Vogtle PEmails

From: Hoellman, Jordan
Sent: Friday, February 17, 2017 7:12 AM
To: Vogtle PEmails
Cc: Patel, Chandu; Gleaves, Bill
Subject: SNC Draft LAR-15-012 S2 for 2/23 pre-submittal meeting_PUBLIC VERSION
Attachments: 2017-02-23_ND-17-0000_LAR-15-012 R2_LAR 49 draft for 20170223 - PUBLIC.pdf

The attached document is provided for the Public Meeting on Thursday, February 23, 2017.

This document DOES NOT contain SUNSI and may be provided to the Public.

Hearing Identifier: Vogtle_COL_Docs_Public
Email Number: 80

Mail Envelope Properties (b8a8ca2054cb4fbf811ec93398c72904)

Subject: SNC Draft LAR-15-012 S2 for 2/23 pre-submittal meeting_PUBLIC VERSION
Sent Date: 2/17/2017 7:11:49 AM
Received Date: 2/17/2017 7:11:52 AM
From: Hoellman, Jordan

Created By: Jordan.Hoellman2@nrc.gov

Recipients:
"Patel, Chandu" <Chandu.Patel@nrc.gov>
Tracking Status: None
"Gleaves, Bill" <Bill.Gleaves@nrc.gov>
Tracking Status: None
"Vogtle PEmails" <Vogtle.PEmails@nrc.gov>
Tracking Status: None

Post Office: HQPWMSMRS01.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	180	2/17/2017 7:11:52 AM
2017-02-23_ND-17-0000_LAR-15-012 R2_LAR 49 draft for 20170223 - PUBLIC.pdf	1904346	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Southern Nuclear
Operating Company, Inc.
42 Inverness Center Parkway
Birmingham, AL 35242

SOUTHERN NUCLEAR
A SOUTHERN COMPANY

February ##, 2016

Docket Nos.: 52-025
52-026

ND-17-0000
10 CFR 50.90
10 CFR 52.98

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:
Containment Internal Floor Module Connections (LAR-15-012 R2)

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 approved AP1000 Design Control Document (DCD) Tier 2* and associated Tier 2 information in the Updated Final Safety Analysis Report (UFSAR) (which includes the plant-specific DCD Tier 2 information).

SNC originally submitted this request by SNC letter ND-16-0319, dated March 11, 2016 [ML16071A404] and revised this request to address discussions with the Nuclear Regulatory Commission (NRC) Staff held on March 31, 2016. The submittal was revised by SNC letter ND-16-0831, dated July 12, 2016 [ML16196A099] and was subsequently accepted for review. The NRC Staff provided comments on the revised submittal during a public telephone conference on August 11, 2016, and a supplement to Revision 1 addressing the comments from the NRC Staff was submitted by SNC letter ND-16-2014, dated October 20, 2016 [ML16294A526]. The NRC Staff provided additional comments on the submittal during a public telephone conference on November 2, 2016, and this Revision 2 addresses those comments from the NRC Staff. SNC also submitted a Preliminary Amendment Request (PAR) on November 2, 2016 [ML16307A027], to allow construction to continue during the NRC review. A second PAR was submitted on January 17, 2017 [ML17017A518], and during discussions related to that PAR, the NRC Staff requested that Revision 2 further address the topic of reinforcement bar use. This topic is identified and addressed in Enclosure 3.

The requested amendment proposes to depart from UFSAR text and figures that describe the connections between floor modules and structural wall modules in the containment internal structures.

Enclosure 1 provides the revised description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration) and environmental considerations for the proposed changes. The regulatory evaluation and environmental considerations are unchanged from Revision 1 of this LAR.

Enclosure 2 provides revised markups depicting the requested changes to the VEGP Units 3 and 4 UFSAR. Enclosure 3 provides responses to the NRC Staff's additional comments from the November 2, 2016 public meeting, addresses the topic of reinforcement bar use identified during discussions of SNC's second PAR, and identifies where Enclosures 1, 2, and 4 were revised. Enclosures 4 and 5 address the NRC Staff comments from the August 11, 2016 meeting, and are appropriately revised to address the NRC Staff additional comments from the November 2, 2016 meeting.

Enclosure 5 provides a figure referenced in Enclosure 4 which contains information identified as security-related, also referred to as sensitive unclassified non-safeguards information (SUNSI). Therefore, Enclosure 5 is requested to be withheld from public disclosure under the provisions of 10 CFR 2.390(d).

This letter contains no regulatory commitments.

The preliminary amendment request (PAR) and requested approval date associated with this amendment request is being addressed by separate correspondence.

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. B.H. Whitley states that he is the Regulatory Affairs Director of Southern Nuclear Operating Company, 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

B. H. Whitley

BHW/ERG/ljs

Sworn to and subscribed before me this _____ day of _____, 2016

Notary Public: _____

My commission expires: _____

Enclosures:

1) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Request for License Amendment: Containment Internal Floor Module Connections (LAR-15-012 R2)

2) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Proposed Changes to Licensing Basis Documents (LAR-15-012 R2)

3) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Responses to NRC Staff Comments from November 2, 2016 and January 17, 2017

4) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Responses to NRC Staff Comments from August 11, 2016 (Publicly Available Information) (LAR-15-012 R2)

5) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Revised Responses to NRC Staff Comments from August 11, 2016 **(Withheld Information)** (LAR-15-012 R2)

cc:
Southern Nuclear Operating Company / Georgia Power Company
Mr. S. E. Kuczynski (w/o enclosures)
Mr. M. D. Rauckhorst
Mr. D. G. Bost (w/o enclosures)
Mr. M. D. Meier (w/o enclosures)
Mr. D. H. Jones (w/o enclosures)
Ms. K. D. Fili (w/o enclosures)
Mr. D. L. McKinney (w/o enclosures)
Mr. T.W. Yelverton (w/o enclosures)
Mr. B. H. Whitley
Mr. C. R. Pierce
Mr. D. L. Fulton
Mr. M. J. Yox
Mr. J. C. Haswell
Mr. T. R. Takats
Mr. W. A. Sparkman
Mr. J. P. Redd
Ms. A. C. Chamberlain
Document Services RTYPE: VND.LI.L00
File AR.01.02.06

Nuclear Regulatory Commission
Ms. C. Haney (w/o enclosures)
Mr. S. Lee (w/o enclosures)
Mr. L. Burkhart (w/o enclosures)
Ms. J. Dixon-Herrity
Mr. P. Kallan
Mr. C. Patel
Mr. W. C. Gleaves
Mr. B. M. Bavol
Ms. R. Reyes
Ms. J. M. Heisserer
Mr. G. Khouri
Mr. J. D. Fuller
Ms. S. Temple
Ms. V. Ordaz
Mr. T. E. Chandler
Ms. P. Braxton
Mr. T. Brimfield
Mr. C. J. Even
Mr. A. Lerch

State of Georgia
Mr. R. Dunn (w/o enclosure 5)

Oglethorpe Power Corporation
Mr. M. W. Price (w/o enclosure 5)
Mr. K. T. Haynes (w/o enclosure 5)
Ms. A. Whaley (w/o enclosure 5)

Municipal Electric Authority of Georgia
Mr. J. E. Fuller (w/o enclosure 5)
Mr. S. M. Jackson (w/o enclosure 5)

Dalton Utilities
Mr. T. Bundros (w/o enclosure 5)

Westinghouse Electric Company, LLC
Mr. R. Easterling (w/o enclosures)
Mr. G. Koucheravy (w/o enclosures)
Mr. C. D. Churchman (w/o enclosures)
Mr. P. A. Russ
Mr. A. F. Dohse
Mr. M. Y. Shaqqo
Mr. C. A. Castell
Mr. F. Gill
Ms. L. Iller
Mr. J. Hopkins
Mr. D. Hawkins

Other
Mr. J. E. Hesler, Bechtel Power Corporation
Ms. L. A. Matis, Tetra Tech NUS, Inc. (w/o enclosure 5)
Dr. W. R. Jacobs, Jr., Ph.D., GDS Associates, Inc. (w/o enclosure 5)
Mr. S. Roetger, Georgia Public Service Commission (w/o enclosure 5)
Ms. S. W. Kernizan, Georgia Public Service Commission (w/o enclosure 5)
Mr. K. C. Greene, Troutman Sanders (w/o enclosure 5)
Mr. S. Blanton, Balch Bingham
Mr. R. Grumbir, APOG
Mr. N. R. Kellenberger, South Carolina Electric & Gas Company
Mr. D. Kersey, South Carolina Electric & Gas Company
Mr. B. Kitchen, Duke Energy
NDDocumentinBox@duke-energy.com, Duke Energy
Mr. S. Franzone, Florida Power & Light

Southern Nuclear Operating Company

ND-16-2717

Enclosure 1

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Revised Request for License Amendment:

Containment Internal Floor Module Connections

(LAR-15-012 R2)

Red text indicates additions and ~~deletions~~.

Green text indicates existing text has been relocated.

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

Table of Contents

1. Summary Description

2. Detailed Description
   (including Licensing Basis Change Descriptions)

3. Technical Evaluation

4. Regulatory Evaluation

   4.1. Applicable Regulatory Requirements/Criteria

   4.2. Precedent

   4.3. Significant Hazards Consideration

   4.4. Conclusions

5. Environmental Considerations

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.

Note that this enclosure reflects text modifications made in response to NRC comments to assist in identifying the related changes.

1. Summary Description

The Updated Final Safety Analysis Report (UFSAR) Subsection 3.8.3 provides a description of the floor modules and the connection between floor modules and structural wall modules in the containment internal structures. The design of the floor modules is shown in UFSAR Figure 3.8.3-3. The connection is shown in UFSAR Figure 3.8.3-17. The text in UFSAR Subsections 3.8.3.1.3 and 3.8.3.5.8.1 references Figure 3.8.3-17. The text in UFSAR Subsection 3.8.3.1.4 describes the design elements in the floor modules and references UFSAR Figure 3.8.3-3. These text references are revised to clarify that the detailed connection design may vary from that shown. These connections connect the floor modules that make up the maintenance floor at elevation 107'-2" and the operating deck at elevation 135'-3".

The text references are expanded to identify the design elements for which the design details may vary. The text is revised to add discussion of controlling design requirements for the connection variations. UFSAR Figure 3.8.3-17 is revised based on changes to the detail design of the connections and to add notes about the design variations. UFSAR Figure 3.8.3-3 is revised to show shear studs on top of the bottom plate of the floor module. These changes are for the connection design and do not change the structural wall module design for the three critical sections identified in the first paragraph of UFSAR Subsection 3.8.3.5.8.1.

This enclosure requests approval of the license amendment necessary to implement the proposed changes to the Tier 2 information and the involved Tier 2* information.

2. Detailed Description

The proposed changes to UFSAR Subsection 3.8.3.1.3 include a revision to separate the discussion of floor connections from the structural wall modules for the containment internal structures. Information is added to identify that connections similar to those shown in UFSAR Figure 3.8.3-17 are also used for connections of floor submodules to wall submodules within structural modules. The elevations of the subject floor modules are added to the description. The proposed changes add a discussion to note that the design elements used and the design details in the floor modules and connection design vary in the implemented design. The proposed changes note that connection design elements are sized based on American Institute of Steel Construction (AISC) N690 criteria and requirements and note that a locally thicker faceplate or an alternative back-up structure design may be used instead of design elements shown in the wall module. Consistent with Note 5 added to UFSAR Figure 3.8.3-17, where reinforcement is used, the size, spacing, and length ~~of reinforcement used as part of the floor to wall connections satisfies~~ satisfy American Concrete Institute (ACI) 349 requirements. The use of ACI 349 standard hooks in the wall and reinforcement connectors on the faceplates is added. ~~Information is added to the description of the floor connection to include a type of floor module~~

~~connection where the top of the wall does not extend past the elevation of the floor as a variance to the floor module to wall module connection designs. Information is added to note that UFSAR Figure 3.8.3-17 is not representative of the connection of the operating deck floor to the walls of the refueling canal and other floor modules that rest on top of a wall module.~~

The proposed changes to UFSAR Subsection 3.8.3.1.4 include a revision to add shear studs and channels to the design elements used to construct the floor modules. Reference to the 107'-2" elevation is removed from the sentence identifying the design elements. ~~The shear studs are included to provide the composite action of the concrete and steel in the floor module and transfer load from the steel plate on the bottom through the concrete to the reinforcement bars that anchor into the wall.~~ The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability. The shear stud size and spacing is not directly credited in the composite section design. The encased beams provide the primary composite action mechanism.

The proposed changes to the second paragraph of UFSAR Subsection 3.8.3.5.8.1 separate the discussion of floor module connections from the wall module discussions. UFSAR Figure 3.8.3-17 is removed from the list of wall module figures. The proposed changes include a revision to note that design elements used in the connections and design details may vary in the implemented design. The proposed changes include adding a sentence in the licensing basis identifying that a key design feature is that design elements provide a direct load path from the floor into the wall. Reference to UFSAR Subsection 3.8.3.1.3 for additional requirements is added to the paragraph. The proposed changes include a revision to note that load capacities of connection design elements satisfy AISC N690 and ACI 349 criteria and requirements. ~~Information is added to the description of the floor module connection to include a type of floor where the top of the wall does not extend past the elevation of the floor as a variance to the floor connection designs. Information is added to note that UFSAR Figure 3.8.3-17 is not representative of the connection of the operating deck floor to the walls of the refueling canal and other locations where a floor module rests on top of a wall module.~~

UFSAR Figure 3.8.3-3 shows the floor module design and is revised to include the shear studs attached on top of the bottom steel plate of the floor module. (These shear studs are also appropriately added to revised Figure 3.8.3-17, Sheets 1 and 3.) Notes are added to the figure to identify variation in the floor design elements including reinforcement, to provide the range of reinforcement sizes used, and to reference the use of wide flange beams and channels. The figure is also revised to remove the elevations for top of concrete (TOC). A note is added about the welding requirements.

There are proposed changes in the design of the structural wall module faceplate connection with the floor modules shown in UFSAR Figure 3.8.3-17, Sheet 1. The figure shows seat angles welded to the vertical face of structural wall modules under the ends of the floor modules with a clip angle connecting the floor module beam to the wall module. The proposed design changes remove the requirement to use these clip angles and include the use of shear plates as a design variation. Notes are added to the figure to identify variation in the connection design. The proposed changes remove the representation of the truss angles and channels inside the wall modules because they are not needed to show the connection design. The design of the trusses inside the wall modules is shown and described in other places in the UFSAR. The figure is also revised to remove the elevations for top of concrete (TOC) and bottom of steel (BOS) on Sheet 1 and Sheet 2 because the wall module to floor module connection designs are

used at more than one floor elevation. The elevations identified for floors in the UFSAR in general arrangement figures and other places are for the top surface of the concrete and are approximate to allow for construction tolerances and floor sloping. The representation of the reinforcement hooks length is changed to be consistent with the ACI standard for standard hooks on Sheet 1 and Sheet 2. The representation of reinforcement connector on the faceplate is changed to be consistent with the type of connector used. In some locations, the bottom reinforcement dowels are not required at the connections. Note 5 is added to clarify that where reinforcement is used, the size, spacing, and length satisfy ACI 349 requirements.

The proposed changes in the design of heavily loaded floor modules, shown in UFSAR Figure 3.8.3-17, Sheet 2, are representative for "heavily loaded" floor connections. The figure shows two clip angles for the beam connection to a structural wall module. The proposed design changes reconfigure the connection, add the use of shear plates, and remove one of the clip angles shown for the connection. At the beam location, the seat angle supporting the beam is changed to show a beam seat. The changes reconfigure the backup structure and remove the plate thickness for the back-up structure because there is a large variation in the detail design of the internal backup structures. The representation of the angle and channel that are part of the truss in the wall modules is removed because this information is included in Figure 3.8.3-8. The backup structure shown in the module wall is a representative design for the connection and the details for the design implemented may vary from that shown in the figure. The changes to the figure remove reinforcement bars at the beam locations connected to the faceplates and the associated hooks within the wall modules. In some locations, reinforcement bars connected to the wall module are not provided immediately adjacent to the beam. In some locations, the bottom reinforcement dowels are not required at the connections. Consistent with Note 5 added to the figure, where reinforcement is used, the size, spacing, and length satisfy ACI 349 requirements. Symbols identifying the location of Section A and representing concrete are moved on the figure to clarify the design. Dimensions of structural angles and reinforcement bars are added and moved on the figure due to removal of this information in other portions of the figure. Use of the term "plate girder" is replaced with "beam" on UFSAR Figure 3.8.3-17, Sheet 2. This is consistent with the use of the term "beam" on Sheet 1 of the figure.

The proposed changes to the connection design and to the UFSAR text and figures are provided to more clearly state what was always understood to be a design requirement for the connection of the floor module to the structural wall modules which is that the connection design satisfies applicable provisions of AISC N690 and ACI 349. UFSAR Figure 3.8.3-17 provides an example of a detail design that demonstrates conformance with the AISC N690 and applicable ACI 349 criteria and requirements. The specific detail design shown in UFSAR Figure 3.8.3-17 is not required to be used at all locations to provide conformance with AISC N690 and ACI 349 criteria and requirements. The proposed changes do not change the design requirements and evaluation methods for the floor modules described in UFSAR Subsection 3.8.3.5.4. The proposed changes do not change the structural wall module design for the critical sections identified in the first paragraph of UFSAR Subsection 3.8.3.5.8.1.

The proposed changes to allow for variance in the connection design are not necessary for the connections between the floor modules and wall modules in the auxiliary building. UFSAR Subsection 3.8.4.1.2 identifies that the configuration of the auxiliary building structural modules is similar to the structural modules used for the containment internal structures. However, the floors connected to structural wall modules in the auxiliary building constructed with concrete on

steel plates are designed as ACI 349 structures, not as AISC N690 composite structures. UFSAR Subsection 3.8.4.1.2 identifies that the design details for structural modules in the auxiliary building are different compared to the containment internals structures. The text in UFSAR Subsection 3.8.4.1.2 provides sufficient allowance to cover the difference between the design shown in UFSAR Figure 3.8.3-17 and the design of the connections between floor modules and wall modules in the auxiliary building.

The design and construction of the shield building is not affected by this activity. The design of the shield building structural wall modules is described in UFSAR Subsection 3.8.4.5.5.

Licensing Basis Change Descriptions

The affected UFSAR subsections and figures are proposed to be modified as discussed below and shown in Enclosure 2.

A. Revise the information in the last paragraph of UFSAR Subsection 3.8.3.1.3, "Structural Wall Modules," describing UFSAR Figure 3.8.3-17 and include additional details with the following proposed changes:

   1. Provide an expanded discussion of the connection of floor modules to the structural wall modules.
   2. Identify where the connections are used.
   3. Identify that connections similar to those shown are also used for connections within structural modules.
   4. Identify that the design elements used and the detailed design vary at different beam locations.
   5. Add reference to AISC N690 Code requirements for the connection design.
   6. Identify that use of clip angles and shear plates vary as needed.
   7. Remove the representation of the design elements in the trusses (channels and angles) in the module wall.
   8. Identify that thicker faceplates may be used.
   9. Identify that the backup structure shown in the module wall is a representative design for the connection and the design elements used and the details for the design used vary.
   10. Add the requirement for conformance of reinforcement to ACI 349 and use of ACI 349 standard hooks in the wall module.
   ~~11. Add information to note that UFSAR Figure 3.8.3-17 is not representative of the connection of the operating deck floor to the walls of the refueling canal and other floor modules that rest on top of a wall module.~~

B. Revise the information in UFSAR Subsection 3.8.3.1.4 to add shear studs and channels to the list of design elements used to construct the floor modules and remove the reference to 107'-2" elevation from the sentence identifying design elements.

C. Revise UFSAR Subsection 3.8.3.5.4 to include shear stud information.

D. Revise the information and include additional detail in the second paragraph of UFSAR Subsection 3.8.3.5.8.1 "Structural Wall Modules," with the following proposed changes:

1. Remove UFSAR Figure 3.8.3-17 from the list of figures showing wall module information.
2. Move the sentence describing the floor module connections to be the first sentence of a newly created separate paragraph.
3. Enhance the discussion of the information in UFSAR Figure 3.8.3-17 as part of the new separate paragraph.
4. Identify that the design elements used and the connection design details vary.
5. Describe direct load path as a key feature in connection design.
6. Add reference to additional information on the connection design in UFSAR Subsection 3.8.3.1.3.
7. Identify that details of the connection design including plate thickness, structural shape size, and reinforcement arrangement may vary based on local loads.
8. Specify that the connection design must provide sufficient load capacity to satisfy AISC N690 and ACI 349 criteria and requirements.
9. ~~Add information to note that UFSAR Figure 3.8.3-17 is not representative of the connection of the operating deck floor to the walls of the refueling canal and other floor modules that rest on top of a wall module.~~

E. Revise UFSAR Figure 3.8.3-3 to add shear studs on top of the bottom steel plate of the floor module, to add notes to identify variation in the floor design elements including reinforcement, to provide the range of reinforcement sizes used, and to reference the use of wide flange beams and channels. Additionally, elevations for top of concrete (TOC) are removed and a note is added about the welding requirements.

F. Revise the information in UFSAR Figure 3.8.3-17, Sheets 1 and 2, "Structural Modules – Design Details Standard Floor Connection" and "Structural Modules – Design Details Heavily Loaded Floor Connection" respectively, for clarity as follows:

1. Replace the term "Plate Girder" with "Beams" in the Labels for the section views shown on Sheet 2.
2. Replace the identifier "PLATE GIRDER" with "BEAMS" in three of the section views on Sheet 2.
3. Add "SHEAR PLATE" and the term "(AS APPLICABLE)" to the clip angle designation where shown on Sheet 1 and Sheet 2. Revise the figure to show a clip angle and a shear plate instead of two clip angles in the connection in Sheet 2, TOP VIEW AT BEAMS IN FLOOR and in Section A.
4. Redraw Section A and "TOP VIEW AT BEAMS IN FLOOR" on Sheet 2 to show connection design based on design finalization. The changes remove the reinforcement adjacent to the beam section and remove the connectors adjacent to the beam in Section A.
5. Redraw reinforcement hooks to show proper length for standard hooks in both sections on Sheet 1 and in SECTION BETWEEN BEAMS IN FLOOR on Sheet 2.

6. Change representation of reinforcement connector on faceplate to show representative configuration of the connector in both sections on Sheet 1.
7. Remove the dimensions from the wall module internal structure and from the plate thickness of backup structure from Top View on Sheet 2.
8. Redraw the representation of the backup structure in Top View, SECTION AT BEAMS IN FLOOR, and Section A on Sheet 2.
9. Redraw the representation of the wall module structure on Sheet 2 to move and reconfigure the plates applied or overlaid onto the faceplates on the connection side of the wall module in TOP VIEW AT BEAMS IN FLOOR, SECTION AT BEAMS IN FLOOR and SECTION BETWEEN BEAMS IN FLOOR.
10. Remove the reinforcement bars in the floor and the reinforcement connectors in the Top View, Section A, and in the SECTION AT BEAMS IN FLOOR on Sheet 2.
11. Remove the elevations for TOC (top of concrete) and BOS (bottom of steel) on Sheet 1 and Sheet 2.
12. Move arrows identifying Section A in SECTION AT BEAMS IN FLOOR on Sheet 2 to clarify the location of Section A.
13. Remove symbols indicating concrete from Sheet 2 SECTION AT BEAMS IN FLOOR and add the symbols indicating concrete to Sheet 2 SECTION BETWEEN BEAMS IN FLOOR and Sheet 1 SECTION BETWEEN BEAMS IN FLOOR to be consistent with the materials at those locations.
14. Add the dimensions for the angles welded to the floor in Sheet 2, SECTION AT BEAMS IN FLOOR.
15. Replace the seat angle with a beam seat in Sheet 2, SECTION AT BEAMS IN FLOOR.
16. Add designation of reinforcement bar size (#11) to Sheet 2 SECTION BETWEEN BEAMS IN FLOOR.
17. Add shear studs attached on top of the bottom steel plate of the floor module in SECTION BETWEEN BEAMS IN FLOOR in Sheet 1 and 2.
18. Remove representation of the truss design elements (channels and angles) in the module wall.
19. Add notes to UFSAR Figure 3.8.3-17, Sheets 1 and 2, to provide the following information:
    a) Identify that details shown are representative of floor modules at El. 107′-2″ and 135′-3″ and the connections of floor modules to wall modules inside containment. Include reference to Subsection 3.8.3.1.3 and other notes for additional information about design details and variations.
    b) Identify that the reinforcement size and spacing in the floor module concrete are based on the requirements in ACI 349 and provide reinforcement size range.
    c) Identify that the design of the plates, beams, and stiffeners in the floor varies and satisfies the requirements of AISC N690.
    d) Identify that the reinforcement and floor design elements shown are for locations away from openings, penetrations, and other obstructions.

e) Identify that for reinforcement included as part of the connection design, the size, spacing, and length satisfy the requirements of ACI 349 and that the design of the standard hooks and the couplers satisfy the requirements of ACI 349.

f) Identify that the detail design, location, and attachment of the floor and beam supports are designed to the requirements of AISC N690 and support configurations are based on loading and local geometry considerations.

g) Identify that the designs of the connections and backup structures within the modules wall satisfy the requirements of AISC N690 and that the strength of the studs is based on ACI 349, Appendix B.

h) Identify that the thickness of the adjacent wall is based on the wall design requirements and location.

20. Add additional note to UFSAR Figure 3.8.3-17, Sheet 2 to provide the following information:

a) Identify that the beam seat shown is not used at all beam locations. The seat angle shown on Sheet 1 is used at other locations.

3. Technical Evaluation

Modular construction techniques are used extensively in the containment internal structures. Subassemblies are initially fabricated both offsite and onsite. Module assembly consists of combining the subassemblies into structural modules after which they are installed in the plant. Structural wall modules, designed and constructed as steel plate concrete filled composite structures, and floor modules are used for major containment internal structures.

The floor modules are seismic Category I structures and are designed for the loads identified in UFSAR Subsection 3.8.3.3, which include dead, live, thermal, pressure, safe shutdown earthquake, and loads due to postulated pipe breaks.

The design of the connections of the floor modules to the structural wall modules are in conformance with applicable criteria and requirements of AISC N690 and ACI 349. The designs of these floor-to-wall connections rely on a direct, mechanical connection from the design elements in the floor through the faceplate and into the wall module. The floor loads and the geometry of the floor module connection to the wall module vary significantly from one location to another. This results in variation in the size and configuration of the design elements connecting the floor module to the faceplate and in the size and configuration of the backup structure within the wall module. The proposed design changes to the connection design, including the design variances permitted by the changes, are in conformance with applicable provisions in AISC N690 and ACI 349.

The floor modules inside the containment structure are constructed of welded steel structural shapes, plates, and shear studs. These floor modules are designed as composite structures in conformance with AISC N690. ~~Shear studs are included in the floor module design to provide for composite action between the steel plate and concrete and transfer load from the steel plate on the bottom through the concrete to the reinforcement bars that anchor into the wall.~~ The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability. The shear stud size and spacing is not directly credited in the

composite section design. The encased beams provide the primary composite action mechanism. The beams directly connect the floor plates to the wall modules. The design requirements and evaluation methods are described in UFSAR Subsection 3.8.3.5.4. Floor modules are designed as simply supported as a conservative approach to consider the largest bending moment in the floor. Floor beams may have thicker sections, stiffeners or other design elements at the connection location. The floor modules are connected to the structural wall modules using structural shapes and reinforcement bars connected to the faceplate of the wall module or passing through the faceplate into the concrete of the wall module. The connection of the floor module to the structural wall modules are designed as fully fixed. ~~The reinforcement included as part of the connection design provides for a fully fixed connection and is designed to satisfy the requirements of ACI 349. The size of the reinforcement ranges from #7 to #11.~~ A key feature of the connection design is that structural shapes provide a direct load path from the floor to the wall through welds or mechanical connectors. The connection of the reinforcement to the hooks or anchors in the wall ~~is also~~ can be credited as a direct connection whenever required. In some floors, the bottom reinforcement dowels are not required at the connection as those floors only have some in-plane tension forces as the result of diaphragm behavior under a seismic event. Those floors are designed with clear load path through primary steel beams. Those primary steel beams are provided with backup structures at the connection to transfer loads from the floors to walls. The design of the floors is consistent with the methodology presented in UFSAR Subsection 3.8.3.5.4, and meets the applicable provisions in AISC N690 and ACI 349.

The proposed changes do not change the design of the three structural wall module critical sections identified in the first paragraph of UFSAR Subsection 3.8.3.5.8.1. The headed studs attached to the wall module faceplate transfer the loads on the faceplate into the concrete. Where necessary, additional embedments and backup structures, located inside the wall, are directly connected to the wall module faceplates to transfer the floor loads into the structural wall modules.

Providing an expanded discussion of the floor-to-wall module connections separate from the discussion of the wall modules and removing UFSAR Figure 3.8.3-17 from the list of wall module figures clarifies the information that applies to the floor module and connection designs. Information is added to UFSAR Subsections 3.8.3.1.3 and 3.8.3.5.8.1 to define the variations in the detail design of the floor module and floor module to wall module connections. The proposed changes to UFSAR Figure 3.8.3-17 include redrawing the representation of the connection design to reflect design detail changes. Notes are added to UFSAR Figure 3.8.3-17 to define the variations in the detail design of the floor module to wall module connections.

Revising the information in UFSAR Subsection 3.8.3.1.4 to add shear studs and channels to the list of design elements used to construct the floor modules and adding shear studs to UFSAR Figure 3.8.3-3 expands the range of design elements used in the construction of the floors. The use of shear studs and channels in the design of the floor is consistent with the applicable requirements of AISC N690 and the design requirements and evaluation methods described in UFSAR Subsection 3.8.3.5.4. The use of shear studs and channels in the design of the floor is included in the evaluation of the floor module and connection design.

Where the reinforcement is included as part of the connection design, the size, shape, and length of the reinforcement satisfies ACI 349 requirements. The reinforcement in the floor module and the use of standard hooks for deformed bars are in conformance with the criteria

and requirements of ACI 349. The size of the reinforcement ranges from #7 to #11. The change to the length of the reinforcement bar hooks shown within the wall modules in the figure is to make the representation consistent with ACI 349 requirements for standard hooks. The change in the representation of the reinforcement connectors attached to the faceplate is consistent with the design used and these connectors satisfy ACI 349 requirements.

~~UFSAR Figure 3.8.3-17 shows connection designs for standard and heavily loaded floors. There is a third connection configuration where the top of the wall does not extend past the elevation of the floor. This type of connection is used to connect the operating deck floor to the wall of the refueling canal. Information is added to the description of the floor module connection in UFSAR Subsections 3.8.3.1.3 and 3.8.3.5.8.1 to include this type of floor module connection as an additional type of floor module connection design. In this connection design the floor module sits on top of the wall instead of connecting to the side of the wall module. Because of the geometry difference a different connection configuration is required to satisfy AISC N690 requirements. Because of the significant differences in the configuration, UFSAR Figure 3.8.3-17 is not representative of this connection.~~

The wide flange tees, channels, and stiffening angles are included in the floor module design to provide strength for the floor. The sections shown in UFSAR Figure 3.8.3-17 are at specific locations in the containment internal structures. The connection design loads vary from location to location. Some floors are supported by seat angles welded to the module walls. In other locations beam seats located at the beams in the floor are required to provide sufficient load capacity. The size and type of the design elements needed at different connection locations also vary and the proposed changes identify that the design details may be different than that shown in the figure. Replacing the term "plate girder" with "beam" provides clarification of the connection description in the licensing basis text and UFSAR Figure 3.8.3-17 by providing consistency in the use of terms within the licensing basis and between the licensing basis and the design.

The thicker wall module faceplates at the connection locations are for the connection and attachment loads and to facilitate fabrication. The shear stud and truss spacing and design of other elements that provide the composite response of the wall modules do not change. The design of the connection of the floor module to the wall module, including design variations, is consistent with the overall structural design of the containment internal structures and the analysis of the seismic response.

The proposed changes do not change the function, design, and operation of the systems and components supported by and located under the floor modules and structural wall modules. The proposed changes do not change the function, design, and operation of the containment vessel and passive containment cooling system. 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 connections between the floor modules and structural wall modules 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 activity has no adverse effect on 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 connections between floor modules and structural wall modules. 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 connections between floor modules and structural wall modules.

The proposed activity has no impact on the Aircraft Impact Assessment. The changes described 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 a change in the detail design of connections between the steel plate concrete composite construction used for the structural wall modules and the concrete composite floors of the containment internal structures. 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 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 nonradioactive material effluents are affected.

The thickness of the walls and floors and the density of the concrete are not changed; therefore, there is no adverse change to the shielding provided by the structural modules and floor modules. 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 walls, doors, or access to the Nuclear Island.

Summary

The proposed changes would revise Tier 2* information and associated Tier 2 information in the UFSAR in regard to requirements for detail design of floor modules and connections between the structural wall modules and the floor modules inside containment. These changes include design changes to the design elements of the connections. The proposed changes do not adversely affect the strength or response of the nuclear island seismic Category I structures.

The above proposed changes do not adversely affect any safety-related equipment or function, design function, radioactive material barrier or safety analysis.

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 52, Appendix D, VIII.B.6 and VIII.B.5.a, require prior NRC approval for departure from Tier 2* information and for Tier 2 information departures that involve changes to Tier 2* information, respectively. The proposed amendment includes changes to design details for construction of the connections between floor modules and the structural wall modules in the containment internal structures and descriptions and figures depicting seismic Category I structures which constitute UFSAR Tier 2* information changes. Therefore, a license amendment request (LAR) (as supplied herein) is required.

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 change does not change the criteria for the design, analysis, and construction of the containment internal structures. These structures remain in conformance with the code requirements identified and supplemented in the UFSAR.

10 CFR Part 50, Appendix A, GDC 2 requires that structures withstand the effects of earthquakes and appropriate combinations of the effects of normal and accident conditions, including the effects of environmental loadings, such as earthquakes and other natural phenomena. The proposed changes have no impact on the seismic motions to which the nuclear island structures are subjected and no impact on the response of the nuclear island structures to seismic motions.

10 CFR Part 50, Appendix A, GDC 4 requires that systems structures and components can withstand the dynamic effects associated with missiles, pipe whipping, and discharging fluids, excluding dynamic effects associated with pipe ruptures, the probability of which is extremely low under conditions consistent with the design basis for the piping. The proposed changes do not change the configuration of the walls and floors which provide

separation between sources and potential targets. The proposed change has no impact on the capability of the systems, structures, and components to withstand dynamic effects associated with missiles, pipe whipping, and discharging fluids as required by this criterion. The proposed change does not change the requirements for anchoring safety related components and supports to seismic Category I structures.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration

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), by revising the design details for construction of the floor modules and the connections between floor modules and the structural wall modules, part of the containment internal structures.

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

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

Response: No

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

The change of the design details for the floor modules and the connections between floor modules and the structural wall modules, and the change to more clearly state the design requirement that these connections meet criteria and requirements of American Concrete Institute (ACI) 349 and American Institute of Steel Construction (AISC) N690, do not have an adverse impact on the response of the nuclear island structures to safe shutdown earthquake ground motions or loads due to anticipated transients or postulated accident conditions. The change of the design details for the connections between floor modules and the structural wall modules, and the clarification of design requirements for these connections, do not impact the support, design, or operation of mechanical and fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor does the change 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 proposed change is to revise design details for the floor modules and the connections between floor modules and the structural wall modules, and more clearly state the design requirement that these connections meet criteria and requirements of ACI 349 and AISC N690. The clarification and changes to the design details for the floor modules and the connections between floor modules and the structural wall modules do not change the design requirements of the nuclear island structures. The clarification and changes of the design details for the floor modules and the connections between floor modules and the structural wall modules do not change the design function, support, design, or operation of mechanical and fluid systems. The clarification and changes of the design details for the floor modules and the connections between floor modules and the structural wall modules do not result in a new failure mechanism for the nuclear island structures or new accident precursors. As a result, the design function of the nuclear island structures is not adversely affected by the proposed change.

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

No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed changes, thus, no margin of safety is reduced. The acceptance limits for the design of seismic Category I structures are included in the codes and standards used for the design, analysis, and construction of the structures. The two primary codes for the seismic Category I structures are American Institute of Steel Construction (AISC) N690 and American Concrete Institute (ACI) 349. The changes to the design of the connection of the floor module to the structural wall modules in the containment internal structures satisfy applicable provisions of AISC N690 and ACI 349 and supplemental requirements included in the UFSAR.

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

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

4.4 Conclusions

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 revises plant-specific Design Control Document (DCD) Tier 2* and associated Tier 2 material incorporated into the Updated Final Safety Analysis Report (UFSAR), by revising the design details for the floor modules and the connections between floor modules and the structural wall modules.

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, 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 changes unrelated to any aspect of plant construction or operation that would introduce any change to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed changes do not affect any effluent release path or diminish the functionality of any design or operational features that are credited with controlling the release of effluents during plant operation. Therefore, it is concluded that the 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 changes to the design details for the connections between floor modules and the structural wall modules but, does not change walls, floors, or other structures which provide shielding in the containment structure. Plant radiation zones are not affected, nor are there any changes to the controls required under 10 CFR Part 20 that preclude a significant increase in occupational radiation exposure. 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.

Southern Nuclear Operating Company

ND-16-2717

Enclosure 2

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Revised Proposed Changes to Licensing Basis Documents

(LAR-15-012 R2)

Red text indicates additions and ~~deletions~~.

Green text indicates existing text has been relocated.

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

(Note: These markups are based on Vogtle Units 3 & 4 UFSAR Revision 5~~4~~.)
(Note also that this enclosure reflects text modifications made in response to NRC comments to assist in identifying the related changes.)

UFSAR Subsection 3.8.3.1.3, Structural Wall Modules - Revise information in the last paragraph to include additional information in the location shown below.

Representative design details of the connections ~~with~~ of floor modules to structural wall modules are shown in Figure 3.8.3-17. These connections connect the floor modules that make up the maintenance floor at elevation 107′-2″ and the operating deck at elevation 135′-3″. Similar connection designs are used within structural modules to connect floors to walls. The design details for the floor modules, including the size and spacing of the reinforcement, the use of shear studs, and the sizes of the structural shapes, are provided for background information and vary based on loading conditions and geometry. The seat angles, beam seats, shear plates, and other design elements supporting the floor modules and connecting the floors to the wall modules are sized to satisfy AISC N690 criteria and requirements. The clip angles and shear plates shown in Figure 3.8.3-17 and other design elements are used as required at beam locations for the connection. The module faceplates in the area of the connection may be thicker than 0.5 inch, up to 1.5-inch thick, in some locations. The backup structure shown in the module wall is a representative design, and the details for the design implemented include variation of the size and thickness of the plates used in the backup structure. The designs of the backup structures satisfy AISC N690 criteria and requirements. As an alternative, locally thicker faceplates or other design elements embedded in the wall and connected to the faceplate may be used to provide sufficient strength in the connection. Where the reinforcement is included as part of the connection design, the size, spacing, and length of the reinforcement satisfies ACI 349 requirements. The standard hooks in the wall module and the reinforcement bar connectors on the faceplates satisfy ACI 349 requirements.

~~The operating deck floor modules adjacent to the refueling canal connect to wall modules that do not extend above the floor elevation. Design elements used for the connection for the operating deck floor modules to the refueling canal wall modules, and other floor modules that rest on top of a wall module, are located inside the wall module and are not connected to the outside of the faceplates. Figure 3.8.3-17 is not representative of these connections.~~

UFSAR Subsection 3.8.3.1.4, Structural Floor Modules - Revise information in the first paragraph to include additional information in the location shown below. {as revised in LAR-15-012 R1S}

… The ~~107′-2″~~ floor~~s~~ modules consist of shear studs, steel tee, ~~and~~ wide flange, and channel sections, welded to horizontal steel bottom plates stiffened by transverse stiffeners. Shear studs are welded on the top of the floor bottom plate. After erection, concrete is placed….

UFSAR Subsection 3.8.3.5.4, Structural Floor Modules - Revise information in the first and second paragraphs to include additional information in the location shown below.

Figure 3.8.3-3 shows the design details for a representative example of the floor modules. The details shown in Figure 3.8.3-3 are the representative design for a specific portion of the operating deck floor in containment. The size, material, and configuration of the structural shapes and plates, the amount and arrangement of the reinforcement, the location, size, and spacing of the shear studs welded on the top of the floor bottom plate, and the type and size of the welds may vary in the final design of floor modules in this and other locations. The operating floor is designed for dead, live, thermal, safe shutdown earthquake, and pressure due to automatic depressurization system operation or due to postulated pipe break loads. The operating floor region above the in-containment refueling water storage tank is a series of structural modules. The remaining floor is designed as a composite structure of concrete slab and steel beams in accordance with AISC-N690.

For vertical downward loads, the floor modules are designed as a composite section, according to the requirements of Section Q1.11 of AISC-N690. Composite action of the steel section and concrete fill is assumed based on meeting the intent of Section Q1.11.1 for beams totally encased in concrete. Although the bottom flange of the steel section is not encased within concrete, the design configuration of the floor module provides complete concrete confinement to prevent spalling. It also provides a better natural bonding than the code-required configuration. The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability. The shear stud size and spacing is not directly credited in the composite section design. The capacity of the studs, whenever required for localized effects, is determined based in accordance with ACI 349.

UFSAR Subsection 3.8.3.5.8.1, Structural Wall Modules - Revise information in the second paragraph, and include the new third paragraph in the location shown below.

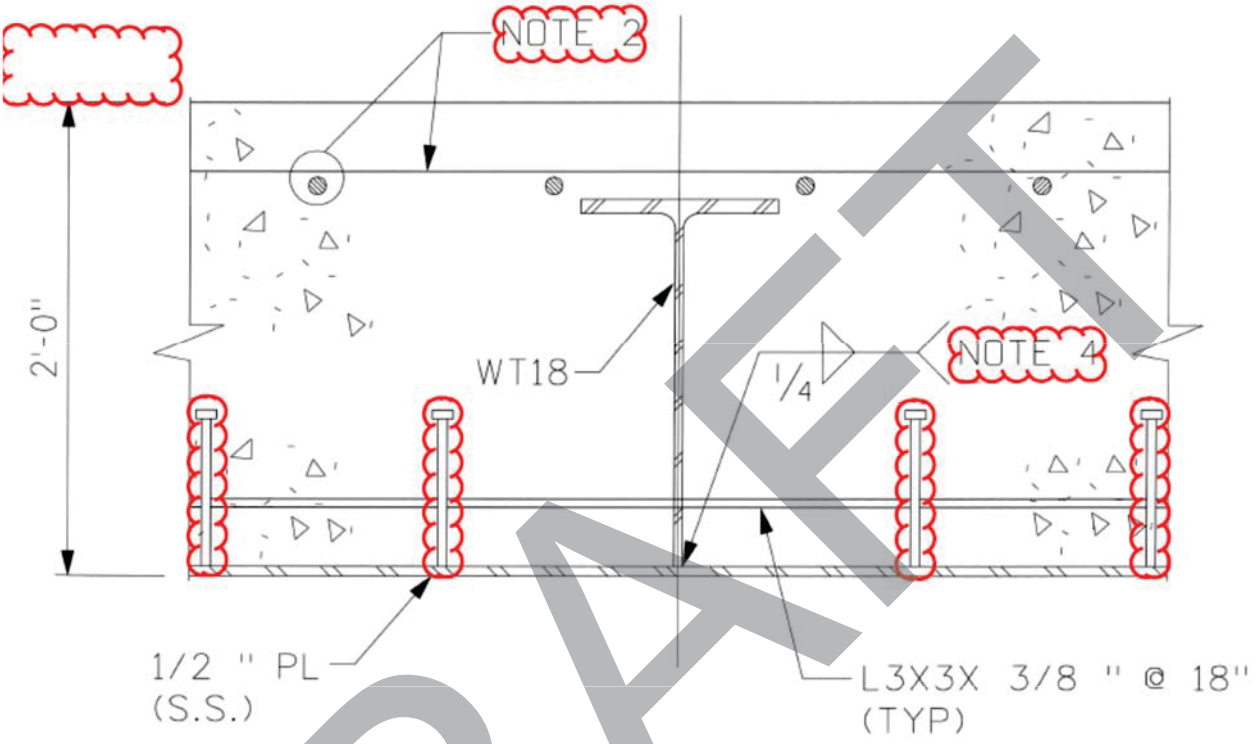
[…

… The structural configuration and typical details are shown in Figures 3.8.3-1, 3.8.3-2, 3.8.3-8, 3.8.3-14~~,~~ and 3.8.3-15~~, and 3.8.3-17~~. ~~The details shown in Figure 3.8.3-17 are representative of connections between floors in containment and walls constructed using steel plate concrete composite construction.~~ Plate thickness….]* The structural analyses are described in Subsection 3.8.3.4 and summarized in Table 3.8.3-2. The design procedures are described in Subsection 3.8.3.5.3.

[*The details shown in Figure 3.8.3-17 are representative of connections between floors in containment and walls constructed using steel plate concrete composite construction.*]* The design details for the floor module are provided for background information and vary based on loading conditions and geometry. The seat angles, beam seats, clip angles, shear plates, shear studs, and reinforcement bars shown in Figure 3.8.3-17 and other design elements are used as required for the connection. A key feature of the connection design is that the design elements provide a direct load path from the floor into the wall. Additional information on the connection design is provided in Subsection 3.8.3.1.3. Details of the connection design, including plate thickness, structural shape type and size, use of specific design elements, and reinforcement arrangement, vary based on local loads. The design implemented in fabrication and construction drawings and instructions may have alternative structural shapes or reinforcement arrangements if they provide sufficient load capacity to satisfy AISC N690 and ACI 349 criteria and requirements. ~~Figure 3.8.3-17 is not representative of the connection between the operating deck floor and the wall modules that form the sides of the refueling canal because these walls do not extend above the floor and the major connection design elements are located within the thickness of the wall and not attached to the faceplates.~~

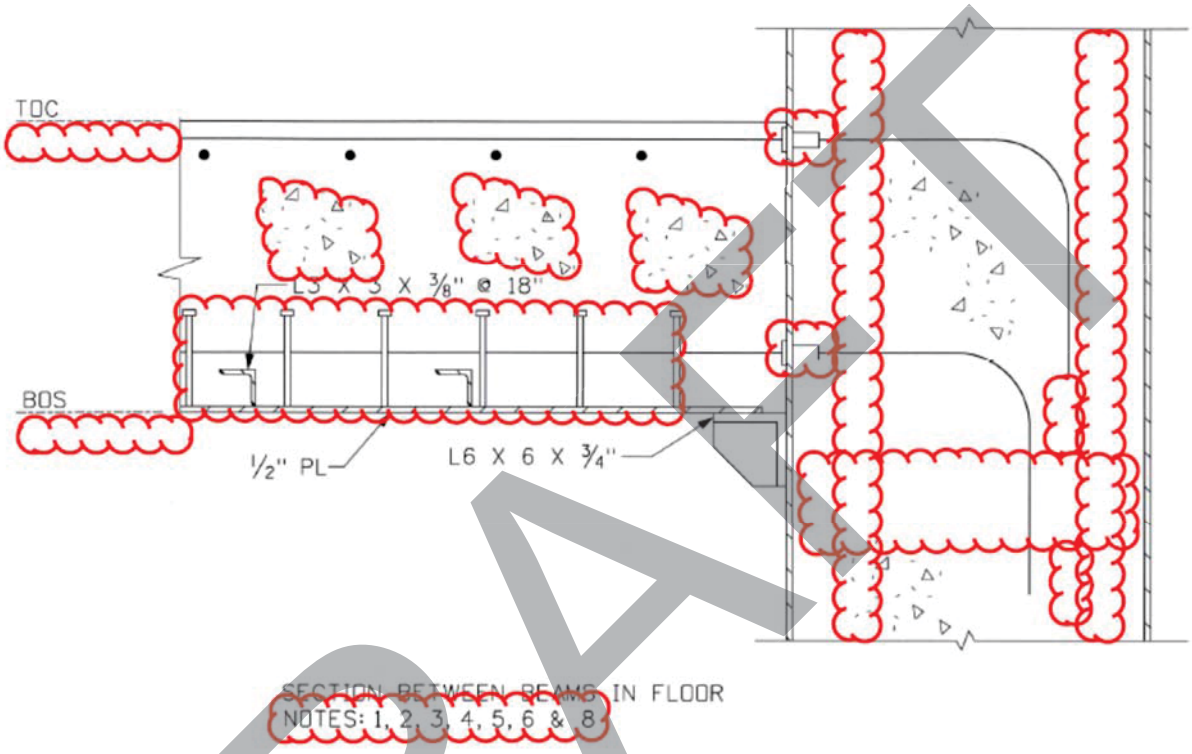
[*The three walls…*

UFSAR Section 3.8, Figure 3.8.3-3, Structural Floor Module - Revise information for the structural floor module as shown below.

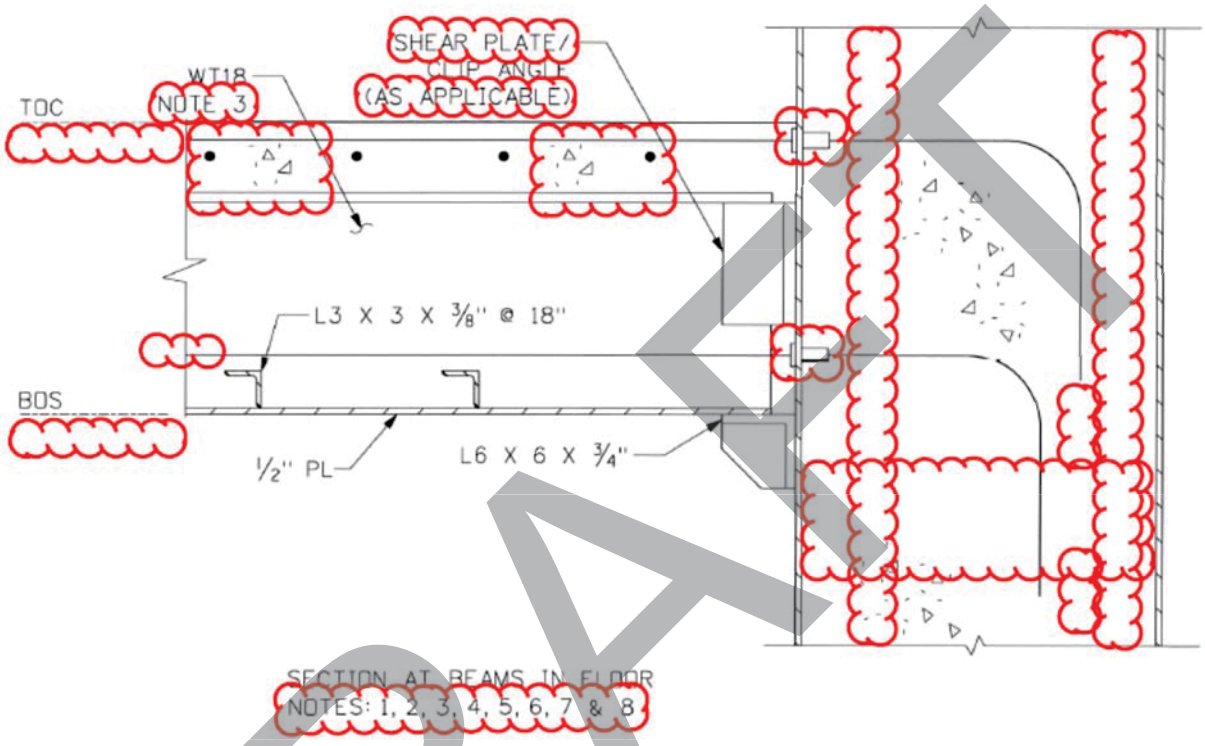


NOTES:
1. DETAILS SHOWN ARE REPRESENTATIVE OF FLOOR MODULES INSIDE CONTAINMENT. CHANNELS AND WIDE FLANGE BEAMS USED IN SOME LOCATIONS ARE NOT SHOWN. REFER TO SUBSECTION 3.8.3.1.4 AND OTHER NOTES FOR ADDITIONAL INFORMATION ABOUT DESIGN DETAILS AND VARIATIONS.
2. REINFORCEMENT USE, SIZE, AND SPACING IN THE FLOOR MODULE CONCRETE SATISFY THE REQUIREMENTS OF ACI 349. THE REINFORCEMENT SIZE RANGE IS #7 TO #11.
3. THE REINFORCEMENT AND FLOOR DESIGN ELEMENTS SHOWN ARE FOR LOCATIONS AWAY FROM OPENINGS, PENETRATIONS AND OTHER OBSTRUCTIONS.
4. THE WELD SIZE AND CONFIGURATION SATISFY THE REQUIREMENTS OF AWS D1.1.

UFSAR Section 3.8, Figure 3.8.3-17, Sheet 1 of 2 [*Structural Modules –Design Details Standard Floor Connection*]* - Revise information for the SECTION BETWEEN BEAMS IN FLOOR as shown below.



UFSAR Section 3.8, Figure 3.8.3-17, Sheet 1 of 2 [*Structural Modules –Design Details Standard Floor Connection*]* - Revise information for the SECTION AT BEAMS IN FLOOR as shown below.



UFSAR Section 3.8, Figure 3.8.3-17, Sheet 1 of 2 [*Structural Modules –Design Details Standard Floor Connection*]* - Revise information to add Notes as shown below.

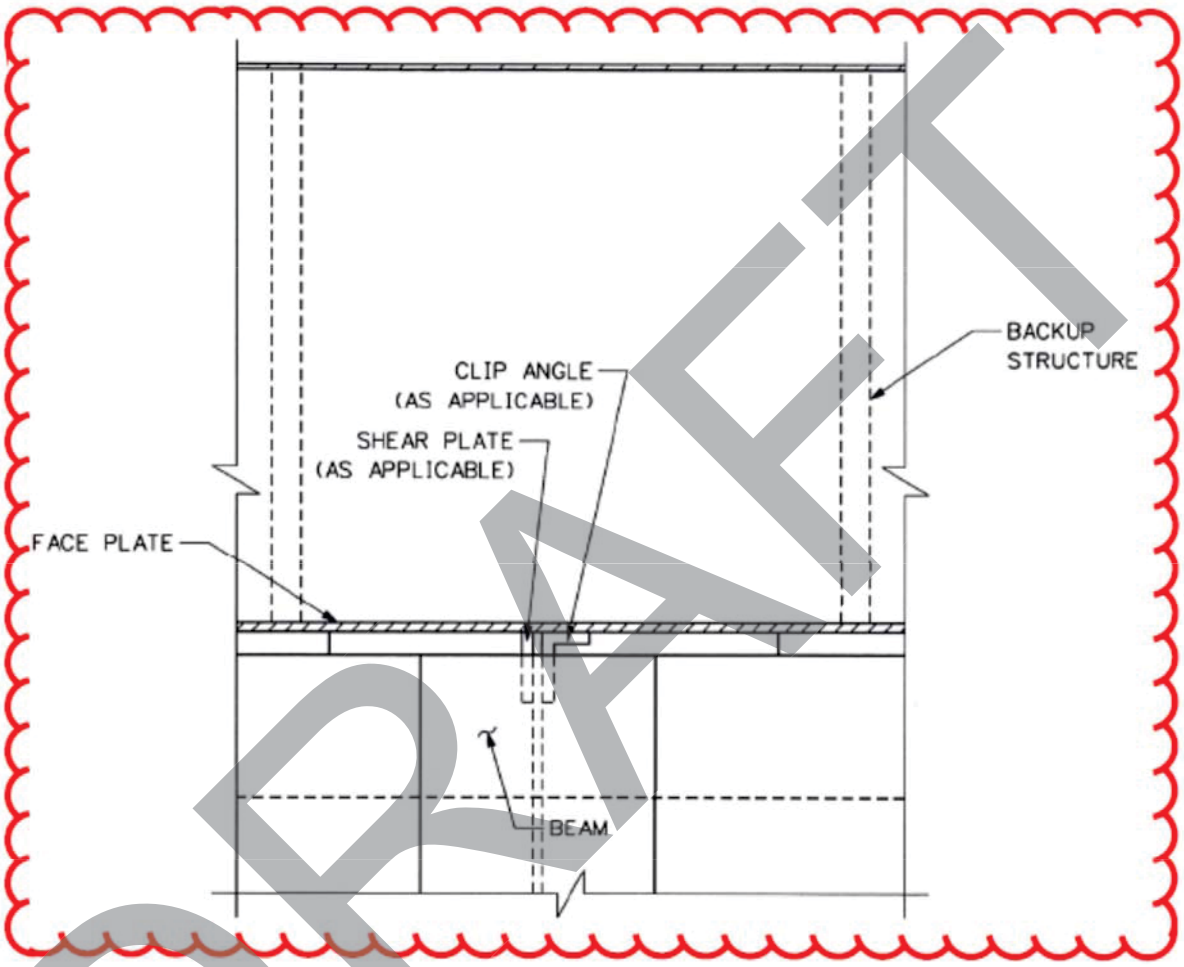
NOTES:

1. DETAILS SHOWN ARE REPRESENTATIVE OF FLOOR MODULES AT EL 107'-2" AND 135'-3" AND THE CONNECTIONS OF FLOOR MODULES TO WALL MODULES INSIDE CONTAINMENT. REFER TO SUBSECTION 3.8.3.1.3 AND OTHER NOTES FOR ADDITIONAL INFORMATION ABOUT DESIGN DETAILS AND VARIATIONS FOR FLOOR MODULE TO WALL MODULE CONNECTIONS. DETAILS ARE NOT REPRESENTATIVE OF THE CONNECTION BETWEEN THE OPERATING DECK FLOOR AND THE WALL MODULES THAT FORM THE SIDES OF THE REFUELING CANAL; SEE SUBSECTION 3.8.3.5.8.1.
2. REINFORCEMENT USE, SIZE, AND SPACING IN THE FLOOR MODULE CONCRETE SATISFY THE REQUIREMENTS IN ACI 349. THE REINFORCEMENT SIZE RANGE IS #7 TO #11.
3. DESIGN OF THE PLATES, BEAMS, AND STIFFENERS IN THE FLOOR, INCLUDING PLATE SIZE AND SPACING, AND TYPE, SIZE, AND SPACING OF STRUCTURAL SHAPES VARIES AND SATISFIES THE REQUIREMENTS OF AISC N690.
4. THE REINFORCEMENT AND FLOOR DESIGN ELEMENTS SHOWN ARE FOR LOCATIONS AWAY FROM OPENINGS, PENETRATIONS, AND OTHER OBSTRUCTIONS.
5. WHERE REINFORCEMENT IS INCLUDED AS PART OF THE CONNECTION DESIGN, THE SIZE, SPACING, AND LENGTH SATISFY THE REQUIREMENTS OF ACI 349. THE DESIGN OF THE STANDARD HOOKS IN THE WALL MODULES AND THE COUPLERS CONNECTING THE FLOOR REINFORCEMENT TO THE HOOKS IN THE WALL MODULES SATISFIES THE REQUIREMENTS OF ACI 349.
6. THE DETAIL DESIGN, LOCATION, AND ATTACHMENT OF THE FLOOR AND BEAM SUPPORTS ARE DESIGNED TO THE REQUIREMENTS OF AISC N690. SUPPORT CONFIGURATIONS, INCLUDING THE USE OF PLATES, STRUCTURAL SHAPES, AND STIFFENERS, ARE BASED ON LOADING AND LOCAL GEOMETRY CONSIDERATIONS.
7. THE DESIGNS OF THE CONNECTIONS AND BACKUP STRUCTURES WITHIN THE MODULES WALL, INCLUDING PLATE SIZE AND SPACING, TYPE, SIZE, AND SPACING OF STRUCTURAL SHAPES, AND USE, SIZE, AND SPACING OF SHEAR STUDS VARY AND SATISFY THE REQUIREMENTS OF AISC N690. THE STRENGTH OF THE STUDS IS BASED ON ACI 349 APPENDIX B.
8. THE THICKNESS OF THE ADJACENT WALL IS BASED ON THE WALL DESIGN REQUIREMENTS AND LOCATION.

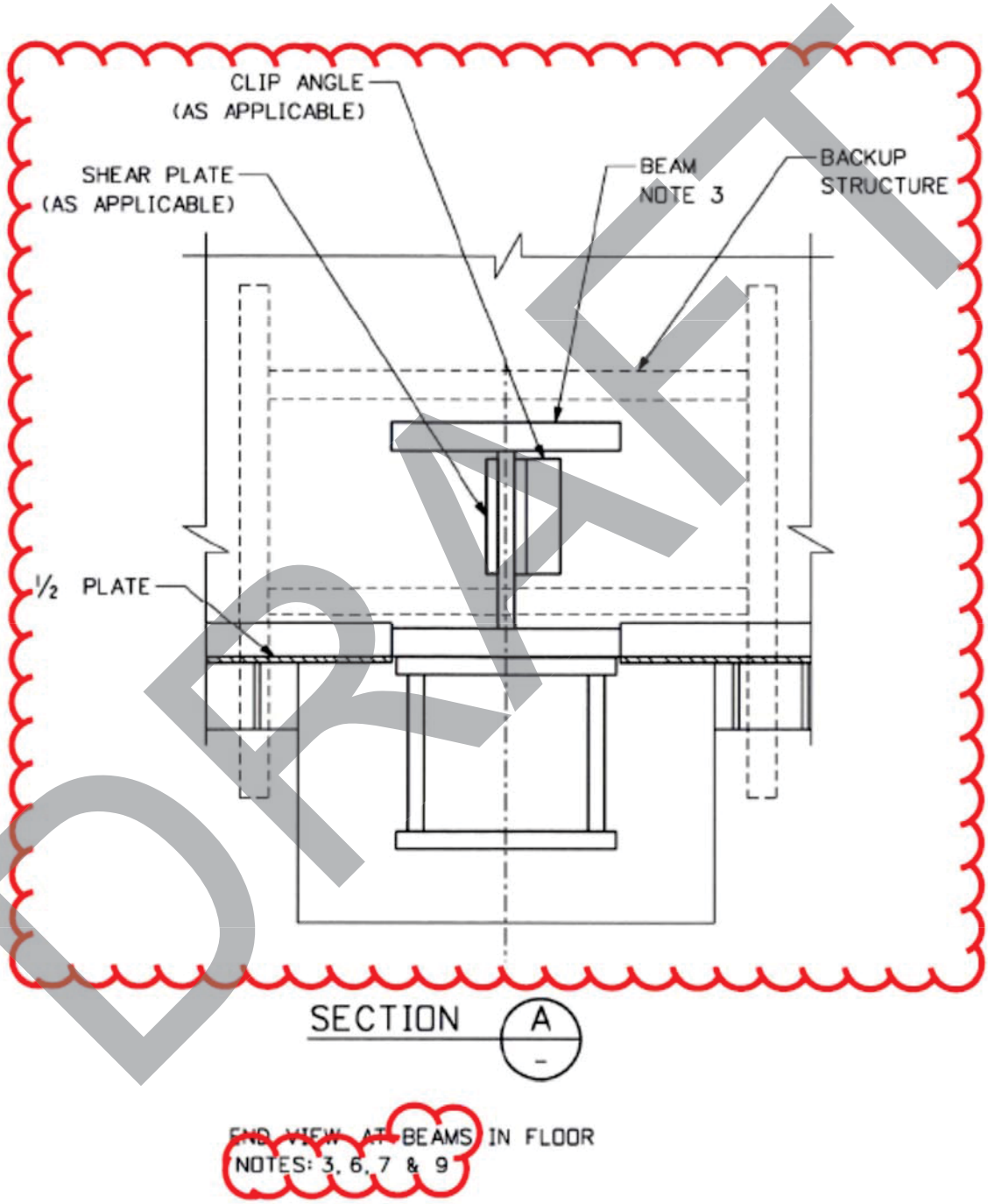
And retain the existing notation of…

See Subsection 3.8.3.5.8.1 for information on Tier 2* designation.

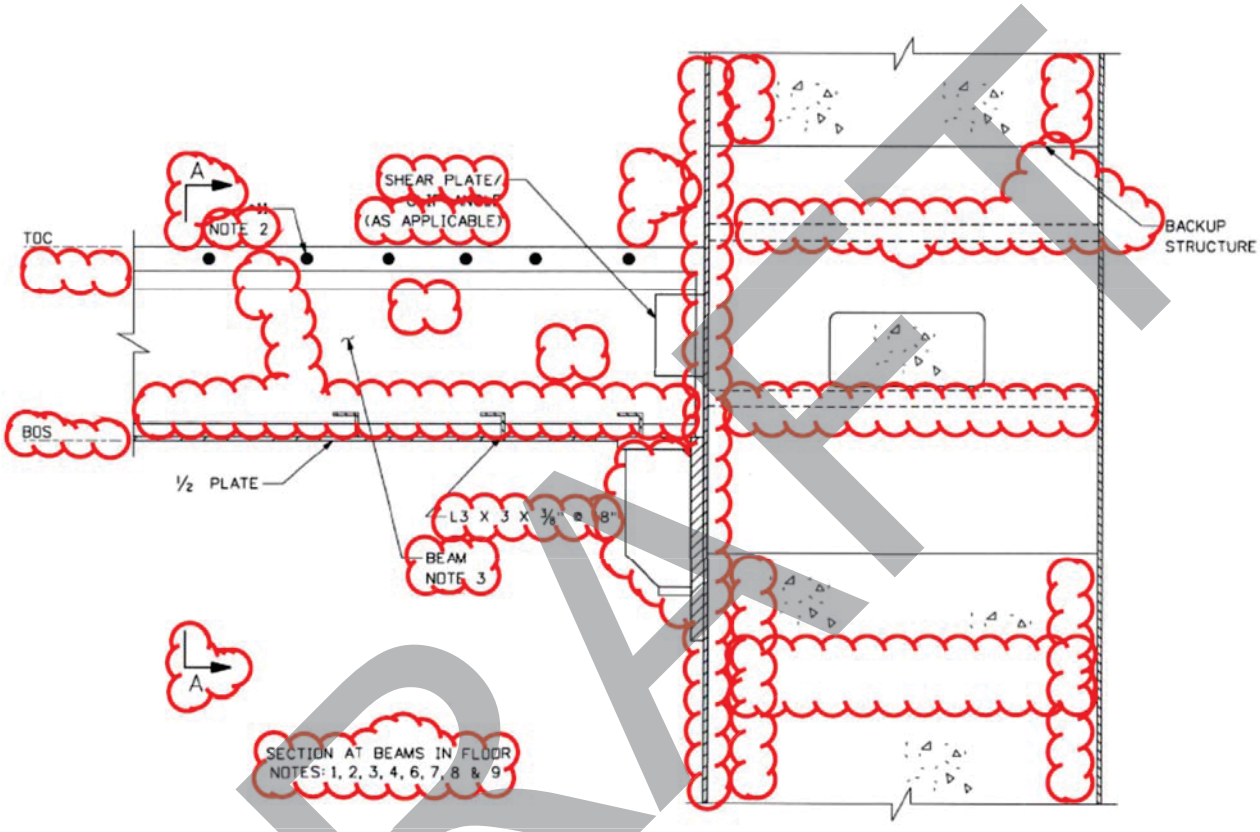
UFSAR Section 3.8, Figure 3.8.3-17, Sheet 2 of 2 [*Structural Modules –Design Details Heavily Loaded Floor Connection*]* - Revise information for the TOP VIEW AT BEAMS IN FLOOR as shown below.



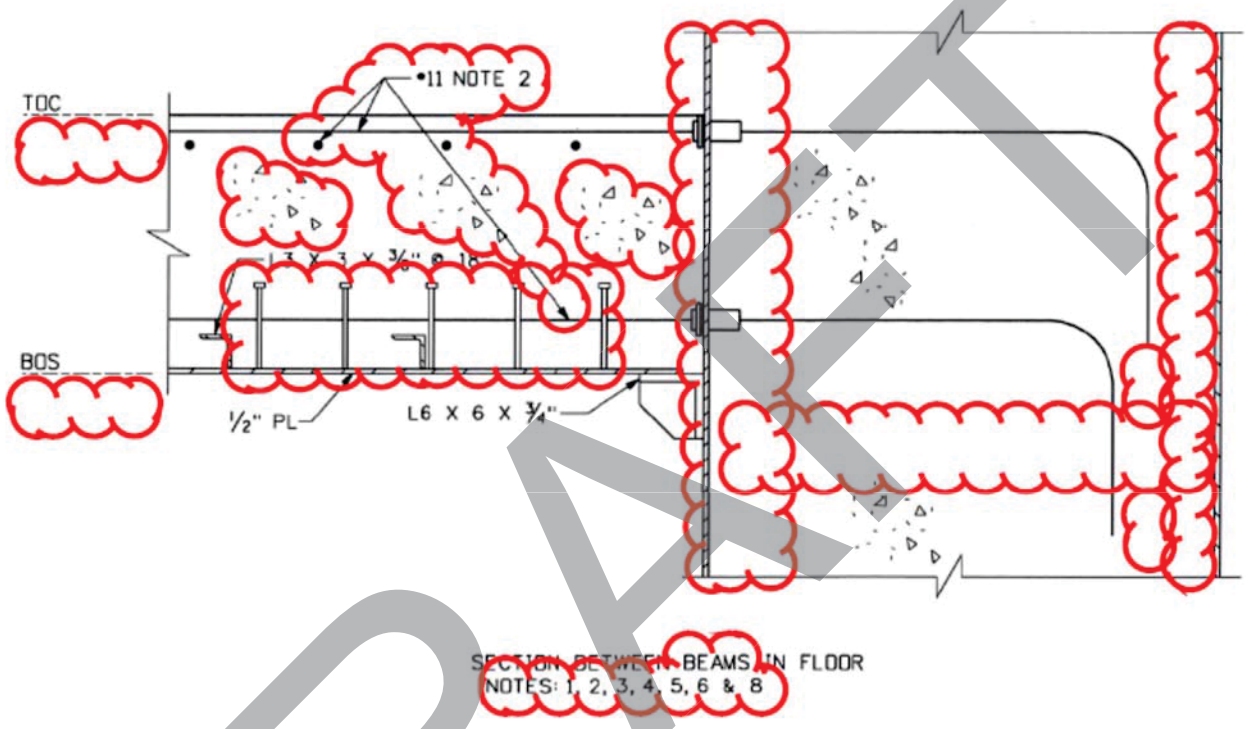
UFSAR Section 3.8, Figure 3.8.3-17, Sheet 2 of 2 [*Structural Modules – Design Details Heavily Loaded Floor Connection*]* - Revise information for the END VIEW AT BEAMS IN FLOOR as shown below.



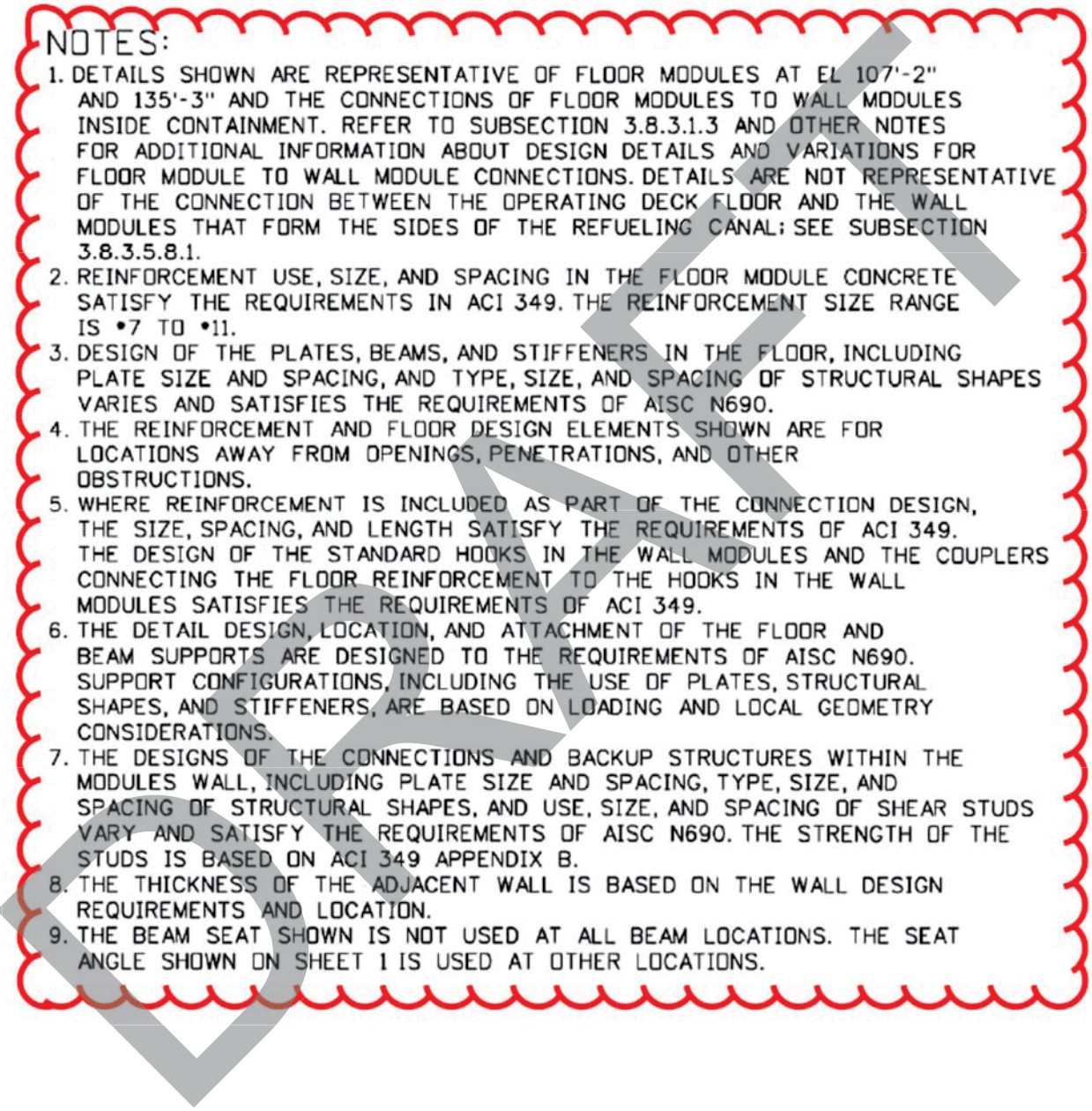
UFSAR Section 3.8, Figure 3.8.3-17, Sheet 2 of 2 [*Structural Modules – Design Details Heavily Loaded Floor Connection*]* - Revise information for the SECTION AT BEAMS IN FLOOR as shown below.



UFSAR Section 3.8, Figure 3.8.3-17, Sheet 2 of 2 [*Structural Modules – Design Details Heavily Loaded Floor Connection*]* - Revise information for the SECTION BETWEEN BEAMS IN FLOOR as shown below.



UFSAR Section 3.8, Figure 3.8.3-17, Sheet 2 of 2 [*Structural Modules – Design Details Heavily Loaded Floor Connection*]* - Revise information to add Notes as shown below.



And retain the existing notation of…

See Subsection 3.8.3.5.8.1 for information on Tier 2* designation.

Southern Nuclear Operating Company

ND-16-2717

Enclosure 3

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Responses to NRC Staff Comments from November 2, 2016

(LAR-15-012 R2)

(This Enclosure consists of 10 pages, including this cover page.)

Revision 1 of LAR-15-012 (SNC LAR-15-012 R1) and the Supplement to LAR-15-012 R1 (SNC LAR-15-012 R1S) revise design details for the construction of floor modules and connections between floor modules and structural wall modules in the containment internal structures (CIS). During discussions with the NRC Staff on November 2, 2016, the NRC Staff provided the licensee with additional comments.

The NRC Staff comments and the responses are provided below.

Comment No. 1

The Staff noted that included material related to connections for wall modules that do not extend above the floor elevation are outside the scope of the LAR and do not require NRC review. Thus, these UFSAR changes and related information should be removed from the LAR and the Supplement. These include:

A) the last paragraph of the added material for UFSAR Subsection 3.8.3.1.3 (LAR R1, Enclosure 2, page 2 of 12);

B) the last sentence of the added material for UFSAR Subsection 3.8.3.5.8.1 (LAR R1, Enclosure 2, page 3 of 12); and

C) the Example of an evaluation for a CA37 module floor to CIS Basemat connection (Detail 2) in the LAR Supplement to R1 (beginning on page 5 of 8).

Response to Comment No. 1

The licensee agrees that the identified material is outside the scope of the LAR and is removing the identified material from the LAR and the Supplement. The requested revisions are reflected in revised Enclosure 2 (pages 2 and 4 of 13) for the proposed UFSAR revisions and in Enclosure 4 (pages 2, 5, and 6 of 8) for the revised LAR Revision 1 supplemental information.

In addition, the corresponding text of the LAR R1 supporting information is also updated to reflect the changes. The revised Enclosure 1 also reflects these revisions on pages 3, 4, 6, 7, 10 and 11 of 17.

The licensee is considering including the above identified, removed material in the licensing basis as an internal departure.

Comment No. 2

The Staff noted that Table 1 of Enclosure 3 of the LAR Supplement to R1 (page 4 of 8) showed the Demand for the top dowels is less than Demand for the bottom dowels, and asked for explanation of it since this is counterintuitive for a slab to wall connection.

The staff also asked whether Table 1 of Enclosure 3 of the LAR is corresponding to the normal loaded connection (as shown in UFSAR Figure 3.8.3-17 Sheet 1) or the heavily loaded connection (as shown in UFSAR Figure 3.8.3-17 Sheet 2).

Response to Comment No. 2

Additional information is provided in Enclosure 4 to address the information provided in Table 1 of the responses to the NRC Staff comments from August 11, 2016 (LAR Supplement to R1).

The requested revision is reflected in revised Enclosure 4 (page 5 of 8) for the LAR Revision 1 supplemental information.

Comment No. 3

The Staff noted that the LAR R1 (Enclosure 1, page 9 of 17) states that "Shear studs are included in the floor module design to provide for composite action between the steel plate and concrete and transfer load from the steel plate on the bottom through the concrete to the reinforcement bars that anchor into the wall." The Staff then noted that this appears to be in conflict with statements in the Enclosure 3 of the LAR Supplement to R1 (page 7 of 8) which states that "The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability, but are not necessary and are not credited to demonstrate composite action." Similarly, the Staff noted that the LAR statement also appears to be inconsistent with the added text at the end of the UFSAR markups of Subsection 3.8.3.5.4 in the Enclosure 3 of the LAR Supplement to R1 (page 8 of 8) which states that "The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability. The shear stud size and spacing is not directly credited in the composite section design. The capacity of the studs whenever required is determined based in accordance with ACI 349."

The staff also noted that PAR (Page 3 of 4) states that the shear studs are provided for the steel and concrete to act as a composite structure and to transfer load from the steel plate on the bottom through the concrete to the reinforcement bars that anchor into the wall. The licensee shall review all statements related to studs/composite action and correct inconsistencies accordingly.

Response to Comment No. 3

The statement in LAR R1 (Enclosure 1, page 9 of 17) is revised to address the NRC Staff comment as reflected in revised Enclosure 1, page 9 of 17. A similar statement in Enclosure 1 (page 4 of 17) of the LAR was also revised for consistency.

In addition, the last sentence of the second paragraph in the markup of UFSAR Subsection 3.8.3.5.4 (Enclosure 2, page 3 of 13), is revised to clarify that even though shear studs are not credited in the composite action, they may be required for "localized effects" (such as loading from attachments).

A similar revision is appropriate for a statement in the Preliminary Amendment Request (PAR) submitted as ND-16-2289 on November 2, 2016 as PAR-15-012. Under item 4 of the PAR Enclosure, replace the sentence:

> The shear studs are provided for the steel and concrete to act as a composite structure and to transfer load from the steel plate on the bottom through the concrete to the reinforcement bars that anchor into the wall.

To read:

> The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability. The shear stud size and spacing is not directly credited in the composite section design. The encased beams provide the primary composite action mechanism.

This revision does not significantly impact the scope of, nor basis for, the PAR, and thus, is addressed herein rather than as a separate submittal.

Comment No. 4

The Staff noted that the LAR Supplement to R1 (page 8 of 8) includes an addition to the UFSAR changes to include a change to UFSAR Subsection 3.8.3.5.4 to identify that "the location of the shear studs welded on the top of the floor bottom plate" may vary in the final design of floor modules in this and other locations. The Staff noted that this addition should likely also address the size and spacing of the shear studs to read "the location, size, and spacing of the shear studs welded on the top of the floor bottom plate…."

Response to Comment No. 4

The statement in the LAR R1 supplement (page 8 of 8) is revised to address the NRC Staff comment as reflected in revised Enclosure 2, page 3 of 13.

Comment No. 5

The Staff Noted that in other submittals the revised mark-ups were given a separate enclosure and questioned whether Enclosure 3 of the Supplement is part of the LAR. It was discussed with the licensee and the NRC PM and concluded that Enclosure 3 of the supplement is part of the LAR.

Response to Comment No. 5

For clarity, each of the pertinent Enclosures is included with this Revision 2 of the LAR.

During discussions with the NRC Staff on January 17, 2017, related to the Preliminary Amendment Request, the NRC Staff requested that Revision 2 further address the topic of omission of some reinforcement bars.

This topic is addressed below.

NRC Request

Identify where in the LAR, the omission of rebar that is shown on UFSAR Figure 3.8.3-17 is identified, and justified.

Response

The LAR clarifies in several locations that the design elements in the floor to wall connection may vary in different floor modules. The information in bold text below is identified from the **Detailed Description** and **Technical Evaluation** discussions to support that bottom dowels are not required in some of floor modules.

On Page 3 of 17 in Enclosure 1, last paragraph:

The proposed changes to UFSAR Subsection 3.8.3.1.3 include a revision to separate the discussion of floor connections from the structural wall modules for the containment internal structures. Information is added to identify that connections similar to those shown in UFSAR Figure 3.8.3-17 are also used for connections of floor submodules to wall submodules within structural modules. The elevations of the subject floor modules are added to the description. **The proposed changes add a discussion to note that the design elements used and the design details in the floor modules and connection design vary in the implemented design.** The proposed changes note that connection design elements are sized based on American Institute of Steel Construction (AISC) N690 criteria and requirements and note that a locally thicker faceplate or an alternative back-up structure design may be used instead of design elements shown in the wall module. Consistent with Note 5 added to UFSAR Figure 3.8.3-17, the size, spacing, and length of reinforcement used as part of the floor to wall connections satisfies American Concrete Institute (ACI) 349 requirements. The use of ACI 349 standard hooks in the wall and reinforcement connectors on the faceplates is added.

On Page 4 of 17 in Enclosure 1, third paragraph:

The proposed changes to the second paragraph of UFSAR Subsection 3.8.3.5.8.1 separate the discussion of floor module connections from the wall module discussions. UFSAR Figure 3.8.3-17 is removed from the list of wall module figures. **The proposed changes include a revision to note that design elements used in the connections and design details may vary in the implemented design.** The proposed changes include adding a sentence in the licensing basis identifying that a key design feature is that design elements provide a direct load path from the floor into the wall. Reference to UFSAR Subsection 3.8.3.1.3 for additional requirements is added to the paragraph. The proposed changes include a revision to note that load capacities of connection design elements satisfy AISC N690 and ACI 349 criteria and requirements.

On Page 5 of 17 in Enclosure 1, the second paragraph (latter portion):

… The backup structure shown in the module wall is a representative design for the connection and the details for the design implemented may vary from that shown in the figure. **The changes to the figure remove reinforcement bars at the beam locations connected to the faceplates and the associated hooks within the wall modules.** In some locations, reinforcement bars connected to the wall module are not provided immediately adjacent to the beam. **Consistent with Note 5 added to the figure, where reinforcement is used, the size, spacing, and length satisfy ACI 349 requirements.** Symbols identifying the location of Section A and representing concrete are moved on the figure to clarify the design. Dimensions of structural angles and reinforcement bars are added and moved on the figure due to removal of this information in other portions of the figure. Use of the term "plate girder" is replaced with "beam" on UFSAR Figure 3.8.3-17, Sheet 2. This is consistent with the use of the term "beam" on Sheet 1 of the figure.

On Page 5 of 17 in Enclosure 1, the third paragraph:

The proposed changes to the connection design and to the UFSAR text and figures are provided to more clearly state what was always understood to be a design requirement for the connection of the floor module to the structural wall modules which is that the connection design satisfies applicable provisions of AISC N690 and ACI 349. UFSAR Figure 3.8.3-17 provides an example of a detail design that demonstrates conformance with the AISC N690 and applicable ACI 349 criteria and requirements. **The specific detail design shown in UFSAR Figure 3.8.3-17 is not required to be used at all locations to provide conformance with AISC N690 and ACI 349 criteria and requirements.** The proposed changes do not change the design requirements and evaluation methods for the floor modules described in UFSAR Subsection 3.8.3.5.4. The proposed changes do not change the structural wall module design for the critical sections identified in the first paragraph of UFSAR Subsection 3.8.3.5.8.1.

On Page 9 of 17 in Enclosure 1, the second paragraph from the bottom:

The design of the connections of the floor modules to the structural wall modules are in conformance with applicable criteria and requirements of AISC N690 and ACI 349. The designs of these floor-to-wall connections rely on a direct, mechanical connection from the design elements in the floor through the faceplate and into the wall module. **The floor loads and the geometry of the floor module connection to the wall module vary significantly from one location to another. This results in variation in the size and configuration of the design elements connecting the floor module to the faceplate and in the size and configuration of the backup structure within the wall module.** The proposed design changes to the connection design, including the design variances permitted by the changes, are in conformance with applicable provisions in AISC N690 and ACI 349.

On Page 10 of 17 in Enclosure 1, the third paragraph from the bottom (last sentence):

… **Notes are added to UFSAR Figure 3.8.3-17 to define the variations in the detail design of the floor module to wall module connections.**

On Page 10 of 17 in Enclosure 1, the last paragraph (first sentence):

Where the reinforcement is included as part of the connection design, the size, shape, and length of the reinforcement satisfies ACI 349 requirements. The reinforcement in the floor module and the use of standard hooks for deformed bars are in conformance with the criteria and requirements of ACI 349. …

The above identified discussions are also reflected in the proposed revisions to the licensing basis documents as shown in bold text below.

On Page 2 of 13 in Enclosure 2:

UFSAR Subsection 3.8.3.1.3, Structural Wall Modules - Revise information in the last paragraph to include additional information in the location shown below.

Representative design details of the connections ~~with~~ of floor modules to structural wall modules are shown in Figure 3.8.3-17. These connections connect the floor modules that make up the maintenance floor at elevation 107′-2″ and the operating deck at elevation 135′-3″. Similar connection designs are used within structural modules to connect floors to walls. **The design details for the floor modules, including the size and spacing of the reinforcement, the use of shear studs, and the sizes of the structural shapes, are provided for background information and vary based on loading conditions and geometry.** The seat angles, beam seats, shear plates, and other design elements supporting the floor modules and connecting the floors to the wall modules are sized to satisfy AISC N690 criteria and requirements. The clip angles and shear plates shown in Figure 3.8.3-17 and other design elements are used as required at beam locations for the connection. The module faceplates in the area of the connection may be thicker than 0.5 inch, up to 1.5-inch thick, in some locations. The backup structure shown in the module wall is a representative design, and the details for the design implemented include variation of the size and thickness of the plates used in the backup structure. The designs of the backup structures satisfy AISC N690 criteria and requirements. As an alternative, locally thicker faceplates or other design elements embedded in the wall and connected to the faceplate may be used to provide sufficient strength in the connection. **Where the reinforcement is included as part of the connection design, the size, spacing, and length of the reinforcement satisfies ACI 349 requirements.** The standard hooks in the wall module and the reinforcement bar connectors on the faceplates satisfy ACI 349 requirements.

On Page 4 of 13 in Enclosure 2 of SNC LAR R2:

UFSAR Subsection 3.8.3.5.8.1, Structural Wall Modules - Revise information in the second paragraph, and include the new third paragraph in the location shown below.

[…

*… The structural configuration and typical details are shown in Figures 3.8.3-1, 3.8.3-2, 3.8.3-8, 3.8.3-14~~,~~ and 3.8.3-15~~, and 3.8.3-17~~. ~~The details shown in Figure 3.8.3-17 are representative of connections between floors in containment and walls constructed using steel plate concrete composite construction.~~ Plate thickness….]** The structural analyses are described in Subsection 3.8.3.4 and summarized in Table 3.8.3-2. The design procedures are described in Subsection 3.8.3.5.3.

[*The details shown in Figure 3.8.3-17 are representative of connections between floors in containment and walls constructed using steel plate concrete composite construction.*]* The design details for the floor module are provided for background information and vary based on loading conditions and geometry. **The seat angles, beam seats, clip angles, shear plates, shear studs, and reinforcement bars shown in Figure 3.8.3-17 and other design elements are used as required for the connection.** A key feature of the connection design is that the design elements provide a direct load path from the floor into the wall. Additional information on the connection design is provided in Subsection 3.8.3.1.3. Details of the connection design, including plate thickness, structural shape type and size, use of specific design elements, and reinforcement arrangement, vary based on local loads. The design implemented in fabrication and construction drawings and instructions may have alternative structural shapes or reinforcement arrangements if they provide sufficient load capacity to satisfy AISC N690 and ACI 349 criteria and requirements. ~~Figure 3.8.3-17 is not representative of the connection between the operating deck floor and the wall modules that form the sides of the refueling canal because these walls do not extend above the floor and the major connection design elements are located within the thickness of the wall and not attached to the faceplates.~~

[*The three walls…*

On Page 8 and 13 of 13 in Enclosure 2, Note 5 for Figure 3.8.3-17:

UFSAR Section 3.8, Figure 3.8.3-17, Sheet[s 1 and] 2 of 2 … - Revise information to add Notes as shown below.

5. **WHERE REINFORCEMENT IS INCLUDED AS PART OF THE CONNECTION DESIGN, THE SIZE, SPACING, AND LENGTH SATISFY THE REQUIREMENT OF ACI 349.**
   THE DESIGN OF THE STANDARD HOOKS IN THE WALL MODULES AND THE COUPLERS CONNECTING THE FLOOR REINFORCEMENT TO THE HOOKS IN THE WALL MODULES SATISFIES THE REQUIREMENTS OF ACI 349.

While reviewing the above discussions and proposed revisions, there were also identified the following enhancements to support the topic of bottom dowels not being required at some locations. The proposed enhancements are provided below in red strikeout and underlined additions:

On Page 3 of 17 in Enclosure 1, modify one sentence in the last paragraph:

The proposed changes to UFSAR Subsection 3.8.3.1.3 include a revision to separate the discussion of floor connections from the structural wall modules for the containment internal structures. Information is added to identify that connections similar to those shown in UFSAR Figure 3.8.3-17 are also used for connections of floor submodules to wall submodules within structural modules. The elevations of the subject floor modules are added to the description. **The proposed changes add a discussion to note that the design elements used and the design details in the floor modules and connection design vary in the implemented design.** The proposed changes note that connection design elements are sized based on American Institute of Steel Construction (AISC) N690 criteria and requirements and note that a locally thicker faceplate or an alternative back-up structure design may be used instead of design elements shown in the wall module. Consistent with Note 5 added to UFSAR Figure 3.8.3-17, where reinforcement is used, the size, spacing, and length ~~of reinforcement used as part of the floor to wall connections satisfies~~ satisfy American Concrete Institute (ACI) 349 requirements. The use of ACI 349 standard hooks in the wall and reinforcement connectors on the faceplates is added.

On Page 5 of 17 in Enclosure 1, add two sentences at the end of the first (partial) paragraph:

…used at more than one floor elevation. The elevations identified for floors in the UFSAR in general arrangement figures and other places are for the top surface of the concrete and are approximate to allow for construction tolerances and floor sloping. The representation of the reinforcement hooks length is changed to be consistent with the ACI standard for standard hooks on Sheet 1 and Sheet 2. The representation of reinforcement connector on the faceplate is changed to be consistent with the type of connector used. In some locations, the bottom reinforcement dowels are not required at the connections. Note 5 is added to clarify that where reinforcement is used, the size, spacing, and length satisfy ACI 349 requirements.

On Page 5 of 17 in Enclosure 1, add one sentence in the second paragraph:

… reinforcement bars connected to the wall module are not provided immediately adjacent to the beam. In some locations, the bottom reinforcement dowels are not required at the connections. **Consistent with Note 5 added to the figure, where reinforcement is used, the size, spacing, and length satisfy ACI 349 requirements.** Symbols identifying the location of Section A and representing concrete are moved on the figure to clarify the design. Dimensions of structural angles and reinforcement bars are added and moved on the figure due to removal of this information in other portions of the figure. Use of the term “plate girder” is replaced with “beam” on UFSAR Figure 3.8.3-17, Sheet 2. This is consistent with the use of the term “beam” on Sheet 1 of the figure.

On Page 10 of 17 in Enclosure 1, add justification information to the first paragraph:

bending moment in the floor. Floor beams may have thicker sections, stiffeners or other design elements at the connection location. The floor modules are connected to the structural wall modules using structural shapes and reinforcement bars connected to the faceplate of the wall module or passing through the faceplate into the concrete of the wall module. The connection of the floor module to the structural wall modules are designed as fully fixed. ~~The reinforcement included as part of the connection design provides for a fully fixed connection and is designed to satisfy the requirements of ACI 349. The size of the reinforcement ranges from #7 to #11.~~ A key feature of the connection design is that structural shapes provide a direct load path from the floor to the wall through welds or mechanical connectors. The connection of the reinforcement to the hooks or anchors in the wall ~~is also~~ can be credited as a direct connection whenever required. In some floors, the bottom reinforcement dowels are not required at the connection as those floors only have some in-plane tension forces as the result of diaphragm behavior under a seismic event. Those floors are designed with clear load path through primary steel beams. Those primary steel beams are provided with backup structures at the connection to transfer loads from the floors to walls. The design of the floors is consistent with the methodology presented in UFSAR Subsection 3.8.3.5.4, and meets the applicable provisions in AISC N690 and ACI 349.

On Page 10 of 17 in Enclosure 1, as the result of modification in the first paragraph, one sentence is moved to a later paragraph beginning at the bottom of the same page:

Where the reinforcement is included as part of the connection design, the size, shape, and length of the reinforcement satisfies ACI 349 requirements. The reinforcement in the floor module and the use of standard hooks for deformed bars are in conformance with the criteria and requirements of ACI 349. The size of the reinforcement ranges from #7 to #11. The change to the length of the reinforcement bar hooks shown within the wall modules in the figure is to make the representation consistent with ACI 349 requirements for standard hooks. The change in the representation of the reinforcement connectors attached to the faceplate is consistent with the design used and these connectors satisfy ACI 349 requirements.

On Page 7 of 8 in Enclosure 4, the Response to Request No.2 is clarified as shown below:

Request No. 2

Provide an engineering representation of “direct load path” (the format of the representation can be descriptive wording or a figure or combination of text and illustration).

Response to Request No. 2

The direct load path at the floor-to-module wall connections is achieved through multiple of the following structural features, as applicable: the floor bottom plate is supported and welded to the stiffened ledger angle or beam ~~continuous floor~~ seat, clip angles, or ~~and~~ shear plates connect the webs of the encased beams to the module wall faceplate, and the top and bottom dowels are anchored into the wall and into the floor, and backup structures located inside the module wall that transfer concentrated forces from the faceplate into the wall section.

Southern Nuclear Operating Company

ND-16-2717

Enclosure 4

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Revised Responses to NRC Staff Comments from August 11, 2016

(Publicly Available Information)

(LAR-15-012 R2)

Red text indicates additions and ~~deletions~~.

(This Enclosure consists of 8 pages, including this cover page.)

Revision 1 of LAR-15-012 (SNC LAR-15-012R1) revises design details for the construction of floor modules and connections between floor modules and structural wall modules in the containment internal structures (CIS). During discussions with the NRC Staff on August 11, 2016, the NRC Staff requested that the licensee provide additional information.

The requested information and the responses are provided below.
Note that this enclosure reflects text modifications made in response to additional NRC comments to assist in identifying the changes.

Request No. 1

Provide a table to demonstrate the demand to capacity ratio of the connection at various sample locations, including locations where the top of the wall is at the same elevation as the top of the floor.

Response to Request No. 1

The CA37 structural module floor has been selected as representative of SNC LAR 15-012R1 because it is one of the most heavily loaded floors. ~~Two~~ The representative connection~~s~~ ~~have~~ has been selected~~:~~ as ~~1)~~ the connection with the CA01 module wall ~~and 2) the connection with the CIS basemat. The latter corresponds to a case in which the top of concrete of the floor coincides with the top of the connecting wall~~. Supporting information, including the demand-to-capacity ratios, are provided below.

Supporting Information

The CA37 structural module floor has been selected as representative of SNC LAR-15-012R1 because it is one of the most heavily loaded floors.

Figure 1 shows a plan view of the CA37 module floor and its boundaries. Figure 1 was obtained from UFSAR Figure 3.8.3-1 (Sheet 4 of 7) and additional information has been added using red markings.

~~Two~~ The representative connection~~s~~ ~~have~~ has been selected~~:~~ as the connection with the CA01 module wall (see Figure 1, Detail 1) ~~and the connection with the CIS basemat (see Figure 1, Detail 2). The latter corresponds to a case in which the top of concrete of the floor coincides with the top of the connecting wall~~.

[This UFSAR figure contains security-related information and is provided in Enclosure 5.]

Figure 1: Plan View of CA37 Floor

Example of evaluation for the CA37 module floor-to-CA01 wall connection (Detail 1)

Figure 2 (revised UFSAR Figure 3.8.3-17 (Sheet 1 of 2) as proposed in SNC LAR-15-012R1 and shown below) shows the configuration of the CA37 module floor-to-CA01 wall connection (Area 4 in Containment, top of floor elevation 107'-2"). This connection is composed primarily of encased steel beams that are welded to continuous stiffened angle beam seats. The seats are continuously welded to the CA01 module wall faceplate. Additionally, there are top and bottom dowels that connect the CA37 floor to the CA01 wall. At some locations where the encased beams are heavier to carry heavier loads, such as the Core Makeup Tank, there are heavy beam seats instead of the continuous stiffened angle. These heavy beam seats are referred to as beam pedestals.

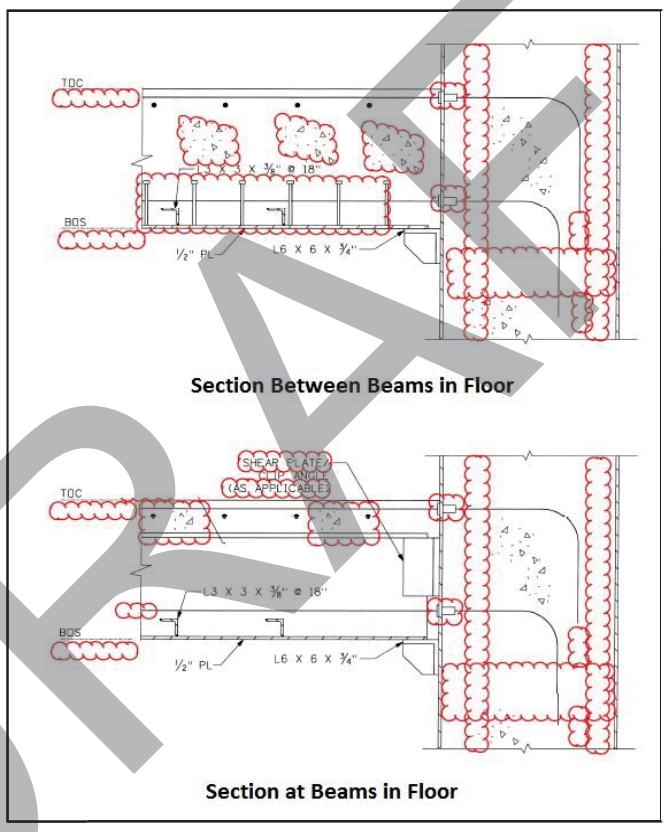


Figure 2: Elevation View of CA37 Floor to CA01 Wall Connection

Table 1 describes the interaction ratios for the CA37 module floor to CA01 module wall connection (Area 4 in Containment, top of floor elevation 107'-2").

Table 1: CA37 Module Floor to CA01 Module Wall Connection Design Interaction Ratios (IR)

Item	Structural Item	Demand	Capacity	IR	Governing failure mode
1	Top dowel	1.32 in^2/ft	2.00 in^2/ft	0.66	Maximum 0.3% concrete compressive strain in bending per ACI 349 requirements.
2	Bottom dowel	1.96 in^2/ft	2.00 in^2/ft	0.98	Maximum 0.3% concrete compressive strain in bending per ACI 349 requirements, determined conservatively neglecting the contribution of the encased beams, the floor bottom plate and the weld to the floor seat.
3	Continuous Stiffened Beam Seat	4.94 kip/in	5.57 kip/in	0.89	Weld connecting floor bottom plate to continuous angle seat, determined conservatively neglecting the contribution of the bottom dowels.
4	Beam Pedestals	12.6 kip/in	50.4 kip/in	0.25	Weld connecting beam to beam pedestal.

Table 1 displays the reinforcement required (see items 1 & 2 in the table) in square inches per linear foot to withstand the demand forces due to axial, bending, & twisting loads from the ANSYS finite element analysis model while neglecting the contribution of the beam seats. The capacity is presented as the available square inches of steel per linear foot.

Table 1 also displays the continuous stiffened angle floor seat (see item 3 in the table) "demand" due to tension (axial, bending, & twisting moment), in-plane shear, and out-of-plane shear loads from the ANSYS finite element analysis model, along with locked-in stress imparted to the seats during concrete placement. The forces applied at the stiffened seat for the evaluation are conservatively based on the largest demand obtained from the analysis model at the CA37 floor to wall connection, while neglecting the contribution of the bottom dowels. The continuous stiffened beam seats are demonstrated to meet the design requirements.

Finally, Table 1 also displays the beam pedestal (see item 4 in the table) "demand" due to in-plane shear and out-of-plane shear loads from the ANSYS finite element analysis model. The beam pedestals are analyzed in a similar fashion as the continuous stiffened angle

beam seats with the exception that they see larger loads due to the Core Makeup Tank being supported on this area of the floor.

The demands shown in Table 1 are values from enveloping load combinations, and it is the reason why the demand of top dowels is less than the one of bottom dowels. The top dowel exhibits a higher demand under normal operation loading combinations. The bottom dowel demand (1.96 in^2/ft) is associated with an abnormal loading combination that is primarily controlled by seismic and flood-thermal loading cases.

The seismic loading results in tension in the bottom dowel due to the upward seismic component and to the overturning moment of the core make-up tank (CMT), which results in uplift in some of the CMT legs, generating upward seismic loads in the floor. Additionally, the CA37 floor connects the CA01 walls to the containment internal structure (CIS) basemat, which restrains the CA01 walls when subject to a horizontal seismic acceleration northward. This generates diaphragm action, and the CA01 motion engages the CA37 floor in tension, resulting in tension in the top and bottom dowels, which contributes to the larger net tension in the bottom dowels.

The flood-thermal case is generated during the flood scenario in which the liquid in the in-containment refueling water storage tank (IRWST) is drained and the entire CIS is filled with liquid up to an elevation of 110'-2" so that the CA37 floor (top of concrete at EL. 107'-2") is submerged. This flood case is associated with elevated temperatures in the water that vary across different areas and depths. In order to account for the effect of these elevated temperatures, the floor is analyzed under a large thermal gradient in which the top of the floor experiences higher temperatures creating a condition that puts the bottom dowel in tension.

This represents the largest dowel demand in all of CA3X floors.

Table 1 includes results that envelope locations along wall CA01, which include beam connections with clip angles and no back-up structures as shown in UFSAR Figure 3.8.3-17, Sheet 1, "Structural Modules - Design Details Standard Floor Connection," connections with clip angles and back-up structures as shown in UFSAR Figure 3.8.3-17, Sheet 2, "Structural Modules - Design Details Heavily Loaded Floor Connections," and connections in between beams that show only top and bottom rebar, as shown in both UFSAR Figure 3.8.3-17, Sheets 1 and 2.

~~**Example of an evaluation for a CA37 module floor to CIS Basemat connection (Detail 2)**~~

~~The location of the CA37 module floor to CIS basemat connection is marked as Detail 2 in Figure 1. This corresponds to a case in which the top of concrete of the floor coincides with the top of the connecting wall. This connection is composed of encased steel beams in the CA37 floor that are welded to embedment plates that transmit loads into the CIS basemat in combination with top and bottom dowels that connect the CA37 floor to the CIS basemat.~~

~~Table 2 shows the interaction ratios for the CA37 module floor to CIS basemat connection (Area 4 in Containment, top of floor elevation 107'-2").~~

Table 2: CA37 Module Floor to CIS Basemat Connection Design Interaction Ratios (IR)

Item	Structural Item	Demand	Capacity	IR	Governing failure mode
1	Top dowel	0.92 in^2/ft	1.56 in^2/ft	0.59	Maximum 0.3% concrete compressive strain in bending per ACI 349 requirements.
2	Bottom dowel	1.50 in^2/ft	1.56 in^2/ft	0.96	Maximum 0.3% concrete compressive strain in bending per ACI 349 requirements, determined conservatively neglecting the contribution of the encased beams, the floor bottom plate and the weld to the embedment plates.
3	Shear friction at floor to wall boundary	2.16 in^2/ft	2.77 in^2/ft	0.78	Shear friction failure mode per ACI 349 requirements, determined conservatively assuming a shear friction failure plane at the floor to wall boundary, even though there are no construction joints, it is a monolithic concrete placement.
4	Embedment plate	265 kip	270 kip	0.98	Embedment shear failure, determined conservatively using the shear capacity of the beam as demand.

Table 2 displays the reinforcement demand (see items 1, 2 & 3 in the table) in square inches per linear foot for demand forces due to axial, bending, & twisting loads from the ANSYS finite element analysis model. The capacity is taken as the available square inches of steel per linear foot. The reinforcement at the module floor to CIS basemat connection is also conservatively qualified to accept the in plane and out of plane shear forces through shear friction, while neglecting the contribution of the encased beams.

Table 2 also displays the controlling design ratio for the connection of the encased steel beams, which are welded to embedment plates to transmit their load into the CIS basemat (see item 4 in the table). The encased beams, the embedment plates, and the welds at the module floor to CIS basemat connection are conservatively qualified to the full demand while neglecting the contribution of the dowels.

Request No. 2

Provide an engineering representation of “direct load path” (the format of the representation can be descriptive wording or a figure or combination of text and illustration).

Response to Request No. 2

The direct load path at the floor-to-module wall connections is achieved through multiple of the following structural features, as applicable: the floor bottom plate is supported and welded to the stiffened ledger angle or beam ~~continuous floor~~ seat, clip angles, or ~~and~~ shear plates connect the webs of the encased beams to the module wall faceplate, and the top and bottom dowels are anchored into the wall and into the floor, and backup structures located inside the module wall that transfer concentrated forces from the faceplate into the wall section.

Request No. 3

Provide a brief description of the methodology of "fully fixed" connection design.

Response to Request No. 3

The floors are evaluated as “fully fixed” because the connection has the capability to resist negative bending moments, in which the top reinforcement is in tension and the concrete in the lower portion of the section is in compression. In addition, the encased beams are evaluated as simply supported for downward loading assuming composite action and for upward loading considering only the steel while ignoring the contribution of the concrete.

Request No. 4

Provide a brief description of the types of mechanical couplers being used and the requirements for these mechanical couplers.

Response to Request No. 4

A brief description of the types of mechanical couplers being used and the requirements for these mechanical couplers is provided below:

A typical mechanical connection between two reinforcing bars to create a tension splice is made with a taper-threaded coupler (e.g., as described in ACI 439.3R-05 Section 3.3.13). These are often referred to as “form savers” at the mechanical connection of reinforcing bars at a floor-to-wall connection as they eliminate protruding dowel bars at the construction joint. Mechanical connectors are used to splice ASTM A706 and A615 reinforcing bar. The mechanical connectors used are mechanical splices that develop at least 125 percent of the specified yield strength of the spliced bar.

Request No. 5

Provide a corrected Note 4 for UFSAR Figure 3.8.3-3. Note 4 is currently showing an extra period (AWS D.1.1 vs AWS D1.1) in the code listing.

Response to Request No. 5

Note 4 for revised UFSAR Figure 3.8.3-3 is revised to correct the identified reference to the AWS code as shown in the markups below (see page 8 of 8).

Request No. 6

Provide references to identify where shear stud information for internal containment floors is specified in the UFSAR. If it is not defined in the UFSAR, consider whether it is necessary to add one.

Response to Request No. 6

Shear stud information for internal containment floors is currently not specified in the UFSAR.

In the internal containment module floors, the encased beams provide the primary composite action mechanism. The shear studs welded on the top of the floor bottom plate supplement the natural bottom plate-to-concrete bond capability, but are not necessary and are not credited to demonstrate composite action. The shear stud size and spacing is determined based on the stud size and spacing methodology used in the module wall. Also, the capacity of studs required for a local effect, such as loading from an attachment, is determined in accordance with ACI 349.

UFSAR Subsection 3.8.3.1.4 and Subsection 3.8.3.5.4 are proposed to be revised to include shear studs information as identified below and shown in the markups below (see page 8 of 8).

Proposed Revisions to the Licensing Basis Proposed Changes

Revised UFSAR Subsection 3.8.3.1.4, Structural Floor Modules, information reflecting the above responses is provided in Enclosure 2.

Revised UFSAR Subsection 3.8.3.5.4, Structural Floor Modules, information reflecting the above responses is provided in Enclosure 2.

Revised UFSAR Section 3.8, Figure 3.8.3-3, Structural Floor Module, information reflecting the above responses is provided in Enclosure 2.

Southern Nuclear Operating Company

ND-16-2717

Enclosure 5

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

Revised Responses to NRC Staff Comments from August 11, 2016

(Withheld Information)

(LAR-15-012 R2)

This Enclosure contains security-related information that is requested to be withheld from public disclosure under 10 CFR 2.390(d).

(This Enclosure consists of 2 pages, including this cover page.)