

B. H. Whitley  
Director  
Regulatory Affairs

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

Tel 205.992.7079  
Fax 205.992.5296



November 30, 2016

Docket Nos.: 52-025  
52-026

ND-16-2518  
10 CFR 50.90  
10 CFR 52.63

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

**Southern Nuclear Operating Company  
Vogtle Electric Generating Plant Units 3 and 4  
Request for License Amendment and Exemption:  
Shield Building Roof Changes (LAR-16-031)**

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 change the Shield Building Roof beam size, material, reinforcement and connection (some of the changes involve the Passive Containment Cooling Water Storage Tank (PCCWST)). The proposed amendment revises the plant-specific Tier 1 information and corresponding changes to COL Appendix C, 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 shield building roof, tension ring, and air inlets and removing tie rods.

Enclosure 1 provides the description, technical evaluation, regulatory evaluation (including the Significant Hazards Consideration Determination), and environmental considerations for the proposed changes in the License Amendment Request (LAR). **Enclosure 2 contains portions of the LAR classified as security-related, also referred to as sensitive unclassified non-safeguards information (SUNSI), protected and requested to be withheld under the provisions of 10 CFR 2.390(d).** Pursuant to the provisions of 10 CFR 52.63(b)(1), Enclosure 3 contains further justification for the associated exemption request to support the proposed departure from Tier 1 material. Enclosure 4 identifies the requested changes and provides markups depicting the requested changes to the plant-specific licensing basis documents. **Enclosure 5 contains the proposed markup depicting the requested change to information classified as security related, also referred to as SUNSI, protected and requested to be withheld under the provisions of 10 CFR 2.390(d).**

This letter contains no regulatory commitments.

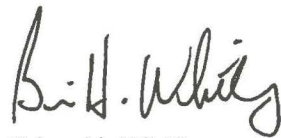
In order to support the SNC Unit 3 construction schedule, SNC requests NRC staff review and approval of the license amendment and exemption no later than April 30, 2017. Approval by this date will allow sufficient time to implement licensing basis changes prior to affected construction activities. SNC expects to implement the proposed amendment within 30 days of approval. South Carolina Electric & Gas Company (SCE&G), acting on behalf of itself and the South Carolina Public Service Authority (Santee Cooper), has stated that the current requested approval date for the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 is November 17, 2017.

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

Should you have any questions, please contact Mrs. Stephanie Agee at (205) 992-7556.

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

Respectfully submitted,  
SOUTHERN NUCLEAR OPERATING COMPANY



Brian H. Whitley



BHW/SYA/ljs

Sworn to and subscribed before me this 30<sup>th</sup> day of November, 2016

Notary Public: Lisa Myrick Spears

My commission expires: June 18, 2019

- Enclosures
- 1) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Request for License Amendment Regarding Shield Building Roof Changes (LAR 16-031)
  - 2) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Protected Information for Request for License Amendment Regarding Shield Building Roof Changes (LAR 16-031) (**Security-Related Information (SUNSI) – Withhold from Public Disclosure Under 10 CFR 2.390(d)**)

- 3) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Exemption Request Regarding Shield Building Roof Changes (LAR 16-031)
- 4) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Proposed Changes to Licensing Basis Documents (LAR 16-031)
- 5) Vogtle Electric Generating Plant (VEGP) Units 3 and 4 – Proposed Changes to Licensing Basis Documents – Protected Information (LAR 16-031)  
(Security-Related Information (SUNSI) – Withhold from Public Disclosure Under 10 CFR 2.390(d))

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

Ms. A. G. Aughtman

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. Burkhardt (w/o enclosures)

Mr. P. Kallan

Mr. C. Patel

Mr. W. C. Gleaves

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 2 & 5)

Oglethorpe Power Corporation

Mr. M. W. Price (w/o enclosure 2 & 5)

Mr. K. T. Haynes (w/o enclosure 2 & 5)

Ms. A. Whaley (w/o enclosure 2 & 5)

Municipal Electric Authority of Georgia

Mr. J. E. Fuller (w/o enclosure 2 & 5)  
Mr. S. M. Jackson (w/o enclosure 2 & 5)

Dalton Utilities

Mr. T. Bundros (w/o enclosure 2 & 5)

Westinghouse Electric Company, LLC

Mr. R. Easterling (w/o enclosures)  
Mr. J. W. Crenshaw (w/o enclosures)  
Mr. C. D. Churchman (w/o enclosures)  
Mr. L. Woodcock  
Mr. P. A. Russ  
Mr. A. F. Dohse  
Mr. M. Y. Shaqqo  
Mr. C. A. Castell

Other

Mr. J. E. Hesler, Bechtel Power Corporation  
Ms. L. A. Matis, Tetra Tech NUS, Inc. (w/o enclosure 2 & 5)  
Dr. W. R. Jacobs, Jr., Ph.D., GDS Associates, Inc. (w/o enclosure 2 & 5)  
Mr. S. Roetger, Georgia Public Service Commission (w/o enclosure 2 & 5)  
Ms. S. W. Kernizan, Georgia Public Service Commission (w/o enclosure 2 & 5)  
Mr. K. C. Greene, Troutman Sanders (w/o enclosure 2 & 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  
NDDocumentinBox@duke-energy.com, Duke Energy  
Mr. S. Franzone, Florida Power & Light

**Southern Nuclear Operating Company**

**ND-16-2518**

**Enclosure 1**

**Vogtle Electric Generating Plant (VEGP) Units 3 and 4**

**Request for License Amendment Regarding**

**Shield Building Roof Changes**

**(LAR 16-031)**

**(This Enclosure consists of 27 pages, including this cover page)**

## **Table of Contents**

1.0	Summary Description
2.0	Detailed Description
3.0	Technical Evaluation
4.0	Regulatory Evaluation
4.1.	Applicable Regulatory Requirements/Criteria
4.2.	Precedent
4.3.	Significant Hazards Consideration Determination
4.4.	Conclusions
5.0	Environmental Considerations
6.0	References

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

## **1.0 Summary Description**

The requested amendment requires changes to Updated Final Safety Analysis Report (UFSAR) information, which involve changes to plant-specific Tier 1, and corresponding changes to COL Appendix C, and changes to Tier 2\* information. This enclosure requests approval of the license amendment necessary to implement these changes.

Proposed change activity no. 1 is made on sizes of thirty-two radial beams spanning between the compression ring in the center of the shield building roof and the tension ring above the shield building wall. Proposed change activity no. 1 is made on the material of the radial and circumferential beams supporting the shield building roof, and also to allow the use of fabricated plate girders.

Proposed change activity no. 2 pertains to the Roof Beam Material Substitution and has been combined with Proposed change 1.

Proposed change activity no. 3 is made on reinforcement in the roof, the walls of the Passive Containment Cooling Water Storage Tank (PCCWST) supported by the shield building roof, and the design details of the shield building tension ring and air inlet structure.

Proposed change activity no. 4 is made on UFSAR tables, sketches and figures to reflect changes defined in proposed change activity nos. 1 and 3, and to remove redundant information or excessive detail in those tables, sketches and figures.

Proposed change activity no. 5 is made to note that the design of the reinforcement in the roof and the design details of the tension ring and air inlets portions of the shield building can vary from these typical design details described in UFSAR. The shield building critical sections represents the key elements of the design of non-critical sections constructed using similar techniques. Proposed changes to the UFSAR are made to address changes to design details identified for critical sections.

Proposed change activity no. 6 is made to remove tie rods between the shield plate and the shield building roof beams in UFSAR and plant-specific Tier 1 (and associated Combined License Appendix C) figures.

## **2.0 Detailed Description**

### **Change Activity No. 1 – Roof Beam Size Change and Roof Beam Material Substitution**

#### **Issue Description**

Thirty-two radial beams span between the compression ring in the center of the shield building roof and the tension ring above the shield building wall. These beams support the concrete roof of the shield building. The size of these beams was identified as W36x393. The W36x393 size beam is no longer manufactured. The design of the roof beams must be changed to a size that can be procured.



The radial and circumferential beams supporting the shield building roof have a requirement for impact tests at very low temperatures (Charpy V-Notch impact tests) which is required by AISC N690 section Q1.4.1 for structures that may be subjected to suddenly applied impact loads (e.g. design basis tornado generated missiles, beyond design basis aircraft impact). The rolled wide flange beams identified in the UFSAR figures are not generally available in a material that will satisfy the required impact testing.

### **Proposed Change**

Change the size of the shield building roof beams to W36x395. This is a standard beam size and provides equal or better strength. The nominal size of the W36x395 beam is 0.60 inch greater from outside flange surface to outside flange surface.

Remove the size designation of the roof beam in UFSAR Subsection 3H.5.6.1. Revise the designation of the roof beam in UFSAR Table 3H.5-15 and Figure 3H.5-11 to W36x395. Remove redundant references to beam size on UFSAR Figures 3H.5-11 Sheets 2, 3, and 4, 3H.5-14, and 3H.5-15. Remove redundant reference to circumferential beam size from UFSAR Figure 3H.5-11 Sheets 2, 4 and 5. On UFSAR Figure 3H.5-11 Sheet 1 the circumferential beam size of W36x135 is shown on the right side of the figure near the connection of the radial beam with the tension ring and midspan of the radial beam below the exterior wall of the PCCWST.

The material of the roof radial beams and roof circumferential beams should comply with the applicable material specifications (e.g., ASTM A572), and also satisfy the impact tests requirements. By using the materials which satisfy the specific requirements defined above, the roof radial beams and roof circumferential beams can be made with two options, option 1 is hot rolled shapes (W36x395 for roof radial beams, and W36x135 for roof circumferential beams), option 2 is built-up plate girders with section dimensions specified in UFSAR Figure 3H.5-11 Sheet 1. Note 6 is added to UFSAR Figure 3H.5-11 Sheet 1 to mention options 1 and 2 for the roof radial beams, and Note 7 is also added to mention options 1 and 2 for the roof circumferential beams. A note is added to UFSAR Table 3H.5-15 to identify that the beams can be fabricated plate girders. The welds in the plate girders are continuous double fillet welds or partial joint penetration with reinforcing fillet welds in order to transfer the full girder web shear capacity to flange and allow the section to develop full bending capacity of the section. The welds of the built-up plate girders are provided in Figure 1 and 2 below. These built-up plate girders are proved through calculations to have a smaller demand to capacity ratio than the hot rolled shapes. The maximum demand to capacity ratio of the built-up plate girder for the roof radial beam is 0.72, and is governed by the axial and bending stress. It is worth noting that similar information has been provided for the hot rolled shape of the roof radial beam in the UFSAR Table 3H.5-15 in the format of Reinforcement Ratio (1.33) which is the reciprocal of the demand to capacity ratio ( $= 1/1.33 = 0.75$ ). The maximum demand to capacity ratio of the built-up plate girder for the roof circumferential beam is 0.26, and is governed by the axial and bending stress. The maximum demand to capacity ratio of the hot rolled shape of the roof circumferential beam is 0.27, and is also governed by the axial and bending stress. The design of the built-up plate girders is based on AISC N690, sections Q1.4.1, Q1.5.1, Q1.5.3, Q1.5.6, Q1.5.7, Q1.6, Q1.8, Q1.9.1.2, Q1.10, Q1.11.1 through Q1.11.4, Q1.14.6, Q1.15.12 and Q1.15.13. The fabrication and erection of the built-up plate girders are based on ASTM A572, AISC N690, sections Q1.4.1, Q1.17, Q1.19, Q1.23 and Q1.24, and AWS D1.1, sections 3.1 through 3.12, sections 4.1 through 4.8, 4.10 and 4.11, 4.18 through 4.22, 4.24, 4.25, 4.30 through 4.32, 5.1 through 5.19, 5.21 through 5.24 and sections 5.26 through 5.31 for fillet and

Partial Joint Penetration (PJP) groove welds. The inspection of the built-up plate girders will be performed based on AISC N690 sections Q1.26 and AWS D1.1 section 6.

SRI

**INSERT 1**

**Figure 1: Welding Sketches of Built-up Plate Girder of Roof Radial Beam**

SRI

**INSERT 2**

**Figure 2: Welding Sketches of Built-up Plate Girder of Roof Circumferential Beam**

**Change Activity No. 2 – Roof Beam Material Substitution (Combined with Change Activity No.1)**

**Change Activity No. 3 –Change to Reinforcement in PCCWST Walls and Shield Building Conical Roof and Air Inlet Structure**

**Issue Description**

Design finalization and review of the reinforcement design for the shield building roof and PCCWST exterior and interior walls determined that changes to the reinforcement design are needed. Changes to shear ties in the PCCWST wall are required to fully conform to the detailing requirements of American Concrete Institute (ACI) 349-01 Section 11.5.4. Other changes in the reinforcement in the PCCWST walls, in the area at the interface of the PCCWST walls with the shield building roof, and in the shield building roof are required to be consistent with the

changes in the shear ties, to satisfy ACI 349 detailing requirements, and to facilitate installation of the reinforcement.

In addition to changes resulting from changes in the reinforcement design for the detailing requirements, changes in the values of steel area required and ratios of required area to provided area of steel for the shield building roof on UFSAR Tables 3H.5-9 and 3H.5-15 are required due to changes in the demands of the shield building. These changes result from the cumulative impact of changes in the nuclear island structure in other areas. These changes include reinforced concrete (RC) to concrete filled steel plate module construction (SC) connections, auxiliary building roof to shield building wall connections, and auxiliary building wall changes. The governing load combinations for the values reported in the table also change for some of the entries.

The air inlets structure is located at the top of the cylindrical wall portion of the shield building, beginning at approximately elevation 251' and rising to approximately elevation 266'. The air inlets region is 4.5-feet thick with 1" thick steel plates on each face. Near the bottom of the air inlet structure, the thickness transitions to 3 feet thick with  $\frac{3}{4}$ " thick steel plates to connect with the shield building cylinder. In order to avoid a plate thickness transition within the air inlet structure at approximately elevation 251' and for the ease of fabrication/construction purposes, the  $\frac{3}{4}$ " thick steel plates will be replaced with 1" thick plates

#### **Proposed Change**

**INSERT 3**

SRI

**Table 1: Summary of Changes in UFSAR Figure 3H.5-11 Sheet 5**

**INSERT 4**

SRI

SRI

**INSERT 5****Figure 3-1: Current UFSAR Figure 3H.5-11 Sheet 5 with Item Labels**

SRI

**INSERT 6****Figure 3-2: Proposed UFSAR Figure 3H.5-11 Sheet 5 with Item Labels**

On UFSAR Figure 3H.5-11, Sheet 6 the following changes are made: the vertical reinforcement bars in the tank interior wall are changed from 1 #11 @ 3.6° to #8 @ 1.12°; the top radial reinforcement in the roof slab near the tank interior wall is changed from 1 #11 @ 7.2° to #11 @ 2.25° + #11 @ 2.25°; the bottom radial reinforcement in the roof slab near the tank interior wall is changed from 1 #11 @ 7.2° + 1 #11 @ 7.2° to #8 @ 1.12° + #8 @ 1.12°, and only one set of bottom reinforcement (#8 @ 1.12°) is connected to tank wall vertical reinforcement on the outer face and the other set of bottom reinforcement is developed into the tank wall without connecting the vertical reinforcement at inner face of the tank wall; the layout of 3 #11 @ 12" hoops at the intersection of tank interior wall to roof is changed from 2 #11 (laid out horizontally) + 1 #11 to 2 #11 (laid out vertically) + 1 #11; the tie bars at the intersection of tank interior wall to roof are changed from 1 #5 @ 3.6° to #4 @ 4.5° with 12 inches spacing; the dowels of vertical reinforcement at inner face of the tank interior wall are changed from 1 #11 @ 7.2° to #8 @ 1.12°, and the vertical reinforcement bars at inner face of the tank wall are all connected to the dowels instead of partially connecting to dowels and partially connecting to the bottom radial reinforcement in the roof; the closed stirrups at the intersection of tank interior wall to roof are changed from #5 @ 3.6° to #6 @ 2.25° and enclose the hoop reinforcement on the side surface of the intersection area; the reinforcement of 1 #11 @ 0.9° represented for the top and bottom

radial reinforcement in the roof at half way between the PCS interior and exterior walls is removed as it is not applicable to this figure; the crossties information in the roof slab “#4 crossties” is added to match the design documents. All changes meet the requirements of ACI 349. In order to better visualize the changes in UFSAR Figure 3H.5-11 Sheet 6 one by one, Table 2 is provided below to summarize the changes with item labels. The design elements in both current and proposed UFSAR Figure 3H.5-11 Sheet 6 are labeled with numbers in Figure 3-3, Figure 3-4 below.

**Table 2: Summary of Changes in UFSAR Figure 3H.5-11 Sheet 6**

Item	Element	Current Figure 3H.5- 11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5- 11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
1	PCS Tank Interior Wall - Vertical Reinforcement	1 #11 @ 3.6°	#8 @ 1.12°	The amount of the reinforcement is changed due to design finalization.	CA#3
2	PCS Tank Interior Wall - Hoop Reinforcement	1 #9 @ 6"	#9 @ 6"	No changes.	-
3	Roof Slab near PCS Tank Interior Wall - Top Radial Reinforcement	1 #11 @ 7.2°	#11 @ 2.25° + #11 @ 2.25°	The amount of the reinforcement is changed due to design finalization.	CA#3
4	Roof Slab PCS Tank Interior Wall - Bottom Radial Reinforcement	1 #11 @ 7.2° + 1 #11 @ 7.2° & One set of # 11 @ 7.2° is connected to the vertical reinforcement at the outer face of PCS tank wall, and the other set is connected to the vertical reinforcement at the inner face of PCS tank wall	#8 @ 1.12° + #8 @ 1.12° & Only one set of #8 @ 1.12° is connected to the vertical reinforcement at the outer face of PCS tank wall, the other set is developed into the PCS tank wall.	The amount of the reinforcement is changed due to design finalization. The detailing of the reinforcement is revised for ease of construction and does not impact the design of the structure. The development length of the reinforcement meets requirements of ACI 349.	CA#3
5	PCS Tank Interior Wall to Roof Intersection	3 #11 @ 12" Hoop; 3 #11 = 2	3 #11 @ 12" Hoop; 3 #11 = 2	The amount of reinforcement remains	CA#3

Item	Element	Current Figure 3H.5- 11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5- 11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
	– Top and Bottom Hoop Reinforcement	#11 (laid out horizontally) + 1 #11	#11 (laid out vertically) + 1 #11	unchanged. The 2 #11 is laid out vertically instead of horizontally as it eases installation of reinforcement.	
6	PCS Tank Interior Wall to Roof Intersection – Tie Bars	Tie Bars 1 #5 @ 3.6°	#4 @ 4.5° x 12" TIE BARS	The amount of the reinforcement is changed due to design finalization.	CA#3
7	PCS Tank Interior Wall – Dowels of Vertical Reinforcement at Inner Face of the Tank	1 #11 @ 7.2° & Half of the vertical reinforcement in the tank interior wall is developed through the dowel, and the other half set is connected to the bottom radial reinforcement in the roof slab.	#8 @ 1.12° & All of the vertical reinforcement in the tank wall is developed through the dowel.	To correspond to the changes made in item 1. All vertical reinforcement at the inner face of the PCS tank wall are developed through the dowels for ease of construction and does not impact the design of the structure.	CA#3
8	PCS Tank Interior Wall to Roof Intersection – Hoop Reinforcement on the side surface	1# 11 @ 6"	#11 @ 6"	No changes.	-
9	PCS Tank Interior Wall to Roof Intersection – Closed Stirrups	#5 @ 3.6°	#6 @ 2.25° & The stirrups enclosed the hoop reinforcement on the side surface of PCS tank	The amount of the reinforcement is changed due to design finalization. The detailing is improved for better configuration and ease of construction, and	CA#3

Item	Element	Current Figure 3H.5- 11 Sheet 6 (Figure 3-3)	Proposed Figure 3H.5- 11 Sheet 6 (Figure 3-4)	Reasons of the Changes	LAR Change Activities (CA)
			interior wall to roof intersection	does not impact the design of the structure.	
10	Roof Slab - Top and Bottom Radial Reinforcement	1 #11 @ 0.9°	Removed	It represents roof radial reinforcement at half way between the PCS interior and exterior walls, and is not applicable to this detail.	CA#3
11, 12, 13	Detailed Information	See Figure 3- 3	Removed	The information is beyond the level of detail of the UFSAR figure.	CA#4C
14	Roof Slab - Crossties	None	#4 CROSSTIES	The crossties in the roof slab are part of the design and always existed in the design documents. The UFSAR figure is updated to match the design documents.	CA#3

## Compression Ring Configuration

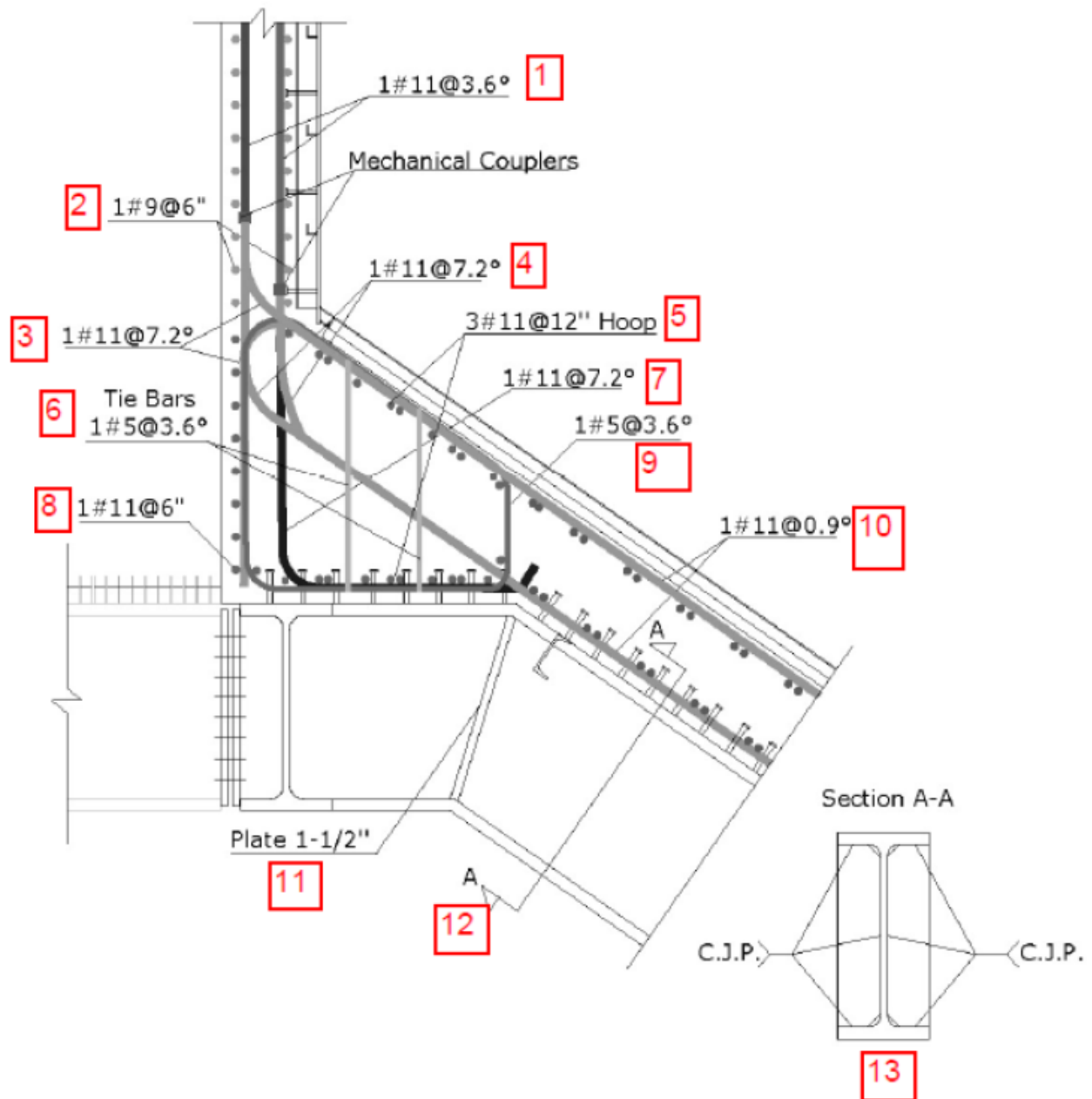
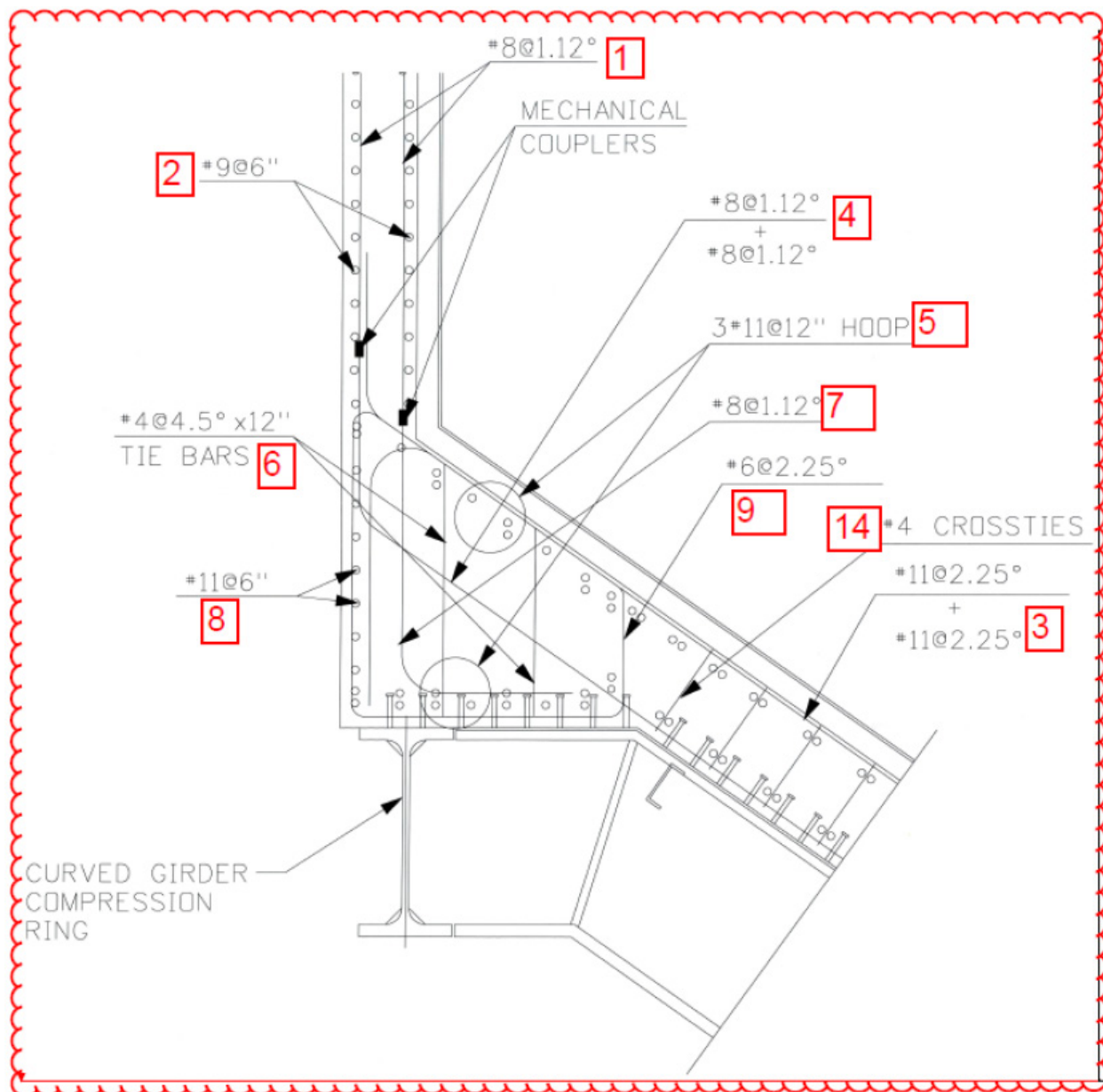


Figure 3-3: Current UFSAR Figure 3H.5-11 Sheet 6 with Item Labels





**Figure 3-4: Proposed UFSAR Figure 3H.5-11 Sheet 6 with Item Labels**

Revise the values in UFSAR Table 3H.5-9 Sheet 1 for the tension ring for maximum stress at specified location and maximum overall, the steel required, and the ratio of required over provided. Revise the values in UFSAR Table 3H.5-9 Sheets 2a, 2b and 2c for the air inlet structure for maximum steel area required at specified locations and maximum overall, steel area provided, and design limit for reinforcement ratios. Revise the values in UFSAR Table 3H.5-9 Sheet 3 for the wall of the PCCWST for maximum required reinforcement, provided reinforcement and design limit for reinforcement ratios. In some cases governing load combinations identified in the table are changed. On UFSAR Table 3H.5-15, revise the values for required reinforcement, provided (minimum) vertical and radial reinforcement, and reinforcement ratio for the shield building roof reinforcement. The changes to the table are

required to make the values consistent with the proposed reinforcement design changes to satisfy detailing requirements and changes to demands in the structural analysis. The changes of demands are the results of the design finalization, including design changes in previous License Amendment Requests and calculation updates. The calculations are performed based on updated loads and meet the requirements of applicable codes. Irrespective of the magnitude of each load change, the demands were found to be smaller than the capacities. The design of the shield building roof with the changes to the reinforcement and roof beams satisfies applicable provisions of AISC N690 and ACI 349. The criteria and requirements of ACI 349 and AISC N690 provide a margin of safety to structural failure, therefore the proposed changes do not raise any safety concerns of the structure.

On UFSAR Figure 3H.5-11, Sheet 3, change the steel plates forming the lower portion of the air inlet structure from  $\frac{3}{4}$ " to 1" to achieve uniform steel plates thickness within the area, so that the transition is to be performed on the bottom joint to the underneath SC panel portion. The change has been evaluated to have negligible impact on the shield building.

The PCCWST wall and shield building roof design using the revised reinforcement design satisfies the requirements of ACI 349.

The change in reinforcement design does not significantly change the nuclear island seismic model or the demands of other portions of the nuclear island. The dimensions of the tank walls and tank liner are not changed so the volume of the PCCWST is not changed. Piping and instrumentation connections to the tank and leak chase design are not changed in size or location.

#### **Change Activity No. 4 – Figure and Sketch Design Finalization Changes**

##### **Issue Description**

Design finalization of the shield building roof, tension ring, and air inlets has resulted in minor changes to design to facilitate fabrication and construction and satisfy requirements in ACI 349 and AISC N690. These changes result in small changes to the UFSAR sketches and figures. Additionally the sketches and figures include information that is redundant or has excessive detail for a UFSAR figure.

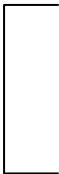
- A. Locator sketches are included with UFSAR Table 3H.5-9, Sheet 1 and Sheet 2b to show the location of the sections through which stresses are identified in the table. The sketches include information such as dimensions of design features not needed for a locator figure. Section names and elevations are sufficient to locate the design features of interest. Some of these dimensions are inconsistent with the dimensions in UFSAR Figure 3H.5-11 and are not needed to locate the sections through which the stresses are considered. The sketches include information about the angular location of some sections.
- B. UFSAR Figure 3H.5-11 shows shear connectors located on the shield building roof, but does not clarify their locations (whether the shear connectors are on the roof radial beams or on the steel plates between roof radial beams) or different sizes of shear connectors at various locations.

- C. UFSAR Figure 3H.5-11, Sheet 3 includes construction detail that is not part of the structural design. UFSAR Figure 3H.5-11, Sheet 5 includes design and fabrication details such as concrete cover, lap splice length, lap splice detailing, layer designation, and tank liner detailing that are inconsistently dimensioned and shown in the figure. UFSAR Figure 3H.5-11, Sheet 6 includes a section showing detail beam stiffener fabrication details that are not needed for the reinforcement design shown on Sheet 6.
- D. UFSAR Figure 3H.5-11 includes redundant information including beam size and information related to the internal construction of the tension ring and air inlet structure on multiple sheets of the figure. UFSAR Figure 3H.5-11, Sheets 2, 3, 4, and 5 and UFSAR Figures 3H.5-14 and 3H.5-15 include beam size information that is redundant with the information on UFSAR Figure 3H.5-11 Sheet 1. UFSAR Figure 3H.5-11, Sheet 1 and 3 both provide detail design information on internal construction of the tension ring and air inlet structure.
- E. The dimensions for the spacing of reinforcement include an excessive number of digits which suggests a level of precision in constructing reinforcement that is not possible.
- F. The designations for the steel beams in the shield building roof are not consistent in Table 3H.5-15, Figure 3H.5-11, Figure 3H.5-14 and Figure 3H.5-15.
- G. The “curved girder” specified in UFSAR section 3.8.4.1.1 and 3H.2.2 has not been identified in any of the figures of UFSAR.
- H. On UFSAR Figure 3H.5-11, Sheet 3, some structural elements are not identified or changed in the design finalization at roof and air inlet interface. On UFSAR Figure 3H.5-11, Sheet 3, the way of identifying roof hoop reinforcement is not consistent with the design documents.

### Proposed Change

- A. Remove the dimensions from the locator sketches on UFSAR Table 3H.5-9. The dimensional information is available on UFSAR Figure 3H.5-11 and is not needed on the locator sketches. Identify location of sections on sketches relative to roof beams. The sections are located at 0° and 5.62° which correspond to the centerline of a radial beam and the midpoint between two beams.

B.



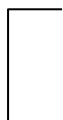
**INSERT 7**

SRI

- C. On UFSAR Figure 3H.5-11, Sheet 3 remove FLP 1/2"-18". On UFSAR Figure 3H.5-11, Sheet 5 remove the dimensions that show concrete cover. Remove the dimensions that show the lap splice length and the lap slice detailing. The dimensions of the splice lengths are removed because they are changed for the revision of reinforcement size and splice lengths are controlled by the requirements of ACI 349. Remove the layer designation and liner details. This information is needed for reinforcement fabrication and concrete placement. These dimensions are consistent with ACI 349 code requirements and are not

needed to show reinforcement design. On UFSAR Figure 3H.5-11, Sheet 6 remove the section that shows the fabrication details and the plate size for the beam stiffeners.

- D. Remove dimensions and annotations for the tension ring and air inlet structure, including faceplate thickness and through wall tie plate dimensions, on UFSAR Figure 3H.5-11, Sheet 1 that are redundant with information on Sheet 3. Remove redundant beam size information on UFSAR Figure 3H.5-11, Sheets 2, 3, 4, and 5 and UFSAR Figures 3H.5-14 and 3H.5-15. Remove detail design dimensions for air inlet structure, tension ring and connection of roof beams to tension ring on UFSAR Figure 3H.5-11, Sheet 1 that are included on Sheet 3.



### INSERT 8

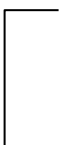


SRI

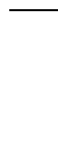
And the #6 tie bar is renamed as  $\frac{3}{4}$ " tie bar in Table 3H.5-9 Sheet 2c for consistency.

- E. Reduce the number of digits in angular dimensions for spacing of tie bars and other design elements on Figure 3H.5-11 Sheets 2 and 4.
- F. Use "roof beam" as the standard designation for steel beams in the shield building roof. On Table 3H.5-15, change the critical section name "Conical Roof Steel Beams" to "Conical Roof Beams," in Note 1 change "Steel beams" and "roof steel beams" to "roof beams". On Figure 3H.5-11, Sheet 3 change "ROOF GIRDER" to "Roof Beam". On Figure 3H.5-14 and Figure 3H.5-15, change "Roof Girder" to "Roof Beam".
- G. On UFSAR Figure 3H.5-11, Sheet 6 identify "Curved Girder" specified in UFSAR section 3.8.4.1.1 and 3H.2.2 with designation of "Curved Girder Compression Ring".

H.



### INSERT 9



SRI

On UFSAR Figure 3H.5-11, Sheet 3, the identification circle of roof hoop reinforcement is updated to match the design documents.

## **Change Activity No. 5 – Design Variances with Critical Sections**

### **Issue Description**

UFSAR Figure 3H.5-11 shows the typical design of critical sections in the shield building air inlet region, tension ring, and conical roof. In the vicinity of obstructions including openings, penetrations, and embedded pipe and conduit the reinforcement design varies from that shown in the figure. Embedments and other internal design elements are required for connections; component, piping, and conduit supports; and other design elements. The penetrations, embedments and other obstructions can require local reconfiguration of the reinforcement design in the roof or walls or the removal or shifting of tie bars or other design elements internal to the tension ring and air inlet structure. The roof beams provide support for structures, including the passive containment cooling system (PCS) valve room, stairs and walkway located

under the shield building roof and above the containment vessel. The critical section figures do not include the design elements connecting the roof beams to these structures.

### **Proposed Change**

Revise the description of the critical sections for the shield building roof and connections in UFSAR Subsections 3H.5.6, 3H.5.6.1, 3H.5.6.2 and 3H.5.6.3 to specify that the design details near interferences can vary from that shown in the figure. Revise the critical section figure, UFSAR Figure 3H.5-11, to add notes about variations in the roof, tension ring, and air inlets structure design. Remove "Weep hole" from UFSAR Figure 3H.5-11, Sheet 3, as it is considered as variation of typical/critical section for the tension ring constructability. The weep holes are provided as one of the quality inspectable attributes and will act as verification that concrete has filled all voids in the tension ring. The removal of "weep hole" from UFSAR Figure 3H.5-11 does not affect the construction quality as the weep holes will still be used in the construction and are well defined in construction drawings. Add a note to identify that reinforcement size and spacing are based on the requirements in ACI 349, and additional reinforcement can be provided for detailing purposes. Add a note to UFSAR Figure 3H.5-11 to address variation and requirements for the design of the beam supports for the radial roof beams. Stiffeners and attachments to the beams are included in the design to address concentrated loads and connections to other structures. Add a note to UFSAR Figure 3H.5-11 about the connections to beams supporting other structures.

### **Change Activity No. 6 – Removal of Tie Rods**

#### **Issue Description**

Located below the chimney through the PCCWST is a shield plate, constructed of steel and concrete, that provides radiation shielding for the area of the chimney. The shield plate is supported by structural shapes connected to the shield building roof compression ring. The original design of the shield plate included tie rods connecting the radial beams supporting the shield building conical roof to the shield plate to stabilize the shield plate. The structural analysis of the shield building has shown that these tie rods are not needed because the design without the tie rods adequately stabilizes the shield plate. The shield building general arrangement figures, UFSAR Figures 1.2-13 and 1.2-14, include the tie rods. Other figures based on the general arrangement include the tie rods. UFSAR Figure 3H.5-1 is the locator figure for auxiliary building critical sections and includes the tie rods.

#### **Proposed Change**

Remove the tie rods from UFSAR Figures 1.2-13, 1.2-14, 3.7.2-12 Sheet 8, 3H.5-1 Sheet 3, 6.2.4-13, and 9A-1 Sheet 10 and 11. Remove the tie rods from Figures 3.3-1 and 3.3-2 of Appendix C of the COL (and associated plant specific Tier 1).

### **Licensing Basis Change Descriptions**

The change activity for each change is designated by CA#X (Where X is the Change Activity number in the write-up above.)

COL Appendix C (and associated plant specific Tier 1) Figures 3.3-1 and 3.3-2 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figures. CA#6

UFSAR Figures 1.2-13 and 1.2-14 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

UFSAR Figure 3.7.2-12, Sheet 8 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

UFSAR Subsections 3H.5.6, 3H.5.6.1, 3H.5.6.2, and 3H.5.6.3

1. Add reference to variations in detail design due to openings, interferences, and obstructions. CA#5
2. Remove size of beam in UFSAR Subsection 3H.5.6.1. CA#1

UFSAR Table 3H.5-9

1. Revise values in table and the numbers of governing load combinations. CA#3
2. Remove dimensions from the locator figures. CA#4A
3. Add a legend to the table sketches to identify the location of the sections. CA#4A
4. The tie bar is renamed. CA#4D

UFSAR Table 3H.5-15

1. Revise the values for provided minimum reinforcement for the radial reinforcement of the conical roof near tension ring. CA#3
2. Change the size of radial roof beam. CA#1
3. Include the use of fabricated plate girders. CA#1
4. Change roof beam designation. CA#4F

UFSAR Figure 3H.5-1 (SUNSI)

- Remove tie rods that connect shield plate to roof beams. CA#6

UFSAR Figure 3H.5-11 (SUNSI)

1. Change size of radial beam to W36x395 on Sheet 1. CA#1
2. Change identification of studs to shear connectors and change nominal length of shear connectors on radial roof beams on Sheet 1. Add shear connector size and spacing information for steel plates between radial roof beams on Sheet 3. CA#4B
3. Remove reference to radial beam size on Sheets 2, 3, and 4. CA#1
4. Remove reference to circumferential beam size on Sheets 2, 4, and 5. CA#1
5. Remove dimensions for internal items including tie bars and tie plates and selected elevations from tension ring and air inlet structure portion of the figure on Sheet 1. Remove dimensions for design elements for connection of radial beams to tension ring on Sheet 1. Move detailed design information from UFSAR Figure 3H.5-11, Sheet 1 to Sheet 3. CA#4D
6. Revise reinforcement design details on Sheet 5. CA#3, CA#4C
7. Revise reinforcement design details on Sheet 6. CA#3, CA#4C

8. Dimensions are rounded to two decimal places. CA#4E
9. Change roof beam designation on Sheet 3. CA#4F
10. Identify "Curved Girder Compression Ring" on Sheet 6. CA#4G
11. Remove construction detail on Sheet 3. CA#4C
12. Identify structural elements on Sheet 3, and add clarification information to the annotation on Sheet 3. CA#4H
13. Update reinforcement sizes on Sheet 3, and update the identification circle of roof hoop reinforcement on Sheet 3. CA#4H
14. Change the steel plates forming the lower portion of the air inlet structure from  $\frac{3}{4}$ " to 1" on Sheet 3. CA#3
15. Remove "Weep hole" on Sheet 3. CA#5
16. Add notes to the figure to provide the following information.
  - A. Identify that details shown are representative of critical sections. Include reference to Subsection 3H.5.6 and other notes for additional information about design details and variations. CA#5
  - B. Identify that the reinforcement and design elements shown are for locations away from openings, penetrations, and other obstructions. Identify that reinforcement and design elements can vary. CA#5
  - C. Identify that reinforcement size and spacing are based on the requirements in ACI 349. Identify that additional reinforcement can be provided for detailing purposes. CA#5
  - D. Identify that the design of beam supports satisfies the requirements of AISC N690 and are based on loading and local geometry considerations. CA#5
  - E. Identify that the design of connections to the beams satisfies the requirements of AISC N690 and are based on loading and local geometry considerations. CA#5
  - F. Identify that roof radial beams can be fabricated with two options (hot rolled shapes or built-up plate girders) and meet the provisions of AISC N690. CA#1
  - G. Identify that roof circumferential beams can be fabricated with two options (hot rolled shapes or built-up plate girders) and meet the provisions of AISC N690. CA#1
17. Add sketches with dimension information of the built-up plate girders CA#1

UFSAR Figure 3H.5-14

- Remove reference to beam size. CA#1
- Change roof beam designation. CA#4F

UFSAR Figure 3H.5-15

- Remove reference to beam size. CA#1
- Change roof beam designation. CA#4F

UFSAR Figure 6.2.4-13 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

UFSAR Figure 9A-1 Sheets 10 & 11 (SUNSI)

- Remove the tie rods connecting the shield plate to the radial roof beam from the figure. CA#6

Note: Figures identified above as Sensitive Unclassified Non-Safeguards Information (SUNSI) contain security-related information and are withheld from public disclosure in accordance with 10 CFR 2.390(d).

### **3.0 Technical Evaluation**

#### **Change Activity No. 1 – Roof Beam Size Change and Roof Beam Material Substitution**

The shield building roof design using W36X395 beams satisfies the requirements of American Institute for Steel Construction (AISC) N690 as demonstrated in the design calculations. The change in beam size does not significantly change the shield building seismic model and is included in the design calculations.

The section dimensions of the built-up plate girders are specified in the markup of Figure 3H.5-11 Sheet 1. The built-up plate girders provide equal or better responses to design basis seismic loads as the rolled structural shapes. The material of the roof radial beams and roof circumferential beams complies with the applicable material specifications (e.g., ASTM A572), and also satisfies the impact tests requirements. The applicable material specifications (e.g. ASTM A572) are previously approved for use in the nuclear island structures, and included on UFSAR Table 3.8.4-6. The welds used to fabricate the plate girders are continuous double fillet welds or partial penetration with reinforcing fillet welds in order to transfer the full girder web shear capacity to flange and to allow the section to develop full bending capacity of the section. The welds of the built-up plate girders are provided in Figure 1 and 2 as shown in the Detailed Description of Change Activity No. 1. The maximum demand to capacity ratio of the built-up plate girder for the roof radial beam is 0.72, and is governed by the axial and bending stress. It is worth noting that similar information has been provided for the hot rolled shape of the roof radial beam in the UFSAR Table 3H.5-15 in the format of Reinforcement Ratio (1.33) which is the reciprocal of the demand to capacity ratio ( $= 1/1.33 = 0.75$ ). The maximum demand to capacity ratio of the built-up plate girder for the roof circumferential beam is 0.26, and is governed by the axial and bending stress. The maximum demand to capacity ratio of the hot rolled shape of the roof circumferential beam is 0.27, and is also governed by the axial and bending stress. The design of the built-up plate girders is based on AISC N690, sections Q1.4.1, Q1.5.1, Q1.5.3, Q1.5.6, Q1.5.7, Q1.6, Q1.8, Q1.9.1.2, Q1.10, Q1.11.1 through Q1.11.4, Q1.14.6, Q1.15.12 and Q1.15.13. The fabrication and erection of the built-up plate girders are based on ASTM A572, AISC N690, sections Q1.4.1, Q1.17, Q1.19, Q1.23 and Q1.24, and AWS D1.1, sections 3.1 through 3.12, sections 4.1 through 4.8, 4.10 and 4.11, 4.18 through 4.22, 4.24, 4.25, 4.30 through 4.32, 5.1 through 5.19, 5.21 through 5.24 and sections 5.26 through 5.31 for fillet and PJP groove welds. The inspection of the built-up plate girders will be performed based on AISC N690 sections Q1.26 and AWS D1.1 section 6.

Because the built-up plate girders were confirmed by calculations to have properties equal or better to the ones of hot rolled shapes, the use of built-up plate girders for the roof beams does not change the results and conclusions of the Aircraft Impact Assessment.

#### **Change Activity No. 2 – Roof Beam Material Substitution (Combined with Change Activity No.1)**



**Change Activity No. 3 – Change to Reinforcement in PCCWST Walls and Shield Building Conical Roof and Air Inlet Structure**

The spacing of shear ties in the PCCWST wall is changed to conform to the detailing requirements of American Concrete Institute (ACI) 349-01 Section 11.5.4. The PCCWST walls and shield building roof design using the revised reinforcement design satisfy the requirements of ACI 349. The steel design satisfies AISC N690. The compliance with ACI 349 and AISC N690 is demonstrated in the design calculations. The design calculations are performed based on revised demands. The proposed design changes reflected in the changes to the figures and tables satisfy the requirements of AISC N690 and ACI 349. The change in mass of the shield building roof is negligible and the change in reinforcement design does not significantly change the shield building seismic model or the demands of other structures on the nuclear island. The dimensions of the tank walls and tank liner are not changed so the volume of the PCCWST is not changed. Piping and instrumentation connections to the tank and the tank leak chase design are not changed in size or location.

Changes to information on UFSAR Tables 3H.5-9, Sheet 3 and 3H.5-15 are required because of the changes in the reinforcement design for the PCCWST walls and shield building roof. Additionally changes to UFSAR Tables 3H.5-9 and 3H.5-15 are required because of changes to the demands of the shield building resulting from the changes of the roof and tank wall reinforcement outlined above and the cumulative impact of changes in the nuclear island structure in other areas. These changes include RC to SC connections, auxiliary building roof to shield building wall connections, auxiliary building wall changes, and changes to auxiliary building roof beams. These changes are outlined in the following.

RC to SC Changes – These changes include minor changes to the detail design of the hardware in the shield building wall modules to which reinforcement bars developed in the adjacent reinforced concrete are connected. The RC to SC connection change activity also changed the wall construction around large penetrations from reinforced concrete to a steel weldment. These changes result in a small change in the stiffness of the shield building wall. These changes were included in Amendment No. 26 approved by the NRC by letter dated November 21, 2014.

Changes to auxiliary building roof to shield building wall connections – These changes include detail changes to the mechanical connection between the auxiliary building roof and the shield building wall modules. These changes result in small changes to the stiffness of the connection design. These changes were included in Amendment No. 26 approved by the NRC by letter dated November 21, 2014.

Changes to the auxiliary building walls – These changes include changes to the wall on Column Line 11. The changes to Wall 11 include filling in openings previously used for vents from the MSIV compartment near the auxiliary building roof. The changes result in a small change in the mass of the wall and small change in the stiffness of the connection of the wall with the roof. These changes were included in Amendment No. 51 approved by the NRC by letter dated August 3, 2016.

Each of these changes was evaluated individually during the development and evaluation of the changes and was found to have an insignificant effect on the seismic model of the nuclear island. Because of the elevated location of the PCCWST and the cumulative effect of the multiple small changes to the seismic model there is a small effect on the information presented

in UFSAR Table 3H.5-15. The changes to the required reinforcement and the reinforcement design reflected in UFSAR Table 3H.5-15 do not change the conformance of the roof design with ACI 349.

#### **Change Activity No. 4 – Figure and Sketch Design Finalization Changes**

Redundant dimensions and detailed fabrication information removed from Figure 3H.5-11 are provided in other sheets, figures or text or is not needed for review of the design.

#### **Change Activity No. 5 – Design Variances with Critical Sections**

The design of the PCCWST walls, shield building roof, tension ring, and air inlets design require local variation in detail design at penetrations and other obstructions. These variations include reconfiguration of reinforcement in the area of the obstruction or shifting, removing, and redesigning design elements such as tie bars internal to the design of the tension ring and air inlet structure. The weep holes in the tension ring are considered as variation of typical/critical section for the tension ring constructability. The weep holes are provided as one of the quality inspectable attributes and will act as verification that concrete has filled all voids in the tension ring. The removal of “weep hole” from UFSAR Figure 3H.5-11 does not affect the construction quality as the weep holes will still be used in the construction and are well defined in construction drawings. The design of these structures with the variations in design is in conformance with design and analysis requirements for the structures identified in the UFSAR including the requirements of AISC N690 and ACI 349. The variations in detail design do not significantly change the shield building seismic model. The design variances do not change the configuration or size of the air inlets or alter the design air flow through the inlets. The design of the stiffeners and attachments to the beams, and other design elements included in the design to address concentrated loads and connections to the beams to support other structures is in conformance with AISC N690.

#### **Change Activity No. 6 – Removal of Tie Rods**

The shield plate is fully supported by the steel truss hung from the curved girder compression ring, where the verticals of the truss are moment connected to the compression ring and the cross bracings of the truss provide the horizontal restraints to the shield plate, therefore the tie rods are not needed to support the shield plate. The tie rods are not included in the structural models and seismic analysis of the shield building roof and are removed from the UFSAR as well as COL Appendix C (and associated plant specific Tier 1). The design and structural analyses of the shield building roof and support of the shield plate do not include the tie rods. Removal of the tie rods does not change the shield plate size and composition, and does not impact the shielding function of the shield plate. Removal of the tie rods does not impact the flow of air out of the shield building chimney in the center of the PCCWST.

#### **Change Conclusions**

The changes to the design of the shield building roof and PCCWST including the use of built up plate girders for the roof beams and design variances do not change the results and conclusions of the Aircraft Impact Assessment. The changes described are to the design details of the structures and do not adversely 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 as described in UFSAR Appendix 19F.

These designs are consistent with the analysis summary information provided in UFSAR Subsection 19F.4.1. The activities described do not change the overall configuration or construction of the shield building.

The proposed changes do not change the function, design, and operation of the systems and components supported by and located within the shield building. There is no change to the number, size, or shape of the air inlets. There is no change to the design or support for the air baffle between the shield building and containment or to the design of the chimney through the PCCWST on the roof of the shield building. The proposed changes do not change the function, design, and operation of the containment vessel and passive containment cooling system including the components located in the PCS valve room. The proposed changes do not affect the prevention and mitigation of abnormal events, e.g., accidents, anticipated operational occurrences, earthquakes, floods and external 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 plant-specific DCD or UFSAR are not affected.

The shield building roof, tension ring, and air inlets do not interface with or affect safety-related equipment inside containment 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 is 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 the shield building roof. 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 the shield building roof.

The proposed changes associated with this license amendment request include a change in the detail design of the shield building. 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 non-radioactive material effluents are affected.

The changes are internal to the shield building structure and the configuration, thickness, and density of the shield building roof, wall, and shield plate are not changed. 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 shield building. 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 plant-specific Tier 1 information and Tier 2\* information and associated Tier 2 information in the UFSAR in regard to requirements for detail design of the beams supporting the roof of the shield building, the reinforcement in the roof and the walls of the Passive Containment Cooling Water Storage Tank (PCCWST) supported by the roof, and the design details of the shield building tension ring and air inlet structure. COL Appendix C (and associated plant specific Tier 1) and UFSAR Figures are revised to remove tie rods between the shield plate and the shield building roof beams. 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.

## **4.0 Regulatory Evaluation**

### **4.1 Applicable Regulatory Requirements/Criteria**

10 CFR 52.98(f) requires NRC approval for any modification to, addition to, or deletion from the terms and conditions of a COL. This activity involves a departure from plant-specific Tier 1 information, and a corresponding change to COL Appendix C, Inspections, Tests, Analyses and Acceptance Criteria information; therefore, this activity requires an amendment to the COL. Accordingly, NRC approval is required prior to making the plant-specific changes in this license amendment request.

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 the design of the beams supporting the roof, reinforcement in the roof, and the design details of the tension ring and air inlets portions of the shield building, removal of tie rods for the shield plate, and description and figures depicting 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 shield plate, roof, tension ring, and air inlet structure portions of the shield building. 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 Determination**

The proposed amendment would require changes to the plant-specific Tier 1 and corresponding changes to COL Appendix C, 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 roof, tension ring, and air inlet structure portions of the shield building.

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

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

Response: No

The design functions of the 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 shield building roof, tension ring, and air inlets and removal of the tie rods 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 changes do not impact the support, design, or operation of mechanical and fluid systems. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to normal operation or postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor 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 shield building roof, tension ring, and air inlets and remove tie rods. The clarification and changes to the design details for the shield building roof, tension ring, and air inlets do not change the design requirements of the nuclear island structures. The changes do not change the design function, support, design, or operation of mechanical and fluid systems. The changes 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 design of the shield building roof with the changes to the reinforcement and roof beams satisfies applicable provisions of AISC N690 and ACI 349. The welding of the plate girders used for roof beams meets the requirements of AISC N690 and AWS D1.1. Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

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

#### 4.4 Conclusions

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

#### 5.0 Environmental Considerations

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

The proposed amendment revises the plant-specific Tier 1 information and corresponding changes to COL Appendix C, 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 shield building roof, tension ring, and air inlets and removing tie rods.

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, or would change an inspection or surveillance requirement. However, facility construction and operation following implementation of the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), in that:

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

As documented in Section 4.3, Significant Hazards Consideration Determination, of this license amendment request, an evaluation was completed to determine whether or not a significant hazards consideration is involved by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment." The Significant Hazards Consideration determined that (1) the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated; (2) the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated; and (3) the proposed amendment does not involve a significant reduction in a margin of safety. Therefore, it is concluded that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

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

The proposed amendment involves 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 design details for the shield building roof, tension ring, and air inlets 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.

## **6.0 References**

None



**Southern Nuclear Operating Company**

**ND-16-2518**

**Enclosure 3**

**Vogtle Electric Generating Plant (VEGP) Units 3 and 4**

**Exemption Request Regarding**

**Shield Building Roof Changes**

**(LAR 16-031)**

**(This Enclosure consists of 7 pages, including this cover page)**

**Table of Contents**

1.0	Purpose
2.0	Background
3.0	Technical Justification of Acceptability
4.0	Justification of Exemption
5.0	Risk Assessment
6.0	Precedent
7.0	Environmental Consideration
8.0	Conclusion
9.0	References

## **1.0 Purpose**

Southern Nuclear Operating Company (SNC) (the Licensee) requests a permanent exemption from the provisions of 10 CFR 52, Appendix D, Section III.B, "Design Certification Rule for the AP1000 Design, Scope and Contents," to allow a departure from elements of the certification information in Tier 1 of the generic AP1000 Design Control Document (DCD). The regulation, 10 CFR 52, Appendix D, Section III.B, requires an applicant or licensee referencing Appendix D to 10 CFR Part 52 to incorporate by reference and comply with the requirements of the Appendix, including certified information in the DCD Tier 1. The Tier 1 information for which a plant-specific departure and exemption is being requested includes a change to Tier 1 to remove the tie rods connecting the shield plate to the radial roof beam from Tier 1 Figures 3.3-1 and 3.3-2 (SUNSI).

This request for exemption provides the technical and regulatory basis to demonstrate that 10 CFR 52.63, §52.7, and §50.12 requirements are met and will apply the requirements of 10 CFR 52, Appendix D, Section VIII.A.4 to allow departures from generic Tier 1 information.

## **2.0 Background**

The Licensee is the holder of Combined License Nos. NPF-91 and NPF-92, which authorize construction and operation of two Westinghouse Electric Company AP1000 nuclear plants, named Vogtle Electric Generating Plant (VEGP) Units 3 and 4, respectively.

The proposed change is needed because the tie rods are not included in the structural analysis of the shield building roof and are removed from the design of the shield building.

An exemption from elements of the AP1000 certified (Tier 1) design information to allow a departure from the design description is requested.

## **3.0 Technical Justification of Acceptability**

An exemption is requested to depart from AP1000 generic DCD Tier 1 material as described above.

The proposed changes affect the design details of the shield building structural design, specifically, the shield plate is supported by structural shapes connected to the shield building roof compression ring. The original design of the shield plate included tie rods connecting the radial beams supporting the shield building conical roof to the shield plate to stabilize the shield plate. The structural analysis of the shield building has shown that these tie rods are not needed and they are removed from the design of the support of the shield plate.

The proposed change is acceptable because the design functions of the shield building, as seismic Category I structures continues to comply with the regulatory acceptance criteria, codes, and industry standards specified in the UFSAR, and provide required fire protection and radiological protection features, continue to be met. The proposed change does not adversely affect any safety-related equipment or function, design function, radioactive material barrier, or safety analysis.

Detailed technical justification supporting this request for exemption is provided in Section 3 of the associated License Amendment Request in Enclosure 1 of this letter.

#### **4.0 Justification of Exemption**

10 CFR Part 52, Appendix D, Section VIII.A.4 and 10 CFR 52.63(b)(1) govern the issuance of exemptions from elements of the certified design information for AP1000 nuclear power plants. Since the Licensee has identified a change (as discussed in Enclosure 1 of the accompanying License Amendment Request) that impacts Tier 1, an exemption to the certified design information in Tier 1 is needed.

10 CFR Part 52, Appendix D, and 10 CFR 50.12, §52.7, and §52.63 state that the NRC may grant exemptions from the requirements of the regulations provided six conditions are met: 1) the exemption is authorized by law [§50.12(a)(1)]; 2) the exemption will not present an undue risk to the health and safety of the public [§50.12(a)(1)]; 3) the exemption is consistent with the common defense and security [§50.12(a)(1)]; 4) special circumstances are present [§50.12(a)(2)(ii)]; 5) the special circumstances outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption [§52.63(b)(1)]; and 6) the design change will not result in a significant decrease in the level of safety [Part 52, App. D, VIII.A.4].

The requested exemption to remove the tie rods connecting the shield plate to the radial roof beam from Tier 1 Figures 3.3-1 and 3.3-2 (SUNSI) satisfies the six criteria for granting specific exemptions, as described below.

##### **1. This exemption is authorized by law**

The NRC has authority under 10 CFR §§ 50.12, 52.7, and 52.63 to grant exemptions from the requirements of NRC regulations. Specifically, 10 CFR §§50.12 and 52.7 state that the NRC may grant exemptions from the requirements of 10 CFR Part 52 upon a proper showing. No law exists that would preclude the changes covered by this exemption request. Additionally, granting of the proposed exemption does not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations.

Accordingly, this requested exemption is "authorized by law," as required by 10 CFR 50.12(a)(1).

##### **2. This exemption will not present an undue risk to the health and safety of the public**

The proposed exemption from the requirements of 10 CFR Part 52, Appendix D, Section III.B would allow changes to elements of the plant-specific DCD Tier 1 information to depart from the AP1000 certified design information. The plant-specific Tier 1 DCD will continue to reflect the approved licensing basis for the Licensee and will maintain a consistent level of detail with that which is currently provided elsewhere in Tier 1 of the plant-specific DCD.

The proposed change will not impact the ability of the components to perform their design functions. There is no change to plant systems or the response of systems to postulated accident conditions. There is no change to the predicted radioactive releases due to postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, and the change described does not create any new accident precursors. Therefore, no adverse safety impact that would present any additional risk to the health and safety is present. The affected Design

Description in the plant-specific Tier 1 DCD will also continue to provide the detail necessary to support the performance of the associated ITAAC.

Therefore, the requested exemption from 10 CFR 52, Appendix D, Section III.B would not present an undue risk to the health and safety of the public.

### **3. The exemption is consistent with the common defense and security**

The proposed exemption from requirements of 10 CFR Part 52, Appendix D, Section III.B would allow changes to elements of the plant-specific DCD Tier 1 information to depart from the AP1000 certified design. The exemption does not alter the design, function, or operation of any structures or plant equipment that are necessary to maintain a safe and secure status of the plant. The proposed exemption has no impact on plant security or safeguards procedures.

Therefore, the requested exemption is consistent with the common defense and security.

### **4. Special circumstances are present**

10 CFR 50.12(a)(2) lists six "special circumstances" for which an exemption may be granted. Pursuant to the regulation, it is necessary for one of these special circumstances to be present in order for the NRC to consider granting an exemption request. The requested exemption meets the special circumstances of 10 CFR 50.12(a)(2)(ii). That subsection defines special circumstances as when "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

The rule under consideration in this request for exemption is 10 CFR Part 52, Appendix D, Section III.B, which requires that a licensee referencing the AP1000 Design Certification Rule (10 CFR Part 52, Appendix D) shall incorporate by reference and comply with the requirements of Appendix D, including Tier 1 information. The COLs reference the AP1000 Design Certification Rule and incorporate by reference the requirements of 10 CFR Part 52, Appendix D, including Tier 1 information. The underlying purpose of Appendix D, Section III.B is to describe and define the scope and contents of the AP1000 design certification, and to require compliance with the design certification information in Appendix D.

The proposed change does not impact the ability of any structures, systems, or components to perform their functions or negatively impact safety. Accordingly, this exemption from the certification information will enable the Licensee to safely construct and operate the AP1000 facility consistent with the intent of the scope and contents of the design certified by the NRC in 10 CFR Part 52, Appendix D.

Therefore, special circumstances are present, because application of the current generic certified design information in Tier 1 as required by 10 CFR Part 52, Appendix D, Section III.B, in the particular circumstances discussed in this request is not necessary to achieve the underlying purpose of the rule.

**5. The special circumstances outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption**

Based on the non-standard nature of the changes to the plant-specific Tier 1 information in this limited area and the understanding that these changes are not related to system functions, these changes will not have a negative impact. Nevertheless, if other AP1000 licensees do not elect to request this exemption, the special circumstances continue to outweigh any decrease in safety from the reduction in standardization because the key design functions associated with this request will continue to be maintained. This exemption request and the associated marked-up table demonstrate that there is a minimal change from the generic AP1000 DCD, minimizing the reduction in standardization and consequently the safety impact from the reduction.

Therefore, the special circumstances associated with the requested exemption outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption.

**6. The design change will not result in a significant decrease in the level of safety.**

The requested exemption does not adversely impact the level of safety because the design changes associated with this exemption request will not adversely affect the ability of any systems or equipment to perform their design functions, there are no new failure modes introduced by these changes and the level of safety provided by the current systems and equipment is maintained. It is concluded that the design change associated with this proposed exemption will not result in a significant decrease in the level of safety.

**5.0 Risk Assessment**

A risk assessment was not determined to be applicable to address the acceptability of this proposal.

**6.0 Precedent**

None identified.

**7.0 Environmental Consideration**

A review of the requested amendment has determined that anticipated construction and operational effects 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 requested amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental impact statement or environmental assessment of the proposed amendment and exemption is not required.

## **8.0 Conclusion**

The proposed changes to Tier 1 information are necessary and the exemption request was confirmed to meet the requirements of 10 CFR 52.63, "*Finality of Design Certifications*," 10 CFR 50.12, "*Specific Exemptions*," and 10 CFR 52 Appendix D, "*Design Certification Rule for the AP1000*." Specifically, the exemption request meets the criteria of 10 CFR 50.12(a)(1) in that the request is authorized by law, presents no undue risk to public health and safety, and is consistent with the common defense and security. Furthermore, approval of this request does not result in a significant decrease in the level of safety, presents special circumstances, does not present a significant decrease in safety as a result of a reduction in standardization, and meets the eligibility requirements for categorical exclusion.

## **9.0 References**

None

**Southern Nuclear Operating Company**

**ND-16-2518**

**Enclosure 4**

**Vogtle Electric Generating Plant (VEGP) Units 3 and 4**

**Proposed Changes to Licensing Basis Documents**

**(LAR 16-031)**

**Note:** Added text is in Blue Underline

Deleted text is ~~Red Strikethrough~~

Proposed changes to figures are shown in **Red Clouded** areas

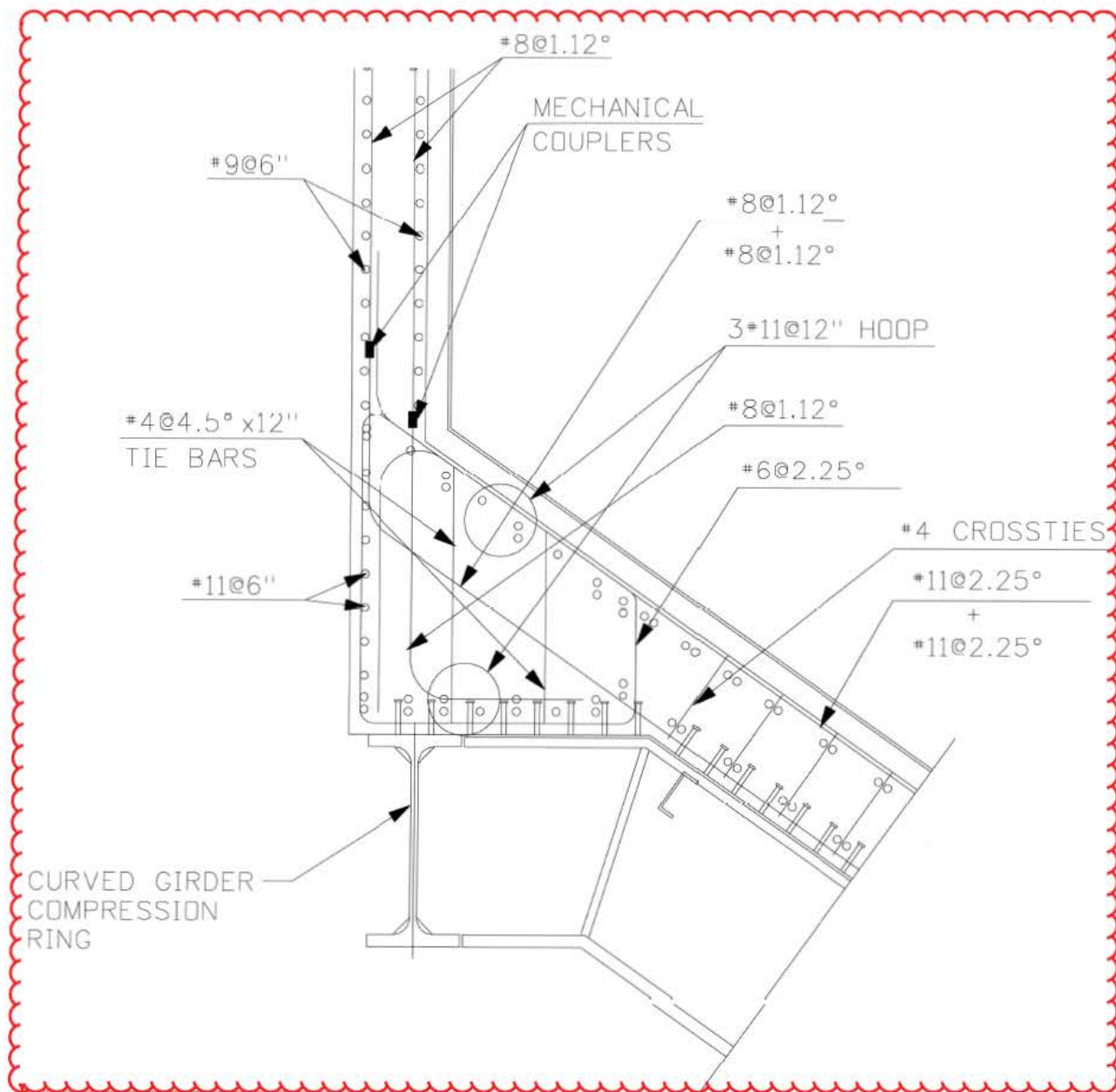
(Other color schemes result from the  
UFSAR Format, and are not changes)

**(This Enclosure consists of 14 pages, including this cover page)**

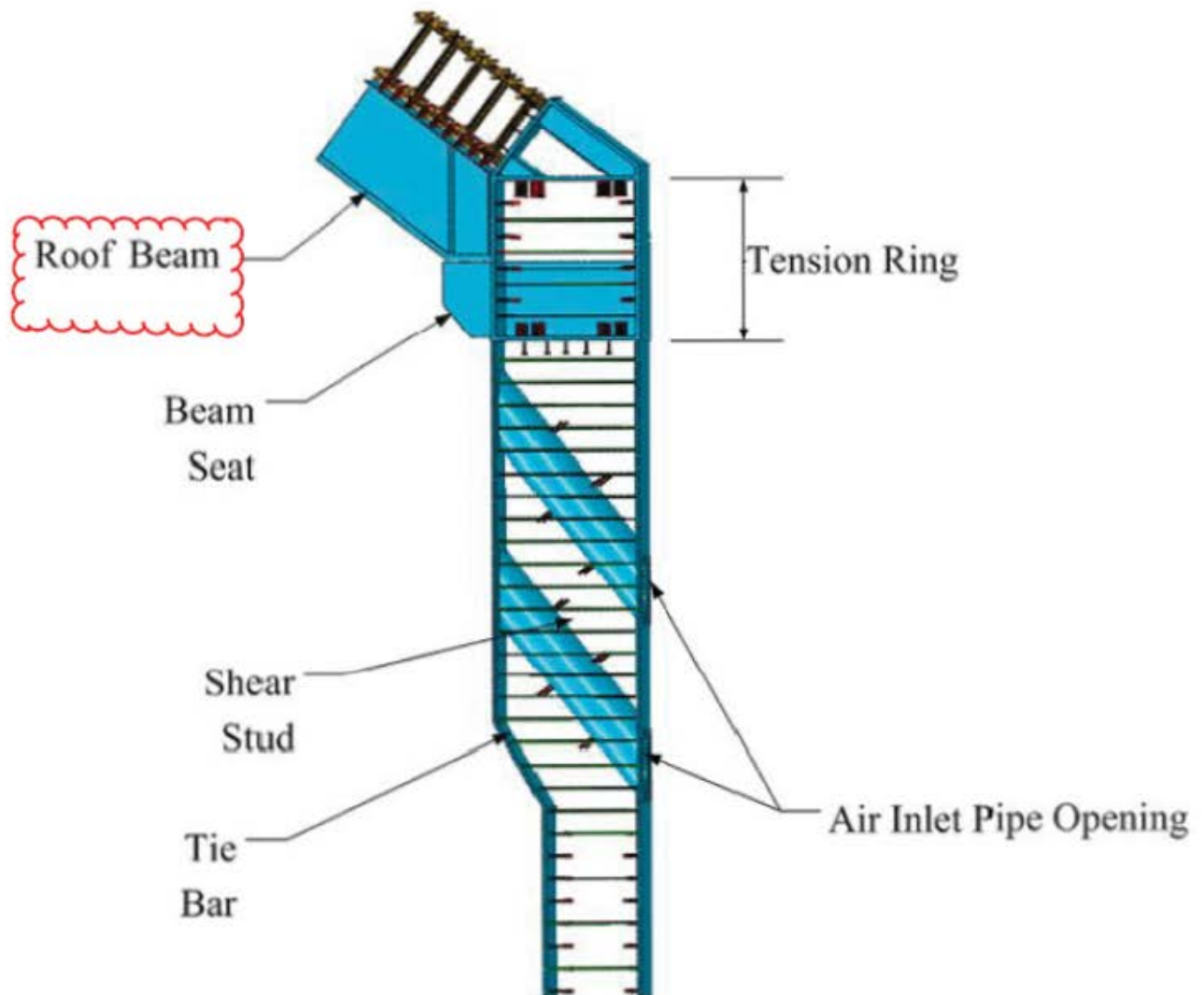


**Associated Licensing Basis Changes related to the Shield Building Roof Changes.**

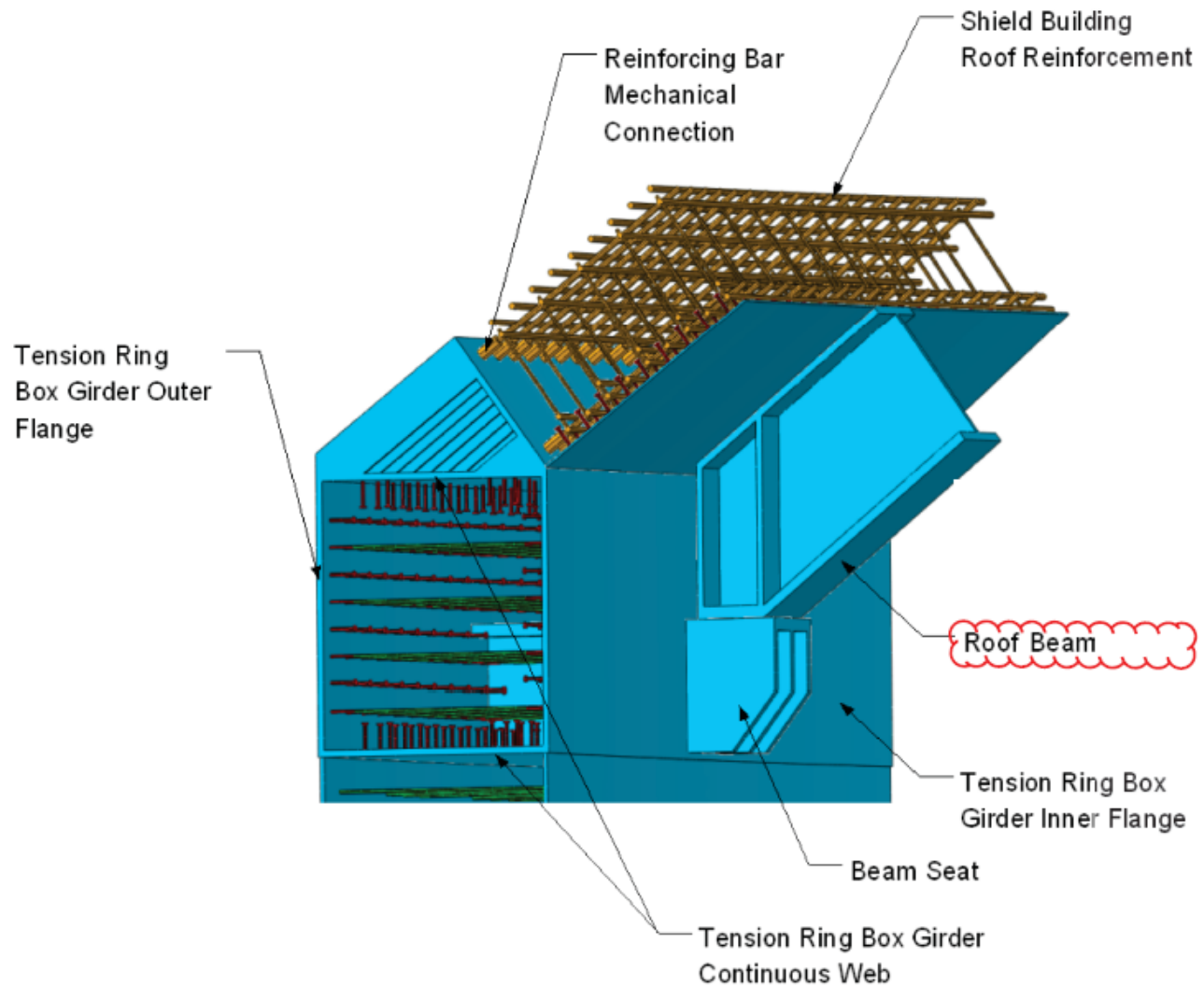
**UFSAR Figure 3H.5-11 (Sheet 6 of 6) Design of Shield Building: Tank/Compression Ring Roof Interface Reinforcement - Revise information as shown below.**



**UFSAR Figure 3H.5-14 Elevation View of Tension Ring and Air Inlets - Revise information as shown below.**



**UFSAR Figure 3H.5-15 Shield Building Tension Ring - Revise information as shown below.**



**UFSAR Subsection 3H.5.6, Shield Building Roof and Connections - Revise information as shown below.**

[...The design of the shield building is shown in **Figure 3H.5-11** (Sheets 1-6). These figures show the typical details of the “Tension Ring,” the “Air Inlet Structure,” and the “Exterior Wall of the Passive Containment Cooling System Tank.” **Figure 3H.5-16**, Sheets 1 and 2, also shows the typical dimensions of the surface plates and the SC to RC connections on the shield building cylindrical segment.]\* The column line and auxiliary building roof information in **Figure 3H.5-16** is shown for reference and is not Tier 2\* information. Interferences such as penetrations; openings; and embedded pipe, conduit, and anchors can cause localized variances with design details shown in the figure.

**UFSAR Subsection 3H.5.6.1, Air Inlets and Tension Ring - Revise information as shown below.**

[... The tension ring also contains 32 radial beam seat connections where the ~~W36 x 393~~ radial beams for the conical roof are connected.

...Tie bars and studs may be omitted in local areas due to design features and other obstructions, such as penetrations, embedments and embedded pipe, conduit, and anchors.]\* In the vicinity of the opening through the air inlet region, pipes and other design elements are not provided and the design details can vary from that shown on the figures.

[The tension ring is designed as a structural steel box structure with concrete infill and shear studs...The tension ring is designed to ANSI/AISC N690 and is a concrete-filled box girder, with two continuous 1.5-inch-thick steel plates top and bottom, which connect the inner liner plate to the outer liner plate, as shown in Figure 3H.5-15.]\* Interferences such as penetrations; embedments; openings for concrete placement; and embedded pipe, conduit, and anchors can cause localized variances with the design details shown in the figure.

**UFSAR Subsection 3H.5.6.2, Compression Ring and Interior Wall of Passive Containment Cooling Water Storage Tank - Revise information as shown below.**

[...The configuration and reinforcement of the compression ring and the connection to the interior wall of the passive containment cooling water storage tank is shown in Figure 3H.5-11.]\* Interferences such as penetrations; leak chases; and embedded pipe, conduit, and anchors can cause localized variances with the reinforcement design details shown in the figure.

[Additional information is provided in Table 3H.5-15.]\*

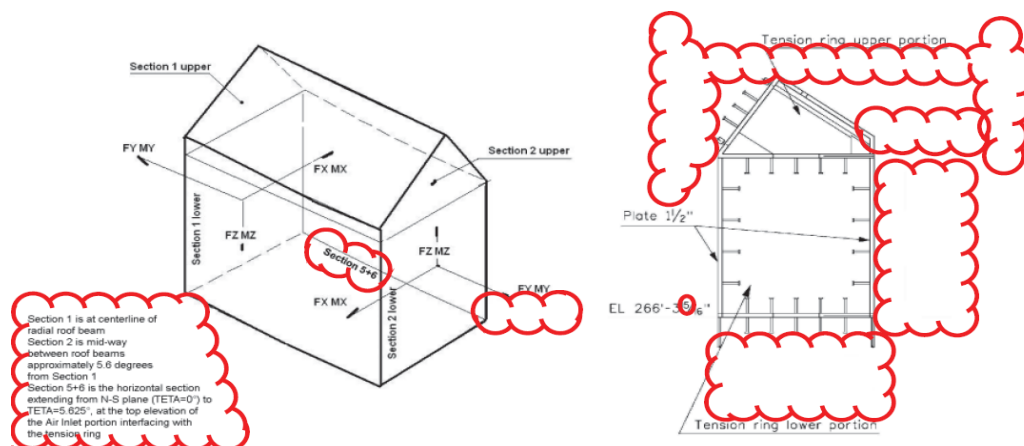
**UFSAR Subsection 3H.5.6.3, Knuckle Region and Exterior Wall of Passive Containment Cooling System Tank - Revise information as shown below.**

[...The governing loads for design of the exterior wall are the hydrostatic pressure of the water, the in-plane and out-of-plane seismic response, and the temperature gradient across the wall. The reinforcement is shown in Figure 3H.5-11.]\* Interferences such as penetrations; leak chases; and embedded pipe, conduit, and anchors can cause localized variances with the reinforcement design details shown in the figure. [The reinforcement required and the reinforcement provided is summarized in Table 3H.5-9.

Additional information is provided in Table 3H.5-15.]\*

**UFSAR Table 3H.5-9 (Sheet 1 of 3) Shield Building Roof Reinforcement Summary (Tension Ring) - Revise information as shown below (figure blow-up is shown on the following pages).**

Tension Ring – Axial Force and Bending Verification								
Location		Seismic Maximum Stresses		Maximum Stresses ksi	F <sub>y</sub> ksi	Maximum Steel Area Required <sup>(2)</sup> (in <sup>2</sup> /ft)	[Steel Area Provided]*	[Design Limit <sup>(1)</sup> for Ratio Max Required/ Provided]*
Section	Angles	Seismic L/C	f <sub>a</sub> ksi					
2 lower	5.625°	9	14.31	14.34 15.35	50	7.74 9.21	[Liner 1 1/2" = 18 (in <sup>2</sup> /ft) (Min)]*	[0.430.51 + 2%]*
	84.375°	17	<del>12.52</del> 13.15					
1 lower	0°	9	<del>12.97</del> 15.35					
	90°	17	<del>11.39</del> 14.46					
Tension Ring – Shear Force and Torsion Verification								
Location		Seismic Maximum Stresses		Maximum Stresses ksi	F <sub>y</sub> ksi	Maximum Steel Area Required <sup>(2)</sup> (in <sup>2</sup> /ft)	[Steel Area Provided]*	[Design Limit <sup>(1)</sup> for Ratio Max Required/ Provided]*
Section	Angles	Seismic L/C	f <sub>v</sub> ksi					
2 lower	5.625°	17	4.83	5.52	50	5.04	[Liner 1 1/2" = 18 (in <sup>2</sup> /ft) (Min.)]*	[0.28 + 2%]*
	84.375°	9	5.52					
1 lower	0°	<del>18</del> 24	<del>3.20</del> 4.52					
	90°	11	4.00					

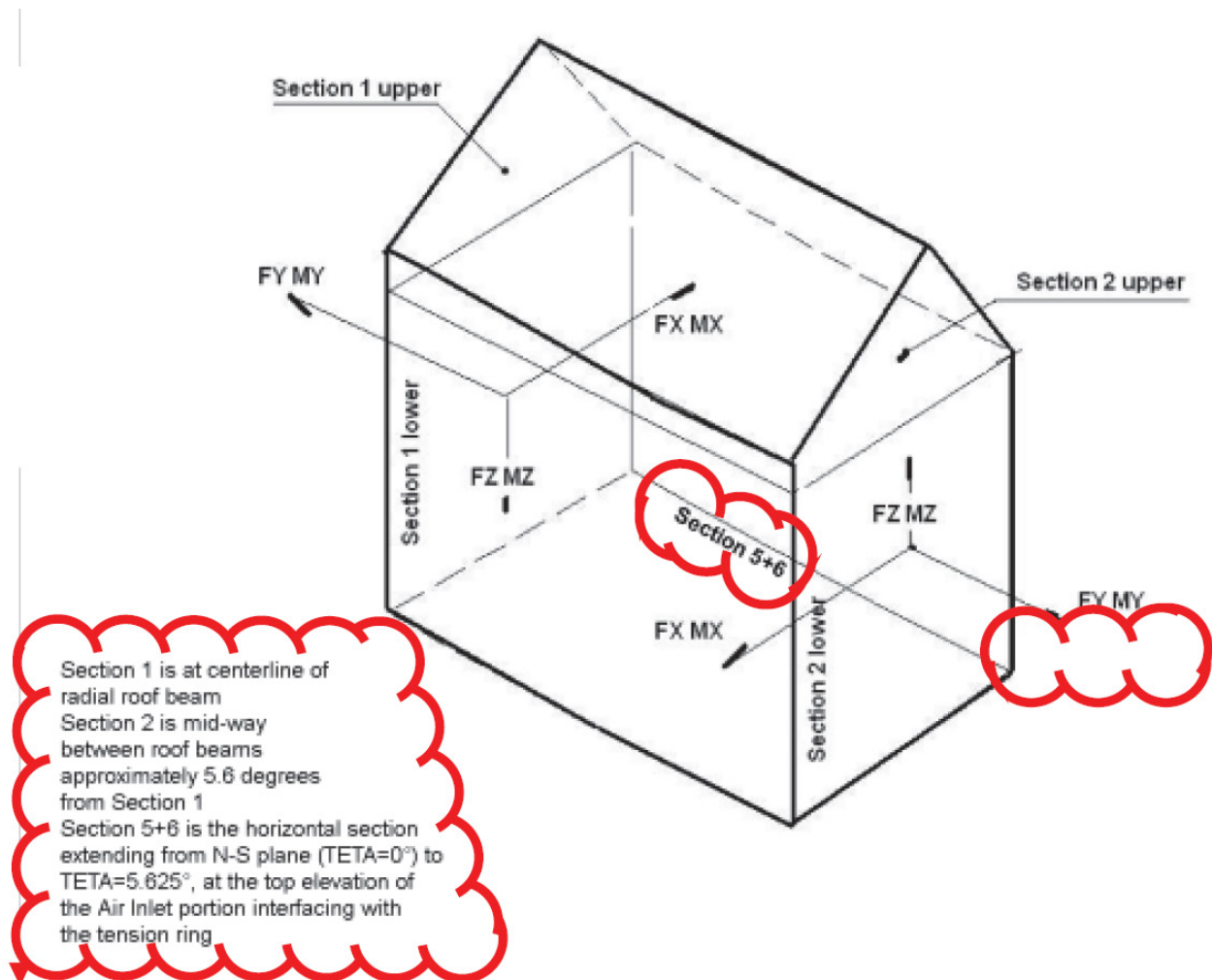


**Notes:**

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

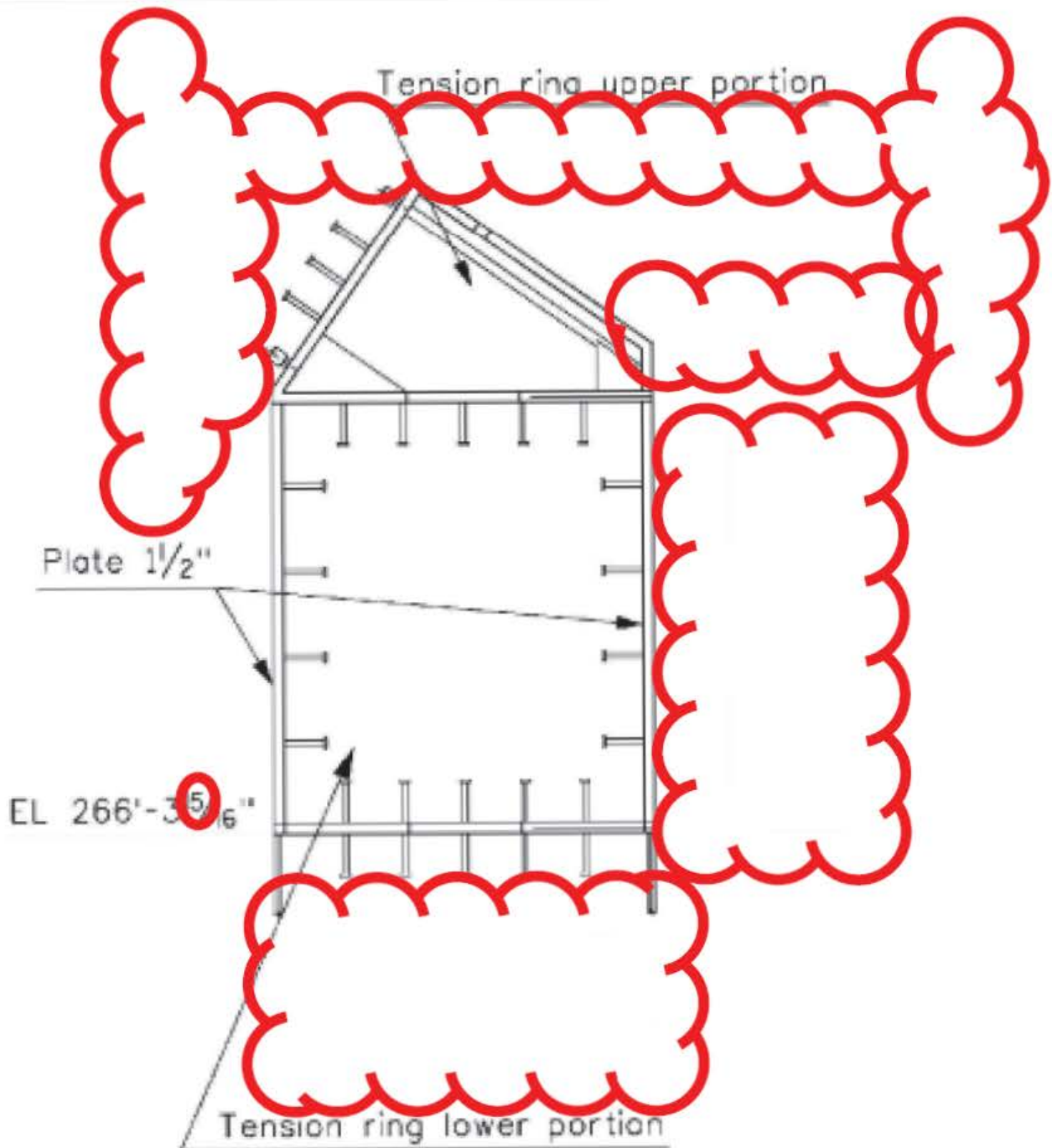
\*NRC Staff approval is required prior to implementing a change in this information.

**UFSAR Table 3H.5-9 (Sheet 1 of 3) Shield Building Roof Reinforcement Summary (Tension Ring) - Revise information as shown below (figure blow-up continued).**





**UFSAR Table 3H.5-9 (Sheet 1 of 3) Shield Building Roof Reinforcement Summary (Tension Ring) - Revise information as shown below (figure blow-up continued).**



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

AIS Reinforcement Summary – Horizontal Sections						
Location (Figure 3H.5-11)		Steel Area (Vertical Direction – Z Local Dir.)				
		Required - Seismic Load Combinations (in <sup>2</sup> /ft)		Maximum Required <sup>(2)</sup> (in <sup>2</sup> /ft)	[Provided]*	[Design Limit <sup>(1)</sup> for Ratio Max Required/ Provided]*
Section	Angles	Seismic L/C	Values			
5+6	0°-5.625°	<del>16</del> 8	<del>1.65</del> 1.80	2.10 2.25	[Liner 1" = 12 (in <sup>2</sup> /ft) (Min.)]*	[0.1750.19 + 2%]*
	84.375°-90°	8	<del>1.41</del> 1.70			
8	0°-5.625°	16	<del>2.10</del> 2.25			
	84.375°-90°	8	<del>1.69</del> 2.02			
9	0°-5.625°	16	<del>2.10</del> 2.14			
	84.375°-90°	<del>8</del> 24	<del>1.68</del> 2.14			
11	0°-5.625°	16	<del>1.61</del> 1.66	1.61 1.66	[Liner <del>3/4</del> 1" = 912 (in <sup>2</sup> /ft) (Min.)]*	[0.180.14 + 2%]*
	84.375°-90°	24	<del>1.21</del> 1.46			

**Notes:**

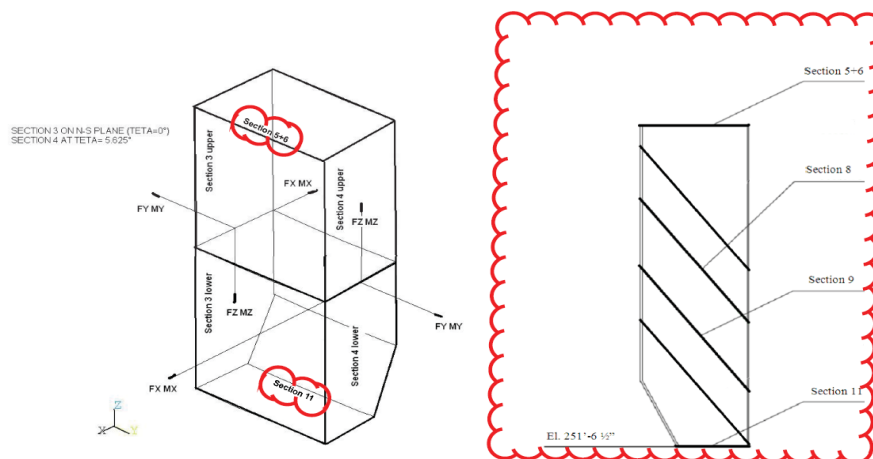
1. [Two percent of the value may be added to the design limit as an allowance for minor variances in analysis results.]\*
2. Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads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

\*NRC Staff approval is required prior to implementing a change in this information.



**UFSAR Table 3H.5-9 (Sheet 2b of 3) Shield Building Roof Reinforcement Summary (Air Inlet) - Revise information as shown below (figure blow-up is shown on the following pages).**

AIS Reinforcement Summary – Vertical Sections						
Location (Figure 3H.5-11)		Steel Area (Hoop Direction – Y Local Dir.)				
Section	Angles	Required - Seismic Load Combinations (in <sup>2</sup> /ft)		Maximum Required <sup>(2)</sup> (in <sup>2</sup> /ft)	[Provided]*	[Design Limit <sup>(1)</sup> for Ratio Max Required/ Provided]*
		Seismic L/C	Values			
3 Upper	0	9	<del>9.56</del> <u>9.97</u>	<del>10.04</del> <u>10.53</u>	[Liner 1" = 12 (in <sup>2</sup> /ft) (Min.)*	[ <del>0.84</del> <u>0.88</u> + 2%]*
	90°	17	<del>8.32</del> <u>9.25</u>			
3 Lower	0	9	<del>8.14</del> <u>8.45</u>			
	90°	<del>18</del> <u>17</u>	<del>7.03</del> <u>7.75</u>			
4 Upper	5.625°	9	<del>10.04</del> <u>10.53</u>			
	84.375°	17	<del>8.69</del> <u>9.75</u>			
4 Lower	5.625°	<del>9</del> <u>10</u>	<del>7.98</del> <u>8.26</u>			
	84.375°	19	<del>6.82</del> <u>7.54</u>			

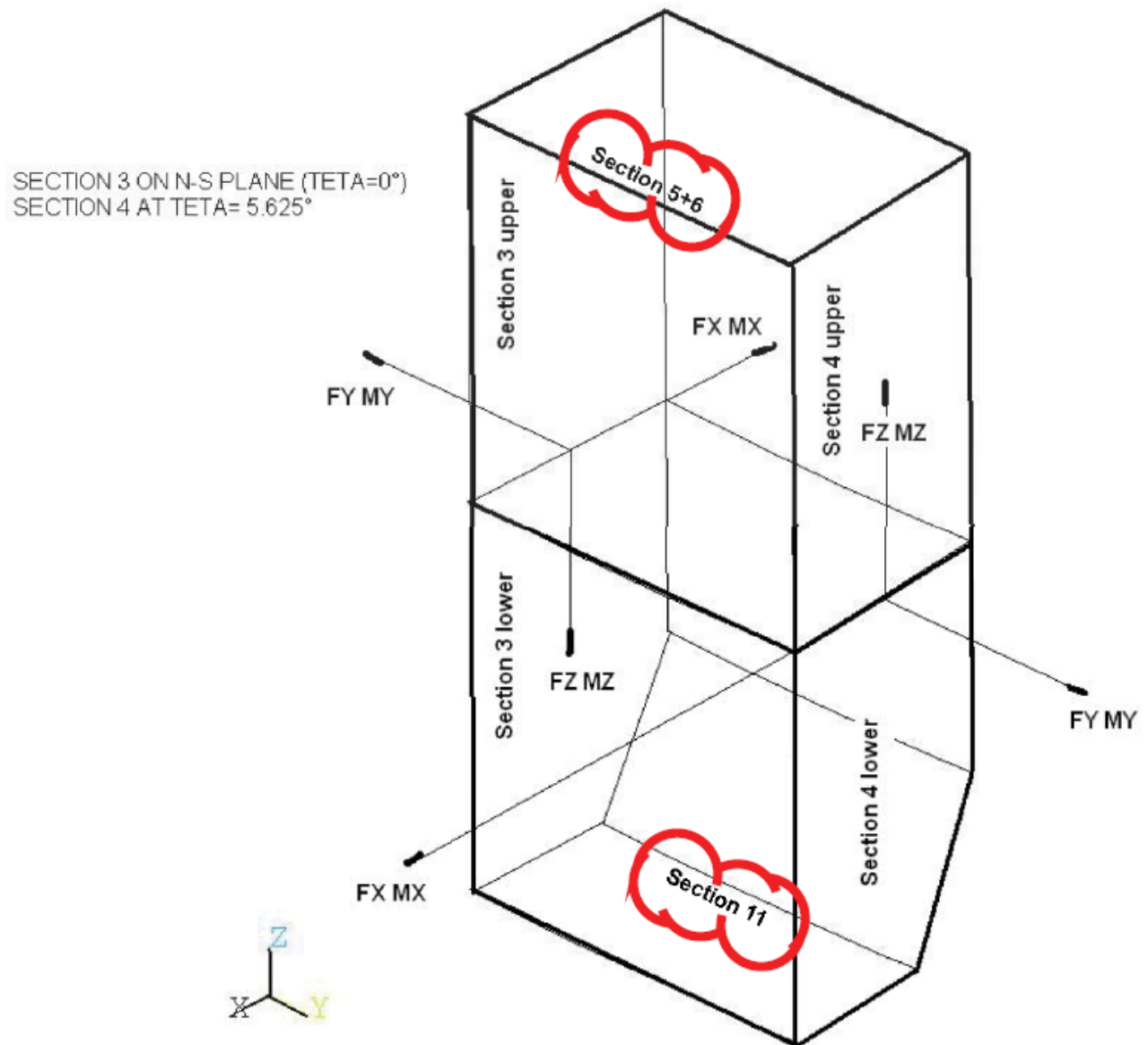


**Notes:**

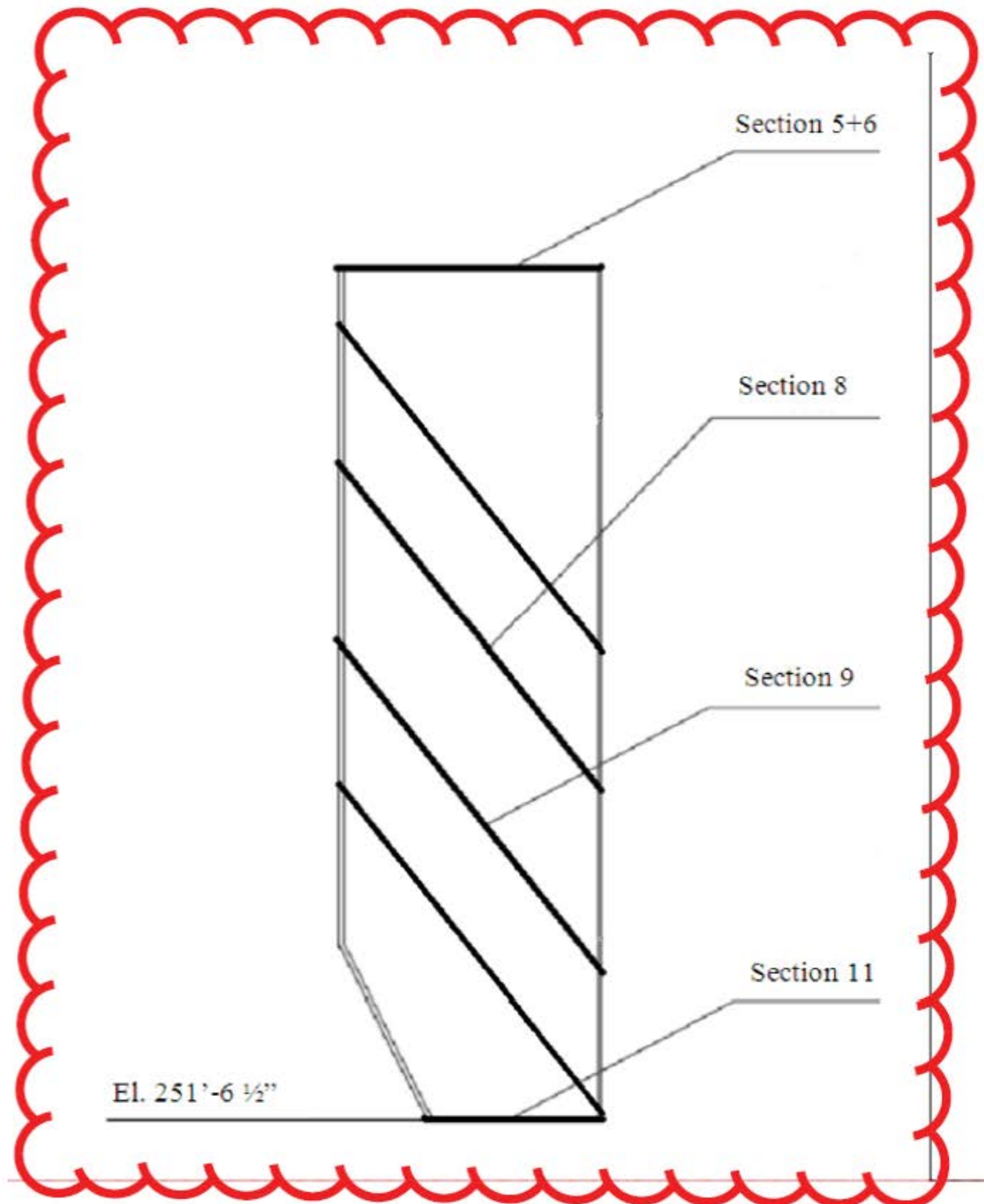
1. [Two percent of the value may be added to the design limit as an allowance for minor variances in analysis results.]\*
2. Thermal loads have been considered in the design of critical sections. The required reinforcement values shown do not include the load case where seismic and normal thermal loads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

\*NRC Staff approval is required prior to implementing a change in this information.

**UFSAR Table 3H.5-9 (Sheet 2b of 3) Shield Building Roof Reinforcement Summary (Air Inlet) - Revise information as shown below (figure blow-up continued).**



**UFSAR Table 3H.5-9 (Sheet 2b of 3) Shield Building Roof Reinforcement Summary (Air Inlet) - Revise information as shown below (figure blow-up continued).**



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

Out of Plane Shear Reinforcement Summary – AIS							
Locations (Figure 3H.5-11)		Required - Seismic Load Combinations (in <sup>2</sup> /ft)			Maximum Required <sup>(2)</sup> (in <sup>2</sup> /ft)	[Steel Area Provided]*	[Design Limit <sup>(1)</sup> for Ratio Max Required/ Provided]*
Angles	Section	Seismic L/C	Values	Sum			
0°- 5.625°	Max of Vertical Sections 3 upper - 4 upper	1	<del>0.10</del> <u>0.13</u>	<del>0.10</del> <u>0.13</u>	0.34	[3#6 <u>3/4"</u> TIE BAR @2.8125° (41.36") (8 1/2" in vertical direction) = 0.54 (in <sup>2</sup> / ft) (Min.))]*	[0.63 + 2%]*
	Horizontal Section 5+6		0.00	<u>0.13</u>			
84.375°- 90°	Max of Vertical Sections 3 upper - 4 upper	1	<del>0.10</del> <u>0.12</u>	<del>0.10</del> <u>0.12</u>			
	Horizontal Section 5+6		0.00	<u>0.12</u>			
0°- 5.625°	Max of Vertical Sections 3 upper - 4 upper	9	0.10	0.34			
	Horizontal Section 8		0.24				
84.375°- 90°	Max of Vertical Sections 3 upper - 4 upper	1	0.10	0.30			
	Horizontal Section 8		0.20				
0°- 5.625°	Max of Vertical Sections 3 upper - 4 upper	0	0.093	0.22			
	Horizontal Section 9		0.127				
84.375°- 90°	Max of Vertical Sections 3 upper - 4 upper	<del>0</del> <u>9</u>	<del>0.183</del> <u>0.20</u>	<del>0.18</del> <u>0.20</u>			
	Horizontal Section 9		0.000	<u>0.20</u>			
0°- 5.625°	Max of Vertical Sections 3 upper - 4 upper	<del>1</del> <u>9</u>	<del>0.167</del> <u>0.21</u>	<del>0.17</del> <u>0.21</u>			
	Horizontal Section 11		0.000	<u>0.21</u>			
84.375°- 90°	Max of Vertical Sections 3 upper - 4 upper	<del>0</del> <u>9</u>	<del>0.02</del> <u>0.20</u>	<del>0.02</del> <u>0.20</u>			
	Horizontal Section 11		0.00	<u>0.20</u>			

**Notes:**

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

\*NRC Staff approval is required prior to implementing a change in this information.

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

Wall Segment	Location (Figure 3H.5-11 Sheet 5 of 6)	Reinforcement on Each Face, in <sup>2</sup> /ft			Ratio Required/ Provided
		Maximum Required	Provided (Minimum)		
Bottom	Vertical	1.37	1# <del>118</del> @ <del>1.20</del> 25°	<del>1.72</del> 1.85	<del>0.80</del> 0.74
	Hoop	<del>0.67</del> 0.76	1#9@6"	2	<del>0.33</del> 0.38
	Shear	<del>0.07</del> 0.11	1# <del>64</del> @ <del>1.20</del> 56.25°x <del>126</del> "	<del>0.48</del> 0.94	<del>0.15</del> 0.12
Mid-height	Vertical	0.64	1# <del>118</del> @ <del>1.20</del> 56.25°	<del>1.72</del> 1.85	<del>0.37</del> 0.35
	Hoop	<del>1.85</del> 1.86	1#9@6"	2	<del>0.92</del> 0.93
Top	Vertical	0.52	1# <del>118</del> @ <del>1.20</del> 56.25°	<del>1.72</del> 1.85	<del>0.30</del> 0.28
	Hoop	0.79	1#9@6"	2]*	0.39

\*NRC Staff approval is required prior to implementing a change in this information.

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

Critical Sections	Stress Component	Required in <sup>2</sup> /ft	Provided (Minimum) in <sup>2</sup> /ft	Reinforcement Ratio
[Conical Roof <del>Steel</del> Beams]* <sup>(1)</sup>	Axial + Bending	-	[Radial Beams W36 X <del>393</del> 395 <sup>(2)</sup> ]*	1.33
	Shear	-		8.33
[Conical Roof Near Tension Ring]*	Radial	1.80	<del>1.96</del> 2.40]*	<del>1.09</del> 1.33
	Hoop	4.31	[4.68]*	1.09
[Knuckle Region]*	Vertical	1.37	<del>1.72</del> 1.82]*	<del>1.25</del> 1.33
	Radial	<del>1.52</del> 2.74	<del>2.23</del> 3.55]*	<del>1.47</del> 1.30
	Hoop	<del>1.37</del> 2.58	[3.12]*	<del>2.28</del> 1.21
[Compression Ring]*	Vertical	1.04	<del>1.48</del> 2.33]*	<del>1.42</del> 2.24
	Radial	3.09	<del>4.42</del> 3.57]*	<del>1.43</del> 1.15
	Hoop	<del>2.14</del> 2.44	[3.12]*	<del>1.45</del> 1.28

**Note:**

1. ~~Steel~~ Roof beams are not considered as reinforcement for the reinforced concrete roof. Ratio for conical roof ~~steel~~ beams is based on demand and allowable stresses in psi.

2. Built-up plate girders can be substituted for rolled shape. The section dimensions of the built-up plate girders are specified in Figure 3H.5-11 Sheet 1.

\*NRC Staff approval is required prior to implementing a change in this information.