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SOUTHERN NUCLEAR
A SOUTHERN COMPANY

October 12, 2016

Docket Nos.: 52-025
52-026

ND-16-1855
10 CFR 50.90

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

Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Revised Request for License Amendment:
Structural Design of Auxiliary Building Floors (LAR-16-009R3)

Ladies and Gentlemen:

Pursuant to 10 CFR 52.98(c) and in accordance with 10 CFR 50.90, Southern Nuclear Operating Company (SNC) requests 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). 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) to revise details of the structural design of auxiliary building floors.

SNC originally submitted this license amendment request (LAR) as LAR-16-009 (via ND-16-0816) with a similar scope on June 14, 2016. SNC subsequently superseded the request as LAR-16-009R1 (via ND-16-1024) with a reduced scope to match the scope of the completed calculations as of July 1, 2016. Having completed the remaining necessary, supporting calculations, LAR Revision 2 was submitted August 12, 2016 (via ND-16-1356) to reinstate the original scope of impacted structures, systems, and components included in the initial request. During a public meeting on August 25, 2016, the NRC Staff provided comments to the Licensees regarding LAR-16-009. LAR Revision 3 revises and supplements the previous versions of this LAR to address the NRC Staff comments.

Enclosures 5 and 6 of ND-16-1356 are enveloped and subsumed within the information provided in Enclosures 7, 9, and 10. No previous revisions of this LAR are withdrawn by this revision, nor has there been any reduction in information available to the NRC staff regarding this amendment request.

Enclosure 7 provides the description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration Determination), and environmental considerations for the proposed changes. The scope and nature of the Significant Hazards Consideration Determination and the environmental considerations for the proposed changes are not impacted by this revised information.

Enclosure 9 provides the revised markups depicting the requested changes to the VEGP Units 3 and 4 UFSAR, excluding those UFSAR changes contained in Enclosure 10 which are requested to be withheld from public distribution under the provisions of 10 CFR 2.390(d).

Enclosure 10 provides markups of additional figures determined to be impacted by the proposed changes. **The figures revised in Enclosure 10 contain information identified as security-related, also referred to as sensitive unclassified non-safeguards information (SUNSI). Therefore, Enclosure 10 is requested to be withheld from public distribution under the provisions of 10 CFR 2.390(d).**

Enclosures 9 and 10 include revisions to address NRC Staff comments provided during the public meeting of August 25, 2016. These comments and associated responses are provided in Enclosure 8.

This letter contains no regulatory commitments.

SNC has also re-evaluated the construction impacts for this LAR, and now requests NRC staff approval of the license amendment by January 7, 2017, to support installation of the first finned floor module at approximately elevation 117'-6". Approval by this date will allow sufficient time to implement the licensing basis changes prior to final installation of the identified auxiliary building floor. SNC expects to implement this proposed amendment within 30 days of approval. South Carolina Electric and Gas has recently indicated the requested approval date for the VC Summer Units 2 and 3 license amendment request for this topic is December 12, 2016.

SNC has previously submitted Preliminary Amendment Request (PAR), PAR-16-009R2S (a supplement to approved PAR-16-009R2), to expand the scope of the PAR to CA20 floors at approximate elevation 100' and 107' and to finned floors at approximate elevation 117'. This revised LAR continues to support the requested PAR for these activities. As noted above, the Enclosures in LAR Revision 2 cited by PAR-16-009R2S remain on the docket and are subsumed by the applicable LAR Revision 3 Enclosures. The PAR “no objections” letter is requested to be issued without delay as these activities are now near term and will impact the construction schedule of VEGP Unit 3.

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

Should you have any questions, please contact Ms. Paige Ridgway at (205) 992-7516.

Mr. Brian H. Whitley states that: he is the Regulatory Affairs Director of Southern Nuclear Operating Company; he is authorized to execute this oath on behalf of Southern Nuclear Operating Company; and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

Brian H. Whitley

BHW/ERG/ljs

Sworn to and subscribed before me this 12th *day of* October, *2016*

Notary Public: Lisa Myrick Spears

My commission expires: June 18, 2019

LISA MYRICK SPEARS
MY COMMISSION EXPIRES June 18, 2019
NOTARY PUBLIC
STATE OF ALABAMA

Enclosures: 1) through 6) provided with previous submittals.

7) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Request for License Amendment Regarding Structural Design of Auxiliary Building Floors (LAR-16-009R3)

8) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Responses to NRC Staff Comments Regarding LAR-16-009R2 (LAR-16-009R3)

9) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Proposed Changes to Licensing Basis Documents (Publicly Available Information) (LAR-16-009R3)

10) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Proposed Changes to Licensing Basis Documents **(Withheld Information)** (LAR-16-009R3)

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Southern Nuclear Operating Company

ND-16-1855

Enclosure 7

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Revised Request for License Amendment Regarding

Structural Design of Auxiliary Building Floors

(LAR-16-009R3)

(This Enclosure consists of 28 pages, including this cover page)

Table of Contents

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

1. Summary Description

Changes are proposed to the Updated Final Safety Analysis Report (UFSAR) to address changes in the structural design of selected floors including floors in the CA20 structural module and finned floors in the auxiliary building.

The selected floors include the following rooms located in the CA20 structural module, in the south end of the auxiliary building:

1. Piping/Valve Room (Room number 12262, top of concrete at elevation 82'-6", enclosed by column lines 2 and 4, and column lines J-1 and J-2),
2. Pipe Chase (Room number 12269, top of concrete at elevation 92'-6", enclosed by column lines 2 and 4, and column lines J-1 and J-2),
3. Cask Loading Pit (Room number 12463, top of steel liner at elevation 90'-3", enclosed by column lines 2 and 3, and column lines J-2 and K-2),
4. Spent Fuel Storage Pit (Room number 12563, top of steel liner at elevation 92'-8.5", enclosed by column lines 2 and 4, and column lines K-2 and L-2),
5. Waste Monitor Tank Room B (Room number 12365, top of concrete at elevation 92'-6", enclosed by column lines 3 and 4, and column lines J-2 and K-2),
6. RNS Heat Exchanger Room (Room number 12362, top of concrete at elevation 100'-0", enclosed by column lines 2 and 3, and column lines J-1 and J-2),
7. Waste Monitor Tank Room A (Room number 12363, top of concrete at elevation 107'-2", enclosed by column lines 3 and 4, and column lines J-1 and J-2),
8. Cask Washdown Pit (Room number 12462, top of steel liner at elevation 117'-6", enclosed by column lines 3 and 4, and column lines J-2 and K-2), and
9. The portion of the Fuel Handling Area enclosed by column lines 3 and 4, and column lines J-1 and J-2 (Room number 12562, top of concrete at elevation 135'-3").

The selected floors also include finned floors located in the following rooms in the north end of the auxiliary building:

10. The portion of the Lower MSIV Compartment B (Room number 12404, top of concrete at elevation 117'-6"), enclosed by column lines L and M, and shield building wall and 10' south of column line 11 (This is the finned ceiling of Division B Instrumentation and Control / Penetration Room [12304]),
11. The portion of the Lower VBS B&D Equipment Room (Room number 12405, top of concrete at elevation 117'-6"), enclosed by column lines M and P, and shield building wall and 10'

south of column line 11 (This is the finned ceiling of Division D Instrumentation and Control / Penetration Room [12305]),

12. The portion of the Main Control Room (Room number 12401, top of concrete at elevation 117'-6"), enclosed by column lines I and K, and column line 9.2 and 10' south of column line 11 (This is the finned ceiling of Divisions A and C Instrumentation and Control Rooms [12301 and 12302]), and
13. The portion of VBS Main Control Room/A&C Equipment Room (Room number 12501, top of concrete at elevation 135'-3"), enclosed by column lines I and L, and column lines 9.2 and 11 (This is the finned ceiling of the main control room [12401]).

The UFSAR text, table, and figures that are proposed to be changed provide information for these floors and are identified as Tier 2* information or as changes in Tier 2 information that are related to involved Tier 2* information. Changes include proposed modifications specific to the critical section, as well as additional clarification to define how similar finned floors other than the critical section and similar concrete on steel plate floors without fins can differ in the design details.

The ceilings of the main control room and the instrumentation and control rooms in the auxiliary building are designed as finned-floor modules. These floors of the auxiliary building are constructed with cast-in-place concrete placed on steel plates stiffened with fins welded to the underside of the plate. UFSAR Figure 3H.5-9, Sheet 1, showing the finned floor critical section, is changed to revise the representation of the openings through the floor (this also affects several general arrangement figures) and the number of supporting steel plates (panels). The variations in the detail design, which include information such as size and spacing of reinforcement in the floors and the spans of the floors, are the result of variations in the geometry of the floors and variations in the loads for which the floors are designed. The floor designs with the design variations meet design code requirements in American Concrete Institute (ACI) 349 and American Institute of Steel Construction (AISC) N690. The variations in the structural design details have no impact on the thermal function of the fins.

The design summary table (UFSAR Table 3H.5-13) for the finned floor comprising the main control room ceiling is reformatted and revised to change the calculation results, provide additional information about the design, and remove the maximum calculated shear stud spacing value from the table. Changes are proposed to UFSAR Figure 3H.5-9, Sheet 2, showing the connection of the finned floor to the supporting wall to change the representation of the reinforcement in the connection. These changes were identified as part of design finalization and meet design code requirements. Notes are added to the figure to identify variances in the design.

This activity also clarifies the floor to wall connection design for concrete on steel plate floors, including finned floors, in the auxiliary building as represented in UFSAR Figure 3H.5-9, Sheet 2. These clarifications provide additional details on the use of the code requirements for the connection design. This activity changes the description for the floors in the auxiliary

building by specifying requirements for length of the connecting dowel and capacity of the shear studs. The connection length requirements use the ACI 349 requirements for splice length.

The finned floors above the instrumentation and control rooms also have a requirement for fire protection reinforcement. The description of the design of these finned floors in UFSAR Subsections 3.8.4.1.2 and 3H.5.4 is changed to include provisions for fire protection reinforcement.

In addition to these changes to the finned floor design, minor changes are proposed to the design of reinforced concrete floors, cast-in-place concrete on precast panels, as described in UFSAR Subsections 3.8.4.1.2 and 3H.5.4 and shown in UFSAR Figure 3H.5-8.

2. Detailed Description

<u>Change Activity 1 – Finned Floor Variations</u>

Issue Description

The ceiling of the main control room (floor at elevation 135′-3″), and the instrumentation and control rooms (floor at elevation 117′-6″) are designed as finned floors. Finned floors are constructed with cast-in-place concrete over a steel plate ceiling stiffened with fins welded to the plate. UFSAR Figure 3H.5-9 shows a critical section and is identified as typical of the finned floor design. This figure is based on the detail design of the floor above the main control room and the design details of the floor above the instrumentation and control rooms vary from that shown; however, the fact that these design details may vary at other locations from those shown is not explicitly stated. Changes to the critical section figure and the referencing text are needed to explain the variances.

Proposed Change

Revise the description of the critical section in UFSAR Subsection 3H.5.4 to specify that the design details at locations other than above the main control room and near penetrations and other interferences may vary from that shown in UFSAR Figure 3H.5-9. The design of the floors with the subject variances is in conformance with design and analysis requirements for the auxiliary building identified in the UFSAR including ACI 349 and AISC N690. Revise the critical section figure, UFSAR Figure 3H.5-9, to add notes about variations in the finned floor design and code requirements involved in the variations. Note 5 is added to state that the reinforcement and connection dowels shown in the figure are away from openings, penetrations, embedments, and other obstructions. Note 9 is added to allow variation in reinforcement spacing and size. Note 11 is added to state that the design of fins varies at locations near openings, penetrations and other obstructions. Note 12 is added to state that the centerlines of the shear studs and fins may not line up. Note 15 is added to clarify that the shear stud design

shown on the figure is for locations away from openings, penetrations, embedments and other obstructions. The information added does not change the compliance of the finned floor design with codes and standards, including ACI 349 and AISC N690. The variations in the structural design details have no impact on the passive heat sink function of the fins.

Change Activity 2 – Application of Design Details to Finned Floors at Other Locations

Issue Description

The text in UFSAR Subsection 3.8.4.1.2 describes the finned floors in the auxiliary building and could be interpreted to indicate that UFSAR Figure 3H.5-9 is also typical of the details for the ceiling of the instrumentation and control rooms (floor at elevation 117′-6″). The design of the finned floor at El. 117'-6" does not exactly match the design details shown in the figure. Changes to the text in UFSAR Subsection 3.8.4.1.2 and UFSAR Figure 3H.5-9 are needed to acknowledge the variances.

Proposed Change

Revise the text in UFSAR Subsection 3.8.4.1.2 to allow variation in design details for locations other than the floor above the main control room. The auxiliary building floors designed as finned floors maintain compliance with codes and standards, including ACI 349 and AISC N690. Revise UFSAR Figure 3H.5-9, Sheet 2, to remove the elevation designation. Add Note 10 on UFSAR Figure 3H.5-9 to clarify that the elevation of the top of concrete is based on location and design requirements for the floor plates.

Change Activity 3 – Finned Floor Steel Plate Panels

Issue Description

UFSAR Figure 3H.5-9, Sheet 1, shows four finned floor steel plates (panels) between column lines 9.2 and 11 from column lines I to L. It is proposed that the number of plates between column lines 9.2 and 11 be increased to facilitate fabrication and construction.

Proposed Change

Add information to UFSAR Subsection 3.8.4.1.2 to note that the number of panels may vary based on size of the room and fabricator capabilities. The rooms utilizing these panels vary in size but, the size of the rooms is not changing. Revise UFSAR Figure 3H.5-9, Sheet 1, to increase the number of panels to six between column lines 9.2 and 11 from column lines I through K, and to five between column lines 9.2 and 11 from column lines K through L and add Note 2 to clarify that the number of the panels will vary at other locations. The change and variation in number and width of panels does not change the compliance of the finned floors

design with codes and standards, including ACI 349 and AISC N690. The variations in the number and size of the panels have no impact on the passive heat sink function of the fins.

Change Activity 4 – Relocate HVAC Penetrations

Issue Description

Openings for HVAC ducts in the ceiling of the main control room are shown in the finned floor critical section UFSAR Figure 3H.5-9, Sheet 1. A proposed change relocates these openings on the figure because of rerouting of the HVAC ducts along column line 11. The openings are moved out of the floor above the main control room to the floor above another room within the control room envelope. In addition, openings shown on the left side of the figure adjacent to column line 9.2 are reconfigured because of final design changes in routing. The same openings are also shown on UFSAR Figure 1.2-10, Figure 9A-1 (Sheet 7 of 16), Figure 12.3-1 (Sheet 8 of 16), Figure 12.3-2 (Sheet 8 of 15), and Figure 12.3-3 (Sheet 8 of 16). In addition, UFSAR Figure 12.3-2 (Sheet 8 of 15), which contains the radiation zones for the ventilation control area for the main control room and instrumentation and control rooms on elevation 135'-3", shows the projected radiation zones in the areas requiring access as well as the route taken for performance of the action related to removal of duct sections to provide an outside air ventilation pathway for the main control room, and divisions A&C equipment room, cooling at 64 hours after the accident. The adjustment of the access route to HVAC ducts along column line 11 is needed due to the relocation of the ducts.

Proposed Change

Revise UFSAR Figure 3H.5-9, Sheet 1, to relocate and reconfigure the openings for HVAC ducts in the relocated position and add Note 3 to clarify that the openings for piping, HVAC ducts, or cable trays may vary. The relocated openings along column line 11 and the reconfigured openings adjacent to column line 9.2 have no adverse impact on the finned floor design and evaluation. The relocated penetrations and the reconfigured openings adjacent to column line 9.2 have no adverse impact on the HVAC design or performance. The structural evaluation of the floor includes the relocated and reconfigured openings and is in compliance with ACI 349 and AISC N690. The changes are also made on UFSAR Figure 1.2-10, Figure 9A-1 (Sheet 7 of 16), Figure 12.3-1 (Sheet 8 of 16), Figure 12.3-2 (Sheet 8 of 15), and Figure 12.3-3 (Sheet 8 of 16). In addition, the access route to HVAC ducts along column line 11 is revised on UFSAR Figure 12.3-2 (Sheet 8 of 15) based on the relocated ducts. The revised access route has been evaluated in the analysis and remains within the dose acceptance limit of 5 rem.

Change Activity 5 – Design of Floor to Wall Connection

Issue Description

Proposed design changes are identified to the detail reinforcement design of the finned floor to wall connection represented in UFSAR Figure 3H.5-9, Sheet 2. The figure shows a floor to wall connection including reinforcement dowels connected to the wall and studs attached to the steel plate on the bottom of the floor. The figure shows the reinforcement is developed through hooks in the wall. UFSAR Subsection 3.8.4.4.1 allows using headed reinforcement as an alternative development method. The figure identifies a length for the dowel for the critical section. The dowel length used for the critical section is not used at all locations. UFSAR Figure 3H.5-9 includes detail fabrication design and construction sequence information that is not needed or appropriate in licensing basis figures. The figure also includes incidental location information that is unnecessary or confusing and should be removed or corrected.

Proposed Change

On UFSAR Figure 3H.5-9, Sheet 2, Note 4 is added to allow using headed reinforcement instead of standard hooks. On UFSAR Figure 3H.5-9, Sheet 2, Note 6 is added to address the range of size and spacing of the connecting dowel and Note 7 is added to address variation in the length dimension of the bottom reinforcement bar dowel; replace the length dimension of top reinforcement with “ACI 349 SPLICE LENGTH” to allow variation and move the top reinforcement dimension line from the face of the wall to the end of the top reinforcement. This activity does not change the design basis or design methodology for the connection between the floor and wall. The connection design methodology was approved as part of the AP1000 design as represented in UFSAR Figure 3H.5-9, Sheet 2. However, the details of the design methodology and design basis of the connection are not specified or discussed in the UFSAR. These details are added as notes on the figure addressing splice length criteria and stud sizing and spacing, and a supplemental evaluation was conducted to document the basis for the connection design and methodology. The supplemental evaluation demonstrates in detail that the force transfer in the connection design meets the ACI 349 and AISC N690 code requirements and appropriately transfers the loads through the connection. Therefore, the supplemental evaluation demonstrates the applicability of the ACI 349 and AISC N690 code requirements.

Note 13 is added to allow for the construction joint shown between the floor and wall and the gap between the steel plate and the wall to vary because these elements may vary based on fabrication considerations and construction sequence. The North–South designator is removed as it is not needed. Note 14 is added to allow for variation in layers of top reinforcement and top dowels as long as they meet the minimum reinforcement requirement per ACI 349. The designation of Wall 11 is changed to “Wall on Column Line 11” instead of using the drafting convention currently shown because the current designation may be confusing. The change of

detail reinforcement design and labeling of the figure does not change the compliance of the finned floors design with codes and standards, including ACI 349 and AISC N690 code requirements.

Change Activity 6 – Design of Concrete on Steel Plate Floors and Floor to Wall Connection

Issue Description

The description of these floors, included in the last paragraph of UFSAR Subsection 3.8.4.4.1, refers to the design methodology for the finned floors described in UFSAR Subsection 3H.5.4. UFSAR Subsection 3H.5.4 describes the design methodology for bending in the floor. The description in the last paragraph of UFSAR Subsection 3.8.4.4.1 has an inappropriate and confusing reference to main control room ceiling and stiffeners. The preceding paragraph describes the finned floor above the control room and reference to finned floors should not be included in the last paragraph. The concrete floors on steel plates in the CA20 module do not have fins. The absence of fins in the floor design makes the design similar but not exactly the same as the finned floors described in UFSAR Subsection 3H.5.4. The description of the floors does not specify all design requirements for the connection of the floor to the wall. The standard hooks shown in the wall in UFSAR Figure 3H.5-9, Sheet 2, show an orientation that may need to vary because of interferences and obstructions in the walls.

Proposed Change

Revise the existing last paragraph of UFSAR Subsection 3.8.4.4.1, to remove the reference to the main control room ceiling and stiffeners. Add text that the methodology is similar to that described in Subsection 3H.5.4.

Revise UFSAR Subsection 3.8.4.4.1, to add information about floor to wall connection design conformance with ACI 349 and AISC N690 requirements for shear stud capacities. This code applicability information applies to the floor to wall connection for both finned floors and concrete on steel plate floors without fins. An evaluation was completed for the floor-to-wall connection to confirm that ACI code provisions are appropriate for developing capacity between the wall dowels and steel plate. The floor to wall connection design information added does not change the compliance of the concrete on steel plate floor design with codes and standards, including ACI 349 and AISC N690.

Revise UFSAR Subsection 3.8.4.4.1 to add information that the orientation of the standard hooks that provide development in the walls for the reinforcement dowels may vary. The connection configurations with hook orientations different than shown in UFSAR Figure 3H.5-9, Sheet 2, meet ACI 349 code requirements for standard hooks and ACI 318-11 requirements for headed reinforcement. In addition, Note 6 on UFSAR Figure 3H.5-9 is clarified to describe that the hook orientation in CA20 floors may vary from that of finned floors.

Since the design of CA20 floors is similar to the one of finned floors, the new notes (Notes 4, 5, 6, 7, 9, 10, 13, and 14) on UFSAR Figure 3H.5-9 proposed in Change Activities 1, 2, and 5 for finned floors are also applicable to CA20 floors.

Change Activity 7 – Update Main Control Room Ceiling Design Summary

Issue Description

A review of the results of the analysis for Auxiliary Building CA51 Finned Floor at El. 135′-3″ Area 2, identified design forces that are not consistent with those listed in UFSAR Table 3H.5-13. The presentation of the information in the table is confusing without familiarity with the evaluation. The reinforcement sizing and strength of the floor design included in the table does not include some important information about the design. The information on reinforcement does not apply in openings and penetrations. The information on calculated required shear stud spacing may cause confusion about tolerances and design margin. In addition, the designation of “Area 1” should be “Area 2” in the title of the table. The reference to the table in UFSAR Subsection 3H.5.4 uses the designation 3.H.5-13.

Proposed Change

Change the values in UFSAR Table 3H.5-13 to reflect the revised design. Reformat and revise the information in the table to present the information in a more understandable manner. The area of steel (top reinforcement) provided for a 9-inch-wide strip to resist negative bending moment is added to the table, and the corresponding negative bending moment capacity is also added to the table. The information on calculated required shear stud spacing is removed from the table because the design spacing meets AISC N690 requirements and is more limiting than the calculated spacing. Add a statement that excludes reinforcement and studs in the area of penetrations, openings, or other obstructions. The discontinuities of the standard grid of shear studs at large openings have been considered in the analysis and are properly detailed per AISC N690-1994 and ACI 349-2001 requirements in the engineering drawings. Change the designation of the area in the table title. Change the reference to the table number in UFSAR Subsection 3H.5.4 from “3.H.5-13” to “3H.5-13”.

Change Activity 8 – Fire Protection Reinforcement

Issue Description

The AP1000 fire hazard analysis credits the floors above the instrumentation and control rooms as 3-hour fire barriers. Additional bottom layer reinforcing steel is required in the floors at the 117′-6″ elevation to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of the mechanical properties of exposed steel floor plate and fin plates during the fire. This reinforcement is not shown or described in the UFSAR text or figures. There is no impact on the fire rating of the floor from the additional reinforcement.

Proposed Change

Additional bottom layer reinforcing steel is added to the floor to maintain the structural integrity of the floor in the event of a fire in the room below. The reinforcement meets ACI 349 requirements, including cover requirements to protect the reinforcement and to prevent collapse of the floor. For analysis of the reinforcement, a fire is treated as an extreme environmental load in accordance with ACI 349, Section 9.2.7, requirements and the fire protection reinforcement is subject to dead, fluid, live, earth pressure, and normal pipe reaction loads. Add information to UFSAR Subsections 3.8.4.1.2 and 3H.5.4 to include use of fire protection reinforcement. Add Note 8 to UFSAR Figure 3H.5-9, Sheet 2, to include fire protection reinforcement in locations other than the critical section. The addition of bottom layer reinforcing steel does not impact the passive heat sink function of the finned floor.

Change Activity 9 – Precast Panel Width and Number of Stirrups

Issue Description

UFSAR Subsection 3H.5.3.1 describes, and UFSAR Figure 3H.5-8 shows, the design of the critical section for reinforced concrete floors constructed of cast-in-place concrete over precast panels. In this subsection and figure, the width of the precast concrete panels is stated and shown as 5′-11″ in the text and in the view titled “Floor El. 133′-11″ (Precast Concrete)”. The proposed design change for this subsection proposes to change the width of the panels to 6′-4 ½″. The change in the width of the panels is because the 5′-11″ panel width is not sufficient to fully cover the room below. The dimensions of the room are not changing. The figure shows three double stirrups connecting the precast panel to the cast-in-place concrete. The proposed design change for this subsection proposes to add a single stirrup for the wider panel to meet ACI 349, Chapter 17 requirements and the orientation of the hooks on the top of the stirrup being in the plane of the stirrup to facilitate fabrication.

Proposed Change

Revise UFSAR Subsection 3H.5.3.1 and UFSAR Figure 3H.5-8 to show the width of the precast panels to be 6′-4 ½″. Revise UFSAR Figure 3H.5-8, Section C, to show three double stirrups and one single stirrup connecting the precast panel and cast-in-place concrete. Revise UFSAR Figure 3H.5-8, Sections C and F, to reorient the hooks on the stirrups to be in the plane of the double stirrup.

Change Activity 10 – Finned Floors and CA20 Floors Construction Information

Issue Description

The finned floors and CA20 floors consist of a concrete slab poured over a stiffened steel plate. The steel plate is stiffened by fins welded at the bottom of plate in finned floors, and by

structural tees welded on the top of the steel plate in CA20 floors. However, there is no information provided in the UFSAR for either the finned floors or the CA20 floors regarding the construction sequence information, such as what formwork is used in the floors, how the stiffeners are supported during construction and whether shoring is needed before concrete is cured.

Proposed Change

Revise UFSAR Subsection 3H.5.4 to include the construction sequence information for finned floors including the steel panel (fins, steel plates, and shear connectors) fabrication and placement information, formwork and design assumptions of steel panels during construction, and shoring information. Revise UFSAR Subsection 3.8.4.4.1 to include the construction sequence information for CA20 floors including the steel panel (steel plates, structural tees, and shear connectors) fabrication and placement information, formwork and design assumptions of steel panels during construction, and shoring information.

Licensing Basis Change Descriptions

A. Revise UFSAR Figure 1.2-10 to move the openings for HVAC ducts from along column line 11 near column lines I and J to along column line L near column line 11, and to reconfigure the openings adjacent to column line 9.2. (Change Activity 4)

B. Revise the seventh paragraph of UFSAR Subsection 3.8.4.1.2 to identify variations in design in other sections, variations in the area of openings and interferences, and in the number and size of the steel panels. Also add reference to reinforcing for fire barrier structural integrity. (Change Activities 2, 3, and 8)

C. Revise the existing last paragraph of UFSAR Subsection 3.8.4.4.1 as follows: (Change Activity 6)
   1. Remove reference to control room ceiling and stiffeners.
   2. Identify that the design methodology is similar to that described in Subsection 3H.5.4.

D. Add a new paragraph to UFSAR Subsection 3.8.4.4.1, after the existing last paragraph, to refer to requirements in ACI 349 and AISC N690 for shear stud capacity. Add information that standard hook orientation may be different, but the differences in dowel anchorage details meet ACI 349 requirements for standard hooks and ACI 318-11 requirements for headed reinforcement. (Change Activity 6)

E. Add a new paragraph to the end of UFSAR Subsection 3.8.4.4.1, following the above added paragraph, to include the construction sequence information for CA20 floors. (Change Activity 10)

F. Revise last paragraph of UFSAR Subsection 3H.5.3.1 to change the width of precast panels. (Change Activity 9)

G. Revise first paragraph of UFSAR Subsection 3H.5.4 to identify variations in design in other sections and variations in the area of openings and interferences. (Change Activity 1)

H. Add a new paragraph to UFSAR Subsection 3H.5.4 after the first paragraph to include the construction sequence information for finned floors. (Change Activity 10)

I. Revise the existing second paragraph of UFSAR Subsection 3H.5.4 to replace “3.H.5-13” with “3H.5-13”. (Change Activity 7)

J. Revise the third paragraph under the heading of Design Methodology in UFSAR Subsection 3H.5.4 to add reference to reinforcing for fire barrier structural integrity. (Change Activity 8)

K. Revise UFSAR Table 3H.5-13 as follows: (Change Activity 7)
   1. Revise the table title to change the area identified in the title.
   2. Reformat the table and add text to improve comprehension.
   3. Define construction loads.
   4. Revise the calculation results for maximum bending moment.
   5. Define tension steel.
   6. Add an exception for reinforcement near penetrations and other interferences.
   7. Revise to add values to the table for the reinforcement to resist negative bending.
   8. Add an exception for shear studs near penetrations and other interferences.
   9. Add a clarification that the design shear strength is not reduced for in-plane axial forces.
   10. Remove from the table the information on shear stud calculated required spacing.

L. Revise UFSAR Figure 3H.5-8 as follows: (Change Activity 9)
   1. In the view labeled Floor EL. 133′-11″ (Precast Concrete) change the panel width from 5′-11″ to 6′-4½″.
   2. In Section C add a row of single stirrups to each of the two precast panels.
   3. In Section C and F reorient the hooks on the stirrups to be in the plane of the double stirrup.

M. Revise UFSAR Figure 3H.5-9, Sheet 1, as follows: (Change Activities 1, 3, 4, 5, and 8)
   1. Revise the figure to show six finned floor steel panels between column lines 9.2 and 11 from column lines I through K, and show five finned floor steel panels between column lines 9.2 and 11 from K through L.

2. Revise the figure to move the openings for HVAC ducts from along column line 11 near column lines I and J to along column line L near column line 11, and to reconfigure the openings adjacent to column line 9.2.
3. Add notes to the figure to provide the following information
   a. State that the section shown is a specific location and other locations will have variations in design details. (Note 1)
   b. State that the number of steel panels in the floor varies. (Note 2)
   c. State that the openings for piping, HVAC ducts, or cable trays may vary. (Note 3)
   d. State that headed reinforcement may be used, and identify the requirements for development of headed reinforcement. (Note 4)
   e. State that the reinforcement and connecting dowels shown are for locations away from obstructions. (Note 5)
   f. Identify the code requirements for connecting dowel spacing and size, and provide the range of connecting dowel spacing and size. Clarify that some connecting dowels may be developed into adjacent reinforcement concrete floors. Clarify that the hook orientation in CA20 floors may vary from that of finned floors. (Note 6)
   g. Identify the requirements for dowel length. (Note 7)
   h. Discuss bottom layer reinforcing steel provided for structural integrity of the fire barrier. (Note 8)
   i. State that the spacing and size of reinforcement in the floors varies. (Note 9)
   j. State that the elevation of the top of concrete is based on location and design requirements for the floors. (Note 10)
   k. State that the design of the fins varies at locations near obstructions and due to attachments to the fins and floor plates. (Note 11)
   l. State that the center line of the location of the studs may vary from that of the fins. (Note 12)
   m. Allow for variation in use of construction joint, and gap between steel plate and wall based on fabrication and construction needs. (Note 13)
   n. Allow for variation in layers of top reinforcement and top dowels as long as it meets the minimum reinforcement requirement per ACI 349. (Note 14)
   o. State that the shear stud design shown is for locations away obstructions. (Note 15)
4. Add identification of applicability of Notes 1, 2 and 3 at the bottom of the figure.

N. Revise UFSAR Figure 3H.5-9, Sheet 2, as follows: (Change Activities 1, 2, 5, 6, and 8)
   1. Revise spacing of the bottom reinforcement bar dowel to @9″.
   2. Remove reference to construction joint.
   3. Remove designation of 135′-3″ elevation; replace with Note 10.
   4. Remove size of the bottom dowel length; replace with Note 7.
   5. Remove size of the top dowel length, replace with “ACI 349 SPLICE LENGTH”. Move the top reinforcement dimension line from the face of the wall to the end of the top reinforcement.

6. Remove information on gap between steel plate and wall.
7. Replace the term “Mechanical Splices” with “Mechanical Couplers”.
8. Remove North–South designator.
9. Revise wall designation to say “WALL ON COLUMN LINE 11”.
10. Add identification of applicability of Notes 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14 on the figure.

O. Revise UFSAR Figure 3H.5-9, Sheet 3, as follows: (Change Activity 1)

1. Add identification of applicability of Notes 11, 12 and 15 on the figure.

P. Revise UFSAR Figure 9A-1 (Sheet 7 of 16) to move the openings for HVAC ducts from along column line 11 near column lines I and J to along column line L near column line 11, and to reconfigure the openings adjacent to column line 9.2. (Change Activity 4)

Q. Revise UFSAR Figure 12.3-1 (Sheet 8 of 16) to move the openings for HVAC ducts from along column line 11 near column lines I and J to along column line L near column line 11, and to reconfigure the openings adjacent to column line 9.2. (Change Activity 4)

R. Revise UFSAR Figure 12.3-2 (Sheet 8 of 15) (Change Activity 4)

1. Move the openings for HVAC ducts from along column line 11 near column lines I and J to along column line L near column line 11, and to reconfigure the openings adjacent to column line 9.2.
2. Revise the access route to the HVAC ducts along column line 11.

S. Revise UFSAR Figure 12.3-3 (Sheet 8 of 16) to move the openings for HVAC ducts from along column line 11 near column lines I and J to along column line L near column line 11, and to reconfigure the openings adjacent to column line 9.2. (Change Activity 4)

3. Technical Evaluation

Structure, System, Component and/or Analysis Description

The nuclear island structures consist of the containment, shield building, and auxiliary building. The 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 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. Some floors provide radiation shielding.

The floors in the auxiliary building are seismic Category I structures and provide support and anchorage for component and piping supports and other attachments. The ceilings of the main control room and the instrumentation and control rooms in the auxiliary building are designed as finned-floor modules. These finned floors are constructed with cast-in-place concrete on a steel plate ceiling stiffened with fins welded to the plate. The finned floor is designed as a two way reinforced concrete slab using the criteria and requirements of ACI 349. The steel plate provides the bottom layer reinforcement for the concrete slab. The steel plate is connected to the concrete with shear studs welded to the top of the plate. The steel plate, stiffened with welded fins, supports the wet concrete prior to the concrete setting. The connection of the floor to the wall transfers the load from the concrete and steel plate in the floor to the wall with reinforcement bar dowels located between shear studs attached to the steel plate with the dowels at an elevation below the top of the studs. The dowels are developed in the wall with a standard hook or headed reinforcement. The floor to wall connection design meets ACI 349 requirements for the length of the dowel, ACI 349 requirements for shear stud strength, and AISC N690 requirements for shear stud capacity. These connection design elements are part of the design of the floor to wall connection approved in the AP1000 design as represented in UFSAR Figure 3H.5-9, Sheet 2, and the methodology for the design remains unchanged.

Floors that are part of, and adjacent to, the CA20 module on the south end of the auxiliary building are designed as concrete on steel plate floors. These floors are similar in design to the finned floors. UFSAR Subsection 3.8.4.4.1 references the finned floor design methodology in UFSAR Subsection 3H.5.4 used for the design methodology for the concrete on steel plate floors. The steel plate provides the bottom layer reinforcement for the concrete slab. The steel plate is connected to the concrete with shear studs welded to the top of the plate. The steel plate supports the wet concrete prior to the concrete setting without the stiffening action of the fins. The design of the connection between concrete on steel plate floors and adjacent walls is similar to that described above for the finned floor connection design.

The finned floors above the instrumentation and control rooms include fire protection reinforcement. The design of these finned floors meets the ACI 349 provisions without consideration of the fins or floor plate during a postulated fire event.

Floors in the auxiliary building constructed with cast-in-place concrete over a precast panel are designed and constructed as a reinforced concrete slab using the criteria and requirements of ACI 349.

The fins and steel plate on the bottom of the floor provide a passive heat sink function for the main control room and instrumentation and control rooms as part of the main control room

emergency habitability system. The heat sinks for each room are designed to limit the temperature rise inside each room during the 72-hour period following a loss of nuclear island nonradioactive ventilation system operation. This function is described in UFSAR Subsection 6.4.2.2. The fins extend into the room and act as thermal fins to enhance the heat transfer from the room air to the concrete.

The design of headed reinforcement is consistent with the criteria for development of headed reinforcement which utilize ACI 318-11, Section 12.6 requirements and which have been previously incorporated into UFSAR Subsection 3.8.4.4.1.

Supporting Technical Details

Variation in floor reinforcement design is required because of differing geometry and loads at locations away from the critical section. In the localized areas adjacent to penetrations, openings, and other obstructions the design of the reinforcement may vary to meet design requirements for the floor or the penetration. The design of the floors with the subject variances is in conformance with design and analysis requirements for the structures identified in the UFSAR including ACI 349 and AISC N690.

The proposed changes to the size of the steel panels upon which the concrete is placed facilitate the fabrication and construction of the finned floor. The size and number of panels used for the finned floors depend on the size of the room and the fabricator capabilities.

Review of the HVAC design has identified proposed changes to the location of the penetrations through the finned floor. These changes do not have an adverse effect on the HVAC function. These changes also do not have an adverse effect on the fin and reinforcement design. With these changes, the design of the floor remains in conformance with the design and analysis requirements. The relocation of the HVAC ducts along column line 11 is also reflected in UFSAR Figure 12.3-2 (Sheet 8 of 15), which contains the radiation zones for the ventilation control area for the main control room and instrumentation and control rooms on elevation 135'-3". The figure shows the projected radiation zones in the areas requiring access as well as the route taken for performance of the action related to removal of duct sections to provide an outside air ventilation pathway for the main control room and divisions A&C equipment room cooling at 64 hours after the accident. The relocation of the duct sections requires an individual to travel approximately an additional 100 feet beyond that required by the current analysis, to where the removable duct sections are now located. The change has been included in an updated dose evaluation, which confirms that the 5 rem acceptance limit continues to be met. The incremental increase in the radiation dose (less than 0.02 rem) caused by the additional travel distance is not significant when compared to the available margin (greater than 1 rem). Therefore, the 5 rem whole body dose acceptance limit is met.

Proposed changes are identified for the development of the reinforcement in the floor and for the detail design of the connection of the floor to the wall to be consistent with standard construction practice. These changes are included in the revised UFSAR Figure 3H.5-9, Sheet 2. Note 13 allows for the gap between steel plate and wall and use of a construction joint to vary because these are related to fabrication details and construction sequence. In some of the affected floors where additional top reinforcement is required, smaller top reinforcement bars (arranged in two layers) may be utilized by considering ACI 349 detailing requirements, such as dowel development length. Therefore, Note 14 is added to allow for variation in layers of top reinforcement and top dowels as long as they meet the minimum reinforcement requirement per ACI 349. The North–South designator is removed to clean up and clarify the figure as it does not provide important information. The designation of Wall 11 is revised to a form that is more understandable. These changes do not affect the strength of the floor or connections or the conformance with ACI 349 and AISC N690.

The length for the reinforcement bar dowel is removed to allow for different lengths for the reinforcement bar dowels in UFSAR Figure 3H.5-9, Sheet 2, because the ACI code requires different lengths based on the reinforcement size used for other sections. Also, the length of the bottom dowels must be sufficient to incorporate sufficient shear studs to develop the capacity of the dowels and the demand in the bottom plate. The design of the connection meets the requirements in ACI 349 and AISC N690 for shear stud capacity. ACI 349, Appendix B includes requirements for shear studs used as anchors in concrete. These requirements are used to determine the capacity of the shear studs and the connection to the bottom plate to determine the number of shear studs required within the dowel length. Information is added in the notes on the figure about the ACI 349 and AISC N690 requirements for the length of the reinforcement dowels. Specifying additional details on the use of the code requirements for the connection design does not change the design basis of the connection as represented in the existing UFSAR Figure 3H.5-9, Sheet 2. The dowel length dimension removed from the figure was determined using these requirements.

Removing the reference to control room ceiling and stiffeners in the existing last paragraph of UFSAR Subsection 3.8.4.4.1 clarifies to which type of floor design the paragraph applies. This change does not change the design and design requirements for the concrete on steel plate floor without fins because the design of these floors does not include reliance on stiffeners. The floors without fins are considered similar to the design methodology described in UFSAR Subsection 3H.5.4 because the finned floors are designed as reinforced concrete slabs, the steel plate provides the bottom layer reinforcement for the concrete slab, and the steel plate is connected to the concrete with shear studs welded to the top of the plate. The absence of fins changes the location of the neutral axis in negative bending and the reliance on compression in the plate which is a difference with the analysis details described in Subsection 3H.5.4. This change to the UFSAR does not change the design and design requirements for the finned floor because the preceding paragraph in UFSAR Subsection 3.8.4.4.1 describes the finned floor used in the control room ceiling and is not changed.

The addition of information about the connection design in UFSAR Subsection 3.8.4.4.1 clarifies the description of the design in the licensing basis for the floor to wall connections for concrete on steel plate floors by adding specific design requirements. These specific design requirements do not change the floor to wall connection design represented in UFSAR Figure 3H.5-9 for finned floors. The design of the connections meets the requirements in ACI 349 and AISC N690 for shear stud capacity. The information added does not change the compliance of the concrete on steel plate floor design with codes and standards, including ACI 349 and AISC N690.

Revise UFSAR Subsection 3.8.4.4.1 to add information that the orientation of the standard hooks that provide development in the walls for the reinforcement dowels may vary. Floors that are connected to walls in the CA20 module on the south end of the auxiliary building use dowels developed in the wall with a standard hook or may use headed reinforcement. The standard hook details may differ from UFSAR Figure 3H.5-9, Sheet 2, because of potential interferences of the hook extension at the free end of the bar with shear studs, wall truss components, overlay plate anchorage, embedments, and other items within the wall. In some cases, the hook extensions may not be oriented toward each other as in typical beam-to-column connections. Justification of the hook orientation is based on the guidance in Regulatory Guide 1.142 and the behavior due to the design features of the CA20 module walls.

The demand-to-capacity ratios for the bending moments in the CA20 module walls do not exceed the criteria set forth in Position 3 of Regulatory Guide 1.142. Since the CA20 lateral force-resisting structures do not meet the threshold to be considered as flexural members, the ACI 349-01 Chapter 21 provisions for joints of frames are not applicable. Therefore, the tails of the top and bottom dowel hooks connecting the CA20 module walls to the adjacent floors can be orientated away from the center of the floor slab. In addition to being below the threshold to be classified as flexural members, various hook orientations are acceptable because increased concrete stress due to hook orientation with both hook extensions oriented downward, upward, or away from each other is resisted by the truss structure that provides structural integrity to the module walls. Because the module faceplate is welded to the truss structure, it provides additional confinement to the concrete and contributes to supporting the increased concrete stress. Further, the CA20 floors in the south end of the auxiliary building do not see a significant load reversal under seismic demand because the upward acting forces do not overcome deadweight. The demand remains within elastic limits, and joint degradation due to cycling into the inelastic range is not a factor in the module floor to wall connection design. The connection configurations with hook orientations different than shown in UFSAR Figure 3H.5-9, Sheet 2, meet ACI 349 code requirements.

Identifying code requirements for development length and splice length that apply to the connection design will clarify the application of ACI 349 requirements. The information added does not change the compliance of the finned floor design including the connection design with codes and standards, including ACI 349 and AISC N690. The connection design between the

floor and wall provides load transfer between reinforcement bar dowels attached to the walls and shear studs attached to the steel plate on the bottom of the floor. The floor to wall connection design is represented in UFSAR Figure 3H.5-9, Sheet 2, and was part of the design approved in the AP1000 design certification. The ACI 349 and AISC N690 requirements for the length of the reinforcement bar dowel, shear stud strength, and shear stud capacity are the design basis for the design represented in UFSAR Figure 3H.5-9. The reference to requirements for headed reinforcement in ACI 318-11 is consistent with the requirements for headed reinforcement in other portions of the auxiliary building.

The AP1000 DCD and the associated Final Safety Evaluation Report (FSER), NUREG-1793 do not specifically discuss the floor to wall connection design represented in UFSAR Figure 3H.5-9, Sheet 2. A supplemental evaluation documents the technical basis for the connection using reinforcement dowels and a matrix of shear studs. This supplemental evaluation includes detailed consideration of the connection and shows that at any location along the connection, either the plate or the dowel can carry the tensile force transferred. The transfer of shear is also evaluated.

In this supplemental evaluation the connection is considered to be divided into regions over the length of the reinforcing bar dowel. In the region adjacent to the wall, the reinforcing bar dowel is fully developed at both ends. The reinforcing bar dowels are sized based on the tension demand in the bottom plate from out-of-plane flexure and membrane tension. The reinforcing bar dowel development length within the module floor is at a minimum the Class B lap splice length in accordance with ACI 349. The reinforcing bar dowels are within the height of the shear studs connected to the module floor bottom plate. In the second region, the bottom dowel transitions from fully developed to the end of the dowel away from the wall over a length determined by the ACI 349 requirements for development length. In this second region the bottom plate is developed adequately to carry floor module demand in accordance with ACI 349 and AISC N690 requirements.

The supplemental evaluation for a CA20 floor is illustrated in Slide 35 of the Proprietary information presentation used at the pre-submittal meeting of May 26, 2016. These slides can be found in ADAMS at ML16146A038. The public non-proprietary version of these slides can be found in ADAMS at ML16146A039.

The bottom plate is anchored to the concrete with the shear studs in the region adjacent to the wall. The stud spacing (10 inches apart for the floors without fins and 9 inches apart for the finned floors) is determined based on AISC N690 requirements for developing composite action. The thickness of the bottom plate is designed to be sufficient for the construction loads (e.g., wet concrete) and the tension demand due to composite action under the applicable load combinations. The change in the spacing of the lower dowels is not required by the supplemental evaluation. The change is to optimize construction. Since there is always at least

one dowel between two adjacent rows of studs, the nominal clear distance between the dowels and shear studs is always less than 6 inches.

The design criteria for the evaluation are those included in ACI 349 and AISC N690 as they apply to the different elements that are part of the connection. The results confirm that the design requirements used for the connection design represented in UFSAR Figure 3H.5-9 for this wall-to-floor connection are appropriate and meet the plant design basis.

The changes to the UFSAR for the floor to wall connection design do not impact the moment of inertia or stiffness of the connection of the floor to the wall. There is no change in the mass of the finned floor sections. Therefore, there is no change to the seismic model and seismic analysis as a result of these changes. For floor-to-wall connections of CA20 where the bottom dowels are transverse to the tee stiffeners within the floor, and the dowels are at an elevation above the top of the bottom plate shear studs, the floor-to-wall connection is considered to be a pinned connection for upward acting loads in the design. Because the upward acting loads are not significant, treating the connection as pinned for upward acting loads has an insignificant effect on the global seismic model. For floor-to-wall connections of CA20 where the bottom dowels are parallel to the tee stiffeners within the floor, and for finned floors, the floor to wall connection is considered to be a fully fixed connection. This is not changed in the seismic model for the proposed changes.

Changes to equipment weight and location of equipment in the rooms above the finned floors, the seismic analytical model for other sections, and seismic loads as a result of cumulative changes to the structures have resulted in small changes to the Tier 2 and Tier 2* values reported in UFSAR Table 3H.5-13 for the finned floor critical section. The area of reinforcement included to resist negative bending provided by the design is proposed to be added to the table to provide information about the design not originally included in the table. The design presented in UFSAR Table 3H.5-13 is in conformance with design and analysis requirements for the structures identified in the UFSAR including ACI 349 and AISC N690. The presentation of the information in the table is confusing without familiarity with the evaluation and is proposed to be reformatted and revised. The information on calculated required shear stud spacing is not needed in the table in addition to the design spacing because the design spacing meets AISC N690 requirements and is more limiting than the calculated spacing.

Additional bottom layer reinforcing steel is added in the floors at the 117′-6″ elevation to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire. This added reinforcement meets the provisions in ACI 349. The AP1000 fire hazard analysis credits the floors as a 3 hour fire barrier. There is no impact on the fire rating of the floor from the additional reinforcement. This additional layer of reinforcing steel is not needed for the fire barrier provided by the main control room ceiling.

Changes are proposed to the size of the precast concrete panels for the reinforced concrete floor shown in UFSAR Figure 3H.5-8 to optimize the construction of the floor. The increase in width also requires an additional row of stirrups to meet ACI 349 Chapter 17 requirements for the precast panel and cast in place concrete to act as a composite section. The orientation of the hooks on the stirrups is changed to facilitate construction. The design with the proposed changes shown in the revised UFSAR Figure 3H.5-8 is in conformance with design and analysis requirements for the structures identified in the UFSAR including ACI 349.

The addition of the construction sequence information for CA20 floors in UFSAR Subsection 3.8.4.4.1 and for finned floors in UFSAR Subsection 3H.5.4 provides the steel panel fabrication and placement information, formwork and design assumptions of steel panels during construction, and shoring information. The information added does not change the design of finned floors and CA20 floors. The information added does not change the compliance of the concrete on steel plate floor design with codes and standards, including ACI 349 and AISC N690.

The passive heat sink function and design of the fins and the heat-absorbing capability of the ceilings are not adversely affected by the changes in the structural design of the finned floor. There is no change to the size of the fins and the welded connection of the fins to the steel plate in the floor above. The addition of the bottom layer of reinforcement does not change the heat capacity of the concrete.

The response of the structure to seismic motions is not altered by the changes in the design details of the subject auxiliary building floors. The stiffness of the floor, the stiffness of the floor to wall connections, and the mass of the floor are not altered from that considered in the seismic analysis finite element model of the floor. The relocation of HVAC penetrations does not impact the nuclear island finite element model. The seismic analysis of the auxiliary building is not impacted by these design changes.

The proposed changes to the detail design of auxiliary building floors do not change the function, design, or operation of the systems and components supported by and located under the floors in the auxiliary building. The proposed changes do not change the function, design, or operation of the containment vessel and passive containment cooling system. The thickness and strength of the auxiliary building floors and roof are not reduced. The proposed changes do not affect the prevention and mitigation of abnormal events, e.g., accidents, anticipated operational occurrences, earthquakes, floods and turbine missiles, or their safety or design analyses. The proposed changes do not involve, nor interface with, any structure, system or component accident initiator or initiating sequence of events, and thus, the probabilities of the accidents evaluated in the UFSAR are not affected.

The detail design changes to floors in the auxiliary building do not interface with or affect safety-related equipment or a fission product barrier. No system or design function or equipment qualification would be adversely affected by the proposed changes. The changes do not result

in a new failure mode, malfunction or sequence of events that could adversely affect a radioactive material barrier or safety-related equipment. The proposed changes do not allow for a new fission product release path, result in a new fission product barrier failure mode, or create a new sequence of events that would result in significant fuel cladding failures.

The proposed changes do not adversely affect any safety-related system or component, equipment, design code, design code allowable value, function or design analysis, nor do they adversely affect any safety analysis input or result, or design/safety margin.

The proposed changes do not adversely affect the ex-vessel severe accident. The design, geometry, and strength of the containment internal structures are not changed. The design and material selection of the concrete floor beneath the reactor vessel are not altered. The response of the containment to a postulated reactor vessel failure, including direct containment heating, ex-vessel steam explosions, and core concrete interactions is not altered by the changes to the detail design of floors in the auxiliary building. The design of the reactor vessel and the response of the reactor vessel to a postulated severe accident are not altered by the changes to the detail design of floors in the auxiliary building.

The proposed changes do not impact the Aircraft Impact Assessment. The changes described to the floors are internal to the structures and do not impact the design or response of the containment vessel and shield building. There is no change to protection of plant structures, systems, and components against aircraft impact provided by the design of the shield building. There is no change to the design of any of the key design features described in UFSAR Appendix 19F. The activity described does not change the overall design or construction of the shield building.

The proposed changes associated with this license amendment request include changes in the detail design of floors in the auxiliary building. The changes are internal to the structures and the configuration, thickness, and density of the structures are not changed. The proposed changes do not affect the radiological source terms (i.e., amounts and types of radioactive materials released, their release rates and release durations) used in the accident analyses, thus, the consequences of accidents are not affected. These changes do not affect the containment, control, channeling, monitoring, processing or releasing of radioactive and non-radioactive materials. The location and design of penetrations through exterior walls and the permeability of the concrete structures is not changed. No effluent release path is affected. The types and quantities of expected effluents are not changed. The functionality of the design and operational features that are credited with controlling the release of effluents during plant operation is not diminished. Therefore, neither radioactive nor non-radioactive material effluents are affected.

The thickness of the floors and the density of the concrete are not changed; therefore, there is no adverse change to the shielding provided by the floors. 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. Plant radiation zones, controls under 10 CFR Part 20, and expected amounts and types of radiologically controlled materials are not affected by the proposed changes. Therefore, individual and cumulative radiation exposures do not change.

The change activity has no impact on the emergency plans or the physical security evaluation since there are no changes to the external configuration of the roof, walls, doors, or access to the nuclear island.

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 1 requires that structures be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed. The proposed changes do not change the criteria used for the design, analysis, and construction of the floors in the auxiliary building. The design of the portions of the auxiliary building affected by this activity remains in conformance with the code requirements identified in the UFSAR.

10 CFR Part 50, Appendix A, GDC 2 states 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. The structures affected by this activity maintain compliance with GDC 2. The thickness, geometry, and strength of the structures are not adversely changed. The response of the structure to seismic motions is not significantly altered by the changes in the design details of the floors.

10 CFR Part 50, Appendix A, GDC 4 states 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 structures affected by this activity maintain compliance with GDC 4. The thickness, geometry, and strength of the structures are not adversely changed. The response of the structure to the effects of extreme winds and external missiles is not altered by the change in the design details of the structure. The response of the structure to the effects of seismic ground motion is not significantly altered by the change in the design details of the structure.

10 CFR Part 52, Appendix D, Section VIII.B.6 and VIII.B.5a require prior NRC approval for Tier 2* information departures and for Tier 2 information departures that involve

changes to Tier 2* information respectively. Although this departure does not adversely affect safety, it does involve departures from Tier 2* and related Tier 2 information. Therefore, NRC approval is required prior to implementing the Tier 2* and associated Tier 2 departures addressed in this departure.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The proposed amendment would revise the plant-specific design control document (DCD) Tier 2* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR) to incorporate changes to UFSAR descriptions and figures which are proposed to address changes in the design of floors in the auxiliary building.

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 auxiliary building floors are to provide support, protection, and separation for the seismic Category I mechanical and electrical equipment located in the auxiliary building. The auxiliary building is a seismic Category I structure and is designed for dead, live, thermal, pressure, safe shutdown earthquake loads, and loads due to postulated pipe breaks. The proposed changes to UFSAR descriptions and figures are intended to address changes in the detail design of floors in the auxiliary building. The thickness and strength of the auxiliary building floors are not reduced. As a result, the design function of the auxiliary building structure is not adversely affected by the proposed changes. 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 postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor do the changes described 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 changes to UFSAR descriptions and figures are proposed to address changes in the detail design of floors in the auxiliary building. The thickness, geometry, and strength of the structures are not adversely altered. The concrete and reinforcement materials are not altered. The properties of the concrete are not altered. The changes to the design details of the auxiliary building structure do not create any new accident precursors. As a result, the design function of the auxiliary building structure is not adversely affected by the proposed changes. 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 criteria and requirements of American Concrete Institute (ACI) 349 and American Institute of Steel Construction (AISC) N690 provide a margin of safety to structural failure. The design of the auxiliary building structure conforms to criteria and requirements in ACI 349 and AISC N690 and therefore maintains the margin of safety. Analysis of the connection design confirms that code provisions are appropriate to the floor to wall connection. The proposed changes to the UFSAR address changes in the detail design of floors in the auxiliary building. The proposed changes also incorporate the requirements for development and anchoring of headed reinforcement which were previously approved. There is no change to design requirements of the auxiliary building structure. There is no change to the method of evaluation from that used in the design basis calculations. There is not a significant change to the in structure response spectra. Therefore, the proposed amendment does not result in 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.

5. Environmental Considerations

The proposed amendment departs from Tier 2* and associated Tier 2 material in the UFSAR related to the structural detail design of the floors for the auxiliary building. The proposed amendment includes changes to allow variances in the detail design of the reinforcement in finned floor sections in locations other than of the critical section. The proposed amendment includes changes in the detail design of the connection of finned floor sections to adjacent walls. The proposed amendment clarifies the floor to wall connection design for concrete on steel plate floors in the auxiliary building. The proposed amendment also includes changes in the detail design of reinforced concrete floors sections.

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, or would change an inspection or surveillance requirement. However, facility construction and operation following implementation of the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed 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 proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the proposed amendment does not involve a significant reduction in a margin of safety. Therefore, 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.

(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 amendment involves structural design changes which do not change the as-built configuration of the plant systems and thus do not introduce any changes 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, these changes do not 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 proposed 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 amendment involves structural detail design changes to floors without impacting the radiation protection evaluation, and thus, do not affect any plant structure, system or component, their function, plant effluent, or radiation controls. This proposed amendment does not change the as-built configuration of the plant systems. Consequently, these changes have no effect on individual or cumulative occupational radiation exposure during plant operation. Therefore, it is concluded that the proposed amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above review of the proposed amendment, it has been determined that anticipated construction and operational impacts of the proposed 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 proposed 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), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. References

1. May 26, 2016 Public Meeting Information, ADAMS Accession Numbers ML16146A038 (Proprietary version) and ML16146A039 (public non-proprietary version).

Southern Nuclear Operating Company

ND-16-1855

Enclosure 8

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Responses to NRC Staff Comments Regarding LAR-16-009R2

(LAR-16-009R3)

Additions identified by red underlined text.
~~Deletions~~ Identified by red strikethrough of text.
Relocated existing text shown in green.
… indicates omitted existing text that is not shown.

(This Enclosure consists of 17 pages, including this cover page)

NRC Comment #1A:

In UFSAR Table 3H.5-13 changes for SNC LAR-16-009R2, NRC is seeking further information on why the Area is changed from 1 to 2 in the Table heading. Licensee to provide reference to Area 1 identification in Subsection 3H.5.2.2 and Table 3H.5-11.

Response to NRC Comment #1A:

Per UFSAR Figure 3H.5-9 (Sheet 1 of 3), the Main Control Room Ceiling at Elevation 135'-3" is enclosed by column lines I and L, and column lines 9.2 and 11, and this area is within the range of AUX BLDG AREA 2 as shown in UFSAR Figure 3H.2-1. Further, Area 1 is identified in Subsection 3H.5.2.2 and Table 3H.5-11 as the floor at elevation 135'-3", but between column lines M and P. Therefore, the title of UFSAR Table 3H.5-13 should be “DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3" AREA ~~1~~2 (MAIN CONTROL ROOM CEILING)”.

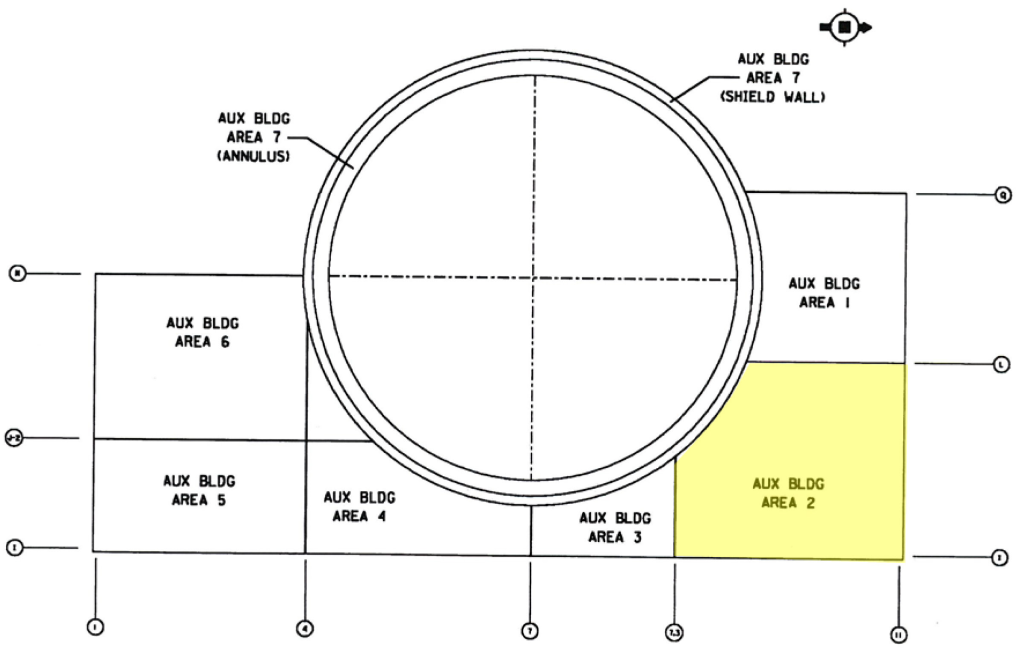


Figure 3H.2-1

[General Layout of Auxiliary Building]*

NRC Comment #1B:

In UFSAR Table 3H.5-13 changes for SNC LAR-16-009R2, in the last bullet, the maximum spacing was replaced with design spacing. The NRC staff has concerns that the maximum spacing of studs is no longer defined for studs in the area of penetrations, openings, or other obstructions, they want to make sure it meets code requirements. Licensee to provide language to address NRC's concern, but does not plan to include specific values of spacing of studs around penetrations, openings, or other obstructions in the table that might not be appropriate for all situations.

NRC Comment #1C:

In UFSAR Table 3H.5-13 changes for SNC LAR-16-009R2, the NRC staff mentioned the demand of negative moment shown in the second row is larger than the capacity in the third row. The Licensee clarified that the demand of negative moment shown in the second row is the maximum value of all finned floors, which controlled by connection at wall K; however, the capacity in the third row is corresponding to connection at wall 11. Licensee to consider adjusting the table to specify demand and capacity locations.

Comment is captured correctly. If the only change to the Table will be to specify the demand and capacity locations, a description will still be necessary for why capacity can be less than demand. Table needs to be clear (the demand and capacity should be for the same connection) and safety conclusion about the main control room design needs to be able to be made based on numbers and description provided.

NRC Comment #1D:

In UFSAR Table 3H.5-13, the NRC staff raised the question regarding why the demand is different if the design of main control room has not been revised. Licensee to investigate and provide basis.

Responses to NRC Comment #1B & 1C& 1D:

For NRC Comment #1B:

In UFSAR Table 3H.5-13, the term "maximum" has been restored to the last bullet of the table.

To address NRC's concern on shear studs design around penetrations, openings or other obstructions, the following justification is provided:

> The number of studs required to achieve full composite action per AISC N690-94 Q1.11.4 is based on the transfer of the smaller of $A_s \cdot F_y/2$ and $0.85 \cdot f_c' \cdot A_c/2$. Partial composite action, in which the amount of force the available studs can transfer is smaller than the values previously presented, is also acceptable per AISC N690-94 Q1.11.4. The number

of studs available is counted between the points of maximum positive moment and zero moment. Openings and penetrations may reduce the number of studs available. In those cases, the design has been reviewed accordingly and the code requirements are met.

For NRC Comment #1C:

In the calculation notes, the maximum negative bending demand for a 12-inch-wide strip of slab is -63 kips-ft at the connection with wall K. However, UFSAR Table 3H.5-13 shows the demand for a 9-inch-wide strip, the corresponding maximum negative demand is equal to -63 kips-ft x 0.75 = -47 kips-ft.

For consistency, the capacity should correspond to a 9-inch-wide strip of slab. The area of steel for the typical top reinforcement layout of #8@12" within a 9 inch-wide strip is 0.59 in^2. The corresponding capacity is 56 kips-ft. The capacity is larger than the demand. Therefore, there is no need to add clarification of the demand and capacity location.

For NRC Comment #1D:

The demands remain the same except for the minimum bending moment. The reason that the minimum bending moment changed from -24.4 kips-ft to -47 kips-ft is that the original demand of -24.4 kip-ft is reported at the floor to wall 11 connection and -47 kips-ft is reported at the floor to wall K connection. The demands of bending moment did not change at each location, it is just the reported location of minimum bending moment that has been changed from a connection at wall 11 to a connection at wall K.

A revised UFSAR Table 3H.5-13, incorporating responses to comments 1B & 1C & 1D, is provided in Enclosure 9.

NRC Comment #2A:

For the fire reinforcement references in SNC LAR-16-009R2, the NRC staff raised the questions on why the fire reinforcement barrier is needed, and whether it has been considered in the original design. Licensee clarified that the LAR did not propose a new design change, only a documentation change to reflect the previously revised configuration. NRC requested identification of the design change and corresponding evaluation documentation. Licensee to address.

Response to NRC Comment #2A:

UFSAR Subsection 9.5.1.2.1.1 identifies that the effects of heat generated by a fire on structural members are considered in the design. UFSAR Subsection 3H.5.4 was intended to identify and discuss the design features of the finned floor critical section at elevation 135'-3", which does not

require the additional reinforcement. This is not a change in the AP1000 design, since the provision of additional reinforcement in the finned floors at elevation 117'-6" is consistent with UFSAR Subsection 9.5.1.2.1.1 consideration of the thermal effects of fire on structural members. This reinforcement was not shown in Figure 3H.5-9 because the figure was specific to the critical section which was for the finned floor at elevation 135'-3" which is not subjected to the postulated fire and therefore does not require the bottom layer reinforcement. The new note regarding fire reinforcement has been added to Figure 3H.5-9 as a result of the expansion of UFSAR Subsection 3H.5.4 detail to identify and address design differences between the finned floor critical section at elevation 135'-3" and other finned floors in the auxiliary building.

NRC Comment #2B:

For the fire reinforcement references in SNC LAR-16-009R2, The NRC staff asked whether the fire reinforcement is needed for all finned floors or the one on elevation 117'-6" only. If so, why only on elevation 117'-6"? On page 2 of 12 of SNC LAR-16-009R2 for Subsection 3.8.4.1.2 changes, there is a reference to the additional rebar for the fire protection purposes. It is not clear where this rebar is added. Licensee to address.

Response to NRC Comment #2B:

Fire protection reinforcement is only required for the finned floors at elevation 117'-6".
These floors are subjected to a postulated fire in the instrumentation and control rooms below the main control room. In accordance with the fifth paragraph in UFSAR Subsection 9.5.1.2.1.1 under “Architectural and Structural Features,” the following is stated:

“The main control room is designed to permit rapid detection and location of fires in the underfloor and ceiling spaces and allow ready access for manual firefighting. Due to the need to provide passive cooling capability into the main control room ceiling, it will not be protected against fires from within the main control room. The ceiling will be a fire barrier from fires in the room above the main control room.”

Manual firefighting is intended to mitigate fires in the main control room. Therefore, it is anticipated that the finned floor at elevation 135'-3" will not be exposed to elevated fire temperatures and will maintain its structural integrity.

Therefore, the markup of UFSAR Subsection 3.8.4.1.2 is revised to specify that “Additional bottom layer reinforcing steel is provided in the finned floors on elevation 117'-6" where needed to maintain…”, as shown in Enclosure 9.

NRC Comment #2C:

The NRC staff asked if the main control room habitability has been impacted by this fire protection related design change. Licensee to address.

Response to NRC Comment #2C:

Please see response to NRC Comment #2D.

NRC Comment #2D:

For the relocation of HVAC penetrations, the NRC staff asked whether air-flow analysis has been performed since the HVAC penetrations have been moved to outside of the main control room. The NRC also questioned impact on flame and smoke spread in the main control room. Licensee to address.

Response to NRC Comment #2D:

There is no effect on the main control room habitability associated with the relocation of the HVAC penetrations from the Main Control Area to the Operation Break Room. The new penetrations are approximately 8 sq. ft. each which replaced the existing 8 sq. ft. penetrations. Therefore, no reduction in finned ceiling area occurred due to this change. The airflow is distributed throughout room 12401 via the duct routing.

The ductwork penetrations are provided with combination fire/smoke dampers at the penetrations to prevent spread of fire and smoke into the main control room fire area from the fire area above, consistent with the previous penetration configuration.

The further review has identified that other UFSAR figures are impacted by Change Activity 4, “Relocate HVAC Penetrations,” of the LAR. The markups of UFSAR Figure 1.2-10, Figure 9A-1 (Sheet 7), Figure 12.3-1 (Sheet 8), Figure 12.3-2 (Sheet 8), and Figure 12.3-3 (Sheet 8) are added to the LAR to consistently reflect the changes proposed in Change Activity 4. In addition, the UFSAR Figure 12.3-2 (Sheet 8), which contains the radiation zone maps for the ventilation control area for the main control room and instrumentation and control rooms on elevation 135'-3", shows the projected radiation zones in the areas requiring access as well as the route taken for performance of the action related to removal of duct sections to provide an outside air ventilation pathway for the main control room and divisions A&C equipment room cooling at 64 hours after the accident. The access route to HVAC ducts along column 11 is revised due to the relocation of the ducts. The revised access route has been evaluated in the analysis and meets the dose acceptance limit of 5 rem.

NRC Comment #2E:

For the gap shown on Figure 3H.5-9, Sheet 2, the NRC staff asked whether there will be any gap filler, and whether the gap filler is 3-hour fire rated. Licensee to address.

Response to NRC Comment #2E:

The gap shown on Figure 3H.5-9, Sheet 2 is a construction feature related to placement of the bottom plate. Once concrete is placed, the concrete closes any gap between the module floor and the adjacent wall. This final configuration provides the 3-hour fire barrier.

NRC Comment #3:

For SNC LAR-16-009R2, the NRC staff requested the licensee to provide more information regarding CA20 and finned floors use of shoring and brackets (and credit for shoring and brackets in loading) in UFSAR text or figures. It is also not clear to NRC how the steel plates in the finned floors are supported during construction. Licensee to investigate and address use of, and credit taken, for shoring and brackets. Since it is composite construction of the floors, UFSAR Subsections 3H.5.2 and 3H.5.4 to address/revise composite steel plate/finned floors construction (Shored or Un-shored) appropriately.

Response to NRC Comment #3:

Add the following construction information after the first paragraph of UFSAR Subsection 3H.5.4 for finned floors.

"The construction sequence for finned floors is as follows:

- Each panel (fins, steel plates, and shear connectors) is fabricated in the shop, brought to the floor location, and placed in position. In some cases, the panels are preassembled and placed as a module. The fins frame into steel shapes at the ends of the floors. The steel shapes are supported by intermittent brackets connected to the walls.
- The steel plate is used as the formwork for concrete placement. The wet concrete load is carried by the steel plates and the fins.
- During concrete placement, shoring may be provided for floors with longer spans. Local shoring of the steel plates at penetrations and other openings in the floor and supporting wall, or to act as temporary support at the location of an incomplete wall may also be provided."

Similarly, add the following construction information in the end of UFSAR Subsection 3.8.4.4.1 for CA20 floors.

"The construction sequence for CA20 floors is as follows:

- Each panel (steel plates, structural tees, and shear connectors) is fabricated in the shop, brought to the floor location, and placed in position. In some cases, panels are preassembled and placed as a module. The bottom plate is supported by brackets connected to the walls.
- The steel plate is used as the formwork for concrete placement. The wet concrete load is carried by the steel plates and the structural tees that act to stiffen the bottom plate.
- During concrete placement, shoring may be provided for floors with longer spans. Local shoring of the steel plates at penetrations and other openings in the floor and supporting wall, or to act as temporary support, may also be provided."

NRC Comment #3A:

On SNC LAR-16-009R2 page 18 of 26, in the last sentence of last paragraph, "The floor to wall connection is considered to be a fully fixed connection. This is not changed in the seismic model for the proposed changes", the NRC staff asked for description of connection mechanism for CA20 floors regarding whether it is fixed or pinned.

Response to NRC Comment #3A:

For downward acting loads, the top reinforcing bar dowels at the module floor-to-wall connection provide the tension reinforcement for the negative bending moment developed at the connection, while the concrete at the bottom of the module floor provides the compressive strength. For upward acting loads, the bottom reinforcing bar dowels at the module floor-to-wall connection provide the tension reinforcement for the positive bending moment developed at the connection, while the concrete at the top of the module floor provides the compressive strength. For floor-to-wall connections of CA20 where the bottom dowels are transverse to the tee stiffeners within the floor, and the dowels are at an elevation above the top of the bottom plate shear studs, the floor-to-wall connection is considered to be a pinned connection for upward acting loads in the design. Because the upward acting loads are not significant, treating the connection as pinned for upward acting loads has an insignificant effect on the global seismic model.

Modify the body of the SNC LAR-16-009R2 to clarify the fixity of connections in finned floors and CA20 floors. The updated LAR is shown below:

The changes to the UFSAR for the floor to wall connection design do not impact the moment of inertia or stiffness of the connection of the floor to the wall. There is no change in the mass of the finned floor sections. Therefore, there is no change to the seismic model and seismic analysis as a result of these changes. For floor-to-wall connections of CA20 where the bottom dowels are transverse to the tee stiffeners within the floor, and the dowels are at an elevation above the top of the bottom plate shear studs, the floor-to-wall connection is considered to be a pinned connection for upward acting loads in the design. Because the upward acting loads are not significant, treating the connection as pinned for upward acting loads has an insignificant effect on the global seismic model. For floor-to-wall connections of CA20 where the bottom dowels are parallel to the tee stiffeners within the floor, and for finned floors, the floor to wall connection is considered to be a fully fixed connection. This is not changed in the seismic model for the proposed changes.

NRC Comment #4:

For SNC LAR-16-009R2, the NRC staff requested to provide example comparisons of limiting demand vs. capacity for one finned floor and for one CA20 floor connection; include all steel members that are credited for capacity computation under the most severe loading (location with greatest interaction ratio or least margin). Cite values of demand/capacity at each of the three zones shown during meeting of May 26. Licensee to provide the requested table of calculation results.

Response to NRC Comment #4:

The examples of comparisons of limiting demand vs. capacity for one finned floor and for one CA20 floor connection are provided below:

Example of an evaluation for a finned floor dowel connection

The table below shows the interaction ratios for the finned floor-to-wall connection for the VBS main control room/A&C Equipment Room (Room number 12501, top of concrete at elevation 135'-3", enclosed by column lines I and L, and column lines 9.2 and 11).

Location* (CA51)	Description of Location	Failure mode	Demand (Maximum Tension, Kip/ft)	Capacity (Kip/ft)	Design Ratio (Demand/ Capacity)	Remarks
A	at face of wall	Bottom Dowel (#8@9")	49.1	56.9	0.86	Failure mode controlled by bar reaching yield
B	at 37 inches from wall	Bottom Plate (0.5" plate A36)	55.5	103.2	0.54	Failure mode controlled by number of studs that anchor bottom plate at location
C	at 6 feet from wall	Bottom Plate (0.5" plate A36)	55.5**	194.4	0.29	Failure mode controlled by bottom plate reaching yield

*For locations A, B, and C, see Slide 34 of the Proprietary information presentation used at the pre-submittal meeting of May 26, 2016. These slides can be found in ADAMS at ML16146A038. The public non-proprietary version of these slides can be found in ADAMS at ML16146A039.

**The demand (maximum tension) at locations A and B is different because at location A it corresponds to the tension at the dowel, and at location B it corresponds to the tension at the bottom plate. The demand (maximum tension at the bottom plate) at locations B and C is the same even though they are 35 inches apart because the larger demand, which occurs at location B, has been reported for both locations conservatively. The design ratio varies and is lower at location C because the plate capacity at location C is larger than at location B.

Example of an evaluation for a CA20 module floor to wall dowel connection

The table below shows the interaction ratios for the CA20 module floor-to-wall connection for the Spent Fuel Storage Pit (Room number 12563, top of steel liner at elevation 92'-8.5", enclosed by column lines 2 and 4, and column lines K-2 and L-2). It presents an example of the results of a module floor to module wall connection. The supplemental evaluations conservatively assume that 100% of the post-construction design forces, specifically tension in the bottom of the slab, can be taken by either the slab bottom dowels or the slab bottom steel plate system (weld and studs) at the wall connection. Both systems provide enough capacity to meet the demand without reliance on a sharing of load between the two possible load paths to the wall. This demonstrates the redundancy of the connection detail.

Location* (CA20_47 to CA20_50)	Description of Location	Failure mode	Demand (Maximum Tension, Kip/ft)	Capacity (Kip/ft)	Design Ratio (Demand/ Capacity)	Remarks
A	at face of wall	Bottom Dowel (#10@10")	63.7	82.3	0.77	Failure mode controlled by dowel reaching yield
B**	at 15 inches from wall	Bottom Plate (0.5" plate A36)	61.76	126.03	0.49	Failure mode is controlled by the number of studs, between locations A & B, that anchor the bottom plate in combination with the continuous weld that connects the bottom plate to the stiffened support bracket.
C	at 5 ft-2 in from wall	Bottom Plate (0.5" plate A36)	60.29	194.4	0.31	Failure mode controlled by bottom plate reaching yield.

* See Slide 35 of the Proprietary information presentation used at the pre-submittal meeting of May 26, 2016. These slides can be found in ADAMS at ML16146A038. The public non-proprietary version of these slides can be found in ADAMS at ML16146A039.

** The capacity that is listed for location B is based off the summation of 1 row of studs within the location of A & B, and the governing weld capacity. Although the ratio is not provided in the table above, the weld capacity without the aid of the studs has been proven to provide sufficient capacity to meet the demand.

NRC Comment #5:

On SNC LAR-16-009R2 page 16 of 26, in the second paragraph last sentence, “the nominal clear distance between the dowels and shear studs is always less than 6 inches”, the NRC staff asked for a source reference for the 6 inches (based on code?), and they asked how this is related to the studs spacing defined on page 18 of 26 in the fourth paragraph. Licensee clarified that the 6" spacing is following the code requirement for non-contact lap splice spacing although the bottom dowels do not constitute a non-contact lap splice. Licensee to consider revising the paragraphs to clarify the information, and link these discussions.

Response to NRC Comment #5:

The background information of “the nominal clear distance between the dowels and shear studs is always less than 6 inches” is provided below as a reviewer’s aid.

The dowels are designed to be at or below the height of the 6" tall shear studs and within 6" of distance from the shear studs as illustrated in Figure 1. The shear studs are spaced at 9" on center. The dowel spacing varies between floors; however, the dowels remain within 6" distance from the shear studs for the CA20 and auxiliary building finned floors.

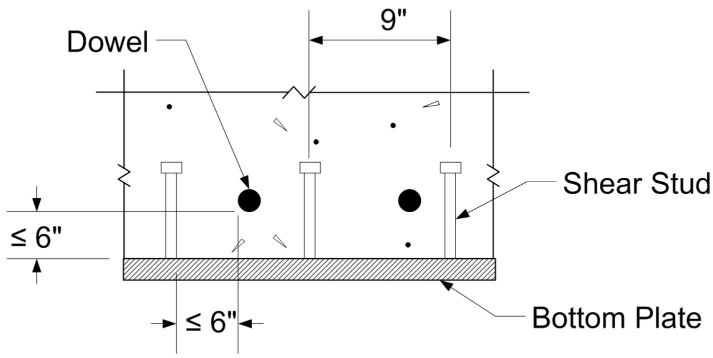


Figure 1

Tension in the bottom plate is transferred to the reinforcing bar dowels anchored in the module wall by the gradual transfer of stress via the shear studs interacting with the dowel extending along the bottom plate. The reinforcing bar development is determined by the ACI 349 Class B lap splice length because the force transfer mechanism between the bottom plate and the reinforcing bar dowel is similar to a reinforcing bar noncontact lap splice. A maximum of 6" clear distance between the dowels and the shear studs is maintained to be consistent with the ACI 349 Section 12.14.2.3 requirements for a noncontact lap splice. The shear studs provide confinement for the lower reinforcing bar dowels and act as transverse reinforcement to control splitting parallel to the bottom plate. In addition, the bottom plate acts as transverse reinforcement to control splitting perpendicular to the bottom plate.

To clarify the text in SNC LAR-16-009R2, the information in the second paragraph on page 16 of 26 is combined with the fourth paragraph on page 18 of 26, and the second paragraph on page 16 of 26 is then deleted; the revised fourth paragraph on page 18 of 26 is shown below:

> The bottom plate is anchored to the concrete with the shear studs in the region adjacent to the wall. The stud spacing (10 inches apart for the floors without fins and 9 inches apart for the finned floors) is determined based on AISC N690 requirements for developing composite action. The thickness of the bottom plate is designed to be sufficient for the construction loads (e.g., wet concrete) and the tension demand due to composite action under the

applicable load combinations. The change in the spacing of the lower dowels is not required by the supplemental evaluation. The change is to optimize construction. Since there is always at least one dowel between two adjacent rows of studs, the nominal clear distance between the dowels and shear studs is always less than 6 inches.

NRC Comment #6:

On SNC LAR-16-009R2 page 2 of 12 and page 3 of 12, the NRC staff requested for clarification of "design element", the NRC staff believes that it is not clear what the design elements are and think that the design elements should be described. Is design element different for Finned and non-Finned floors? Licensee to provide this information.

Response to NRC Comment #6:

The corresponding paragraphs with "design elements" in UFSAR Subsections 3.8.4.1.2 and 3H.5.4 are only for finned floors. The references to "design elements" are changed to "connecting dowels" as shown in the markups of UFSAR Subsections 3.8.4.1.2 and 3H.5.4 inserted below:

UFSAR Subsection 3.8.4.1.2, Auxiliary Building – Revise to include additional information in the seventh paragraph as shown below.

The ceiling of the main control room.... ...Shear studs are welded on the other side of the steel plate, and the steel and concrete act as a composite section. Figure 3H.5-9 shows the finned floor above the main control room and the connection of the floor to the wall on column line 11. The finned floors above the instrumentation and control rooms are similar, but differ with some design details, such as the size and spacing of reinforcement and the design elements [connecting dowels] used in the connection of the floor to the wall. Penetrations and other interferences in the floors and adjacent walls may cause localized variances with the design details shown in the figure. The fins are exposed to the environment of the room, and enhance the heat-absorbing capacity of the ceiling (see Design Control Document (DCD) Subsection 6.4.2.2). Several shop-fabricated steel panels, placed side by side, are used to construct the stiffened plate ceiling in a modularized fashion. The number of panels used is determined by the size of the room and fabricator capabilities. The stiffened plate is designed to withstand construction loads prior to concrete hardening. Additional bottom layer reinforcing steel is provided where needed to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire.

UFSAR Subsection 3H.5.4, Concrete Finned Floors – Revise to include additional information in the first paragraph as shown below.

[*The ceilings…. …Shear studs are welded on the other side of the steel plate, and the steel and concrete act as a composite section. Figure 3H.5-9 shows the finned floor above the main control room and the connection of the floor to the wall on column line 11. The finned floors above the instrumentation and control rooms are similar, but differ with some design details, such as the size and spacing of reinforcement and the design elements used in the connection of the floor to the wall. Penetrations and other interferences may cause localized variances with the design details shown in the figure. The fins are exposed…*]*

connecting dowels

NRC Comment #7:

On SNC LAR-16-009R2 page 17 of 26, in the second paragraph last sentence, the NRC staff asked why the latest edition of ACI-349 is mentioned, and suggested to remove it if not necessary. Licensee agrees the reference is not necessary and will remove it.

Response to NRC Comment #7:

On SNC LAR-16-009R2 page 17 of 26, the last sentence in the second paragraph is deleted as suggested.

NRC Comment #8:

On SNC LAR-16-009R2 page 2 of 12, the NRC staff does not like "continue to meet" phrase. Licensee agrees to search for and remove "continue to" phrase

Response to NRC Comment #8:

On SNC LAR-16-009R2 page 2 of 12, the phrase "continue to" is deleted from UFSAR Subsection 3.8.4.4.1 as suggested.

Further, a search was performed, and other "continue to" statements are also removed from the body of the LAR, as summarized below:

On page 5 of 26, in the Proposed Change of Change Activity 1:

"…The design of the floors with the subject variances is ~~continues to be~~ in conformance with design and analysis requirements for the auxiliary building identified in the UFSAR including ACI 349 and AISC N690…"

On page 6 of 26, in the Proposed Change of Change Activity 2:

"…The auxiliary building floors designed as finned floors ~~continue to~~ maintain compliance with codes and standards, including ACI 349 and AISC N690…"

On page 9 of 26, in the Proposed Change of Change Activity 6:

"…The connection configurations with hook orientations different than shown in UFSAR Figure 3H.5-9, Sheet 2, ~~continue to~~ meet ACI 349 code requirements…"

On page 17 of 26, in the ninth paragraph of Supporting Technical Details:

"…The connection configurations with hook orientations different than shown in UFSAR Figure 3H.5-9, Sheet 2, ~~continue to~~ meet ACI 349 code requirements. …"

NRC Comment #9:

On SNC LAR-16-009R2 page 10 of 12 and page 11 of 12, the NRC staff requested to add a note to explain the variation of hook orientation in CA20 floors and finned floors. The NRC staff asked the licensee to add hook orientation description in either LAR and UFSAR 3.8.4.4.1 changes or add Note to UFSAR Figure 3H.5-9 (Sheet 2 of 3) to allow for variation. Licensee will investigate.

The licensee should also add a description of the WT shapes and the brackets in either LAR or UFSAR 3.8.4.4.1 or add Note to Figure 3H.5-9 (Sheet 2 of 3) to allow for variation from the Figure for CA20 floors.

Response to NRC Comment #9:

To address NRC's Comment #9 in the first paragraph:

On the markup of UFSAR Figure 3H.5-9, add the sentence "THE HOOK ORIENTATION IN CA20 FLOORS MAY VARY FROM THAT OF FINNED FLOORS" in note 6 (original note 4) after "IN CERTAIN LOCATIONS SOME CONNECTING DOWELS ARE DEVELOPED INTO ADJACENT REINFORCEMENT CONCRETE FLOORS INSTEAD OF CONNECTING TO HOOKS OR HEADED REINFORCEMETN IN THE WALL."

To address NRC's Comment #9 in the second paragraph, the WT shapes and the brackets information is added in the end of UFSAR Subsection 3.8.4.4.1 for CA20 floors, as shown in the response to Comment #3A.

NRC Comment #10:

The NRC staff commented that the SNC LAR-16-009R2 sequencing of Notes on separate sheets of a single figure (3H.5-9) may lead to confusion and suggested the Notes be similarly numbered on each sheet. Licensee to address.

Response to NRC Comment #10:

On the markup of UFSAR Figure 3H.5-9, the notes on Sheet 1, 2 and 3 are combined, and the combined notes are provided on Sheet 1 only. Additionally, Notes 1, 2, and 3 are identified as applicable to Sheet 1.

The markup of Figure 3H.5-9, Sheet 2, is revised to reflect the updated notes numbering.

The markup of Figure 3H.5-9, Sheet 3, is revised to reflect the updated notes numbering.

In addition, the body of the LAR where these notes are referenced has been revised to reflect the updated notes numbering.

NRC Comment #11:

On page 8 of 26 of SNC LAR-16-009R2 there is a statement that CA20 does not include stiffeners. However, there are stiffeners provided in CA20 floors such as WT. The use of stiffeners needs to be clarified in the LAR. Licensee to consider and address.

Response to NRC Comment #11:

On page 8 of 26 of SNC LAR-16-009R2, in the Issue Description of Change Activity 6, modify the use of stiffeners in CA20 floors as shown below:

> "…The preceding paragraph describes the finned floor above the control room and reference to finned floors should not be included in the last paragraph. ~~The concrete on steel plate floors without fins do not have stiffeners.~~ The concrete floors on steel plates in the CA20 module do not have fins. The absence of fins in the floor design makes the design similar but not exactly the same as the finned floors described in UFSAR Subsection 3H.5.4…."

NRC Comment #12:

The NRC staff commented that the text description in SNC LAR-16-009R2 for change activities #2 and #5 appears to describe the change for only finned floors; these should likely also address how they are applicable to the CA20 floors as well. Licensee to investigate and address.

Response to NRC Comment #12:

It is identified that Notes 4, 5, 6, 7, 9, 10, 13, and 14 proposed on Figure 3H.5-9 are applicable to both CA20 floors and finned floors.

Notes 5 and 9 proposed on Figure 3H.5-9 are identified in the change activity #1 of the LAR. Note 10 proposed on Figure 3H.5-9 is identified in the change activity #2 of the LAR, and Note 4 proposed on Figure 3H.5-9 is identified in the change activity #5 of the LAR. Although change activities #1, 2 and 5 only describe changes for finned floors, some of the changes in activities #1, 2 and 5 are also applicable to CA20 floors for the reason that UFSAR Subsection 3.8.4.4.1 correlates CA20 floors with finned floors. Since change activity #6 is the one discussing changes for CA20 floors, add the following paragraph after the last paragraph of Change Activity #6 “Proposed Change.”

> “Since the design of CA20 floors is similar to the one of finned floors, the notes (Notes 4, 5, 6, 7, 9, 10, 13, and 14) on UFSAR Figure 3H.5-9 proposed in Change Activities 1, 2, and 5 for finned floors are also applicable to CA20 floors.”

Southern Nuclear Operating Company

ND-16-1855

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Enclosure 9

Proposed Changes to Licensing Basis Documents

(Publically Available Information)

(LAR-16-009R3)

Additions identified by red underlined text.
~~Deletions~~ Identified by red strikethrough of text.
Relocated existing text shown in green.
… indicates omitted existing text that is not shown.

(This Enclosure consists of 13 pages, including this cover page)

UFSAR Figure 1.2-10, Nuclear Island General Arrangement Plan at El. 135'-3" – Revise HVAC duct locations in Room 12501 as shown below.

This UFSAR figure contains security-related information and is provided in Enclosure 10.

UFSAR Subsection 3.8.4.1.2, Auxiliary Building – Revise to include additional information in the seventh paragraph as shown below.

The ceiling of the main control room…. ...Shear studs are welded on the other side of the steel plate, and the steel and concrete act as a composite section. Figure 3H.5-9 shows the finned floor above the main control room and the connection of the floor to the wall on column line 11. The finned floors above the instrumentation and control rooms are similar, but differ with some design details, such as the size and spacing of reinforcement and the connecting dowels used in the connection of the floor to the wall. Penetrations and other interferences in the floors and adjacent walls may cause localized variances with the design details shown in the figure. The fins are exposed to the environment of the room, and enhance the heat-absorbing capacity of the ceiling (see Design Control Document (DCD) Subsection 6.4.2.2). Several shop-fabricated steel panels, placed side by side, are used to construct the stiffened plate ceiling in a modularized fashion. The number of panels used is determined by the size of the room and fabricator capabilities. The stiffened plate is designed to withstand construction loads prior to concrete hardening. Additional bottom layer reinforcing steel is provided in the finned floors at elevation 117'-6" where needed to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire.

UFSAR Subsection 3.8.4.4.1, Seismic Category I Structures – Revise to include additional information for, and after, the last paragraph as shown below.

The concrete floors on steel plates, including the ~~control room ceiling and the~~ floors in the CA20 module, are designed as reinforced concrete slabs in accordance with ACI-349. The steel panels are designed and constructed in accordance with AISC-N690. For positive bending, the steel plate is in tension and the steel plate ~~and stiffeners~~ serves as the bottom reinforcement. For negative bending, compression is resisted by the concrete and ~~stiffened~~ steel plate and the tension by top reinforcement in the concrete. This methodology is similar to that described for the control room ceiling in Subsection 3H.5.4.

The design of the connection meets ACI 349 and AISC N690 requirements for shear stud capacity. The anchorage of the reinforcing dowels may vary from that shown in Figure 3H.5-9, Sheet 2. Differences in dowel anchorage details meet ACI 349 requirements for standard hooks and ACI 318-11 requirements for headed reinforcement.

The construction sequence for CA20 floors is as follows:

- Each panel (steel plates, structural tees, and shear connectors) is fabricated in the shop, brought to the floor location, and placed in position. In some cases, panels are preassembled and placed as a module. The bottom plate is supported by brackets connected to the walls.
- The steel plate is used as the formwork for concrete placement. The wet concrete load is carried by the steel plates and the structural tees that act to stiffen the bottom plate.
- During concrete placement, shoring may be provided for floors with longer spans. Local shoring of the steel plates at penetrations and other openings in the floor and supporting wall, or to act as temporary support, may also be provided.

UFSAR Subsection 3H.5.3.1, Operations Work Area (Tagging Room) Ceiling – Revise the information in the last paragraph as shown below.

[*….*

The two precast concrete panels, each 6′-4½″ ~~5′-11″~~ wide and spanning over 16′-0″ clear span, are installed to serve as the formwork.]*

UFSAR Subsection 3H.5.4, Concrete Finned Floors – Revise to include additional information as shown below, and revise the table reference in the paragraph following the inserted material.

[*The ceilings…. …Shear studs are welded on the other side of the steel plate, and the steel and concrete act as a composite section. Figure 3H.5-9 shows the finned floor above the main control room and the connection of the floor to the wall on column line 11. The finned floors above the instrumentation and control rooms are similar, but differ with some design details, such as the size and spacing of reinforcement and the connecting dowels used in the connection of the floor to the wall. Penetrations and other interferences may cause localized variances with the design details shown in the figure. The fins are exposed… …prior to concrete hardening.*]*

The construction sequence for finned floors is as follows:

- Each panel (fins, steel plates, and shear connectors) is fabricated in the shop, brought to the floor location, and placed in position. In some cases, the panels are preassembled and placed as a module. The fins frame into steel shapes at the ends of the floors. The steel shapes are supported by intermittent brackets connected to the walls.
- The steel plate is used as the formwork for concrete placement. The wet concrete load is carried by the steel plates and the fins.
- During concrete placement, shoring may be provided for floors with longer spans. Local shoring of the steel plates at penetrations and other openings in the floor and supporting wall, or to act as temporary support at the location of an incomplete wall may also be provided.

[*The main control room ceiling fin floor is designed for the dead, live, and the seismic loads. The design summary is shown in Table 3~~.~~H.5-13.*

The finned floor structure is evaluated for the load combinations listed in Tables 3.8.4-1 and 3.8.4-2.]*

UFSAR Subsection 3H.5.4, Concrete Finned Floors – Revise the information at the end of the third paragraph under the heading of Design Methodology to include additional information as shown below.

[…

…The stiffened plate provides crack control capability for the bottom of the slab in the transverse direction. Additional bottom layer reinforcing steel is provided in the finned floors at elevation 117'-6" where needed to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire.

*…]**

UFSAR Table 3H.5-13, Design Summary Of Floor At Elevation 135'-3" Area 1 (Main Control Room Ceiling) – Revise the title of this table to read as shown below.

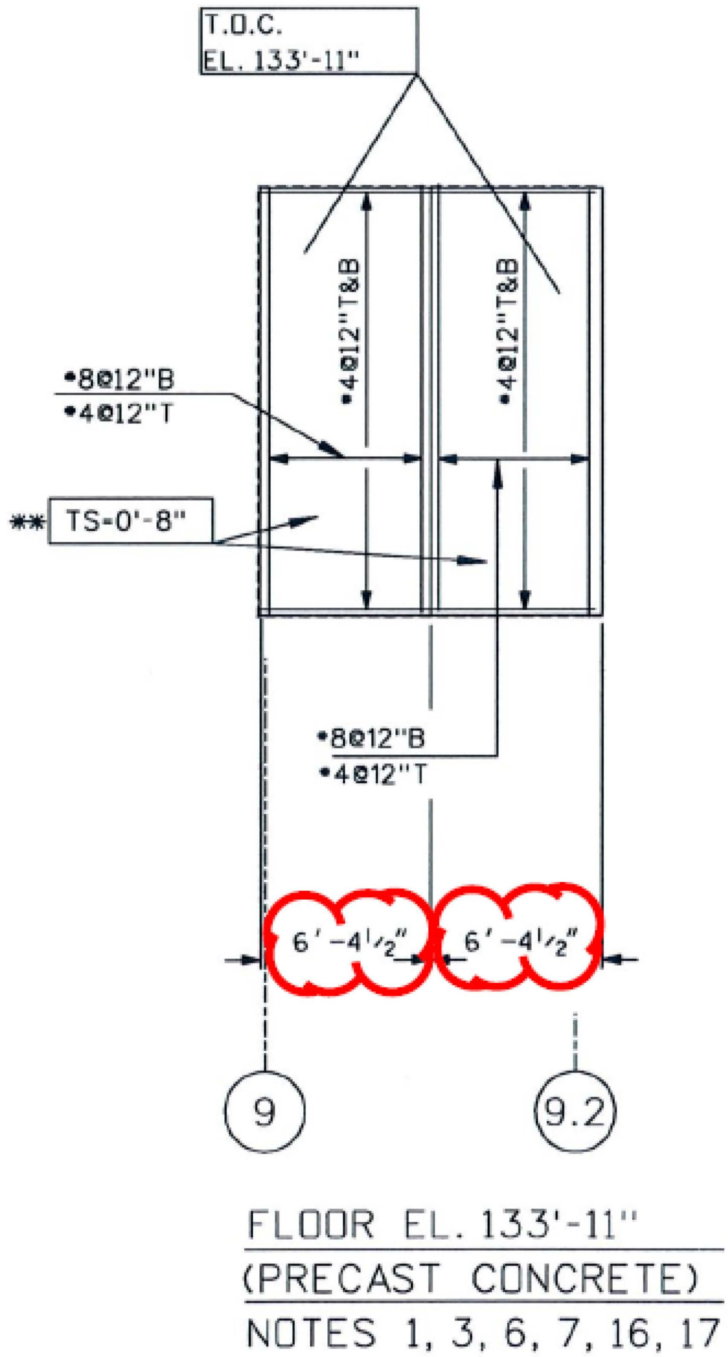
DESIGN SUMMARY OF FLOOR AT ELEVATION 135'-3"
AREA 1 2 (MAIN CONTROL ROOM CEILING)

UFSAR Table 3H.5-13, Design Summary Of Floor At Elevation 135'-3" Area 1 (Main Control Room Ceiling) – Revise the information in the table as shown below.

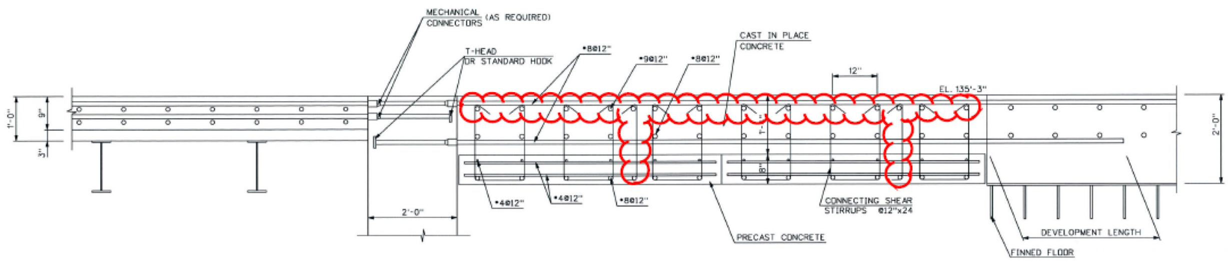
The design of the bottom plate with fins is governed by the construction (wet concrete) load.
For the composite floor, the design forces used for the evaluation of a typical 9-inch-wide strip of the slab are as follows: Maximum bending moment = +35.0 (-24.4) (-47.0) kips-ft Maximum shear force = 22.3 kips
The design evaluation results key structural capacities of a 9-inch wide strip of the slab are as followssummarized below:(1) • [*The actual area of the tension steel (bottom plate and fins) is 9.0 in*^{2} *(Min.), except in the area of penetrations, openings, or other obstructions,*]* which provides a design strength positive bending moment capacity of 518.5 kips-ftbending moment capacity. • The minimum provided area of tension steel (top reinforcement) is 0.59 in^2, except in the area of penetrations, openings, or other obstructions, which provides a negative bending moment capacity of 56 kips-ft. • [*The design shear strength, not reduced for in-plane axial forces, is 23.22 kips.* • *The shear studs are spaced have a maximum design spacing of 9 inches c/c, in both directions except in the area of penetrations, openings, or other obstructions.*]* The calculated required spacing is 9.06 inches.

{The existing note is not revised.}

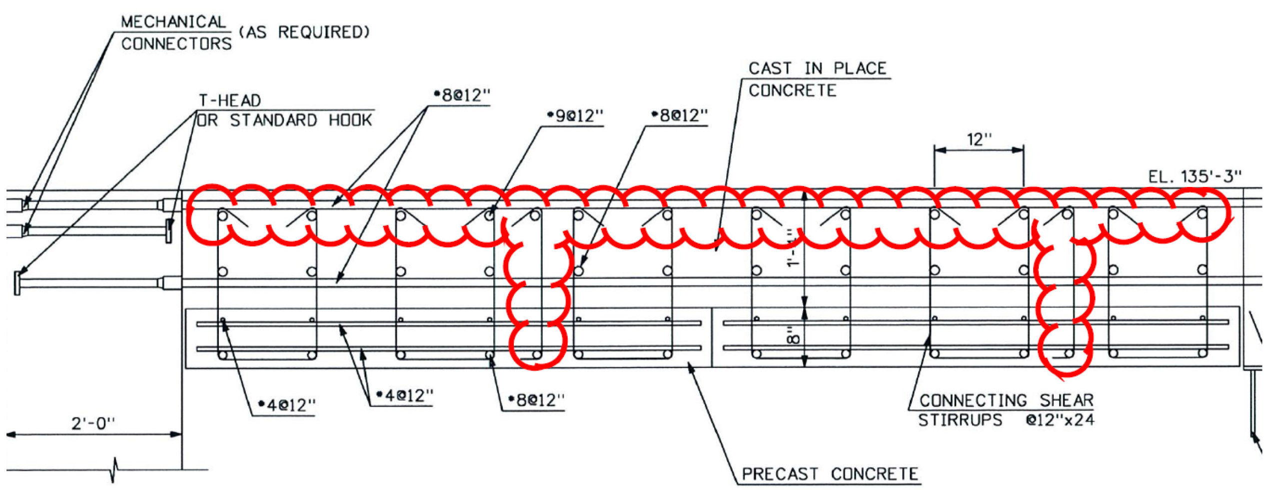
UFSAR Figure 3H.5-8, Auxiliary Building Operations Work Area (Tagging Room) Ceiling – Revise the information for Floor El. 133'-11" (Precast Concrete) as shown below.



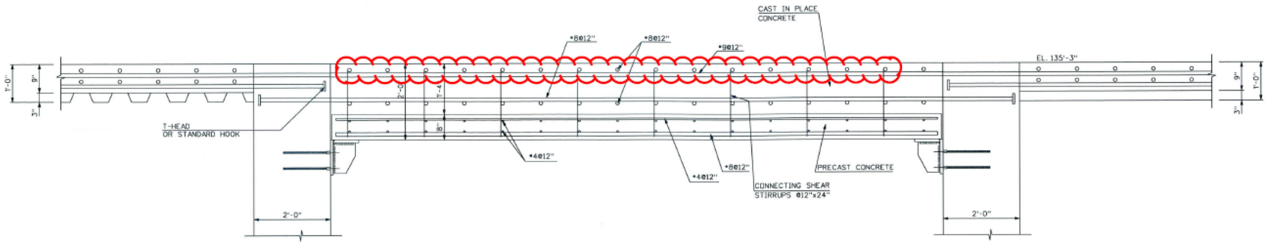
UFSAR Figure 3H.5-8, Auxiliary Building Operations Work Area (Tagging Room) Ceiling – Revise the information for Section C (Looking West) as shown below.



Additional detail of changed area.

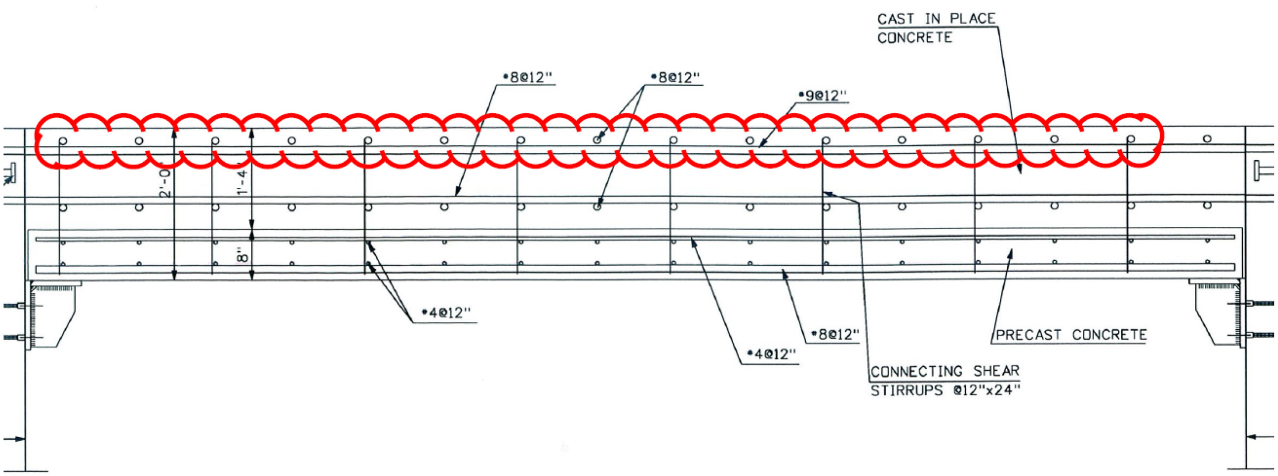


UFSAR Figure 3H.5-8, Auxiliary Building Operations Work Area (Tagging Room) Ceiling – Revise the information for Section F (Looking North) as shown below.

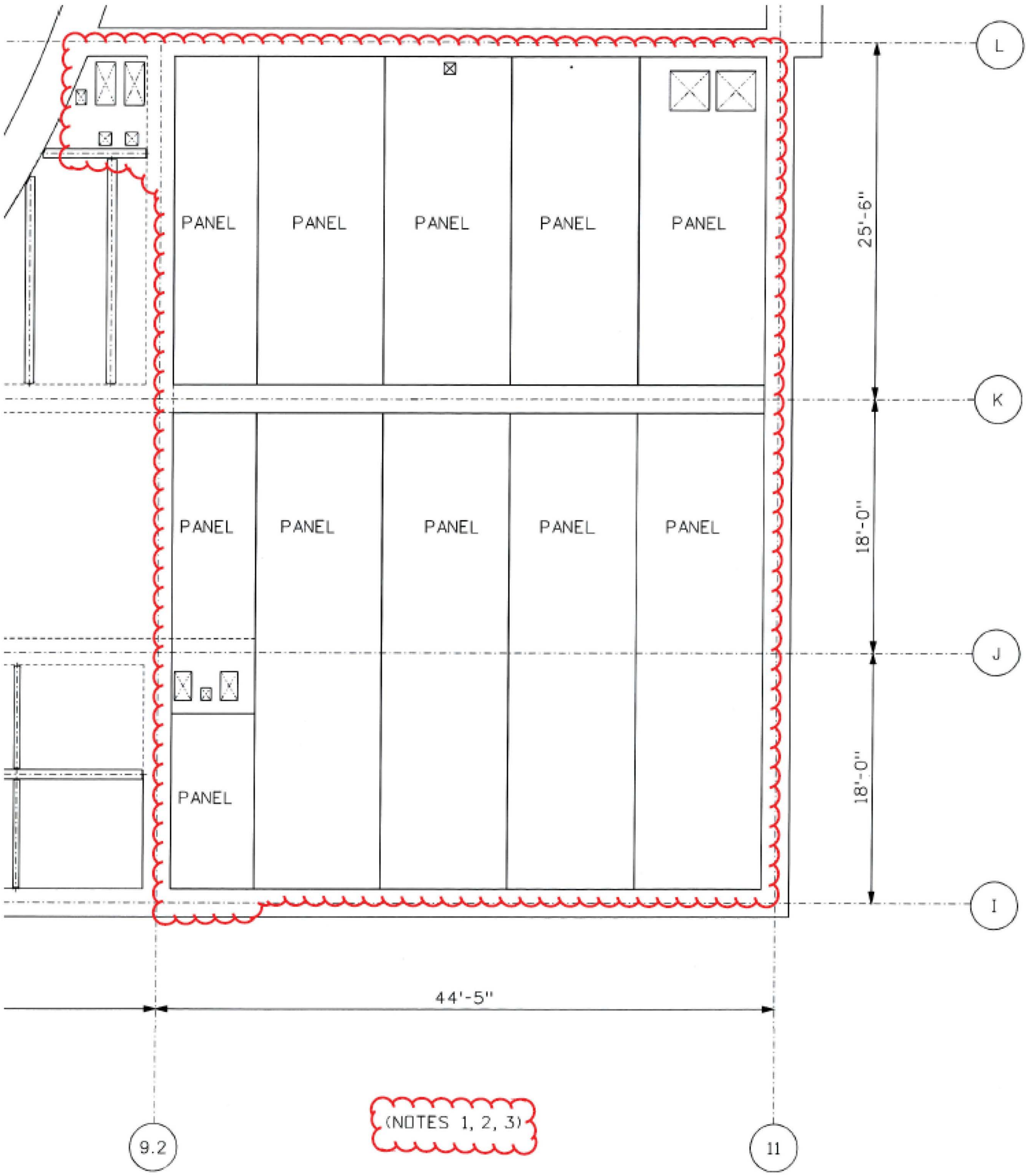


SECTION F (LOOKING NORTH)
NOTES 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

Additional detail of changed area.



UFSAR Figure 3H.5-9 (Sheet 1 of 3), Auxiliary Building Finned Floor – Revise the information as shown below.



UFSAR Figure 3H.5-9 (Sheet 1 of 3), Auxiliary Building Finned Floor – Revise the information to add the Notes shown below.

NOTES:

1. DETAIL SHOWN IS SPECIFIC TO THE REINFORCED CONCRETE FLOOR AT EL. 135'-3" (MAIN CONTROL ROOM CEILING). REFER TO THIS AND OTHER NOTES FOR ADDITIONAL INFORMATION ABOUT DESIGN DETAILS FOR OTHER FLOOR SECTIONS AND FOR CONNECTIONS TO OTHER WALLS.

2. THE NUMBER OF STEEL PANELS USED TO CONSTRUCT THE FLOORS IS DETERMINED BY THE SIZE OF THE ROOM AND FABRICATOR CAPABILITIES.

3. THE OPENINGS FOR PIPING, HVAC DUCTS, OR CABLE TRAYS MAY VARY.

4. THE DEVELOPMENT OF THE FLOOR REINFORCEMENT IN THE WALLS CAN BE HEADED REINFORCEMENT INSTEAD OF STANDARD HOOKS. REFER TO SUBSECTION 3.8.4.4.1 FOR THE REQUIREMENTS FOR DEVELOPMENT OF HEADED REINFORCEMENT.

5. THE REINFORCEMENT AND CONNECTION DOWELS SHOWN ARE FOR LOCATIONS AWAY FROM OPENINGS, PENETRATIONS, EMBEDMENTS, AND OTHER OBSTRUCTIONS.

6. REINFORCEMENT SPACING AND SIZE FOR CONNECTING DOWELS ARE BASED ON THE REQUIREMENTS IN ACI 318-11 SECTION 12.6 AND ACI 349. THE RANGE OF SPACING AND SIZE OF THE CONNECTING DOWELS VARIES FROM 6" TO 12" AND FROM #8 TO #11, RESPECTIVELY. IN CERTAIN LOCATIONS SOME CONNECTING DOWELS ARE DEVELOPED INTO ADJACENT REINFORCEMENT CONCRETE FLOORS INSTEAD OF CONNECTING TO HOOKS OR HEADED REINFORCEMENT IN THE WALL. THE HOOK ORIENTATION IN CA20 FLOORS MAY VARY FROM THAT OF FINNED FLOORS.

7. DOWEL LENGTH IS THE LONGEST OF A) ACI 349 REQUIREMENTS FOR SPLICE LENGTH, B) LENGTH TO INCORPORATE SUFFICIENT SHEAR STUDS TO DEVELOP THE CAPACITY OF THE DOWEL, PER AISC N690 SHEAR STUD CAPACITIES, OR C) LENGTH TO INCORPORATE SUFFICIENT SHEAR STUDS TO DEVELOP THE DEMAND IN THE BOTTON PLATE, PER AISC N690 SHEAR STUD CAPACITIES.

8. ADDITIONAL BOTTOM LAYER REINFORCING STEEL IS PROVIDED IN THE FINNED FLOORS AT ELEVATION 117'-6" WHERE NEEDED TO MAINTAIN THE STRUCTURAL INTEGRITY OF THE FIRE BARRIER.

9. THE RANGE OF REINFORCEMENT SPACING AND SIZE VARIES FROM 6" TO 12" AND FROM #7 TO #11, RESPECTIVELY.

10. THE ELEVATION OF THE TOP OF CONCRETE IS BASED ON LOCATION AND DESIGN REQUIREMENTS FOR THE FLOOR PLATES.

11. THE DESIGN OF THE FINS VARIES AT LOCATIONS NEAR OPENINGS, PENETRATIONS, AND OTHER OBSTRUCTIONS AND DUE TO ATTACHMENTS TO THE FINS AND FLOOR PLATES.

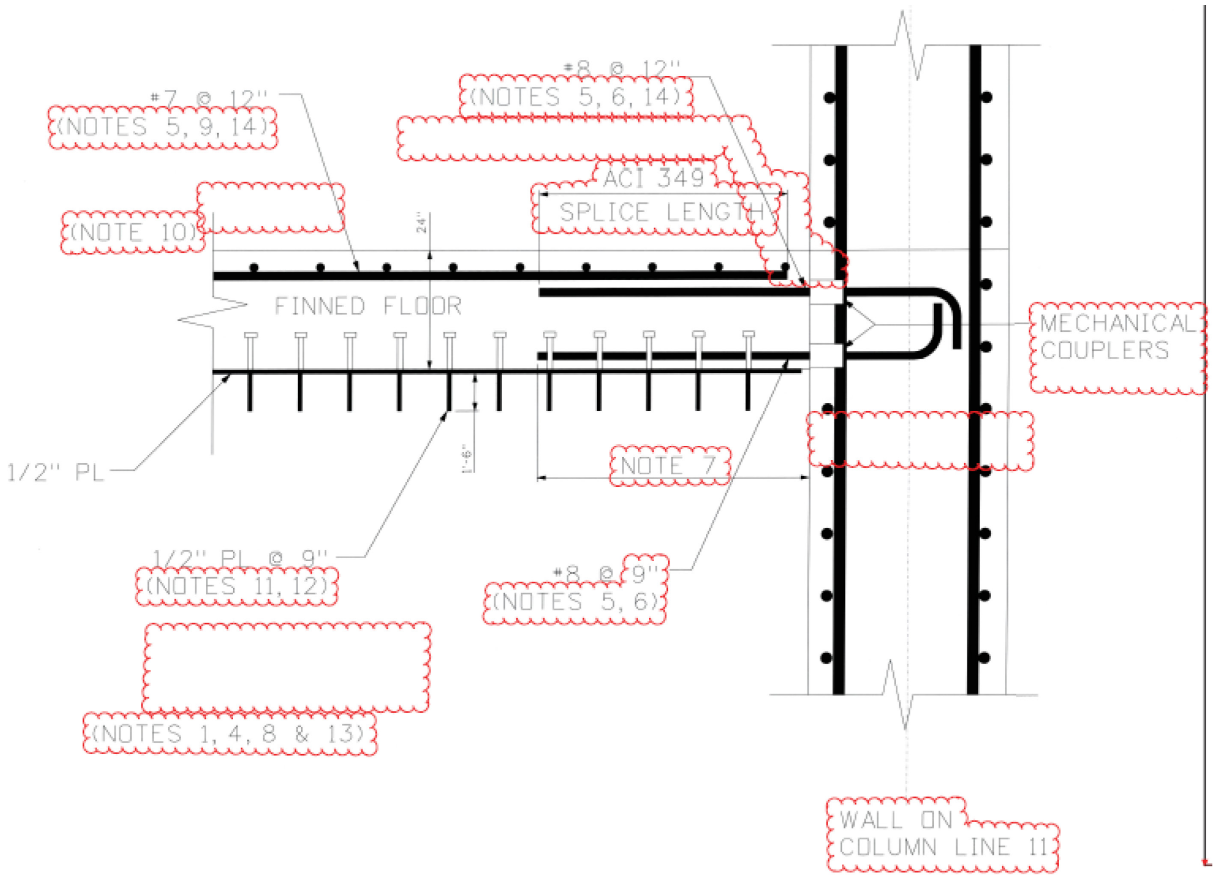
12. THE CENTER LINE LOCATION OF THE SHEAR STUDS MAY VARY FROM THAT OF THE FINS.

13. THE GAP BETWEEN STEEL PLATE AND WALL, AND USE OF CONSTRUCTION JOINTS VARIES BASED ON FABRICATION AND CONSTRUCTION NEEDS.

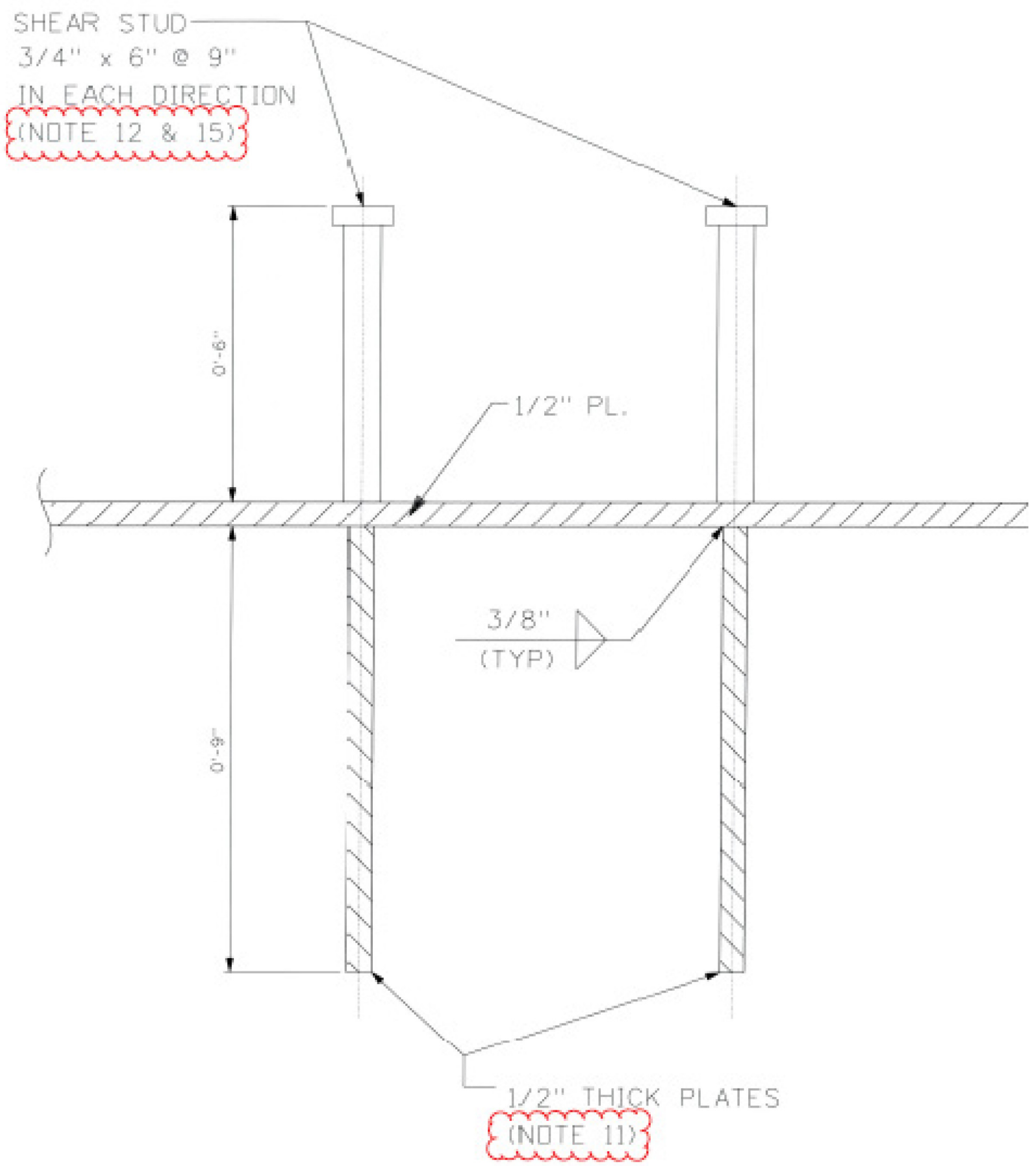
14. THE NUMBER OF LAYERS OF TOP REINFORCEMENT AND TOP DOWELS ALONG EACH DIRECTION MAY VARY AS LONG AS THE MINIMUM REQUIRED REINFORCEMENT IS PROVIDED PER ACI 349.

15. THE SHEAR STUD DESIGN SHOWN IS FOR LOCATIONS AWAY FROM OPENINGS, PENETRATIONS, EMBEDMENTS, AND OTHER OBSTRUCTIONS.

UFSAR Figure 3H.5-9 (Sheet 2 of 3), Auxiliary Building Finned Floor – Revise the information to add the Notes shown below.



UFSAR Figure 3H.5-9 (Sheet 3 of 3), Auxiliary Building Finned Floor – Revise the information to add Notes as shown below.



UFSAR Figure 9A-1 (Sheet 7 of 16), Nuclear Island Fire Area Plan at El. 135'-3" – Revise HVAC duct locations in Room 12501 as shown below.

This UFSAR figure contains security-related information and is provided in Enclosure 10.

UFSAR Figure 12.3-1 (Sheet 8 of 16), Radiation Zones, Normal Operations/Shutdown, Nuclear Island, Elevation 135'-3" – Revise HVAC duct locations in Room 12501 as shown below.

This UFSAR figure contains security-related information and is provided in Enclosure 10.

UFSAR Figure 12.3-2 (Sheet 8 of 15), Radiation Zones, Post-Accident Nuclear Island, Elevation 135'-3" – Revise HVAC duct locations in Room 12501 as shown below.

This UFSAR figure contains security-related information and is provided in Enclosure 10.

UFSAR Figure 12.3-3 (Sheet 8 of 16), Radiological Access Controls, Normal Operations/Shutdown, Nuclear Island, Elevation 135'-3" – Revise HVAC duct locations in Room 12501 as shown below.

This UFSAR figure contains security-related information and is provided in Enclosure 10.