stresses on lower portions of the wall between EL. 82'-6" and EL.100'-0". In addition, as discussed in Change 1B, the accident thermal gradient for the exterior walls below grade in the auxiliary building is changed from NR to 140°F inside/50°F outside in a loss of AC power or loss of HVAC event. The wall segment below grade is designed for combined seismic and accident thermal gradient due to either a loss of AC power or loss of HVAC event. Since loss of AC power can also cause SFP boiling, the wall segment between EL. 82'-6" and EL.100'-0" is checked for combined thermal demands due to SFP boiling on EL. 135'-3" and loss of AC below grade. The markup of UFSAR Tables 3H.5-2 and 3H.5-3 reflect the combined seismic and thermal demands under those two types of

accident events. The required reinforcement in Note 4 of UFSAR Table 3H.5-3 is proposed to be revised to reflect combined seismic and accident thermal loads. This change does not impact the conclusion in Note 4 that the required vertical reinforcement is less than the provided vertical reinforcement in the area with reduced reinforcement between EL.135'-3" and EL.137'. In addition, the change of load combinations in the calculations provide a conservative design because the revised load combinations are more comprehensive and can envelope the possible scenarios in the service life of the structures. The refined analysis also provides more conservative results because the envelope of peak values from FEA meshes can better reflect the localized demands. The refined thermal reduction factor by using individual factors per elevation can better reflect the actual thermal behavior of structures at different locations, and therefore is more accurate. Therefore, the revised demands in the UFSAR tables provide conservative and accurate results of the design. The revised provided shear reinforcement of #4@6"x6" meets the requirements of ACI 349-01. The markup of Table 3H.5-3 shows that the required reinforcement is smaller than the provided reinforcement. The markup to UFSAR Subsection 3H.5.1.1 is for clarification purposes to improve reader understanding. The Wall 1 design remains in compliance with ACI 349-01 and the requirements in UFSAR Subsection 3.8.4.5.1. There is no reduction in margin of safety for the structure because Wall 1 continues to meet ACI 349-01. The proposed changes do not have adverse impact on the global structural analysis of the nuclear island. The proposed changes do not impact the design function regarding the capability of Wall 1 to withstand tornado missile impact. The proposed changes do not impact the ability of Wall 1 to resist strike from the non-seismic radwaste in seismic event.

<u>Change 2C – Wall 7.3 Critical Section Table Update (Tables 3H.5-4 and 3H.5-5)</u>
Wall 7.3 is a SC-I reinforced concrete wall that connects the shield building and the auxiliary building Wall I. Wall 7.3 extends from EL. 66'-6" to EL. 180'-0" and is designed in accordance with ACI 349-01. Wall 7.3 is designed to withstand seismic impact.

UFSAR Table 3H.5-4 for Wall 7.3 shows the moments and forces in different segments along the height from EL. 66'-6" to roof. UFSAR Table 3H.5-5 for Wall 7.3 shows the required reinforcement under governing load combinations without seismic and thermal loads combined due to the thermal note and shows provided reinforcement as well. The required reinforcement in UFSAR Table 3H.5-5 is calculated based on the demands in UFSAR Table 3H.5-4. This activity proposes to delete the thermal note and show the required reinforcement under load combinations with seismic and thermal combined in UFSAR Table 3H.5-5. This activity proposes to update the corresponding moment and forces in UFSAR Table 3H.5-4 as well. Wall 7.3 is an interior wall in the auxiliary building and is not subject to normal thermal or accident thermal loads. However, due to the thermal loads applied at other locations in the nuclear island, the thermal induced deformation in the nuclear island causes thermal stresses in Wall 7.3. Wall 7.3 is designed for combined seismic and thermal. The markup of UFSAR Tables 3H.5-4 and 3H.5-5 reflect the combined seismic and thermal demands. In addition, the change of load combinations in the calculations provide a conservative design because the revised load combinations are more comprehensive and can envelope the possible scenarios in the service life of the structures. The refined analysis also provides more conservative results because the envelope of peak values from FEA meshes can better reflect the localized demands. The refined thermal reduction factor by using individual factors per elevation

can better reflect the actual thermal behavior of structures at different locations, and therefore is more accurate. The revised concrete reinforcement cover meets ACI 349-01 and has negligible impact on the performance of the wall. Therefore, the revised demands in the UFSAR tables provide conservative and accurate results of the design and do not impact the performance of the structure. The revised provided shear reinforcement meets the requirements of ACI 349-01. The markup of Table 3H.5-5 shows that the required reinforcement is smaller than the provided reinforcement. The Wall 7.3 design remains in compliance with ACI 349-01 and the requirements in UFSAR Subsection 3.8.4.5.1. There is no reduction in margin of safety for the structure because Wall 7.3 continues to meet ACI 349-01. The proposed changes do not have adverse impact on the global structural analysis of the nuclear island. The proposed changes do not impact the ability of Wall 7.3 to withstand seismic impact.

Change 2D – Wall L Critical Section Table Update (Tables 3H.5-6 and 3H.5-7)
Wall L, to the west of Main Control Room (MCR) in the auxiliary building, is a SC-I reinforced concrete wall, and extend from EL. 66'-6" to the roof. Wall L is designed to withstand seismic impact.

UFSAR Table 3H.5-6 for Wall L shows the moments and forces in different segments along the height from EL. 117'-6" to 154'-2". UFSAR Table 3H.5-7 for Wall L shows the required reinforcement under governing load combinations without seismic and thermal loads combined due to a thermal note and shows provided reinforcement as well. The required reinforcement in UFSAR Table 3H.5-7 is calculated based on the demands in UFSAR Table 3H.5-6. This activity proposes to delete the thermal note and show the required reinforcement under load combinations with seismic and thermal combined in UFSAR Table 3H.5-7. This activity proposes to update the corresponding moment and forces in UFSAR Table 3H.5-6 as well. Wall L is the east wall of the east MISV compartment and can be subject to accident thermal temperature due to high energy line break in the MISV compartment. Wall L is also an interior wall and can be subject to ambient temperature of 70°F. Wall L is designed for combined seismic and thermal. The markup of UFSAR Tables 3H.5-6 and 3H.5-7 reflect the combined seismic and thermal demands. In addition, the change of load combinations in the calculations provide a conservative design because the revised load combinations are more comprehensive and can envelope the possible scenarios in the service life of the structures. The refined analysis also provides more conservative results because the envelope of peak values from FEA meshes can better reflect the localized demands. The refined thermal reduction factor by using individual factors per elevation can better reflect the actual thermal behavior of structures at different locations, and therefore is more accurate. The revised concrete reinforcement cover meets ACI 349-01 and has negligible impact on the performance of the wall. The change of MSIV accident pressure and generator accident pressure as result of previous licensing amendment request LAR-17-028 has been incorporated into the wall calculations and does not impact the physical design of the wall. Therefore, the revised demands in the UFSAR tables provide conservative and accurate results of the design and do not impact the performance of the structure. The revised provided shear reinforcement meets the requirements of ACI 349-01. The markup of Table 3H.5-7 shows that the required reinforcement is smaller than the provided reinforcement. The Wall L design remains in compliance with ACI 349-01 and the requirements in UFSAR Subsection 3.8.4.5.1. There is no reduction in margin of safety

for the structure because Wall L continues to meet ACI 349-01. The proposed changes do not have adverse impact on the global structural analysis of the nuclear island. The proposed changes do not impact the ability of Wall L to withstand seismic impact. Wall L continues to provide MCR boundary and MSIV boundary.

Change 2E – Shield Building Roof Critical Section Table Update (Tables 3H.5-9 and 3H.5-15)

The shield building and shield building roof provide shielding of the containment vessel and the radioactive systems and components located in the containment vessel. The shield building protects the containment vessel and the reactor coolant system from the external event, i.e. tornado missile impact, aircraft impact. The shield building supports the baffle that directs the air over the exterior of the containment vessel. The air inlets in the shield building provide the air flow for the passive containment cooling system. The PCCWST, located on the roof of the shield building, stores water for external cooling of the containment as parts of the passive containment cooling system.

UFSAR Table 3H.5-9 Sheets 1-2c show the demands and capacities of the air inlet and tension ring of the shield building under load combinations without seismic and thermal combined due to the thermal note. UFSAR Table 3H.5-9 Sheet 3 and UFSAR Table 3H.5-15 show the demands and capacities of the PCS tank exterior wall and conical roof of the shield building under load combinations with seismic and normal thermal combined. This activity proposes to delete the thermal note in UFSAR Table 3H.5-9 Sheets 1-2c, update the content of Note 1 in UFSAR Table 3H.5-9 Sheets 1, 2a, and 2c, relocate the applicability of Note 1 in UFSAR Table 3H.5-9 Sheet 1, remove Note 1 in UFSAR Table 3H.5-9 Sheet 2b, add a clarification Note 3 to UFSAR Table 3H.5-9 Sheet 2b, add a clarification Note 3 to UFSAR Table 3H.5.15, and show the demands under load combinations with seismic and normal/accident thermal loads combined in UFSAR Tables 3H.5-9 and 3H.5-15. The additions, revisions, and deletions of these notes are proposed to improve reader understanding by providing clarifications to the values in the tables. This activity also proposes to change “Horizontal Section” to “Circumferential Section” for all sections and angles in UFSAR Table 3H.5-9 Sheet 2c for clarification and improved reader understanding.

The tension ring and air inlet in the shield building are next to the upper annulus interior. The upper annulus, which is on the outside of the air baffle, is exposed to air without HVAC control and contains air which experiences only a relatively small heat up during accident. The accident air temperature on the inside of the shield building at the elevation of tension ring and air inlet can reach 165 °F in summer and 10 °F in winter. Since the atmosphere temperatures in summer is 115 °F and in winter is -40 °F, the maximum accident thermal gradient for the tension ring and air inlet is 50 °F (= 165 °F – 115 °F). The tension ring and air inlet structures are also subject to normal thermal gradient of 110 °F (-40 °F outside/ 70 °F inside) in winter and 45 °F (115 °F outside/70 °F inside) in summer. Therefore, the tension ring and air inlet are designed for combined seismic and normal/accident thermal loads. The markups of Table 3H.5-9 Sheets 1-2c show that the required reinforcement is equal or smaller than the provided reinforcement under combined seismic and thermal loads. The tension ring and air inlet structural design remains in compliance with the applicable requirements in ACI 349-01 and AISC N690-94. There is no reduction in margin of safety for the structure because the design of tension ring and air inlet structures

continues to meet the applicable codes. Even though the demand to capacity ratio of axial force and bending at the tension ring Section “1 lower” is equal to 1.0 in the proposed markup of UFSAR Table 3H.5-9 Sheet 1, the calculation of the tension ring is conservative and the corresponding demand to capacity ratio without the conservativeness is 0.63. The tension ring is conservatively considered as steel structure and is designed in accordance with ANSI/AISC N690. As indicated in Table Q1.5.7.1 from ANSI/AISC N690, load combinations including SSE loads are categorized as extreme and a corresponding Stress Limit Coefficient (SLC) of 1.6 (1.4 in shear) can be applied to the allowable stresses. The calculation of the tension ring conservatively uses SLC of 1.0 instead of 1.6. Therefore, the actual demand to capacity ratio of axial force and bending at the tension ring Section “1 lower” is 0.625 (= 1 / 1.6).

The conical roof is above the containment vessel and is subject to air which can be heated up after passing through the bottom of the air baffle and beginning to rise during accident. The accident air temperature on the inside of the shield building conical roof can reach 180 °F in summer and 120 °F in winter. Since a portion of the conical roof is exposed to atmosphere and the atmosphere temperatures in summer is 115 °F and in winter is -40 °F, the maximum accident thermal gradient for the conical roof is 160 °F (= 120 °F - (-40) °F). The conical roof is also subject to normal thermal gradient of 110 °F (-40 °F outside/70 °F inside) in winter and 45 °F (115 °F outside/70 °F inside) in summer. Therefore, the shield building conical roof is designed for combined seismic and normal/accident thermal loads. The markup of Table 3H.5-15 shows that the required reinforcement is smaller than the provided reinforcement under combined seismic and thermal loads. The conical roof design remains in compliance with ACI 349-01. There is no reduction in margin of safety for the structure because the design of the conical roof continues to meet the applicable codes.

The PCS tank has a minimum water temperature of 40°F and maximum water temperature of 120°F during normal operation. The PCS tank exterior wall is also subject to atmosphere temperature of -40 °F in winter and atmosphere temperature of 115 °F in summer. The structural design of the PCS tank walls takes a conservative deterministic assumption to the maximum thermal gradient across the walls by using thermal gradient of 40°F (inside) / 115°F (outside) and 40°F (inside) / -40°F (outside) during normal operation. Even though there is no accident thermal load on the PCS tank exterior wall, thermal loads applied at other locations of the shield building roof, i.e. conical roof and tension ring, can induce deformation and therefore cause thermal stresses in the PCS tank exterior wall. Therefore, the PCS tank exterior wall is designed for combined seismic and normal/accident thermal loads. The markup of Table 3H.5-9 Sheet 3 shows that the required reinforcement is smaller than the provided reinforcement under combined seismic and thermal loads. The PCS tank exterior wall design remains in compliance with ACI 349-01. There is no reduction in margin of safety for the structure because the design of the PCS tank exterior wall continues to meet the applicable codes.

Since the values in the markup of UFSAR Table 3H.5-9 Sheet 2b for the air inlet vertical sections reflect averaged values between the upper and lower sections, Note 3 is added to UFSAR Table 3H.5-9 Sheet 2b to clarify the averaged values. The required radial reinforcement in the knuckle region in the markup of Table 3H.5-15 is also based on averaged values between different angles of the stress line, therefore Note 3 is added to

UFSAR Table 3H.5-9 to clarify this. The averaging uses lengths which meet the effective length requirement in ACI 349-01 Section 14.2.4, and therefore is acceptable.

The proposed changes do not have adverse impact on the global structural analysis of the nuclear island. The proposed changes do not impact the ability of the shield building to withstand tornado missile impact or aircraft impact because the configuration of the shield building roof and provided steel remain unchanged. The proposed changes do not change the configuration or size of the air inlets or alter the design air flow through the inlets. The proposed changes do not impact the volume of the PCS tank and the performance of the tank. Piping and instrumentation connections to the tank and the tank leak chase design are not changed in size or location.

Change 3 – Spent Fuel Pool West Wall Critical Section Table Update (Table 3H.5-8)
The SFP walls are module walls which are located on the south side of the auxiliary building from elevation 66'-6" to elevation 135'-3", enclosed by column lines 2 and 4, and L2 and K2, as shown in UFSAR Figure 3.8.4-4 Sheets 1-5. The SFP walls are similar to the module walls inside containment, which consist of steel faceplates, steel trusses, shear studs and concrete. The west wall of the SFP along column line L-2 is a critical section as defined in UFSAR Subsection 3H.5.5.1. UFSAR Table 3H.5-8 shows the demands and capacities of the SFP west wall at seven critical locations, which are defined in UFSAR Figure 3H.5-10. UFSAR Table 3H.5-8 shows forces and moments under critical load cases, including dead load, live load, hydrostatic load, normal thermal load and accident load, and shows moments and forces under representative load combinations, such as gravity load combination, gravity and seismic load combination, and load combinations with seismic and normal thermal loads combined. UFSAR Table 3H.5-8 also shows required steel plate thickness without thermal versus provided steel plate thickness, maximum principal stress versus yield stress, and maximum stress intensity versus allowable stress intensity. This activity proposes to revise demands in UFSAR Table 3H.5-8 to match the revise design evaluation of SFP walls.

SFP walls are subject to 212 °F of accident thermal during SFP boiling. As part of design finalization, the accident thermal load is combined with seismic load and other loads in accordance with UFSAR Tables 3.8.4-1 and 3.8.4-2, and ACI 349-01. The moments and forces under combined seismic and accident loads are added to the markups of UFSAR Table 3H.5-8. The original SFP wall analysis used finite element model with approximate 5' by 5' mesh and fixed-fixed boundary condition. The design finalization refines the finite element model by changing the mesh size to 1' by 1' and creating two finite element models with fixed-fixed and fixed-pinned boundary conditions. The seismic design of the AP1000 nuclear island relies on the analysis methods and FEA models described in DCD Chapter 3.7 and related appendixes. These ANSYS models (i.e., NI-05, NI-10, NI-20, etc.) are sufficiently detailed to capture global and in-structure response at key equipment and building locations. However, for detailed design, local FEA models with a refined mesh size different than the global seismic models are sometimes utilized to capture more detailed response needed to evaluate the effects of local demand and localized stresses to design reinforcement in localized areas. These subsystem models utilize the seismic inputs and boundary conditions consistent with the nuclear island model(s). The seismic analysis methods for local models are the same as those used for the Nuclear Island models and are described in DCD Section 3.7.2. The pinned connection is used at floor to wall connections where the bottom dowel is located above the bottom WT stiffeners on the floor to capture the potential rotation. The results from the two FEA models are enveloped to conservatively capture

potential behavior of the floor to wall connection. The results from the refined FEA models are also averaged back to the original element size. SFP Wall L-2 is designed under load combinations with seismic and accident thermal loads combined by using results from refined FEA models. The markups of UFSAR Table 3H.5-8 show that the required plate thickness excluding thermal is smaller than the provided plate thickness, the maximum principal stress for the load combinations including thermal is smaller than the yield stress, and the maximum stress intensity range for the load combinations including thermal is smaller than the allowable stress intensity. The design of SFP Wall L-2 remains in compliance with the applicable requirements in ACI 349-01 and AISC N690-94. There is no reduction in margin of safety for the structure because the design of the SFP Wall L-2 continues to meet the applicable codes. The proposed changes do not have adverse impact on the global structural analysis of the nuclear island because the changes are made to local models and do not impact the mass or stiffness of the global model. The proposed changes do not impact the ability of SFP Wall L-2 to withstand seismic impact.

<u>Change 4 – Critical Section Tables Update for Auxiliary Building Floors</u>
The floors in the auxiliary building are seismic Category I structures and provide support and anchorage for component and piping supports and other attachments. One type of auxiliary building floor system is designed as composite structural steel and reinforced concrete in accordance with AISC N690-94 utilizing a metal deck spanning between the beams to support the wet concrete during construction. The design of the concrete and reinforcement in the floor sections satisfies the requirements of ACI 349. Other floor structures in the auxiliary building are designed as reinforced concrete slabs with cast-in-place concrete placed on precast panels in accordance with ACI 349.

<u>Change 4A – Composite Floor Critical Section Table Update (Table 3H.5-11)</u>
UFSAR Table 3H.5-11 shows the demands and capacities of the composite floor between column lines M and P at EL. 135'-3". This activity proposes to revise the demands and capacities of the composite floor. There are multiple changes made in the latest design for the composite floor, including (a) modified seismic mass by counting 25% of live load instead of 100% of the live load, (b) refined floor vertical seismic acceleration, (c) account for air handling unit loads. As result of the changes in the design, the governing load combinations of the floor is changed from extreme environmental condition which has combined gravity and seismic loads to abnormal condition which has combined gravity and accident thermal/pressure loads. The in-plane shear in the direction parallel to the beams in increased from 20 kips per foot width to 31 kips per foot width. The required reinforcement is changed from 0.41 in^2/ft to 0.43 in^2/ft in the direction parallel to the beams and from 0.28 in^2/ft to 0.43 in^2/ft in the direction perpendicular to the beams. The revised required reinforcement remains smaller than the provided reinforcement.

Even though there is no direct thermal load applied on the composite floor at this location, the composite floor between column lines M and P is next to the MSIV compartments which are subject to accident thermal loads, and the thermal induced deformation in the structures around MSIV compartments can cause thermal stresses in the floor. The composite floor is also evaluated under the combined seismic and accident thermal loads by using refined thermal reduction factor. The evaluation shows that the required reinforcement under combined seismic and accident thermal loads with refined thermal reduction factor can be bounded by the required reinforcement under abnormal condition without seismic included. Therefore, this change activity proposes to use the demands

under abnormal condition without seismic included and delete Note 1 in UFSAR Table 3H.5-11.

The design of the composite floor remains in compliance with applicable requirements in AISC N690-94 and ACI 349-01. There is no reduction in margin of safety for the structure because the design of the composite floor continues to meet the applicable codes. The proposed changes do not impact the ability of the composite floor to withstand seismic impact. The proposed changes do not impact the ability of the composite floor to provide support and anchorage for component and piping supports and other attachments.

Change 4B – Tagging Room Ceiling Critical Section Table Update (Table 3H.5-12)
UFSAR Table 3H.5-12 shows the demands and capacities of the tagging room ceiling floor, which is a cast-in-place concrete placed on precast concrete floor. This activity proposes to revise the demands and capacities of the floor. There are multiple changes made in the latest design for the floor, including (a) refined analysis to more accurately account for 2-way behavior of the slab, (b) revised design methodology as approved in LAR-14-003. The current value is based on a depth of slab equal to 24-inch taking into consideration the composite behavior of the precast panel and cast-in-place slab using the bottom layer of reinforcement in the precast panel for the mid-span positive moment reinforcement. The methodology for designing these types of floor slabs was revised through LAR-14-003, which was approved by NRC and has been incorporated in the licensing basis. The revised methodology requires the floor slab to be designed based on the thickness of the cast-in-place portion only. This results in a reduced depth to the reinforcement which has a corresponding increase in area of reinforcement required. The revised required reinforcement in the 24-inch slab remains smaller than the provided reinforcement.

Even though there is no direct thermal load applied on the tagging room ceiling floor, thermal loads are applied at other locations in the nuclear island, and the steady state heat transfer analysis can result in thermal gradient in the tagging room ceiling floor. The heat transfer analysis of the auxiliary building shows that there is no normal thermal gradient in the tagging room ceiling floor, and the accident thermal gradient is only 17 °F and therefore has negligible impact on the demands in the floor. Therefore, the demands in the markup of UFSAR Table 3H.5-12 do not reflect the demands under accident thermal.

The design of the tagging room ceiling floor remains in compliance with ACI 349-01. There is no reduction in margin of safety for the structure because the design of the tagging room ceiling floor continues to meet the applicable codes. The proposed changes do not impact the ability of the tagging room ceiling floor to withstand seismic impact. The proposed changes do not impact the ability of the tagging room ceiling floor to provide support and anchorage for component and piping supports and other attachments.

Summary
The proposed changes revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall. The proposed changes do not physically alter the structures

within the nuclear island's response to environmental conditions associated with normal operation, and because the same design criteria are used before and after the changes, the auxiliary and shield buildings continue to be able to withstand similar conditions.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 52, Appendix D, VIII.B.6 requires prior NRC approval for the departure from Tier 2* information. This activity includes Tier 2* departures that do not meet the Tier 2* departure exemption criteria of License Condition 2.D.(13) of the VEGP Units 3 and 4 combined license (COL), and thus requires NRC approval. Therefore, a license amendment request (LAR) (as supplied herein) is required.

10 CFR 50, Appendix A, General Design Criteria for Nuclear Power Plants, General Design Criterion (GDC) 1, Quality standards and records, requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. By continuing to follow the guidelines of the NRC Regulatory Guides and industry standards, the requirements of GDC 1 have been maintained.

10 CFR 50, Appendix A, GDC 2, Design bases for protection against natural phenomena, requires that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. There is no change to the expected responses to natural phenomena, the nuclear island continues to be able to respond to the same design basis earthquake; therefore, there are no changes to the conformance with GDC 2.

10 CFR 50, Appendix A, GDC 4, Environmental and dynamic effects design bases, requires that structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. The changes in this activity do not physically alter the structures within the nuclear island's response to environmental conditions associated with normal operation, and because the same design criteria are used before and after the changes, the auxiliary and shield building continue to be able to withstand similar conditions; therefore, there are no changes to the conformance with GDC 4.

10 CFR Part 50, Appendix S provides the earthquake engineering criteria necessary for nuclear power plants to implement GDC 2 insofar as it requires structures, systems, and components important to safety to withstand the effects of earthquakes. As described in UFSAR subsections 3.2.1.1.1 and 3.7.1.1, 10 CFR 50, Appendix S, applies to seismic Category I structures. As described in UFSAR subsection 3.2.1.1.2, seismic Category II structures, such turbine building first bay which is adjacent to nuclear island outlined by Columns I.1 to R, 11.05 to 11.2, and 11.02 to 11.2, are designed to prevent their collapse during a safe shutdown earthquake, to preclude interactions with seismic Category I structures that could degrade the functioning of a safety-related structure, system or component. The proposed changes to the nuclear island SSCs do not adversely affect the

structural capability of the seismic Category II structures. Therefore, compliance with 10 CFR 50, Appendix S, is not affected by this activity.

10 CFR 50.150 requires that nuclear power plants shall be designed to accommodate the impact of a large, commercial aircraft and to identify design features and functional capabilities that demonstrate with reduced use of operator actions (i) the reactor core remains cooled, the containment remains intact, and (ii) spent fuel pool integrity is maintained. The proposed changes to the PCS tank do not adversely affect physical design or the design function of the PCS. The PCS tank design continues to meet the requirements of ACI-349 and AISC N690. Therefore, compliance with 10 CFR 50.150 is not affected by this activity.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration

The proposed changes would revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall.

The requested amendment proposes a change to Updated Final Safety Analysis Report (UFSAR) Tier 2 and Tier 2* information that do not meet the Tier 2* departure exemption criteria of License Condition 2.D.(13) of the VEGP Units 3 and 4 combined license (COL), and thus requires NRC approval.

An evaluation to determine whether or not a significant hazards consideration is involved with the proposed amendment was completed by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

4.3.1 Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The design functions of the nuclear island structures are to provide support, protection, and separation for the seismic Category 1 mechanical and electrical equipment located in the nuclear island. The nuclear island structures are structurally designed to meet seismic Category 1 requirements as defined in Regulatory Guide 1.29.

The proposed changes to revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall do not have an adverse impact on the response of the nuclear island structures to safe shutdown earthquake ground motions or loads to anticipated or postulated accident conditions. The proposed changes do not adversely affect the design

function of any SSCs contained within the nuclear island. This change does not involve any accident initiating components or events, thus leaving the probabilities of an accident unaltered. The changes do not impact the support, design, or operation of mechanical and fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor do the proposed changes create any new accident precursors.

Therefore, the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

4.3.2 Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed changes to revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall do not change the design requirements of the nuclear island structures. The proposed changes do not adversely affect the design function of any SSC contained within the nuclear island, or any other SSC design functions or methods of operation in a manner that results in a new failure mode, malfunction, or sequence of events that affect safety-related or non-safety-related equipment. The proposed changes do not change the design, function, support, or operation of mechanical and fluid systems.

Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

4.3.3 Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed changes to revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall do not alter any safety-related equipment, applicable design codes, code compliance, design function, or safety analysis. These changes maintain conformance to American Institute of Steel Construction (AISC) N690 and American Concrete Institute (ACI) 349-01. The criteria and requirements of AISC N690 and ACI 349-01 provide a margin of safety to structural failure. The design of the nuclear island SSCs conform to criteria and requirements in AISC N690 and ACI 349-01 and therefore, maintains the margin of safety. The change does not alter any design function, design analysis, or safety analysis input

or result, and sufficient margin exists to justify departure Consequently, no safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed change, thus the margin of safety is not reduced.

Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

Based on the above, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. Pursuant to 10 CFR 50.92, the requested change does not involve a Significant Hazards Consideration.

5. ENVIRONMENTAL CONSIDERATIONS

The details of the proposed changes are provided in Sections 2 and 3 of this licensing amendment request.

The requested amendment proposes changes to information in the Updated Final Safety Analysis Report (UFSAR) related to the normal thermal loads for the PCS tank, the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, updates to the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall.

This review has determined the proposed change requires an amendment to the COL. However, a review of the anticipated construction and operational effects of the requested amendment has determined the requested amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), in that:

(i) *There is no significant hazards consideration.*

As documented in Section 4.3, Significant Hazards Consideration Determination, of this license amendment request, an evaluation was completed to determine whether or not a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment." The Significant Hazards Consideration determined that (1) the requested amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the requested amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the requested amendment does not involve a significant reduction in a margin of safety.

Therefore, it is concluded that the requested amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of “no significant hazards consideration” is justified.

(ii) *There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.*

The proposed changes revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall. The proposed changes are unrelated to any aspect of plant construction or operation that would introduce any change to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed change does not affect any effluent release path or diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation.

Therefore, it is concluded that the requested amendment does not involve a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite.

(iii) *There is no significant increase in individual or cumulative occupational radiation exposure.*

The proposed changes revise the normal thermal loads for the PCS tank, revise the accident thermal loads for the exterior walls below grade and basemat in the auxiliary building, update the critical section tables for the auxiliary building basemat, concrete walls, and floors, the shield building roof, and the SFP west wall. . Plant radiation zones (addressed in UFSAR Section 12.3) are not affected, and controls under 10 CFR 20 preclude a significant increase in occupational radiation exposure. Therefore, the requested amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the requested amendment, it has been determined that anticipated construction and operational effects of the requested amendment do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the requested amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment of the proposed exemption is not required.

6. REFERENCES

None.

Southern Nuclear Operating Company

ND-20-0266

Enclosure 2

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Proposed Changes to Licensing Basis Documents

(LAR-19-019R1)

Additions identified by blue underlined text.
~~Deletions Identified by red strikethrough of text.~~
* * * indicates omitted existing text that is not shown.

(This Enclosure consists of 34 pages, including this cover page)

Revise UFSAR Tier 2* Subsection 3H.3.3, Loads, sixth subheading, Operating Thermal Loads (T_o), as shown below.

3H.3.3 Loads

* * *

Normal thermal loads for the passive containment cooling system (PCS) tank design are calculated based on the outside air temperature extremes specified for the safety-related design. The PCS tank is assumed to be at 40°F when the outside air temperature is -40°F. ~~The water in the PCS tank is assumed to be at 70°F~~ The structural design of the PCS tank also conservatively assumes that the temperature on the inside of the PCS tank walls is at 40°F when the outside air temperature is postulated to be at 115°F.

* * *

Revise UFSAR Tier 2* Subsection 3H.5.1.1, Exterior Wall at Column Line 1, as shown below.

3H.5.1.1, Exterior Wall at Column Line 1

* * *

The wall is designed for the applicable loads including dead load, live load, hydrostatic load, static and dynamic lateral soil pressure loads, seismic loads, and thermal loads. For various segments of this wall, Table 3H.5-2 provides the listing and magnitude of the various design loads under governing load combinations and Table 3H.5-3 presents the details of the wall reinforcement. The sections where the required reinforcement is calculated are shown in Figure 3H.5-2 (Sheet 1). Typical wall reinforcement is shown on Figure 3H.5-3.]*

* * *

Revise UFSAR Table 3.8.5-3, Definition of Critical Locations, Thicknesses and Reinforcement for Nuclear Island Basemat[(1)] (in^2/ft) as shown below.

Basemat Segment (see detail in subsection 3.8.5.4.4)	**Location**	**Required[(3)]~~[(6)]~~**			***[Provided (Minimum)[(4)]]****		
		North-South	**East-West**	**Shear**	***North-South***	***East-West***	***Shear***
Auxiliary Building Basemat Elevation 66' 6''							
Column line K to L and from Shield Building to Col. Line 11[(2)][(6)]							
	Top Face	Note 5	~~1.5~~ Note 5		*[2.25*	*2.25*	
	Bottom Face	Note 5	~~1.6~~ 1.85		*2.25*	*2.25*	
				~~0.23~~ 0.24			*0.25]**
Column line 1 to 2 and from Column Line K-2 to N wall[(2)]							
General Area	Top Face	Note 5	Note 5		*[2.25*	*2.25*	
Central Zone	Top Face	~~2.72~~ 3.11	Note 5		*3.25*	*2.25*	
	Bottom Face	~~2.25~~ Note 5	~~Note 5~~ 1.85		*2.25*	*2.25*	
				0.47			*0.50]**

Notes:

* * *

5. Reinforcement demand is low. Basemat reinforcement is fairly uniform across all of the basemat and the governing location is in other segments (see Figure 3.8.5-3, sheets 3 to 6)
6. ~~Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~
6. The 5'-0" portion of the Basemat between column line L to 5' east of column line and shield building to column line 9.2, as shown in Figure 3.8.5-3, Sheet 6, are not included in this area.

Revise UFSAR Table 3H.5-1, Nuclear Island: Design Temperatures for Thermal Gradient as shown below.

Structure (See detail in Subsection 3H.3.3)	Load	Temperature (°F)		Remark
PCS Tank Walls	Normal Thermal, T_o	*[(Outside)* *-40* *+115*	*(Inside)* *+40* ~~*+70*~~ *+40*	-
* * *				
Exterior Walls Below Grade	Normal Thermal, T_o Accident Thermal, T_a	N/R ~~N/R~~ +50	N/R ~~N/R~~ +140	- ~~-~~Auxiliary Building
Basemat	Normal Thermal, T_o Accident Thermal, T_a	N/R ~~N/R~~ +50	N/R ~~N/R~~ +140	- ~~-~~Auxiliary Building
* * *				

Revise UFSAR Table 3H.5-2, Exterior Wall at Column Line 1 Forces and Moments in Critical Locations as shown below.

Load Combination	M_X	M_Y	M_{XY}	T_X	T_Y	T_{XY}
Elevation 180'-0" to 135'-3"						
~~[D + L + H + Ta~~		~~177.8~~	~~3.1~~		~~115.5~~	~~8.8~~
~~1.05 D + 1.3 L + 1.3 H+ 1.2 To]*~~	~~106.4~~		~~5.6~~	~~117.0~~		~~23.9~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		194.9	0.3		155.8	82.8
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		266.4	18.4		27.2	34.0
D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym	144.3		49.1	144.3		95.5
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	126.6		42.5	149.0		52.0
Elevation 135'-3" to 100'-0"						
~~[D + L + H + Ta~~		~~50.8~~	~~0.3~~		~~89.8~~	~~104.8~~
~~D + L + H + Ta~~	~~82.9~~		~~7.6~~	~~172.9~~		~~24.8~~
~~D + L + H + Ta]*~~	~~60.0~~		~~3.6~~	~~165.7~~		~~106.0~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		42.1	5.0		257.9	44.0
D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym	59.7		1.9	149.7		47.3
D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	83.4		37.0	72.2		53.0
Elevation 100-0" to 82'-6"						
~~[1.05 D + 1.3 L + 1.3 H + 1.2 To~~		~~48.1~~	~~8.4~~		~~106.1~~	~~17.3~~
~~D + L+ Es]*~~	~~1.8~~		~~5.4~~	~~15.6~~		~~58.6~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		16.4	13.8		194.4	130.8
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		16.4	13.8		194.4	130.8
0.9D+0.9F+1.3L+1.2To+1.3H+1.3Ro	1.0		19.2	34.5		122.3
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	5.9		16.0	36.0		128.8
Elevation 82'-6" to 66'-6"						
~~[D + L – Es~~		~~93.8~~	~~26.5~~		~~170.7~~	~~31.5~~
~~0.9 D + Es~~		~~32.7~~	~~27.2~~		~~182.1~~	~~42.4~~
~~0.9 D + Es]*~~	~~15.5~~		~~27.2~~	~~18.6~~		~~42.4~~
[0.9D+F+H+Ro+To+Es		18.1	2.3		204.2	83.4
0.9D+F+H+Ro+To+Es		105.7	22.8		230.6	25.6
0.9D+F+H+Ro+To+Es]*	24.4		2.3	11.4		83.4

Revise UFSAR Table 3H.5-3, Exterior Wall on Column Line 1 Details of Wall Reinforcement (in²/ft) as shown below.

Wall Segment (See detail in Subsection 3H.5.1.1.)	Location	Required(2)			*[Provided (Minimum)]**		
		Vertical	Horizontal	Shear(3)	Vertical	Horizontal	*Shear(3)*
Wall Section 1, 6							
Elevation 180'-0" to 135'-3"				N/R			None
	Outside Face	3.48(4) 3.65	2.65 3.08		*[3.91(4)*	*3.12*	
	Inside Face	1.94 2.76	1.52 2.51		*3.12*	*3.12]**	
Wall Section 2, 3, 7							
Elevation 135'-3" to 100'-0"				NR 0.17			None *[0.80]**
	Outside Face	1.88 2.96	3.04 1.98		*[3.12*	*3.12*	
	Inside Face	1.77 2.96	2.23 2.10		*3.12*	*3.12]**	
Wall Section 4, 8							
Elevation 100'-0" to 82'-6"				0.003 0.03			*[0.44]**
	Outside Face	1.42 3.04	0.70 1.55		*[3.12*	*1.56*	
	Inside Face	1.01 3.04	0.70 1.25		*3.12*	*1.27]**	
Wall Section 5, 9							
Elevation 82'-6" to 66'-6"				0.27 0.56			*[0.88]**
	Outside Face	2.29 3.37	0.87 0.95		*[4.39*	*1.27*	
	Inside Face	1.87 2.68	0.87 0.95		*3.12*	*1.27]**	

Notes:

* * *

2. Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable. Not used.

4. *[* * * This reduction in minimum provided area does not change the performance of the existing structure under postulated loads and does not cause any excessive stress locally along the development length of the bar, as the required area of steel for elevation 135'-3" to 137'-0" is 2.81 3.09 in²/ft. The arrangement of bars in the wall for both units is unchanged per Figure 3H.5-3.]**

Revise UFSAR Table 3H.5-4, Interior Wall at Column Line 7.3 Forces and Moments in Critical Locations as shown below.

Load Combination	M_X	M_Y	M_{XY}	T_X	T_Y	T_{XY}
From Roof to Elevation 155'-6''						
~~[1.05 D + 1.3 L + 1.2 To~~		~~135.3~~	~~10.9~~		~~117.3~~	~~210.2~~
~~1.05 D + 1.3 L + 1.2 To]*~~	~~75.5~~		~~4.1~~	~~229.8~~		~~94.3~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		21.3	15.6		135.0	233.5
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	54.3		16.9	241.8		199.5
Elevation 155'-6'' to 135'-3''						
~~[0.9 D – Es~~		~~14.1~~	~~1.3~~		~~160.8~~	~~228.7~~
~~D + L – Es]*~~	~~28.0~~		~~1.0~~	~~29.8~~		~~231.7~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		9.1	4.0		192.2	189.3
D+F+L+H+Ro+To+Es]*	23.5		2.5	39.1		215.9
Elevation 135'-3'' to 117'-6''						
~~[0.9 D – Es~~		~~3.3~~	~~1.3~~		~~142.2~~	~~140.9~~
~~D + L – Es]*~~	~~10.0~~		~~1.0~~	~~41.7~~		~~175.0~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		9.3	3.7		177.9	161.6
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	11.3		0.6	46.3		184.3
Elevation 117'-6'' to 100'-0''						
~~[0.9 D – Es~~		~~4.7~~	~~2.8~~		~~143.9~~	~~184.9~~
~~D + L + Es]*~~	~~6.4~~		~~1.5~~	~~172.8~~		~~107.9~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		7.8	2.7		133.8	199.0
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	4.7		1.2	178.9		116.4
Elevation 100'-0'' to 82'-6''						
~~[0.9 D – Es~~		~~15.4~~	~~2.6~~		~~90.4~~	~~169.8~~
~~D + L – Es]*~~	~~8.7~~		~~2.6~~	~~46.6~~		~~175.6~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		31.0	8.5		166.2	91.5
D+F+L+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	12.8		0.0	6.4		164.8
Elevation 82'-6' to 66'-6'''						
~~[0.9 D – Es~~		~~23.5~~	~~1.3~~		~~80.9~~	~~49.3~~
~~D + L – Es]*~~	~~0.8~~		~~1.3~~	~~1.7~~		~~74.1~~
[0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym		24.5	3.8		105.7	79.3
0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]*	2.5		3.8	9.7		79.3

Revise UFSAR Table 3H.5-5, Interior Wall on Column Line 7.3 Details of Wall Reinforcement as shown below.

Wall Segment (see detail in Subsection 3H.5.1.2.)	Location	Wall Section	Reinforcement on Each Face (in²/ft)	
			Required(1)	*[Provided (Min.)]**
From Roof to Elevation 155'-6"	Horizontal	1	3.96 4.06	*[4.12*
	Vertical	7	3.60 3.52	*3.72*
Elevation 155'-6" to 135'-3"	Horizontal	2	2.80 2.52	*3.12*
	Vertical	8	3.59 3.64	*3.72*
Elevation 135'-3' to 117'-6"	Horizontal	3	2.03 2.10	*2.54*
	Vertical	9	2.63 3.10	*3.12*
Elevation 117'-6" to 100'-0"	Horizontal	4	2.29 2.34	*2.54*
	Vertical	10	2.98 2.97	*3.12*
Elevation 100'-0" to 82'-6"	Horizontal	5	1.69 1.38	*2.54*
	Vertical	11	2.08 2.33	*3.12*(3)
Elevation 82'-6" to 66'-6"	Horizontal	6	0.85 0.63	*1.27*
	Vertical	12	0.98 1.52	*1.56*
Shear Reinforcement(2) (in²/ft²)				
From Roof to Elevation 155'-6"	Standard hook or T headed bar	7	0.38 0.22	*0.44 0.80]**

Notes:

1. Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable. Not used.

Revise UFSAR Table 3H.5-6, Interior Wall at Column Line L Forces and Moments in Critical Locations as shown below.

Load Combination	M_x	M_Y	M_{XY}	T_X	T_Y	T_{XY}
Elevation 154'-2'' to 135'-3''						
[0.9 D + Es+ Pa + Yj		6.0	3.5		115.4	170.2
*0.9 D + Es+ Pa + Yj]**	14.3		3.5	46.0		170.2
[0.9D+F+L+H+Ro+To+Es		12.0	4.8		124.1	129.7
*0.9D+F+H+Es+Pa+Ta+Ra+Yr+Yj+Ym]**	31.3		4.4	24.6		233.1
Elevation 135'-3'' to 117'-6''						
[0.9 D + Es+ Pa + Yj		145.3	12.2		26.0	38.2
*0.9 D + Es+ Pa + Yj]**	24.5		7.1	15.5		114.9
[0.9D+F+L+H+Ro+To+Es		4.5	5.0		124.8	127.5
*0.9D+F+L+H+Ro+To+Es]**	26.1		6.2	9.3		132.6

Revise UFSAR Table 3H.5-7, Interior Wall on Column Line L Details of Wall Reinforcement as shown below.

Wall Segment (see detail in Subsection 3H.5.1.3.)	Location	Wall Section	Reinforcement on Each Face (in^2/ft^2)	
			Required(1)	*[Provided (Min.)]**
Elevation 154'-2'' to 135'-3''	Horizontal	1	~~2.08~~ 2.09	*[2.27*
	Vertical	3	~~2.59~~ 2.38	*3.12*
Elevation 135'-3'' to 117'-6''	Horizontal	2	~~1.36~~ 1.46	*4.39*
	Vertical	4	~~2.02~~ 2.37	*5.66]**
Shear Reinforcement(2) (in^2/ft^2)				
Elevation 154'-2'' to 135'-3''	Standard hook or T headed bar	5	~~0.01~~ 0.13	*[~~0.11~~0.80*
Elevation 135'-3'' to 117'-6''	Standard hook or T headed bar	6	~~0.33~~ 0.55	*1.76]**

Notes:

1. ~~Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~ Not used.

Revise UFSAR Table 3H.5-8 (Sheet 1 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 20477 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
~~Dead (D)~~	~~-16.15~~	~~-22.92~~	~~-28.34~~	~~-1.34~~	~~-1.06~~	~~-0.32~~	~~-0.32~~	
~~Live (L)~~	~~1.46~~	~~0.32~~	~~-1.57~~	~~-0.06~~	~~-0.21~~	~~0.04~~	~~0.03~~	
~~Hydro (F)~~	~~37.52~~	~~12.36~~	~~-4.32~~	~~-100.50~~	~~-14.49~~	~~62.14~~	~~-9.95~~	
~~Seismic (Es)~~	~~46.21~~	~~56.51~~	~~183.20~~	~~81.72~~	~~28.70~~	~~103.00~~	~~14.79~~	
~~Thermal (To)~~	~~-61.80~~	~~-267.70~~	~~-51.15~~	~~-426.90~~	~~-145.50~~	~~90.32~~	~~-23.66~~	
~~Thermal (Ta)~~	~~-955.80~~	~~-444.60~~	~~-139.70~~	~~-1401.0~~	~~-450.00~~	~~227.50~~	~~-83.16~~	
~~LC(1a)~~	~~32.40~~	~~-14.25~~	~~-48.39~~	~~-142.68~~	~~-22.12~~	~~86.61~~	~~-14.33~~	~~*[1.4D+1.7L+1.4F*~~
~~LC(3a)~~	~~84.05~~	~~51.21~~	~~147.24~~	~~-60.38~~	~~7.15~~	~~189.71~~	~~0.56~~	~~*D+L+F+Es*~~
~~LC(3b)~~	~~84.05~~	~~51.21~~	~~-219.16~~	~~-223.82~~	~~-50.25~~	~~-16.29~~	~~-29.02~~	~~*D+L+F+E's*~~
~~LC(3e)~~	~~-267.08~~	~~-116.11~~	~~115.28~~	~~-327.19~~	~~-83.79~~	~~246.16~~	~~-14.22~~	~~*D+L+F+Es+To*~~
~~LC(3f)~~	~~-267.08~~	~~-116.11~~	~~-251.12~~	~~-490.63~~	~~-141.19~~	~~40.16~~	~~-43.80~~	~~*D+L+F+E's+To*~~
~~LC(3m)~~	~~84.20~~	~~53.18~~	~~151.64~~	~~-60.18~~	~~7.46~~	~~189.71~~	~~0.57~~	~~*0.9D+F+Es*~~
~~LC(3n)~~	~~84.20~~	~~53.18~~	~~-214.76~~	~~-223.62~~	~~-49.94~~	~~-16.29~~	~~-29.01~~	~~*0.9D+F+E's*~~
~~LC(3o)~~	~~-266.92~~	~~-114.13~~	~~119.68~~	~~-326.99~~	~~-83.47~~	~~246.16~~	~~-14.22~~	~~*0.9D+F+Es+To*~~
~~LC(3p)~~	~~-266.92~~	~~-114.13~~	~~-246.72~~	~~-490.43~~	~~-140.87~~	~~40.16~~	~~-43.80~~	~~*0.9D+F+E's+To*~~
~~LC(5a)~~	~~-574.55~~	~~-288.12~~	~~-121.54~~	~~-977.52~~	~~-297.00~~	~~204.04~~	~~-62.22~~	~~*D+L+F+Ta*~~
~~LC(5b)~~	~~-825.30~~	~~-421.18~~	~~-153.29~~	~~-53.19~~	~~-5.28~~	~~63.89~~	~~-15.73~~	~~*D+L+F+Ta*~~
~~LC(7a)~~	~~-397.01~~	~~-211.45~~	~~-74.69~~	~~-427.19~~	~~-125.72~~	~~132.70~~	~~-28.49~~	~~*1.05D+1.3L+1.05F+ 1.2To]**~~
Dead (D)	-15.54	-11.97	-19.88	0.12	0.10	-1.72	-0.36	
Live (L)	0.78	-0.04	-1.18	-0.24	-0.13	-0.01	0.02	
Hydro (F)	30.96	4.98	-3.82	-63.41	-5.35	43.84	-5.16	
Seismic (Es)	82.85	54.22	125.46	58.55	31.63	87.52	15.70	
Thermal (To)	-493.98	-241.71	-55.16	-494.28	-151.42	59.44	-31.16	
Thermal (Ta)	-863.45	-406.83	-143.22	-466.24	-453.18	196.15	-90.75	
LC(1a)	22.92	-9.85	-35.18	-89.01	-7.58	58.96	-7.69	*[1.4D+1.7L+1.4F*
LC(3a)	111.43	49.18	99.06	-30.33	24.10	147.17	8.14	*D+L+F+Es*
LC(3b)	111.43	49.18	-151.86	-147.44	-39.15	-27.87	-23.26	*D+L+F+E's*
LC(3e)	-197.31	-101.89	64.59	-339.26	-70.53	184.32	-11.34	*D+L+F+Es+To*
LC(3f)	-197.31	-101.89	-186.34	-456.36	-133.79	9.28	-42.73	*D+L+F+E's+To*
LC(3m)	112.20	50.42	102.23	-30.11	24.23	147.35	8.15	*0.9D+F+Es*
LC(3n)	112.20	50.42	-148.70	-147.21	-39.03	-27.69	-23.24	*0.9D+F+E's*
LC(3o)	-196.53	-100.65	67.75	-339.03	-70.41	184.50	-11.32	*0.9D+F+Es+To*
LC(3p)	-196.53	-100.65	-183.17	-456.13	-133.67	9.46	-42.72	*0.9D+F+E's+To*
LC(5a)	-523.45	-261.30	-114.39	-979.93	-288.62	164.71	-62.21	*D+L+F+Ta*

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
LC(5b)	-624.45	-326.96	-150.38	-10.07	8.26	60.09	-7.70	*D+L+F+Ta*
LC(6a)	-541.61	-272.74	-24.91	-921.37	-256.99	252.23	-46.51	*D+L+F+Es+Ta*
LC(6b)	-707.30	-381.18	-275.84	-1038.48	-320.25	77.19	-77.91	*D+L+F+E's+Ta*
LC(7a)	-353.28	-188.68	-67.78	-437.47	-119.25	88.80	-29.14	*1.05D+1.3L+1.05F+ 1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.
See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	~~0.42~~ 0.24 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~46.33~~ 35.8 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~46.3~~ 74.2 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-8 (Sheet 2 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 10529 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
~~Dead (D)~~	~~-24.40~~	~~-96.30~~	~~-20.71~~	~~-1.16~~	~~-2.27~~	~~-0.28~~	~~-0.34~~	
~~Live (L)~~	~~-0.44~~	~~-2.48~~	~~-0.55~~	~~-0.01~~	~~-0.24~~	~~0.01~~	~~0.08~~	
~~Hydro (F)~~	~~9.86~~	~~-5.49~~	~~6.22~~	~~8.37~~	~~-73.49~~	~~16.94~~	~~16.02~~	
~~Seismic (Es)~~	~~110.80~~	~~335.20~~	~~95.73~~	~~19.03~~	~~93.81~~	~~22.15~~	~~29.34~~	
~~Thermal (To)~~	~~-215.70~~	~~-479.30~~	~~-150.10~~	~~-99.69~~	~~-357.90~~	~~16.39~~	~~19.34~~	
~~Thermal (Ta)~~	~~-389.40~~	~~-883.60~~	~~-273.20~~	~~-364.10~~	~~-982.20~~	~~40.42~~	~~17.26~~	
~~LC(1a)~~	~~-21.10~~	~~-146.72~~	~~-21.23~~	~~10.09~~	~~-106.48~~	~~23.34~~	~~22.09~~	~~*[1.4D+1.7L+1.4F*~~
~~LC(3a)~~	~~99.77~~	~~228.74~~	~~83.17~~	~~29.58~~	~~-11.59~~	~~45.60~~	~~51.51~~	~~*D+L+F+Es*~~
~~LC(3b)~~	~~99.77~~	~~228.74~~	~~-108.29~~	~~-8.48~~	~~-199.21~~	~~1.30~~	~~-7.17~~	~~*D+L+F+E's*~~
~~LC(3e)~~	~~-35.05~~	~~-70.83~~	~~-10.64~~	~~-32.72~~	~~-235.28~~	~~55.84~~	~~63.60~~	~~*D+L+F+Es+To*~~
~~LC(3f)~~	~~-35.05~~	~~-70.83~~	~~-202.10~~	~~-70.78~~	~~-422.90~~	~~11.54~~	~~4.92~~	~~*D+L+F+E's+To*~~
~~LC(3m)~~	~~102.64~~	~~240.85~~	~~85.80~~	~~29.71~~	~~-11.12~~	~~45.61~~	~~51.47~~	~~*0.9D+F+Es*~~
~~LC(3n)~~	~~102.64~~	~~240.85~~	~~-105.66~~	~~-8.35~~	~~-198.74~~	~~1.31~~	~~-7.21~~	~~*0.9D+F+E's*~~
~~LC(3o)~~	~~-32.17~~	~~-58.72~~	~~-8.02~~	~~-32.60~~	~~-234.81~~	~~55.86~~	~~63.55~~	~~*0.9D+F+Es+To*~~
~~LC(3p)~~	~~-32.17~~	~~-58.72~~	~~-199.48~~	~~-70.66~~	~~-422.43~~	~~11.56~~	~~4.87~~	~~*0.9D+F+E's+To*~~
~~LC(5a)~~	~~-258.35~~	~~-656.52~~	~~-185.79~~	~~-220.36~~	~~-689.88~~	~~41.93~~	~~26.55~~	~~*D+L+F+Ta*~~
~~LC(5b)~~	~~-362.67~~	~~-963.64~~	~~-260.17~~	~~7.94~~	~~-144.07~~	~~12.21~~	~~12.80~~	~~*D+L+F+Ta*~~
~~LC(7a)~~	~~-177.61~~	~~-469.58~~	~~-128.51~~	~~-67.20~~	~~-348.29~~	~~29.80~~	~~31.07~~	~~*1.05D+1.3L+1.05F +1.2To]**~~
Dead(D)	-17.41	-97.25	-17.82	-1.28	-0.78	-0.71	-1.27	
Live(L)	-0.49	-3.11	-0.65	-0.09	-0.29	0.00	0.03	
Hydro(F)	6.13	-6.31	3.61	-1.47	-51.56	11.49	13.08	
Seismic(Es)	75.07	320.60	80.95	15.40	78.74	18.35	26.14	
Thermal(To)	-196.00	-447.61	-134.64	-144.47	-333.40	8.42	-4.77	
Thermal(Ta)	-361.26	-827.41	-251.05	-409.00	-954.60	32.29	-7.21	
LC(1a)	-16.64	-150.28	-21.00	-3.99	-73.77	15.09	16.57	*[1.4D+1.7L+1.4F*
LC(3a)	65.74	211.40	67.54	11.98	5.48	33.73	43.20	*D+L+F+Es*
LC(3b)	65.74	211.40	-94.37	-18.82	-151.99	-2.98	-9.07	*D+L+F+E's*
LC(3e)	-56.76	-68.36	-16.61	-78.31	-202.89	38.99	40.22	*D+L+F+Es+To*
LC(3f)	-56.76	-68.36	-178.52	-109.11	-360.36	2.29	-12.05	*D+L+F+E's+To*
LC(3m)	67.98	224.24	69.97	12.20	5.85	33.80	43.31	*0.9D+F+Es*
LC(3n)	67.98	224.24	-91.94	-18.60	-151.62	-2.90	-8.97	*0.9D+F+E's*
LC(3o)	-54.52	-55.52	-14.18	-78.10	-202.53	39.06	40.33	*0.9D+F+Es+To*
LC(3p)	-54.52	-55.52	-176.09	-108.90	-360.00	2.36	-11.95	*0.9D+F+E's+To*
LC(5a)	-237.57	-623.81	-171.77	-258.46	-649.25	30.96	7.33	*D+L+F+Ta*
LC(5b)	-293.85	-862.10	-215.10	7.87	-109.50	11.32	19.92	*D+L+F+Ta*
LC(6a)	-218.78	-541.51	-134.14	-243.06	-570.52	49.31	33.47	*D+L+F+Es+Ta*
LC(6b)	-368.91	-1182.70	-296.05	-273.86	-727.99	12.60	-18.81	*D+L+F+E's+Ta*
LC(7a)	-159.49	-448.50	-116.74	-111.35	-305.38	17.63	8.86	*1.05D+1.3L+1.05F +1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.

See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	~~0.47~~ 0.26 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~40.3~~ 48.2 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~50.8~~ 70.1 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-8 (Sheet 3 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 10544 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
~~Dead (D)~~	~~-20.03~~	~~-75.69~~	~~-42.72~~	~~3.53~~	~~-2.18~~	~~-0.01~~	~~-1.93~~	
~~Live (L)~~	~~-0.64~~	~~-1.98~~	~~-1.22~~	~~0.36~~	~~-0.06~~	~~0.02~~	~~-0.07~~	
~~Hydro (F)~~	~~-4.13~~	~~-2.97~~	~~-4.10~~	~~39.78~~	~~3.54~~	~~0.99~~	~~-4.80~~	
~~Seismic (Es)~~	~~67.42~~	~~185.70~~	~~113.20~~	~~48.28~~	~~7.62~~	~~5.78~~	~~5.32~~	
~~Thermal (To)~~	~~-121.60~~	~~-387.30~~	~~-239.80~~	~~75.83~~	~~-107.40~~	~~39.64~~	~~49.91~~	
~~Thermal (Ta)~~	~~-215.20~~	~~-670.10~~	~~-416.60~~	~~184.20~~	~~-269.30~~	~~115.50~~	~~136.20~~	
~~LC(1a)~~	~~-34.91~~	~~-113.49~~	~~-67.62~~	~~61.25~~	~~1.81~~	~~1.40~~	~~-9.54~~	~~*[1.4D+1.7L+1.4F*~~
~~LC(3a)~~	~~40.97~~	~~103.87~~	~~63.52~~	~~107.86~~	~~10.34~~	~~7.18~~	~~-3.41~~	~~*D+L+F+Es*~~
~~LC(3b)~~	~~40.97~~	~~103.87~~	~~-162.88~~	~~11.30~~	~~-4.90~~	~~-4.39~~	~~-14.04~~	~~*D+L+F+E's*~~
~~LC(3e)~~	~~-35.03~~	~~-138.19~~	~~-86.36~~	~~155.26~~	~~-56.79~~	~~31.95~~	~~27.79~~	~~*D+L+F+Es+To*~~
~~LC(3f)~~	~~-35.03~~	~~-138.19~~	~~-312.76~~	~~58.70~~	~~-72.02~~	~~20.39~~	~~17.15~~	~~*D+L+F+E's+To*~~
~~LC(3m)~~	~~43.61~~	~~113.42~~	~~69.01~~	~~107.15~~	~~10.61~~	~~7.16~~	~~-3.14~~	~~*0.9D+F+Es*~~
~~LC(3n)~~	~~43.61~~	~~113.42~~	~~-157.39~~	~~10.59~~	~~-4.62~~	~~-4.41~~	~~-13.78~~	~~*0.9D+F+E's*~~
~~LC(3o)~~	~~-32.39~~	~~-128.64~~	~~-80.87~~	~~154.54~~	~~-56.51~~	~~31.93~~	~~28.05~~	~~*0.9D+F+Es+To*~~
~~LC(3p)~~	~~-32.39~~	~~-128.64~~	~~-307.27~~	~~57.98~~	~~-71.75~~	~~20.37~~	~~17.41~~	~~*0.9D+F+E's+To*~~
~~LC(5a)~~	~~-159.30~~	~~-499.45~~	~~-308.41~~	~~158.79~~	~~-167.01~~	~~73.19~~	~~78.32~~	~~*D+L+F+Ta*~~
~~LC(5b)~~	~~-267.05~~	~~-805.64~~	~~-503.54~~	~~51.38~~	~~-38.58~~	~~1.37~~	~~-9.65~~	~~*D+L+F+Ta*~~
~~LC(7a)~~	~~-117.40~~	~~-375.64~~	~~-230.60~~	~~102.82~~	~~-79.20~~	~~30.78~~	~~30.27~~	~~*1.05D+1.3L+1.05F +1.2To]**~~
Dead(D)	-23.37	-59.59	-41.62	3.76	-0.81	0.28	-0.71	
Live(L)	-0.82	-2.01	-1.14	0.36	-0.04	0.04	-0.02	
Hydro(F)	-4.24	-1.67	-3.22	28.34	2.08	1.19	-2.90	
Seismic(Es)	75.42	145.64	111.14	44.70	4.30	5.79	4.07	
Thermal(To)	-103.44	-329.56	-196.76	87.54	-91.81	42.74	40.36	
Thermal(Ta)	-188.49	-561.47	-351.05	198.05	-247.04	118.07	126.02	
LC(1a)	-40.05	-89.18	-64.72	45.55	1.71	2.13	-5.10	*[1.4D+1.7L+1.4F*
LC(3a)	45.29	81.70	63.87	88.50	6.37	7.78	-0.73	*D+L+F+Es*
LC(3b)	45.29	81.70	-158.42	-0.91	-2.24	-3.80	-8.87	*D+L+F+E's*
LC(3e)	-19.36	-124.27	-59.11	143.21	-51.01	34.49	24.50	*D+L+F+Es+To*
LC(3f)	-19.36	-124.27	-281.39	53.80	-59.62	22.91	16.36	*D+L+F+E's+To*
LC(3m)	48.45	89.67	69.17	87.76	6.49	7.72	-0.63	*0.9D+F+Es*
LC(3n)	48.45	89.67	-153.12	-1.64	-2.12	-3.87	-8.78	*0.9D+F+E's*
LC(3o)	-16.20	-116.31	-53.81	142.48	-50.89	34.43	24.59	*0.9D+F+Es+To*
LC(3p)	-16.20	-116.31	-276.09	53.07	-59.50	22.84	16.45	*0.9D+F+E's+To*
LC(5a)	-146.24	-414.18	-265.39	156.24	-153.16	75.31	75.13	*D+L+F+Ta*
LC(5b)	-238.80	-668.77	-433.11	76.45	-23.63	2.24	-19.91	*D+L+F+Ta*
LC(6a)	-163.37	-523.13	-321.97	200.94	-148.86	81.10	-15.83	*D+L+F+Es+Ta*
LC(6b)	-314.22	-814.40	-544.25	31.75	-157.47	69.51	-23.98	*D+L+F+E's+Ta*

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
LC(7a)	-107.64	-314.11	-196.14	99.83	-67.57	33.65	26.45	*1.05D+1.3L+1.05F +1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.
See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	~~0.31~~ 0.16 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~46.95~~ 51.3 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~84.9~~ 97.4 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-8 (Sheet 4 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 10524 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
Dead (D)	-35.61	-104.80	0.68	-4.70	7.72	-0.55	-2.22	
Live (L)	-0.45	-2.21	-0.72	-0.25	-0.49	0.00	0.10	
Hydro (F)	11.85	-1.35	4.92	28.52	16.50	3.71	3.79	
Seismic (Es)	76.80	225.60	79.29	53.31	177.00	6.83	55.70	
Thermal (To)	-369.10	-433.40	179.90	-215.40	-109.40	-7.32	-59.63	
Thermal (Ta)	-696.60	-730.00	329.40	-555.10	-487.60	-13.58	-95.78	
LC(1a)	-34.04	-152.37	6.62	32.92	33.09	4.43	2.37	*[1.4D+1.7L+1.4F*
LC(3a)	57.33	116.69	86.14	88.29	207.34	11.48	58.89	*D+L+F+Es*
LC(3b)	57.33	116.69	-72.44	-18.33	-146.66	-2.18	-52.51	*D+L+F+E's*
LC(3e)	-173.36	-154.18	198.57	-46.34	138.96	6.90	21.62	*D+L+F+Es+To*
LC(3f)	-173.36	-154.18	39.99	-152.96	-215.04	-6.76	-89.78	*D+L+F+E's+To*
LC(3m)	61.34	129.38	86.78	89.00	207.05	11.53	59.02	*0.9D+F+Es*
LC(3n)	61.34	129.38	-71.80	-17.62	-146.95	-2.13	-52.38	*0.9D+F+E's*
LC(3o)	-169.35	-141.49	199.22	-45.62	138.68	6.96	21.75	*0.9D+F+Es+To*
LC(3p)	-169.35	-141.49	40.64	-152.24	-215.32	-6.71	-89.65	*0.9D+F+E's+To*
LC(5a)	-459.59	-564.62	210.75	-323.37	-281.01	-5.32	-58.19	*D+L+F+Ta*
LC(5b)	-741.71	-755.24	398.88	19.86	124.99	-105.77	-114.64	*D+L+F+Ta*
LC(7a)	-302.36	-439.4	139.9	136.9	57.2	-2.2	-42.9	*1.05D+1.3L+1.05F+ 1.2To]**
Dead(D)	-26.88	-136.36	-4.55	-2.71	8.30	-1.73	-2.55	
Live(L)	-0.57	-3.79	-0.78	-0.28	-0.56	0.01	0.10	
Hydro(F)	9.65	-2.30	3.42	20.28	15.30	2.96	-1.29	
Seismic(Es)	71.56	289.90	91.93	54.83	199.98	7.42	64.34	
Thermal(To)	-318.13	-400.37	145.44	-220.52	-146.44	-5.03	-40.60	
Thermal(Ta)	-622.23	-668.85	285.16	-561.88	-521.80	-9.38	-75.34	
LC(1a)	-25.08	-200.56	-2.90	24.13	32.08	1.74	-5.20	*[1.4D+1.7L+1.4F*
LC(3a)	57.62	146.53	91.38	80.24	229.14	9.85	60.09	*D+L+F+Es*
LC(3b)	57.62	146.53	-92.47	-29.42	-170.83	-5.00	-68.59	*D+L+F+E's*
LC(3e)	-141.21	-103.70	182.28	-57.58	137.61	6.71	34.72	*D+L+F+Es+To*
LC(3f)	-141.21	-103.70	-1.57	-167.25	-262.35	-8.14	-93.96	*D+L+F+E's+To*
LC(3m)	60.88	163.95	92.61	80.79	228.87	10.01	60.24	*0.9D+F+Es*
LC(3n)	60.88	163.95	-91.24	-28.87	-171.09	-4.84	-68.44	*0.9D+F+E's*
LC(3o)	-137.95	-86.28	183.51	-57.03	137.35	6.87	34.87	*0.9D+F+Es+To*
LC(3p)	-137.95	-86.28	-0.34	-166.70	-262.62	-7.98	-93.81	*0.9D+F+E's+To*
LC(5a)	-406.69	-560.48	176.31	-333.88	-303.09	-4.62	-50.82	*D+L+F+Ta*
LC(5b)	-633.03	-744.00	335.67	-9.66	68.94	-92.69	-84.33	*D+L+F+Ta*
LC(6a)	-561.47	-454.11	427.59	-279.05	-103.11	-85.27	-19.99	*D+L+F+Es+Ta*
LC(6b)	-704.58	-1033.90	243.74	-388.71	-503.08	-100.12	-148.67	*D+L+F+E's+Ta*

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
LC(7a)	-257.42	-450.80	106.88	-147.30	-85.78	-2.46	-34.34	*1.05D+1.3L+1.05F +1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.
See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	~~0.32~~ 0.27 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~42.1~~ 39.6 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~72.6~~ 74.3 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-8 (Sheet 5 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 10524 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
~~Dead (D)~~	~~-7.31~~	~~-29.13~~	~~-1.51~~	~~-1.45~~	~~-3.75~~	~~-0.06~~	~~0.35~~	
~~Live (L)~~	~~-0.11~~	~~-0.55~~	~~0.21~~	~~-0.14~~	~~-0.60~~	~~0.00~~	~~0.05~~	
~~Hydro (F)~~	~~5.04~~	~~-0.04~~	~~-1.61~~	~~-16.58~~	~~64.59~~	~~-1.48~~	~~-20.87~~	
~~Seismic (Es)~~	~~25.64~~	~~33.82~~	~~32.90~~	~~10.45~~	~~114.90~~	~~2.48~~	~~12.55~~	
~~Thermal (To)~~	~~-286.10~~	~~-78.70~~	~~66.37~~	~~-208.70~~	~~-130.00~~	~~0.86~~	~~-1.51~~	
~~Thermal (Ta)~~	~~-616.80~~	~~-121.80~~	~~116.60~~	~~-650.20~~	~~-502.40~~	~~6.16~~	~~3.93~~	
~~LC(1a)~~	~~-3.36~~	~~-41.77~~	~~-4.01~~	~~-25.47~~	~~84.16~~	~~-2.15~~	~~-28.64~~	~~*[1.4D+1.7L+1.4F*~~
~~LC(3a)~~	~~25.28~~	~~4.09~~	~~29.35~~	~~-14.35~~	~~200.98~~	~~0.35~~	~~-16.27~~	~~*D+L+F+Es*~~
~~LC(3b)~~	~~25.28~~	~~4.09~~	~~-36.45~~	~~-35.25~~	~~-28.82~~	~~-4.61~~	~~-41.37~~	~~*D+L+F+E's*~~
~~LC(3e)~~	~~-153.54~~	~~-45.10~~	~~70.83~~	~~-144.78~~	~~119.73~~	~~0.89~~	~~-17.21~~	~~*D+L+F+Es+To*~~
~~LC(3f)~~	~~-153.54~~	~~-45.10~~	~~5.03~~	~~-165.68~~	~~-110.07~~	~~-4.07~~	~~-42.31~~	~~*D+L+F+E's+To*~~
~~LC(3m)~~	~~26.11~~	~~7.55~~	~~29.29~~	~~-14.06~~	~~201.95~~	~~0.35~~	~~-16.35~~	~~*0.9D+F+Es*~~
~~LC(3n)~~	~~26.11~~	~~7.55~~	~~-36.51~~	~~-34.96~~	~~-27.85~~	~~-4.61~~	~~-41.45~~	~~*0.9D+F+E's*~~
~~LC(3o)~~	~~-152.70~~	~~-41.63~~	~~70.77~~	~~-144.50~~	~~120.70~~	~~0.89~~	~~-17.29~~	~~*0.9D+F+Es+To*~~
~~LC(3p)~~	~~-152.70~~	~~-41.63~~	~~4.97~~	~~-165.40~~	~~-109.10~~	~~-4.07~~	~~-42.39~~	~~*0.9D+F+E's+To*~~
~~LC(5a)~~	~~-387.88~~	~~-105.84~~	~~69.97~~	~~-424.54~~	~~-253.76~~	~~2.31~~	~~-18.01~~	~~*D+L+F+Ta*~~
~~LC(5b)~~	~~-646.13~~	~~-113.41~~	~~80.41~~	~~35.38~~	~~175.18~~	~~-4.36~~	~~-31.38~~	~~*D+L+F+Ta*~~
~~LC(7a)~~	~~-217.10~~	~~-90.37~~	~~46.78~~	~~-175.63~~	~~-34.40~~	~~-0.96~~	~~-22.61~~	~~*1.05D+1.3L+1.05F+ 1.2To]**~~
Dead(D)	-8.17	-30.95	-0.12	-1.17	0.10	-0.16	0.54	
Live(L)	-0.14	-0.57	0.14	-0.22	-0.79	0.00	0.07	
Hydro(F)	5.35	-0.40	-1.33	8.58	86.46	1.24	-22.66	
Seismic(Es)	24.18	33.34	30.34	23.64	161.73	3.85	15.90	
Thermal(To)	-242.25	-76.28	48.77	-202.47	-136.67	0.52	-1.81	
Thermal(Ta)	-542.05	-110.19	87.80	-643.16	-500.95	5.98	3.24	
LC(1a)	-4.18	-44.88	-1.79	10.01	119.85	1.52	-30.86	*[1.4D+1.7L+1.4F*
LC(3a)	23.37	1.25	28.50	34.27	282.09	5.44	-15.22	*D+L+F+Es*
LC(3b)	23.37	1.25	-32.18	-13.01	-41.37	-2.27	-47.03	*D+L+F+E's*
LC(3e)	-128.03	-46.43	58.98	-92.27	196.68	5.76	-16.35	*D+L+F+Es+To*
LC(3f)	-128.03	-46.43	-1.70	-139.55	-126.78	-1.94	-48.16	*D+L+F+E's+To*
LC(3m)	24.32	4.92	28.37	34.60	282.87	5.45	-15.34	*0.9D+F+Es*
LC(3n)	24.32	4.92	-32.31	-12.67	-40.59	-2.25	-47.15	*0.9D+F+E's*
LC(3o)	-127.08	-42.76	58.85	-91.94	197.45	5.78	-16.48	*0.9D+F+Es+To*
LC(3p)	-127.08	-42.76	-1.82	-139.21	-126.00	-1.93	-48.28	*0.9D+F+E's+To*
LC(5a)	-341.74	-100.80	53.57	-394.78	-227.32	4.82	-20.04	*D+L+F+Ta*
LC(5b)	-539.71	-94.05	58.98	41.54	179.68	-5.14	-28.12	*D+L+F+Ta*
LC(6a)	-515.53	-67.46	89.32	-371.14	-65.59	8.68	-12.22	*D+L+F+Es+Ta*
LC(6b)	-563.90	-134.15	28.64	-418.42	-389.05	-8.99	-44.03	*D+L+F+E's+Ta*

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
LC(7a)	-184.82	-90.88	35.24	-144.35	-12.63	1.53	-24.50	*1.05D+1.3L+1.05F +1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.
See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	0.20 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~20.6~~ 18.0 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~20.6~~ 23.0 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-8 (Sheet 6 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 21402 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
~~Dead (D)~~	~~-1.82~~	~~-17.93~~	~~4.00~~	~~0.92~~	~~0.93~~	~~-0.32~~	~~0.22~~	
~~Live (L)~~	~~-0.21~~	~~-0.98~~	~~0.41~~	~~0.19~~	~~-0.04~~	~~-0.02~~	~~-0.03~~	
~~Hydro (F)~~	~~7.14~~	~~0.29~~	~~-2.18~~	~~104.60~~	~~15.51~~	~~-16.65~~	~~3.08~~	
~~Seismic (Es)~~	~~36.81~~	~~21.41~~	~~17.68~~	~~139.90~~	~~28.75~~	~~12.42~~	~~12.08~~	
~~Thermal (To)~~	~~-228.50~~	~~-181.90~~	~~85.52~~	~~-291.30~~	~~-212.00~~	~~11.34~~	~~6.92~~	
~~Thermal (Ta)~~	~~-379.10~~	~~-378.40~~	~~159.80~~	~~-783.80~~	~~-661.10~~	~~41.72~~	~~28.29~~	
~~LC(1a)~~	~~7.08~~	~~-26.36~~	~~3.24~~	~~148.06~~	~~22.95~~	~~-23.80~~	~~4.56~~	~~*[1.4D+1.7L+1.4F*~~
~~LC(3a)~~	~~44.77~~	~~2.90~~	~~19.03~~	~~287.45~~	~~51.36~~	~~-11.24~~	~~16.58~~	~~*D+L+F+Es*~~
~~LC(3b)~~	~~44.77~~	~~2.90~~	~~-16.33~~	~~7.65~~	~~-6.14~~	~~-36.08~~	~~-7.58~~	~~*D+L+F+E's*~~
~~LC(3e)~~	~~-98.05~~	~~-110.78~~	~~72.48~~	~~105.39~~	~~-81.14~~	~~-4.15~~	~~20.90~~	~~*D+L+F+Es+To*~~
~~LC(3f)~~	~~-98.05~~	~~-110.78~~	~~37.12~~	~~-174.41~~	~~-138.64~~	~~-28.99~~	~~-3.26~~	~~*D+L+F+E's+To*~~
~~LC(3m)~~	~~45.16~~	~~5.68~~	~~18.23~~	~~287.17~~	~~51.31~~	~~-11.18~~	~~16.59~~	~~*0.9D+F+Es*~~
~~LC(3n)~~	~~45.16~~	~~5.68~~	~~-17.13~~	~~7.37~~	~~-6.19~~	~~-36.02~~	~~-7.57~~	~~*0.9D+F+E's*~~
~~LC(3o)~~	~~-97.65~~	~~-108.01~~	~~71.68~~	~~105.11~~	~~-81.19~~	~~-4.09~~	~~20.91~~	~~*0.9D+F+Es+To*~~
~~LC(3p)~~	~~-97.65~~	~~-108.01~~	~~36.32~~	~~-174.69~~	~~-138.69~~	~~-28.93~~	~~-3.25~~	~~*0.9D+F+E's+To*~~
~~LC(5a)~~	~~-231.84~~	~~-255.12~~	~~102.10~~	~~-384.16~~	~~-396.79~~	~~9.08~~	~~20.95~~	~~*D+L+F+Ta*~~
~~LC(5b)~~	~~-268.90~~	~~-468.00~~	~~168.35~~	~~-17.41~~	~~14.23~~	~~-18.83~~	~~13.88~~	~~*D+L+F+Ta*~~
~~LC(7a)~~	~~-166.1~~	~~-156.2~~	~~66.6~~	~~-107.4~~	~~-141.8~~	~~-9.3~~	~~8.6~~	~~*1.05D+1.3L+1.05F+ 1.2To]**~~
Dead(D)	-1.52	-18.30	4.68	-0.37	0.72	0.00	-0.10	
Live(L)	-0.21	-0.93	0.42	0.28	-0.02	-0.02	-0.06	
Hydro(F)	4.03	-0.43	-1.50	92.82	12.95	-15.46	3.60	
Seismic(Es)	36.96	21.63	18.85	145.49	29.84	11.74	17.22	
Thermal(To)	-192.49	-155.43	84.14	-251.71	-207.93	11.21	8.20	
Thermal(Ta)	-334.80	-329.90	141.91	-762.50	-659.55	44.32	29.47	
LC(1a)	3.16	-27.81	5.16	129.90	19.09	-21.67	4.80	*[1.4D+1.7L+1.4F*
LC(3a)	40.88	1.79	21.85	275.34	48.66	-9.92	22.10	*D+L+F+Es*
LC(3b)	40.88	1.79	-15.86	-15.63	-11.02	-33.39	-12.34	*D+L+F+E's*
LC(3e)	-79.43	-95.35	74.44	118.02	-81.30	-2.92	27.23	*D+L+F+Es+To*
LC(3f)	-79.43	-95.35	36.73	-172.95	-140.98	-26.39	-7.21	*D+L+F+E's+To*
LC(3m)	41.24	4.55	20.97	275.10	48.61	-9.90	22.17	*0.9D+F+Es*
LC(3n)	41.24	4.55	-16.74	-15.87	-11.07	-33.38	-12.27	*0.9D+F+E's*
LC(3o)	-79.07	-92.59	73.55	117.78	-81.35	-2.90	27.29	*0.9D+F+Es+To*
LC(3p)	-79.07	-92.59	35.85	-173.19	-141.03	-26.37	-7.15	*0.9D+F+E's+To*
LC(5a)	-206.95	-225.85	92.29	-383.84	-398.58	12.22	21.86	*D+L+F+Ta*
LC(5b)	-234.63	-256.17	103.47	-397.15	-399.55	10.60	21.12	*D+L+F+Ta*
LC(6a)	-197.67	-234.54	122.33	-251.67	-369.71	23.96	38.35	*D+L+F+Es+Ta*
LC(6b)	-271.60	-277.80	84.62	-542.64	-429.39	0.49	3.90	*D+L+F+E's+Ta*

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
LC(7a)	-142.00	-137.45	66.99	-91.35	-141.63	-7.85	9.75	*1.05D+1.3L+1.05F +1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.

See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	~~0.28~~ 0.20 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~25.1~~ 28.2 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~31.3~~ 34.2 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-8 (Sheet 7 of 7), Design Summary of Spent Fuel Pool Wall Design Loads, Load Combinations, and Comparisons to Acceptance Criteria – Element No. 21414 as shown below.

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
~~Dead (D)~~	~~0.69~~	~~-10.62~~	~~-2.57~~	~~-0.52~~	~~-0.22~~	~~-0.03~~	~~0.12~~	
~~Live (L)~~	~~0.18~~	~~0.12~~	~~-0.45~~	~~0.00~~	~~-0.11~~	~~-0.01~~	~~0.02~~	
~~Hydro (F)~~	~~4.25~~	~~0.56~~	~~-2.73~~	~~-27.01~~	~~-31.06~~	~~-1.46~~	~~1.82~~	
~~Seismic (Es)~~	~~26.90~~	~~13.88~~	~~36.68~~	~~26.35~~	~~21.70~~	~~2.17~~	~~4.34~~	
~~Thermal (To)~~	~~-79.35~~	~~-40.69~~	~~49.04~~	~~-129.00~~	~~-119.30~~	~~10.01~~	~~6.90~~	
~~Thermal (Ta)~~	~~-129.60~~	~~-66.37~~	~~57.50~~	~~-374.60~~	~~-374.70~~	~~26.38~~	~~24.34~~	
~~LC(1a)~~	~~7.24~~	~~-13.89~~	~~-8.19~~	~~-38.54~~	~~-43.97~~	~~-2.09~~	~~2.75~~	~~*[1.4D+1.7L+1.4F*~~
~~LC(3a)~~	~~33.73~~	~~4.16~~	~~29.84~~	~~-11.98~~	~~-22.11~~	~~0.10~~	~~7.03~~	~~*D+L+F+Es*~~
~~LC(3b)~~	~~33.73~~	~~4.16~~	~~-43.52~~	~~-64.68~~	~~-65.51~~	~~-4.24~~	~~-1.66~~	~~*D+L+F+E's*~~
~~LC(3e)~~	~~-15.86~~	~~-21.27~~	~~60.49~~	~~-92.61~~	~~-96.67~~	~~6.36~~	~~11.34~~	~~*D+L+F+Es+To*~~
~~LC(3f)~~	~~-15.86~~	~~-21.27~~	~~-12.87~~	~~-145.31~~	~~-140.07~~	~~2.01~~	~~2.66~~	~~*D+L+F+E's+To*~~
~~LC(3m)~~	~~33.48~~	~~5.10~~	~~30.55~~	~~-11.93~~	~~-21.98~~	~~0.11~~	~~7.00~~	~~*0.9D+F+Es*~~
~~LC(3n)~~	~~33.48~~	~~5.10~~	~~-42.81~~	~~-64.63~~	~~-65.38~~	~~-4.23~~	~~-1.69~~	~~*0.9D+F+E's*~~
~~LC(3o)~~	~~-16.12~~	~~-20.33~~	~~61.20~~	~~-92.56~~	~~-96.54~~	~~6.37~~	~~11.31~~	~~*0.9D+F+Es+To*~~
~~LC(3p)~~	~~-16.12~~	~~-20.33~~	~~-12.16~~	~~-145.26~~	~~-139.94~~	~~2.02~~	~~2.62~~	~~*0.9D+F+E's+To*~~
~~LC(5a)~~	~~-75.87~~	~~-51.43~~	~~30.19~~	~~-261.65~~	~~-265.57~~	~~15.00~~	~~17.17~~	~~*D+L+F+Ta*~~
~~LC(5b)~~	~~-114.31~~	~~-96.07~~	~~55.47~~	~~-35.06~~	~~-36.08~~	~~2.55~~	~~-1.61~~	~~*D+L+F+Ta*~~
~~LC(7a)~~	~~-54.08~~	~~-40.93~~	~~30.63~~	~~-125.65~~	~~-122.46~~	~~5.94~~	~~7.24~~	~~*1.05D+1.3L+1.05F+ 1.2To]**~~
Dead(D)	0.86	-10.93	-2.70	0.30	-0.02	-0.04	0.03	
Live(L)	0.15	0.06	-0.38	0.00	-0.13	-0.01	0.03	
Hydro(F)	3.53	0.73	-2.83	-24.72	-26.63	-1.07	1.12	
Seismic(Es)	23.63	12.73	32.11	21.80	30.03	2.52	5.47	
Thermal(To)	-66.65	-39.03	45.95	-118.96	-121.48	8.32	7.62	
Thermal(Ta)	-111.54	-58.96	50.88	-364.47	-375.75	24.84	24.99	
LC(1a)	6.38	-14.19	-8.39	-34.20	-37.54	-1.57	1.64	*[1.4D+1.7L+1.4F*
LC(3a)	29.57	2.87	25.06	-12.51	-7.41	0.97	7.08	*D+L+F+Es*
LC(3b)	29.57	2.87	-39.15	-56.11	-67.47	-4.06	-3.86	*D+L+F+E's*
LC(3e)	-12.09	-21.52	53.78	-86.86	-83.33	6.17	11.85	*D+L+F+Es+To*
LC(3f)	-12.09	-21.52	-10.43	-130.46	-143.39	1.14	0.91	*D+L+F+E's+To*
LC(3m)	29.34	3.91	25.72	-12.54	-7.28	0.98	7.06	*0.9D+F+Es*
LC(3n)	29.34	3.91	-38.50	-56.14	-67.33	-4.05	-3.88	*0.9D+F+E's*
LC(3o)	-12.32	-20.49	54.43	-86.89	-83.20	6.18	11.82	*0.9D+F+Es+To*
LC(3p)	-12.32	-20.49	-9.78	-130.49	-143.26	1.15	0.88	*0.9D+F+E's+To*
LC(5a)	-65.19	-47.00	25.89	-252.22	-261.63	14.41	16.78	*D+L+F+Ta*
LC(5b)	-88.36	-71.43	29.84	-36.01	-27.13	3.01	-2.28	*D+L+F+Ta*
LC(6a)	-64.73	-58.70	61.95	-230.42	-231.60	16.92	3.19	*D+L+F+Es+Ta*
LC(6b)	-111.99	-84.16	-2.27	-274.02	-291.66	11.89	-7.75	*D+L+F+E's+Ta*

Load/ Combination	S_{xx} kip/ft	S_{yy} kip/ft	S_{xy} kip/ft	M_{xx} kip/ft	M_{yy} kip/ft	N_x kip/ft	N_y kip/ft	Comments
LC(7a)	-45.20	-39.92	28.16	-114.86	-119.27	5.06	6.95	*1.05D+1.3L+1.05F +1.2To]**

Notes:

x – direction is horizontal; y – direction is vertical.
See Figure 3H.5-10 for element location.

Plate thickness required for load combinations excluding thermal:	~~0.14~~ 0.11 inches (Maximum)
[Plate thickness provided:	*0.50 -0.01 +0.10 inches]**
Maximum principal stress for ~~load combination 5~~ the load combinations including thermal:	~~22.1~~ 27.2 ksi
[Yield stress:	*65.0 ksi (Minimum)]**
Maximum stress intensity range for ~~load combination 5~~ the load combinations including thermal:	~~22.1~~ 35.0 ksi
Allowable stress intensity:	130.0 ksi (Minimum)

Revise UFSAR Table 3H.5-9 (Sheet 1 of 3), Shield Building Roof Reinforcement Summary (Tension Ring) as shown below.

Tension Ring – Axial Force and Bending Verification								
Location		Seismic Maximum Stresses		Maximum Stresses ksi	F_y ksi	Maximum Steel Area Required~~(2)~~ (in²/ft)	*[Steel Area Provided]**	*[Design Limit~~(1)~~ for Ratio Max Required/Provided]**
Section	Angles	Seismic L/C	f_a ksi					
2 lower	5.625°	~~9~~ 33	~~14.31~~ 28.11	~~15.35~~ 30.07	50	~~9.21~~ 18.00	*[Liner 1 1/2" = 18 (in²/ft) (Min)]**	*[~~0.51 + 2%~~1.00]**
	84.375°	~~17~~ 41	~~13.15~~ 27.59					
1 lower	0°	~~9~~ 34	~~15.35~~ 30.07					
	90°	~~17~~ 43	~~14.46~~ 29.48					
Tension Ring – Shear Force and Torsion Verification								
Location		**Seismic Maximum Stresses**		**Maximum Stresses ksi**	**F_y ksi**	**Maximum Steel Area Required~~(2)~~ (in²/ft)**	***[Steel Area Provided]****	***[Design Limit(1) for Ratio Max Required/Provided]****
Section	**Angles**	**Seismic L/C**	**f_a ksi**					
2 lower	5.625°	~~18~~ 42	~~4.83~~ 4.58	~~6.28~~ 7.27	50	~~5.65~~ 6.54	*[Liner 1 1/2" = 18 (in²/ft) (Min)]**	*[~~0.31~~ 0.36+ 2%]**
	84.375°	~~11~~ 35	~~5.52~~ 4.24					
1 lower	0°	17	~~6.28~~ 7.27					
	90°	9	~~5.80~~ 6.78					

* * *

Notes:

1. *[~~Two~~ The two percent of the ratio value that may be added to the design limit ~~as~~ represents an allowance for minor variances in analysis results.]**
2. ~~Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~ Not used.

Revise UFSAR Table 3H.5-9 (Sheet 2a of 3), Shield Building Roof Reinforcement Summary (Air Inlet) as shown below.

AIS Reinforcement Summary – Horizontal Sections						
Location (Figure 3H.5-11)		**Required – Seismic Load Combinations (in²/ft)**		**Maximum Required(2) (in²/ft)**	***[Provided]****	***[Design Limit(1) for Ratio Max Required/Provided]****
Section	**Angles**	**Seismic L/C**	**Values**			
5+6	0°-5.625°	~~8~~ 32	~~1.91~~ 2.43	~~2.38~~ 5.03	*[Liner 1" = 12 (in²/ft) (Min)]**	*[~~0.20~~ 0.42 + 2%]**
	84.375°-90°	~~8~~ 32	~~1.89~~ 2.31			
7	0°-5.625°	16	~~2.38~~ 4.19			
	84.375°-90°	~~8~~ 24	~~2.15~~ 4.27			
9	0°-5.625°	16	~~2.26~~ 5.02			
	84.375°-90°	24	~~2.27~~ 5.03			
11	0°-5.625°	16	~~1.73~~ 3.55	~~1.73~~ 3.57	*[Liner 1" = 12 (in²/ft) (Min)]**	*[~~0.15~~ 0.30 + 2%]**
	84.375°-90°	24	~~1.53~~ 3.57			

Notes:

1. [*~~Two~~ The two percent of the ratio value that may be added to the design limit ~~as~~ represents an allowance for minor variances in analysis results.*]*
2. ~~Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~ Not used.

Revise UFSAR Table 3H.5-9 (Sheet 2b of 3), Shield Building Roof Reinforcement Summary (Air Inlet) as shown below.

AIS Reinforcement Summary – Vertical Sections						
Location (Figure 3H.5-11)		**Steel Area (Hoop Direction – Y Local Dir.)**				
		Required – Seismic Load Combinations (in^2/ft)				
Section	**Angles**	**Seismic L/C**	**Values[(3)]**	**Maximum Required~~[(2)]~~ (in^2/ft)**	***[Provided]****	***[Design Limit~~[(1)]~~ for Ratio Max Required/Provided]****
3 Upper	0°	~~9~~ 33	~~9.97~~ 11.66	~~10.53~~ 11.91	*[Liner 1" = 12 (in^2/ft) (Min)]**	[~~0.88+ 2%~~ *0.99*]*
	90°	~~17~~ 41	~~9.25~~ 11.00			
3 Lower	0°	~~9~~ 33	~~8.45~~ 11.66			
	90°	~~17~~ 41	~~7.75~~ 11.00			
4 Upper	5.625°	~~9~~ 33	~~10.53~~ 11.91			
	84.375°	~~17~~ 41	~~9.75~~ 11.16			
4 Lower	5.625°	~~10~~ 33	~~8.26~~ 11.91			
	84.375°	~~19~~ 41	~~7.54~~ 11.16			

* * *

Notes:

1. ~~[*Two percent of the value may be added to the design limit as an allowance for minor variances in analysis results.*]*~~ Not used.
2. ~~Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~ Not used.
3. The values reflect averaged results between the upper and lower sections.

Revise UFSAR Table 3H.5-9 (Sheet 2c of 3), Shield Building Roof Reinforcement Summary (Air Inlet) as shown below.

Out of Plane Shear Reinforcement Summary -AIS							
Location (Figure 3H.5-11)		Required – Seismic Load Combinations (in²/ft)			Maximum Required[(2)] (in²/ft)	*[Steel Area Provided]**	*[Design Limit[(1)] for Ratio Max Required/Provided]**
Angles	Sections	Seismic L/C	Values	Sum			
0°-5.625°	Max of Vertical Sections 3 upper - 4 upper	~~1~~ 25	~~0.13~~ 0.16	~~0.13~~ 0.16	~~0.34~~ 0.22	*[(3) 3/4" TIE BAR @2.8125° (41.36") (8 1/2" in vertical direction) = 0.50 (in2/ ft) (Min.)]**	*[0.68 + 2%]**
	~~Horizontal~~ Circumferential Section 5+6		0.00				
84.375°-90°	Max of Vertical Sections 3 upper - 4 upper	~~1~~ 25	~~0.12~~ 0.16	~~0.12~~ 0.16			
	~~Horizontal~~ Circumferential Section 5+6		0.00				
0°-5.625°	Max of Vertical Sections 3 upper - 4 upper	~~1~~ 25	~~0.10~~ 0.16	~~0.34~~ 0.16			
	~~Horizontal~~ Circumferential Section 7		~~0.24~~ 0.00				
84.375°-90°	Max of Vertical Sections 3 upper - 4 upper	~~1~~ 25	~~0.10~~ 0.16	~~0.30~~ 0.16			
	~~Horizontal~~ Circumferential Section 7		~~0.20~~ 0.00				
0°-5.625°	Max of Vertical Sections 3 lower - 4 lower	18	~~0.21~~ 0.22	~~0.21~~ 0.22			
	~~Horizontal~~ Circumferential Section 9		0.00				
84.375°-90°	Max of Vertical Sections 3 lower - 4 lower	11	~~0.21~~ 0.22	~~0.21~~ 0.22			
	~~Horizontal~~ Circumferential Section 9		0.00~~0~~				

Out of Plane Shear Reinforcement Summary -AIS							
Location (Figure 3H.5-11)		Required – Seismic Load Combinations (in²/ft)			Maximum Required~~(2)~~ (in²/ft)	*[Steel Area Provided]**	*[Design Limit(1) for Ratio Max Required/Provided]**
Angles	Sections	Seismic L/C	Values	Sum			
0°-5.625°	Max of Vertical Sections 3 lower - 4 lower	18	~~0.21~~ 0.22	~~0.21~~ 0.22			
	~~Horizontal~~ Circumferential Section 11		0.00~~0~~				
84.375°-90°	Max of Vertical Sections 3 lower - 4 lower	11	~~0.21~~ 0.22	~~0.21~~ 0.22			
	~~Horizontal~~ Circumferential Section 11		0.00				

Notes:

1. *[~~Two~~ The two percent of the ratio value that may be added to the design limit ~~as~~ represents an allowance for minor variances in analysis results.]**
2. ~~Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~ Not used.

Revise UFSAR Table 3H.5-9 (Sheet 3 of 3), Shield Building Roof Reinforcement Summary (Exterior Wall of Passive Containment Cooling System Tank) as shown below.

Wall Segment	Location (Figure 3H.5-11 Sheet 5 of 6)	Reinforcement on Each Face, in²/ft			Ratio Required/ Provided
		Maximum Required	Provided (Minimum)		
Bottom	Vertical	~~1.49~~ 1.53	1#8@1.125° & 1#11@1.125°	*[2.75*	~~0.54~~ 0.56
	Hoop°	~~0.80~~ 1.22	1#9@6"	*2*	~~0.40~~ 0.61
	Shear	~~0.15~~ 0.11	1#4@0.5625°x6"	*0.94*	~~0.16~~ 0.12
Mid-height	Vertical	~~0.64~~ 0.69	1#8@1.125° & 1#11@1.125°	*2.75*	~~0.23~~ 0.25
	Hoop°	~~1.93~~ 1.99	1#9@6"	*2*	~~0.97~~ 0.99
Top	Vertical	~~0.52~~ 0.34	1#8@1.125° & 1#11@1.125°	*2.75*	~~0.19~~ 0.12
	Hoop°	~~0.79~~ 0.58	1#9@6"	*2]**	~~0.40~~ 0.29

Revise UFSAR Table 3H.5-11, Design Summary of Floor Elevation 135’-3’’ Area 1 (Between Column Lines M and P) as shown below.

Governing Load Combination (Steel Beam)	
Load Combination Bending Moment Corresponding Stress Allowable Stress Shear Force Corresponding Stress Allowable Stress	3 – Extreme Environmental Condition Downward Seismic =(-) ~~63.9~~ 41.1 kips-ft = ~~17.0~~ 13.9 ksi = ~~33.26~~ 38.0 ksi = ~~30.7~~ 22.1 kips = ~~8.7~~ 6.2 ksi = 20.1 ksi
Governing Load Combination (Concrete Slab)	
Parallel to the Beams Load Combination Bending Moment In-plane Shear Reinforcement (Each Face) Required~~(1)~~ *[Provided*	 ~~3 – Extreme Environmental Condition Downward Seismic~~ 6 – Abnormal Condition =(-) ~~16.09~~ 7.6 kips-ft/ft = ~~20.0~~ 31.0 kips (per foot width of the slab) = ~~0.41~~ 0.43 in^2/ft *= 0.44 in^2/ft (Min)]**
Perpendicular to the Beams Combination Number Bending Moment Reinforcement (Each Face) Required~~(1)~~ *[Provided*	 ~~Normal Condition~~ 6 – Abnormal Condition =~~(+) 6.66~~ (-) 1.42 kips-ft (per foot width of the slab) = ~~0.28~~ 0.43 in^2/ft *= 0.60 in^2/ft (Min)]**

Note:

~~1. Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads are numerically combined as the normal thermal loads were assessed to be insignificant. When the seismic and normal thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.~~

Revise UFSAR Table 3H.5-12, Design Summary of Floor Elevation 135'-3'' (Operations work Area (Previously Known as 'Tagging Room') Ceiling)) as shown below.

Design of Precast Concrete Panels	
Governing Load Combination	Construction
Design Bending Moment (Midspan)	=~~14.54~~ 12.07 kip-ft/ft
Bottom Reinforcement (E/W Direction)	
Required(1)	= ~~0.58~~ 0.49 in^2/ft
[Provided	*= 0.79 in^2/ft (Min.)]**
Top Reinforcement (E/W Direction)	
Required(1)	= (Minimum required by the Code)
[Provided	*= 0.20 in^2/ft (Min.)]**
Top and Bottom Reinforcement (N/S Direction)	
Required(1)	= (Minimum required by the Code)
[Provided	*= 0.20 in^2/ft (Min.)]**
Design of 24-inch-Thich Slab	
Governing Load Combination	~~Extreme Environmental Condition (SSE)~~ Abnormal Condition
Design Bending Moment (E/W Direction) Midspan	= ~~14.40~~ 16.23 kips-ft/ft
Design In-plane Shear	= ~~31.9 kips-ft~~ 30.19 kips/ft
Design In-plane Tension	= ~~21.9 kips-ft~~ 37.1 kips/ft
Bottom Reinforcement (E/W Direction)	
Required(1)	= ~~0.53~~ 0.71 in^2/ft
[Provided	*= 0.79 in^2/ft (Min.)]**
Design Bending Moment (E/W Direction) at Support	= ~~28.81~~ 17.75 kips-ft/ft
Design In-plane Shear	= ~~31.9~~ 30.19 kips/ft
Design In-plane Tension	= ~~21.9~~ 37.1 kips/ft
Top Reinforcement (E/W Direction)	
Required(1)	= ~~0.93~~ 0.73 in^2/ft
[Provided	*= 1.00 in^2/ft (Min.)]**
Design Bending Moment (N/S Direction)	= ~~8.47~~ 21.55 kips-ft/ft
Design In-plane Shear	= ~~31.9~~ 30.19 kips/ft
Design In-plane Tension	= ~~27.2~~ 24.65 kip/ft
Top and Bottom Reinforcement (N/S Direction)	
Required(1)	= ~~0.59~~ 0.65 in^2/ft
[Provided	*= 0.79 in^2/ft (Min.)]**

Notes:

1. Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and ~~normal~~ thermal loads are numerically combined as the ~~normal~~ thermal loads were assessed to be insignificant. When the seismic and ~~normal~~ thermal loads are numerically combined, the value of required reinforcement may increase; however, in all cases the required reinforcement is less than the provided reinforcement and thus the design of the critical section reinforcement is acceptable.

Revise UFSAR Table 3H.5-15 Shield Building Roof Reinforcement Ratio of Code Required Versus Provided as shown below.

Critical Section	Stress Component	Required in^2/ft	Provided (Minimum) in^2/ft	Reinforcement Ratio
[Conical Roof Beams](1)*	Axial + Bending	-	*[Radial Beams W36 X 395(2)]**	~~1.33~~ 1.65
	Shear	-		~~8.33~~ 3.85
*[Conical Roof Near Tension Ring]**	Radial	~~1.80~~ 1.81	*[2.34]**	~~1.30~~ 1.29
	Hoop	~~4.31~~ 4.01	*[4.68]**	~~1.09~~ 1.16
*[Knuckle Region]**	Vertical	~~1.49~~ 1.53	*[2.75]**	~~1.85~~ 1.80
	Radial	~~2.85~~ 3.48(3)	*[3.55]**	~~1.25~~ 1.02
	Hoop	~~2.64~~ 2.67	*[3.12]**	~~1.18~~ 1.16
*[Compression Ring]**	Vertical	~~1.24~~ 1.09	*[2.40]**	~~1.94~~ 2.20
	Radial	~~3.09~~ 2.08	*[3.56]**	~~1.15~~ 1.71
	Hoop	~~2.49~~ 2.50	*[3.12]**	1.25

Note:

* * *

3. The value reflects averaged result between different angles of the stress line.