April R. Rice
Manager
Nuclear Licensing

August 28, 2014
NND-14-0471
10 CFR 50.90

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

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3
Combined License Nos. NPF-93 and NPF-94
Docket Nos. 52-027 & 52-028

Subject: LAR 13-23 R2 Reinforced Concrete to Steel Plate Composite Construction Connections

Reference:

A. Southern Nuclear Operating Company, ND-14-0959, Vogtle Electric Generating Plant Units 3 and 4 LAR-13-014 R2 Revised License Amendment Request: Reinforced Concrete to Steel Plate Composite Construction Connections (Adams Accession Number ML14171A591)

B. South Carolina Electric & Gas Company (SCE&G), NND-14-0188, Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 LAR-14-01 R0 License Amendment Request: Auxiliary Building Structural Floor Details (Adams Accession Number ML140938255)

C. South Carolina Electric & Gas Company (SCE&G) Request for License Amendment Revision 1: Reinforced Concrete to Steel Plate Composite Construction Connections August 05, 2014 (NND-14-0450).

In accordance with the provisions of 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G) requests an amendment to the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 combined licenses (COLs) numbers NPF-93 and NPF-94, respectively.

As some differences were noted between Reference C and Reference A, the LAR has been revised to better match with Reference A.

The purpose of the LAR is unchanged and the proposed amendment would revise Tier 2* and associated Tier 2 material related to the design details of connections in several locations between the steel plate composite construction (SC) used for the shield building and the standard reinforced concrete (RC) walls, floors, and roofs of the auxiliary building and lower walls of the shield building. These connections are also referred to as "RC to SC connections."

Enclosure 1 contains the Description, Technical Evaluation, Regulatory Evaluation (including Significant Hazards Consideration), and Environmental Considerations for the proposed changes in the License Amendment Request (LAR). Enclosure 2 and 3 provide the information

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to support the withholding of proprietary information as requested below. Enclosure 4 contains the proposed markups depicting the requested changes to publicly available information. Enclosure 5 includes a copy of APP-GW-GLR-603, Revision 4, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections (Non-Proprietary). Enclosure 6 contains the proposed markups depicting the requested changes to information protected and to be withheld under the provisions of 10 CFR 2.390 (both proprietary and security-related information). Enclosure 7 includes a proprietary copy of APP-GW-GLR-602, Revision 4, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections also to be withheld under the provisions of 10 CFR 2.390. Note that Enclosure 8 was previously submitted with Reference C, it contained VSL_VSG_000167's Proprietary Information & Copyright Notice, but in this submittal it has been assimilated into Enclosure 2 to better match the format of Reference A.

As discussed above, Enclosures 6 and 7 contain proprietary information and security related information that is requested to be withheld from public disclosure under 10 CFR 2.390. Enclosures 2 and 3 support this request and are supported by affidavits. The affidavits set forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.390 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavits should reference CAW-14-3958 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066, and also to April R. Rice, SCE&G, at the contact information within this letter.

In order to support the VCSNS Unit 2 construction schedule, SCE&G requests NRC staff review and approval of the license amendment by December 15, 2014. Approval by this date will allow sufficient time to implement the licensing basis changes prior to affected construction activities. SCE&G expects to implement the proposed amendment within 30 days of approval.

Please note that SCE&G has also prepared and submitted an LAR-14-01 R0 (Reference B) addressing the auxiliary building structural floor details. During pre-submittal meetings for that LAR, the NRC Staff provided comments that were determined to also impact this LAR; such comments have also been addressed in this submittal, where applicable.

This letter contains no regulatory commitments.

In accordance with 10 CFR 50.91, SCE&G is notifying the State of South Carolina of this LAR by transmitting a copy of this letter and enclosures to the designated State Official.

Should you have any questions, please contact Mrs. April R. Rice by telephone at (803) 941-9858, or by email at arice@scana.com.

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

Executed on this 28th day of August, 2014.

Sincerely,

April Rice
Manager
Nuclear Licensing

MMD/ARR/mmd

Enclosure 1: Virgil C. Summer Nuclear Station Units 2 and 3 – License Amendment Regarding Reinforced Concrete to Steel Plate Composite Construction Connections (LAR 13-23 R2)

Enclosure 2: Westinghouse Authorization Letter CAW-14-3958, Accompanying Affidavit, Proprietary Information Notice, and Copyright Notice

Enclosure 3: Virgil C. Summer Nuclear Station Units 2 and 3 – South Carolina Electric and Gas Company Affidavit for Proprietary Information

Enclosure 4: Virgil C. Summer Nuclear Station Units 2 and 3 – Redacted Proposed Changes to the Updated Final Safety Analysis Report (LAR 13-23 R2)

Enclosure 5: APP-GW-GLR-603, Revision 4, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections (Non-Proprietary)

Enclosure 6: Virgil C. Summer Nuclear Station Units 2 and 3 – Proposed Changes to the Licensing Basis Documents (LAR 13-23 R2) **(Security-Related and Proprietary Information)**

Enclosure 7: APP-GW-GLR-602, Revision 4, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections **(Proprietary Information)**

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South Carolina Electric and Gas Company
Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-14-0471

Enclosure 1

License Amendment Request Regarding Reinforced Concrete to Steel Plate Composite Construction Connections (LAR 13-23 R2)

Table of Contents

1. Summary Description

In accordance with 10 CFR 50.90, South Carolina Electric and Gas Company (SCE&G), the licensee for Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, requests an amendment to Combined License (COL) Numbers NPF-93 and NPF-94, for VCSNS Units 2 and 3, respectively.

The proposed changes would revise the design of connections between reinforced concrete and steel plate concrete composite construction.

The proposed changes revise the design details of connections in several locations between the steel plate concrete filled composite construction (SC) used for the shield building and the standard reinforced concrete (RC) walls, floors, and roof of the auxiliary building and lower walls of the shield building. The critical section descriptions and figures in UFSAR Appendix 3H are revised to be consistent with the design changes. The revised design details continue to satisfy the supplemental requirements and applicable code and standard criteria established during the review of the AP1000 Design Certification and documented in Updated Final Safety Analysis Report (UFSAR) Subsection 3.8.4.5, which incorporates the plant-specific Design Control Document (DCD).

Design summary information included in UFSAR Table 3H.5-14 is revised. This table includes required faceplate thicknesses and required shear reinforcement for the SC wall modules that are based on the forces and moments in the wall determined in the analyses at the specified locations. The supporting load and moment information in the table is also revised.

This enclosure requests approval of the license amendment necessary to implement the proposed changes to the Tier 2* and associated Tier 2 material. Note that some of the requested changes impact the incorporated by reference topical report APP-GW-GLR-602, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections. This document, and the information showing the associated changes, are proprietary and withheld from public disclosure. The nonproprietary version of the report is APP-GW-GLR-603. Additionally, some of the requested changes impact security related information. The information showing these changes is also withheld from public disclosure.

2. Detailed Description

The proposed change activity includes design changes to connections in several locations, defined below, between the steel plate concrete composite construction (SC) used for the shield building and the standard reinforced concrete (RC) used for the walls, floors, and roofs of the auxiliary building and a portion of the shield building. The licensing basis, including developed views of the shield building cylinder and critical sections identified in the UFSAR, is changed to reflect the design changes. Tier 2* information being changed includes text, tables, and figures in UFSAR Section 1.6, Section 3.8, and Appendix 3H and in the incorporated by reference Topical Report APP-GW-GLR-602.

Note: the cardinal directions used in the following description are based on a convention of the turbine building being located north of the nuclear island. UFSAR Figure 3.7.2-12 Sheet 3 shows the geometric configuration of the shield building cylindrical wall in "plan view" and the pertinent column line designations. This figure is identified as a reviewer aid and does not show

the detailed connection information. Figure 3.7.2-12 Sheet 3 is not included in this requested amendment as no changes were required to this figure.

The portion of the shield building wall located within the auxiliary building is constructed of standard RC construction. Near the west walls of the auxiliary building there are vertically oriented connections between the RC used in the shield building below the roof of the auxiliary building and the SC used to construct the wall of the shield building near Azimuth 180° shown in Figure 3H.5-16 Sheet 2 and current Figure 6 of APP-GW-GLR-602. The connection uses end and support plates attached to the faceplates of the SC modules to transfer loads into the reinforced concrete. Deformed hoop bars embedded in the reinforced concrete are connected to the end and support plates. Interferences require that these connections be shifted to provide the connection design described in the licensing basis in UFSAR Subsection 3H.5.7.2 and in Section 4 and Figures 1, 2, 3, and 4 of APP-GW-GLR-602.

Wall N is the western wall of the auxiliary building south of the shield building. The connection between the RC and SC portions of the shield building is proposed to be shifted because of interferences with reinforcement in the 5 ft. 6 in. thick Wall N and the fuel transfer canal. These interferences are eliminated when the azimuth of the RC/SC location is moved from within the thickness of Wall N to the outside edge of Wall N on the West side of the shield building cylinder. The connection location moves approximately 6 feet to approximately Azimuth 183° shown in Figure 3H.5-16 Sheet 2 and Figure 6 of APP-GW-GLR-602. This change also removes the offset between the upper and lower portions of the connection between RC and SC. The offset was the result of interference with the location of concrete blocks provided to shield the refueling transfer canal. The shift of the connection location removes the interference with the shield blocks. Shifting the location of the connection does not change the pertinent details of the connection. The sizes of the deformed bars, faceplates, support plates, endplates, and mechanical connectors are not changed.

The connection location near auxiliary building Wall Q north of the shield building is proposed to be modified because of the proximity of the main steam and feedwater penetrations through the shield building wall shown between Azimuth 337° and 352° in Figure 3H.5-16 Sheet 1 and shown near Azimuth 340° and Figure 6 of APP-GW-GLR-602. A portion of the vertical connection is moved from approximately Azimuth 342° to the other side of these penetrations at approximately Azimuth 352°. The standard vertically oriented connection between RC and SC portions of the shield building is shown in Figure 3 of APP-GW-GLR-602. This connection provides a direct mechanical connection between the hoop reinforcement in the reinforced concrete and the shield building wall module. The hoop bars are mechanically connected to support plates welded to the inside surface of the wall module faceplates. The nominal spacing of the hoop bars is approximately 6 inches. The penetrations through the RC portion of the shield building wall in this area are for the steam line and the feedwater line to pass thorough. These large steam line and the feedwater line penetrations would displace or interrupt many of the hoop bars in the RC portion of the shield building wall in the original location of the connection. The reinforcement displaced by the penetrations would have to be formed around the penetrations and would result in congested reinforcement near the penetrations. UFSAR Figure 3H.5-16 is revised to show the modified connection at the penetration.

The revised RC to SC connection in the regions of the penetrations continues to provide direct mechanical connection between the reinforcement in the reinforced concrete wall and the SC wall modules. The connection assembly is designed as a steel weldment satisfying the requirements of AISC N690. Specifying that the connection is designed to AISC N690

requirements is not a change in the design or licensing basis. The hoop reinforcement is connected to a vertical plate that spans the thickness of the shield building wall. This vertical connection plate is located on the opposite side of the penetrations from the SC wall. The design of the assembly assumes a load from the reinforcement of 125 percent of the specified yield strength of the reinforcement. The vertical connection plate is connected to the module faceplates with plates (approximately 2 inches thick) on the inner and outer surface of the wall. The surface plates are sized to carry the load from deformed reinforcement bars around the openings. Horizontal plates between the inner and outer plates at the top and bottom of the assembly span between and stiffen the connecting wall plates. The vertical reinforcing bars that are interrupted by the weldment are anchored to the top and bottom support plates with mechanical connectors. The shield building module faceplates are welded to the connection assembly with a complete joint penetration weld. The volume inside the assembly surrounding the penetrations is filled with concrete but the concrete strength is neglected in the design.

The design width of the support plates included in the RC to SC connection shown in proposed Figure 1 of APP-GW-GLR-602 is changed from 12 5/8" to 12". The support plates connect to vertical deformed bars that are anchored in the concrete below the RC to SC connection module. During design finalization, it was determined that the positions of the bars connected to the support plates need to be shifted slightly resulting in a change in the width of the support plates. The requirements for the capacity of the connection are not changed. In Figures 1 and 4 the gusset plate configuration is proposed to be changed to show the plate ending above the tie bar. The weld of the tie bar to face plate continues to satisfy the requirements to develop 125% of the specified yield strength of the bar. Connection design elements may be shifted or reconfigured as noted above due to penetrations or other interferences in the connection modules. Where the support plates or gusset plates must be moved or reconfigured due to a penetration or other obstruction the connection continues to satisfy the AICS N690 criteria.

In several places penetrations through the shield building wall panels displace tie bars and studs in the local area. APP-GW-GLR-602 is revised to note that penetrations through the shield building wall may alter the spacing of tie bars. These penetrations through the wall panels and connection modules are designed with the use of a structural sleeve. The structural sleeve is designed to replace the tie bar area and develop the capacity of the tie bars displaced.

The auxiliary building roof connection to the SC portion of shield building, included as part of a critical section described in UFSAR Subsection 3H.5.2.1, is also being revised. The revised connection reduces the rebar congestion in the roof and simplifies fabrication and construction. The certified design consists of radial bars that pass through the outer SC faceplate and are attached to the far faceplate of the shield building wall modules. These radial bars are separate from the reinforcement provided for roof reinforcement.

The revised auxiliary building roof connection design eliminates the separate radial bars extending into the roof concrete and directly connects the roof reinforcement to the wall module. An example of the connection is shown in the revised Figure 7 of APP-GW-GLR-602. This example is different than the configuration shown for the critical section in Figure 3H.5-7. The details of the connections between the auxiliary building roof and the shield building wall vary because of loads on the connection and the orientation of the wall to the roof reinforcement arrangement. Connection or ring plates, which provide connections to the top and bottom roof reinforcement, are welded to built-up connection plates on the outer faceplate of the shield building wall. The faceplates in the connection region are thicker than the faceplates for a standard shield building wall module. The added faceplate thickness is provided on the inside

surface of the faceplates and does not change the thickness of the shield building wall. The roof reinforcement bars are welded to the connection plates, or to plates welded to the connection plates, using a flare bevel weld in conformance with AWS D1.4. The welded connection fully develops 125% of the specified yield strength of the reinforcement bars. The additional plates are used when the elevation of the reinforcement is offset from the top surface of the connection plate by other reinforcement. In some locations mechanical connectors welded to front plates perpendicular to the connection plate are used to connect the reinforcement bars to the connection assembly. This configuration is shown as part of a critical section in the revised UFSAR Figure 3H.5-7. Welding and mechanically connecting the reinforcement bars to the connection assembly eliminates the need for the separate reinforcement bars connecting the shield building to the roof to be oriented radially to the shield building wall. This revised design provides a direct connection of the roof reinforcement to the SC wall. The connection design includes radial shear lugs adjacent to the faceplates between the wall plates. Stiffener plates on the outer edge provide additional rigidity to the connection assembly when needed and act as additional shear lugs. Internal tie bars in the wall module pass the loads from the connection plate and outer faceplate to the faceplate on the far face of the SC wall module. These tie bars replace the extension of the radial reinforcement into the wall module. The tie bars in the connection regions may be larger in diameter and spaced closer together than the tie bars for standard shield building wall modules. The spacing of tie bars in these areas may be equal to the spacing of tie bars in Type 1 modules. Type 1 modules are described in APP-GW-GLR-602, Section 4 and Figure 6. The revised connection design, including the design detail variations, of the roof to the wall module is in conformance with the AISC N690 and ACI 349 requirements and supplemental requirements included in the UFSAR Subsection 3.8.4.5.5.6 and the seismic analysis of the structures. Roof girders supporting the metal decking and concrete are attached to the shield building module faceplates. Tie bars in the wall module provide backup structure for the roof girder connection.

UFSAR Subsection 3H.5.7.2 is revised to clarify that the requirements described for the reinforcement bars in the RC are for the bars that are part of the connection. There are reinforcement bars in the RC that are not part of the mechanical connection between the RC and SC. UFSAR Subsection 3H.5.7.2 is revised to clarify that the design of the mechanical connections are designed to 125 percent of the capacity of the connecting reinforcement bars. The previous description, that the design was to 125 percent of the weaker of the steel plate or the reinforcing bar, was confusing and did not reflect the preferred design approach. The term mechanical coupler is changed to mechanical connection or mechanical connector to clarify the nature of the connector design.

UFSAR Subsection 3.8.4.5.5.6 is proposed to be revised to include supplemental requirements for the design of RC to SC connections and to identify where the connections are located. These supplemental requirements were developed and discussed during design certification and NRC review of the shield building design. They are added to 3.8.4.5.5.6 to document the requirements in the licensing basis.

In two locations a typographical correction is proposed to be made to a table and a figure designation to change 3.H.5 to 3H.5. The changes are located in Item 5 in Subsection 3H.5 and the fourth paragraph of UFSAR Subsection 3H.5.2.1. These changes have no effect on the design or safety of the structure.

UFSAR Figure 3H.5-7 for the critical section showing the connection of the auxiliary building roof (above the radiologically controlled area of the auxiliary building) to the shield building wall

also includes extraneous information unrelated to the critical section and this unrelated information is removed. This information includes the shield building wall radius and thickness and center lines which are shown in Figure 3.7.2-12 Sheet 6. Dimensions of the auxiliary building roof and walls, column lines not needed to define the critical section, distance between column lines, roof elevations, and center lines are removed. This auxiliary building information is shown in Figure 3.7.2-12 Sheets 6 and 7. The representation of the auxiliary building roof reinforcement requirement is changed such that it does not extend into the wall. The drawing scales are not appropriate and are proposed to be removed from the roof plan and Section A showing the connections in the roof since UFSAR figures are not to scale. The roof details provided for Region A and Region B are proposed to be removed since information for this type of roof or floor is provided in Subsection 3H.5.2.2 and Figure 3H.5-6. Also the information for Region B is duplicated in Section A of Figure 3H.5-7. The auxiliary building Wall 4 and Wall N connection details (identified as PLAN AT EL. 170'-0") are revised. The information revised is the detail design of connections of auxiliary building wall to the shield building wall and these wall detail designs are not part of the connection of the roof to the shield building wall and are not part of the roof connection critical section. Notes are added to the figure to describe the variances in the connection detail designs.

Figure 7 of APP-GW-GLR-602 showing an example of the connection of the auxiliary building roof to the shield building wall, incorporated by reference into the UFSAR, is proposed to be updated to incorporate the auxiliary building roof to shield building connection design changes described above. Notes on the figure are revised to include design requirements and design basis instead of specific reinforcement size and spacing. A note is added to reference to UFSAR Subsection 3.8.4.5.5.6.

Table 1 in APP-GW-GLR-602 is proposed to be revised to include material requirements for additional components related to the revised connection design. Table 1 is reformatted as part of this change.

Text and tables in the licensing basis are revised to clarify that the 3/4 inch thickness is the minimum design thickness for the shield building module faceplates. The faceplate is increased in thickness (up to 1.0-inch nominal) in portions of the wall to address connections and attachment loads. For example, the faceplates are thicker at the connection of the auxiliary building roof to handle the roof load and to facilitate welding of thick connectors and backup structures. The size of the thicker faceplates considers the size needed to handle the local loads, module fabrication considerations, and minimizing thickness transitions within and between faceplate sections. The statements in the UFSAR text and Table 3H.5-14 Sheets 1, 2, and 3 that the faceplates are 0.75 inch thick are potentially inconsistent with the design of the connection without the clarification.

To support the design changes for the RC to SC connections, an analysis of the shield building SC wall module design has been completed. This analyses impacts the design summary information included in UFSAR Table 3H.5-14. This table includes required faceplate thicknesses and required shear reinforcement for the SC wall modules that are based on the forces and moments in the wall determined in the analyses at the specified locations. The faceplate thicknesses and shear reinforcement information are designated as Tier 2* information and require NRC approval if the value is exceeded because of design changes. This information has very small allowance for an increase in the required value and in some cases the values in the analysis exceed the values in the table plus the allowance. The required faceplate and shear reinforcement information is being revised as part of this change to

accommodate the increase in the analysis results and to provide bounding values in the table. The supporting load and moment information in the table is also revised. The values for faceplate thickness and shear reinforcement provided as part of the SC shield building wall design are not changed. The location of the element location in the structural model used to determine the required values is not changed.

The tie bar size and spacing given in APP-GW-GLR-602, Figure 6 is the nominal design spacing required by the design demands for the structure based on limiting load combinations. An increase in the tie bar capacity may be provided to handle local attachments and connections in the area of the attachments and connections. For example, the tie bar spacing is decreased on the west side of the shield building to accommodate the attachment loads from platforms and HVAC supports. On the east side of the shield building the tie bar spacing is decreased to accommodate the attachment loads for the plant vent and stair structure. The spacing of tie bars in these areas may be equal to the spacing of tie bars in Type 1 modules. Type 1 modules are described in APP-GW-GLR-602, Section 4 and Figure 6. In local regions near wall and roof connections tie bar diameter may also be increased to accommodate the connections to the shield building. The areas with decreased tie bar spacing to address attachment loads are not identified in all cases on Figure 6 of APP-GW-GLR-602.

The changes to APP-GW-GLR-602 to correct typographical and format issues and the rewrites of the text to clarify the description and design information are not technical changes and are included in the change description identified below.

Licensing Basis Change Descriptions

Revise the information in the entry for Section 3.8 in UFSAR Table 1.6-1 to update the revision of APP-GW-GLR-602.

Revise the information in the entry for Section 3H in UFSAR Table 1.6-1 to update the revision of APP-GW-GLR-602.

Revise UFSAR Subsection 3.8.4.5.5.6 information to include supplemental requirements for the RC to SC connection design, add a reference to Figure 3H.5-7, note that details may vary, and add reference to AISC N690.

Revise the information in Reference 57 of UFSAR Subsection 3.8.7 to update the revision of APP-GW- GLR-602 and APP-GW-GLR-603.

Revise Subsection 3H.1 to add the word "are" as an editorial correction.

Revise Subsection 3H.5 Item 5 to change 3.H.5-7 to 3H.5-7.

Revise UFSAR Subsection 3H.5.2.1 description of the figure, identify variations in design details from the critical section, and add reference to Subsection 3.8.4.5.5.6. The designation of Table 3.H.5-10 is changed to Table 3H.5-10.

Revise the second paragraph of UFSAR Subsection 3H.5.6 to change the description of the information shown in Figure 3H.5-16 and identify information that is not Tier 2*.

Revise the information in the second paragraph of UFSAR Subsection 3H.5.7.1 to note that faceplates are thicker in localized areas.

Revise the information in the second paragraph of UFSAR Subsection 3H.5.7.2 to remove the term "each" in reference to vertical reinforcement bars. Appropriate editorial changes are included as part of this change. Revise the information in this paragraph to clarify the design of the connectors. The term mechanical coupler is changed to mechanical connection to clarify the nature of the connector design.

Revise the information in Reference 1 of UFSAR Subsection 3H.5.8 to update the revision of APP-GW- GLR-602 and APP-GW-GLR-603.

Revise the values for forces and moments and the required plate thickness and required shear reinforcement information included in UFSAR Table 3H.5-14, Sheets 1, 2, and 3.

Revise the information to add a note on plate thickness in UFSAR Table 3H.5-14 Sheets 1, 2, and 3.

Revise the information in UFSAR Figure 3H.5-7 as follows:

1. The Upper Section in the Section A detail showing an elevation of the roof to wall module connection information is revised to reflect changes to the connection of the roof to the wall including change in the design of the shear lug, addition of a connection plate for connection of roof reinforcement to structural modules, the addition of a stiffener plate, the addition of an connecting plate welded to the module faceplate, and the change in the design of the connection of the girder to the wall. The extension of roof reinforcement into the wall is removed and tie bars in the wall module are designated as internal wall reinforcement to develop roof reinforcement and provide backup structure for the roof girder connection.
2. Extraneous information is removed from the roof plan including the shield building wall radius and thickness, dimensions of the roof and walls, column lines not needed to define the critical section, distance between column lines, roof elevations, and center lines and the information removed from UFSAR Figure 3H.5-7 is provided in UFSAR Figure 3.7.2-12 and Subsection 3H.5.2.2. The representation of the roof reinforcement requirement is changed to not extend into the wall. The N (North) direction indicator is removed from the upper right portion of the figure.
3. The partial PLAN AT EL. 170'-0" which shows the connections between auxiliary building Wall 4 and Wall N and the shield building wall is revised. The information revised is the detail design of the connection of auxiliary building walls to the shield building wall, and these connections are not included in the critical section addressed in UFSAR Subsection 3H.5.2.1 and this figure.
4. The drawing scale is removed from the Roof Plan because UFSAR figures are not to scale. The scale is not relevant to the critical section addressed in UFSAR Subsection 3H.5.2.1 and this figure and UFSAR figures are not to scale.
5. The REINFORCEMENT FLOOR DETAIL IN REGION "A" information is removed since the information is provided in other UFSAR figures including Figure 3H.5-6. The size and spacing of the reinforcement bars are shown in the Roof Plan of Figure 3H.5-7. The dimensions of the metal decking and the roof thickness are included in Figure 3H.5-6.

The detail shown is not needed to describe the critical section addressed in UFSAR Subsection 3H.5.2.1 and this figure.

6. The REINFORCEMENT FLOOR DETAIL IN REGION "B" is removed since it is duplicate information to the Tier 2* information details shown in SECTION A.
7. The tie bar spacing is removed from the Lower Section in Section A. This information is available in APP-GW-GLR-602, Figure 6.
8. Couplers are removed from the vertical bars in the Lower Section of Section A to reflect changes in the detail design.
9. The following notes are added.

    1) Detail shown is specific to the connection of the roof to the shield building wall at the location shown. Refer to Subsection 3H.5.2.1 and other notes for additional information about design details for other connections.

    2) Reinforcement size and spacing for the roof in other locations include range from #7@6" to #11@6" and are based on the requirements in ACI 349.

    3) The details of the connections between the auxiliary building roof reinforcement and the shield building wall vary because of loads on the connection and the orientation of the wall to the roof reinforcement arrangement.

    4) The detail design and location of the beam supports and connection between the beam and the shield building SC wall modules are designed to the requirements of AISC N690. Beam support and connection configuration, including the use of fasteners, plates, structural shapes, and stiffeners, is based on loading and local geometry considerations.

    5) The details of the connections between the auxiliary building walls and the shield building wall vary because of loads on the connection and the orientation of the auxiliary building wall to the shield building wall. The connection configurations, including the use of plates, structural shapes, and stiffeners and backup structure inside the shield building wall modules, are based on loading and local geometry considerations and are designed to the requirements of AISC N690.

Revise the information in UFSAR Figure 3H.5-16 Sheets 1 and 2 to:
(Note that Figure 3H.5-16 contains security related information and is withheld from public disclosure.)

1. Match the configuration changes shown in Figure 6 of APP-GW-GLR-602. This includes:

    a. Shift slightly the vertical connection between RC and SC on the right side of Sheet 2. This change also removes an offset between the top and bottom portions of the connection near the bottom of the connection.

b. Extend a portion of the vertical connection to move to the right of the representation of the main steam and main feedwater penetrations.

2. Revise information shown as background information for reference for walls and other structural elements in the auxiliary building adjacent to or intersecting the shield building wall. The removal of the structures housing the MSIV compartment vents because of design finalization changes to the auxiliary building is one such revision. These background elements in the auxiliary building provide context for the connection design and do not affect the revised RC to SC connection.

3. Remove the N (North) direction indicator from Sheets 1 and 2. The removal of direction indicator from the figure does not affect the design of the RC to SC connection.

Revise the information in the incorporated by reference document APP-GW-GLR-602 as indicated below: (This document, and the information showing the associated changes, are proprietary and withheld from public disclosure. APP-GW-GLR-603 is the non-proprietary version; it is also revised appropriately and provided as Enclosure 19.)

Editorial change to Section 1 Paragraph 3 Sentence 4

Add designation of "RC to SC Connection Components" to first row of Table 1 and reformatted list of components under this designation. Reformat the designation of "Connection with Auxiliary Building Roof" in the bottom row of the table. Add "Connection Plate", "Stiffener Plate", and "Backing Plate" to the list of components in Table 1.

Revise the second paragraph in Section 4 first sentence to add the term "significant features" to critical sections. This will clarify the purpose of the document.

Editorial change: In three locations in Section 4, where it is the first word of the paragraph, remove the underline under "Figure #".

Revise and rewrite the first paragraph under the heading Steel Concrete Composite (SC) Shield Building RC/SC Connection Zone Details of Section 4 as described below to clarify the connection design methodology.

Describe the design approach and approximate location of the RC to SC connections. Separate and expand the description of the vertically oriented connection of the hoop bars in the RC portion of the shield building. Change an azimuth dimension from 177 to183 and note that azimuths are approximate. Add reference to Figure 2. Specify that couplers are welded to the end plate and to clarify where the end plate is connected to the hoop bars.

Add a new paragraph under the heading Steel Concrete Composite (SC) Shield Building RC/SC Connection Zone Details of Section 4 to reference AISC N690 criteria for the support plates and gusset plates. Add a sentence that the details may vary to address local geometry and loads. Add information to note that connection design elements may be shifted to avoid penetrations and other interferences and describe the changes for the area near the penetration near Wall Q.

Add a new paragraph in Section 4 under the heading Steel Concrete Composite (SC) Shield Building RC/SC Connection Zone Details to describe the vertical connection between RC and SC construction in the area of the main steam and feedwater line penetrations.

Revise the first sentence in the paragraph following the added paragraphs to specify that the information is about the connection modules.

Revise Section 4, first sentence second paragraph, under the heading Steel Concrete Composite (SC) Shield Building Wall Panel, first sentence to make modules plural and to clarify stud and tie bar spacing differences for Type 1 modules.

Editorial change to Section 4, second sentence, third paragraph under the heading Steel Concrete Composite (SC) Shield Building Wall Panel, to make the studs plural. Add information to same paragraph on the design of structural sleeves to replace tie bars at penetrations.

Revise the last paragraph under the heading Steel Concrete Composite (SC) Shield Building Wall Panel (3H.5.7.1) in Section 4 to clarify the description of Figure 6 to show the location of the Type 1 and Type 2 tie bar spacing. In the same paragraph identify that the tie bar spacing may be decreased for local attachment and connections.

Revise the last paragraph of Section 4 to identify that the details of the auxiliary building roof to wall connection design may vary.

Revise the original second sentence of the last paragraph of Section 4 to add consideration of AISC N690 for steel stresses.

Revise the last paragraph of Section 4 to reference Subsection 3.8.4.5.5.6 for supplemental requirements for connections.

Revise the last paragraph of Section 4 to include ACI requirement for couplers.

Revise Figure 1 to:

1. Change the start and stop azimuth locations for the RC to SC connection included as notes in the figure.
2. Change the design width of Support Plates from 12 5/8" to 12".
3. Revise configuration of gusset plates to end above tie bars.

Revise Figure 4 to change configuration of gusset plates to be located above tie bar.

Revise Figure 6 to:

1. Shift slightly (from Azimuth 177° to Azimuth 183°) the location of the vertical connection between RC and SC on the right side of the figure.
2. Remove the offset in azimuthal location between the upper portion and the bottom portion of the vertical connection between RC and SC on the right side of the figure since shielding blocks around the fuel transfer tube are not an obstruction at the revised location.

3. Extend a portion of the vertically oriented connection to move the connection to the right of the representation of the main steam and main feedwater penetrations on the left side of the figure.
4. Add a note to state "The connection in the vicinity of the shield building wall penetrations adjacent to Azimuth 0° is a welded assembly constructed to the requirements of AISC N690."
5. Add a note to state "Tie Bars spacing may be decreased to as small as a Type 1 module and tie bar size may be increased to accommodate local attachments."
6. Editorial changes are made to the legend.
7. Two azimuth values are rounded to one decimal place.

Revise Figure 7 to show a revised connection design including:

1. The removal of two layers of reinforcement bars radial to the faceplate extending into the concrete roof and two layers of reinforcement perpendicular to these radial bars.
2. Addition of a connection plate to connect reinforcement bars in the roof to the wall module faceplate.
3. Revision of the shear lug design from a shear lug welded directly to module faceplate to a shear lug welded to backing plate and located between connection plate above and below the shear lug.
4. Addition of a backing plate welded to the structural module faceplate.
5. Addition of a stiffener plate located between the connection plates.
6. Replacement of reinforcements inside the wall module with additional wall module tie bars.
7. Revise Note 1 to remove the specific size and spacing of reinforcement inside the wall and add the requirement to fully develop reinforcement in the roof.
8. Revise Note 2 to include discussion of load path through connection plates and tie bars.
9. Revise Note 2 to identify that the details of the connection design may vary.
10. Remove Note 5 and move information on couplers to Subsection 3.8.4.5.5.6.
11. Add note to reference Subsection 3.8.4.5.5.6 for supplemental design requirements.

Revise the information in the incorporated by reference document APP-GW-GLR-603 as indicated for APP-GW-GLR-602 above. APP-GW-GLR-603 is the non-proprietary version and some of the information noted above is redacted.

3. Technical Evaluation

Structure, System, Component and/or Analysis Description

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

The nuclear island structures provide protection for the safety-related equipment against the consequences of either a postulated internal or external event. The nuclear island structures are designed to withstand the effects of natural phenomena such as hurricanes, floods, tornados, tsunamis, and earthquakes without loss of capability to perform safety functions. The nuclear island structures are designed to withstand the effects of postulated internal events such as fires and flooding without loss of capability to perform safety functions.

The shield building is the structure that surrounds the containment vessel. During normal operations, a primary function of the shield building is to provide shielding for the containment vessel and the radioactive systems and components located in the containment. The shield building, in conjunction with the internal structures of the containment, provides the required shielding for the reactor coolant system and the other radioactive systems and components housed in the containment. The shield building also protects the containment vessel from external events. The shield building protects the containment vessel and the reactor coolant system from the effects of tornadoes and tornado produced missiles. The shield building protects the containment vessel and the reactor coolant system from the impact of a large commercial aircraft. The shield building is an integral part of the passive containment cooling system.

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

Supporting Technical Details

The shield building uses concrete-filled steel plate construction (SC) for a portion of the shield building wall. The SC module faceplates are considered as the reinforcing steel, bonded to the concrete by headed studs and tie bars. The through-wall tie bars provide a structural framework for the modules, maintain the separation between the faceplates, and act as "form ties" between the faceplates when concrete is being placed. In addition, the tie bars provide out-of-plane shear capacity for the SC wall similar to that provided by shear ties in reinforced concrete (RC). The shear studs provide shear transfer between the steel faceplates and concrete infill at their interface.

Most of the auxiliary building and the portion of the shield building located under the auxiliary building roof are constructed of reinforced concrete. The steel plate modules are anchored to the reinforced concrete below the connection modules by deformed bars directly connected to the modules. The design of the connection of RC to SC is not explicitly covered by requirements in the codes and standards used for the RC and SC design and construction. The requirements and criteria for the design and evaluation of these connections are based on

licensing basis commitments, supplemental requirements, and critical section information included in the UFSAR. The licensing basis commitments include applicable and designated portions of ACI 349 and AISC N690. The connections of RC walls, roof, and floors to the SC module satisfy similar provisions. The supplemental requirements for the RC to SC connections are itemized below. These supplemental requirements are added to UFSAR Subsection 3.8.4.5.5.6 to document the requirements in the licensing basis.

1. The connections provide for the direct transfer of forces from the RC reinforcing steel to the SC faceplates. Lap splice type connections between dowels extending out of the RC into the SC adjacent to the headed shear studs are not used to connect the modules to the base concrete.
2. Loads are transferred directly from the faceplates to the reinforced concrete using reinforcing bars, mechanical connection, and welds.
3. The mechanical connections develop 125% of specified yield of the connected reinforcement bar.
4. Loads that are out of plane of the wall, such as from roofs or walls, are carried through the full thickness of the shield building walls.

The sizing of the design elements in the connections is governed by the appropriate portions of AISC N690 and ACI 349. The size and development length requirements of the deformed bars that tie the connection modules into the reinforced concrete are governed by ACI 349 requirements. The applicable provisions of ACI 349, Chapter 21 are applied to the connection design. The requirement that the welded connections fully develop 125 percent of the specified yield strength of the reinforcement bars is in accordance with ACI 349 Paragraph 12.14.3.3. The sizing of plates and bars that make up the connection in the SC construction are governed by requirements and criteria in AISC N690. Welding requirements are based on AWS requirements specified in AISC N690 including AWS 1.4. These requirements continue to be satisfied with the revised and relocated connection designs.

In some connection locations, the shield building wall module design uses thicker faceplates to facilitate the welding of heavy attachments and connections to the faceplates. The use of thicker faceplates is documented in proposed changes to UFSAR Subsection 3H.5.7.1 and a note on Table 3H.5-14. The design of these attachments, including the sizing of the thicker faceplates and the sizing of the welds, is in conformance with AISC N690 criteria and requirements. The size of the thicker faceplates also considers module fabrication considerations and minimizing thickness transitions within and between faceplate sections. These thicker faceplates are not credited in the evaluations of the response of the composite structures to loads due to seismic movement of the shield building wall structure. In some connection locations increased tie bar density may be used. Where the thicker faceplates are used, the shield building wall overall thickness remains the nominal 3 foot thickness. The increased faceplate thickness is on the inside of the wall. The use of thicker faceplates for the shield building wall does not require a change to the wall thickness in Tier 1, Table 3.3-1. The design of the modules with the increased tie bar density and thicker faceplates continues to satisfy the module design criteria and requirements specified in UFSAR Subsections 3.8.3.5.3 and 3.8.4.5.5 including conformance with applicable portions of AISC N690. The auxiliary building roof and wall reinforcement satisfy the criteria and requirements in ACI 349 including the development length and detailing in the connection of the roof and wall.

The clarification of the description of the design requirements for the connectors does not change the design requirement. The design of the connection remains in conformance with applicable portions of AISC N690 and ACI 349.

The UFSAR Appendix 3H includes the descriptions of critical sections in the structures that demonstrate how the code and supplemental requirements in the UFSAR are implemented in the design of the structures. One of these critical sections, described in Subsection 3H.5.2.1, is a portion of the auxiliary building roof including the connection of the roof to the SC shield building wall. Figure 3H.5-7 is referenced by Subsection 3H.5.2.1 to supplement the description of the critical section. The proposed changes to the connection assembly detail design shown in Figure 3H.5-7 were identified as part of design finalization. The design details of the RC roof to SC shield building wall connections vary at different locations because of differences in loads and differences in the orientation of the shield building wall to the reinforcement grid in the roof. The notes added to Figure 3H.5-7 provide the range of variations in the design in other locations. The different configurations of the connection design details have the same design requirement of having a direct mechanical connection from the SC wall faceplate to the roof reinforcement. These designs satisfy the supplemental design requirements for RC to SC connections. The revised designs of the connections between the shield building and the auxiliary building roof and wall in the critical section described in Subsection 3H.5.2.1 have been evaluated and are consistent with the response of the shield building and auxiliary building to seismic loads documented in the UFSAR Subsection 3.7.2 and Appendix 3G. The typographical changes of a table and figure number in Section 3H.5 have no effect on the design or safety of the structure.

The information proposed to be removed from Figure 3H.5-7, including the roof elevations and column line dimensions, and roof plan details are shown in UFSAR Figure 3.7.2-12 Sheets 5, 6, and 7, Subsection 3H.5.2.2, and Figures 3H.5-1 Sheet 1 and 3H.5-6. The drawing scale is removed from the roof plan because it is inappropriate since licensing basis figures are not to scale. The tie bar spacing is removed from the lower portion of Section A since this information may be different in the area of the connection and is available in APP-GW-GLR-602, Figure 6. This removed information is not needed to show the design of the critical section. Couplers are removed from the vertical bars below the RC to SC connection shown in the lower portion of Section A on Figure 3H.5-7 due to a change in the detail design. This design change maintains conformance with ACI 349.

The RC to SC connection assembly in the regions of the main steam and feedwater line penetrations through the shield building wall is designed as a steel weldment satisfying the requirements of AISC N690. This connection provides direct mechanical connection between the reinforcement in the reinforced concrete wall and the SC wall modules. The connection assembly is designed for a load from the reinforcement of 125% of the specified yield of the reinforcement. This is consistent with the ACI-349 requirement for mechanical connectors. Figure 3H.5-16 shows the locations of the RC to SC connections. The connection assembly in the region of the penetrations is shown in the revised Figure 3H.5-16. The proposed changes in Figure 3H.5-16 to the auxiliary wall, floor, roof, and column line information shown as background provide context for the connection design but do not impact the connection design because these design elements do not interface with the connections. The word "are" is added as an editorial correction to a sentence in Subsection 3H.1.

The changes in APP-GW-GLR-602 align with the proposed changes included in the UFSAR and are provided to clarify the connection designs, enhance the description of the connection design

and reflect the proposed changes in the connection design. The description of the location of the vertical connection adjacent to Wall N is changed to reflect the location shift. The reference to AISC N690 criteria is added to clarify the design requirement for the connection design. Shifting and reconfiguring the connection design elements due to penetrations and other obstructions does not change the conformance with the design requirements. The description in Section 4 of the RC to SC connection in the area of the penetrations is added to clarify and provide a more complete description of this connection. The changes to the description for Figure 6 clarify the purpose of the figure and identify the potential for increased tie bar density to address local loads. The description for Figure 7 is changed to identify potential variations in the connection designs. The supplemental requirements for RC to SC connections in the shield building and the requirements for couplers are also referenced as part of the description of Figure 7. These changes are consistent with the proposed changes in the UFSAR and the designs of the connections, including the variances to address interferences in the connection modules, continue to satisfy the requirements of AISC N690 and the supplemental requirements identified in the licensing basis. The references in the UFSAR are changed to reflect the revision of APP-GW-GLR-602.

Where penetrations through the shield building wall panels displace tie bars and studs in the local area, the penetrations through the wall panels and connection modules are designed with the use of a structural sleeve. The structural sleeve is designed to replace the tie bar area and develop the capacity of the tie bars displaced. The design of the modules with the structural penetration sleeves continues to satisfy the module design criteria and requirements specified in UFSAR Subsections 3.8.3.5.3 and 3.8.4.5.5 including conformance with applicable portions of AISC N690.

Editorial changes to APP-GW-GLR-602 are made to clarify the design of the connections and the requirements of the connections.

Figure 1 of APP-GW-GLR-602 is changed to be consistent with the shift in location of the vertical assembly. Also the sizes of the support plate in Figure 1 and length of the gussets plates in Figure 1 and 4 are changed. Figure 6 in APP-GW-GLR-602 is changed to show the changes in location of the RC to SC vertical connections. Notes are added to the figure to identity requirements for the assembly in the vicinity of the penetrations and the potential for variations in tie bar size and density. Figure 7 is changed to show the revised design of the RC roof to SC connection. The notes are changed to be consistent with the change in the design, to identify the variation in design details, and to reference supplemental requirements.

The effect of shifting the location of the RC to SC connections in the shield building wall has been considered in the calculation and analysis of the shield building and other nuclear island structures. Shifting the location changes a portion of the wall from SC design to RC design. Shifting the location of the RC to SC connections in the shield building wall does not change the global seismic response of the shield building or the auxiliary building. The change in demand for the connection zone demand is small and results in no impact on the RC to SC connection design. The demand to capacity ratio is minimally affected in the zone changed to RC.

The design of the RC to SC connection, described in UFSAR Subsection 3H.5.7.2, at the bottom of the modules into the reinforced concrete below is not changed except for a minor change to the support plate shown in Figure 1 of APP-GW-GLR-602. The change in the support plate width does not reduce the capacity of the connection below the required capacity. The description is changed to clarify that the design requirements for the reinforcement bars

apply to the bars that are part of the connection. There are reinforcement bars in or near the connection region that are there to satisfy other ACI 349 reinforcement requirements and the RC to SC connection requirements do not apply to these bars. The description is changed to clarify the design requirements for the mechanical connector and reflect the design approach used in the design of the connector. The term mechanical coupler is changed to mechanical connection or mechanical connector to clarify the nature of the connection design. The term mechanical coupler may be considered to be limited to a traditional coupler rather than include a broader range of mechanical connectors. The design requirement is consistent with the ACI-349 requirements for mechanical connectors. The loads and load combinations applicable to the shield building and auxiliary building are defined in Subsection 3.8.4.3. The proposed changes do not change the orientation, arrangement, or overall configuration of the structures. The proposed changes do not change the structural analysis methods used or the results and conclusions of the analyses which demonstrate conformance of the structures to regulatory requirements and applicable codes and standards. The function of the nuclear island structures is not changed.

The change to design summary information included in UFSAR Table 3H.5-14, including the supporting load and moment information in the table and the required faceplate thicknesses and required shear reinforcement for the SC shield building wall modules, are based on the forces and moments determined in the analysis at the specified locations. The specified model element locations were selected based on considerations documented in UFSAR Subsection 3H.5.7.1 and are not changed. The required faceplate thicknesses and required shear reinforcement information defined in the table has very small allowance for an increase in the required value and in some cases the values in the analysis exceed the value in the table plus the allowance. The required faceplate and shear reinforcement information is being revised as part of this change to accommodate the increase in the analysis results and to provide bounding values in the table. The plate thicknesses and shear reinforcement are determined based on the criteria and requirements of ACI 349 and remain in conformance with ACI 349. The design basis acceptance limit for the design elements in the shield building wall modules is the criteria in ACI-349. The margin of safety in the SC module wall design provided by the use of the ACI 349 requirements is not changed. The increases in the values for the plate thicknesses and shear reinforcement are a small fraction of the provided reinforcement. The values for the face plate thicknesses and shear reinforcement provided as part of the SC shield building wall module design are not changed.

The proposed changes do not change the function, design, and operation of the systems and components enclosed and contained in the shield building and auxiliary building. The proposed changes do not change the function, design, and operation of the containment vessel and passive containment cooling system. The proposed changes do not affect the prevention and mitigation of abnormal events, e.g., accidents, anticipated operational occurrences, earthquakes, floods and turbine missiles, or their safety or design analyses. The proposed changes do not involve, nor interface with, any structure, system or component accident initiator or initiating sequence of events, and thus, the probabilities of the accidents evaluated in the plant-specific DCD or UFSAR are not affected. The proposed changes do not change the thickness or density of the walls, floors and roofs of the nuclear island and therefore the radioactive shielding provided by these structures is not changed. The proposed changes do not affect the radiological source terms (i.e., amounts and types of radioactive materials released, their release rates and release durations) used in the accident analyses, thus, the consequences of accidents are not affected.

The connections in the structures do not interface with or affect safety-related equipment or a fission product barrier. No system or design function or equipment qualification would be adversely affected by the proposed changes. The proposed 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 equipment, design code, design code allowable value, function or design analysis, nor do they adversely affect any safety analysis input or result, or design/safety margin.

The proposed activity has no adverse effect on the ex-vessel severe accident. The design, geometry, and strength of the containment internal structures are not changed. The design and material selection of the concrete floor beneath the reactor vessel are not altered. The response of the containment to a postulated reactor vessel failure, including direct containment heating, ex-vessel steam explosions, and core concrete interactions is not altered by the changes to the detail design of connections between RC and SC. The design of the reactor vessel and the response of the reactor vessel to a postulated severe accident are not altered by the proposed changes to the detail design of connections between RC and SC.

The proposed activity has no impact on the Aircraft Impact Assessment. The changes described are to minor shifts in the location of connections and do not impact the design or response of module faceplates to postulated impact. The minor shifts of location of the joints are consistent with design features used to mitigate aircraft impact. An additional set of changes are connection design changes interior to structural modules and reinforced concrete sections. There is no change to protection of plant structures, systems, and components against aircraft impact provided by the design of the shield building and the auxiliary building. There is no change to the design of any of the key design features described in UFSAR Appendix 19F. The activity described does not change the overall design or construction of the shield building.

The proposed changes associated with this license amendment request include a change in the detail design of connections between the steel plate concrete composite construction (SC) used for the shield building and the standard reinforced concrete (RC) walls, floors, and roofs of the auxiliary building. The changes are internal to the structures and the configuration, thickness, and density of the structures are not changed. 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 thickness of the wall and density of the concrete are not changed; therefore, there is no adverse change to the shielding provided by the structural modules and auxiliary building walls. 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 proposed change activity has no impact on the emergency plans or the physical security evaluation since there are no changes to the external configuration of walls, doors, or access to the Nuclear Island.

Summary

The proposed changes would revise Tier 2* information and associated Tier 2 information in the UFSAR in regard to requirements for detail design of connections between the steel plate concrete composite construction (SC) used for the shield building and the standard reinforced concrete (RC) walls, floors, and roofs of the auxiliary building. These changes include small shifts in the location of the connections, design changes to mechanical connections, and the rearrangement of reinforcement bars to reduce congestion and interferences. The proposed changes do not adversely affect the strength or response of the nuclear island seismic Category I structures.

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

4. Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

10 CFR Part 52, Appendix D, VIII.B 6 and VIII.B.5.a, require prior NRC approval for departure from Tier 2* information and for Tier 2 information departures that involve changes to Tier 2* information, respectively. The proposed changes to detail design of connections between the steel plate concrete composite construction (SC) used for the shield building and the standard reinforced concrete (RC) walls, floors, and roofs of the auxiliary building and portions of the walls of the shield building require changes to text, tables, and figures in the UFSAR which are identified as Tier 2* information. Therefore, a license amendment request (LAR) (as supplied herein) is required.

General Design Criterion (GDC) 1 (from 10 CFR Part 50, Appendix A) requires that structures be designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety functions to be performed. The proposed changes shift the location of connections between SC and RC construction and revise details of some connections. The connection designs remain in conformance with applicable portions of ACI 349 and AISC N690 and supplemental requirements as identified in the UFSAR. Therefore the connection design remains in compliance with GDC 1.

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 structures are subjected and no impact on the response of the nuclear island structures to seismic motions. Therefore the connection design remains in compliance with GDC 2.

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 changes have 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 changes do not change the requirements for anchoring safety related components and supports to seismic Category I structures. Therefore the connection design remains in compliance with GDC 4.

4.2 Precedent

No precedent is identified.

4.3 Significant Hazards Consideration Determination

The proposed amendment would depart from 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 detail design of connections between the steel plate concrete composite construction (SC) used for the shield building and the standard reinforced concrete (RC) walls, floors, and roofs of the auxiliary building and portions of the walls 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 function of the nuclear island structures is 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 changes to the detail design of connections between the RC and SC structures 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 to the detail design 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 postulated accident conditions. The plant response to previously evaluated accidents or external events is not adversely affected, nor do the changes described create any new accident precursors. Therefore,

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

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

Response: No

The proposed changes are to the detail design of connections between the RC and SC structures. The changes to the detail design of connections do not change the criteria and requirements for the design and analysis of the nuclear island structures. The changes to the detail design of connections do not change the design function, support, design, or operation of mechanical and fluid systems. The changes to the detail design of connections do not change the methods used to connect the RC to SC. The changes of the detail design of connections do not result in a new failure mechanism for the nuclear island structures or new accident precursors. As a result, the design functions of the nuclear island structures are not adversely affected by the proposed changes. Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No

No safety analysis or design basis acceptance limit/criterion is challenged or exceeded by the proposed changes; and thus, no margin of safety is reduced. Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

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

4.4 Conclusions

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

5. Environmental Consideration

The proposed amendment would depart from 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 detail design of connections between the steel plate concrete composite construction (SC) used for the shield building and the standard reinforced concrete

(RC) walls, floors, and roofs of the auxiliary building and portions of the walls of the shield building.

A review has determined that the proposed changes would require an amendment from the COL. 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 changes are unrelated to any aspect of plant construction or operation that would introduce any change to effluent types (e.g., effluents containing chemicals or biocides, sanitary system effluents, and other effluents), or affect any plant radiological or non-radiological effluent release quantities. Furthermore, the proposed 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 changes to the detail design of connections between the steel plate concrete composite construction and the standard reinforced concrete do not change the thickness or density of walls, floors, or other structures which provide shielding in the auxiliary building, shield building or inside containment. 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. Therefore, 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 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 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.

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-14-0471

Enclosure 2

Westinghouse Authorization Letter CAW-14-3958, Accompanying Affidavit, Proprietary Information Notice, and Copyright Notice

(LAR 13-23 R2)

June 5, 2014

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

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Nuclear Power Plants
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Project letter: VSL_VSG_000167

Our ref: CAW-14-3958

June 5, 2014

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: Transmittal of **APP-GW-GLR-602, Revision 4**, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections (Proprietary) and **APP-GW-GLR-603, Revision 4**, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections (Non-Proprietary)

The proprietary information for which withholding is being requested in the above-referenced letter is further identified in the affidavit signed by Westinghouse Electric Company LLC. The affidavit accompanying this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and address with specificity the considerations listed in paragraph (b) (4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying affidavit by **South Carolina Electric & Gas Company.**

Correspondence with respect to the proprietary aspects of this application for withholding or the accompanying affidavit should reference CAW-14-3958 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania 16066.

Very truly yours,

Robert B. Sisk
Program Manager Licensing, International Licensing Programs

CAW-14-3958
June 5, 2014

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared **Robert B. Sisk**, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Robert B. Sisk
Program Manager Licensing, International
Licensing Programs

Sworn to and subscribed
before me this 5th day
of June 2014.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Linda J. Bugle, Notary Public
City of Pittsburgh, Allegheny County
My Commission Expires June 18, 2017
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

Notary Public

CAW-14-3958
June 5, 2014

(1) I am Program Manager Licensing, International Licensing Programs, Westinghouse Electric Company, LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitute Westinghouse policy and provide the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component

may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390; it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld from within the **APP-GW-GLR-602, Revision 4**, AP1000 Shield Building Design Details for Select Wall and RC/SC Connections, and may be used only for that purpose.

The information requested to be withheld reveals details of the AP1000 design; sequence and method of construction; and timing and content of inspection and testing. This information was developed and continues to be developed by Westinghouse. The information is part of that which enables Westinghouse to manufacture and deliver products to utilities based on proprietary designs.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar commercial power reactors without commensurate expenses.

The information requested to be withheld is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

South Carolina Electric and Gas Company
Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-14-0471

Enclosure 3

South Carolina Electric and Gas Company Affidavit for Proprietary Information

(LAR 13-23 R2)

Affidavit of A. R. Rice

1. My name is April R. Rice. I am the Manager, Nuclear Licensing, for the South Carolina Electric & Gas Company (SCE&G). I have been delegated the function of reviewing proprietary information sought to be withheld from public disclosure and I am authorized to apply for its withholding on behalf of SCE&G.

2. I am making this affidavit on personal knowledge, in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations, and in conjunction with SCE&G's filings on dockets 52-027 and 52-028 of Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3, respectively, of Request for LAR 13-23 R2, "Reinforced Concrete to Steel Plate Composite Construction Connections," submitted to the NRC under correspondence letter number NND-14-0471. I have personal knowledge of the criteria and procedures used by SCE&G to designate information as a trade secret, privileged, or as confidential commercial or financial information.

3. Based on the reason(s) at 10 CFR 2.390(a)(4), this affidavit seeks to withhold from public disclosure Enclosures 6 and 7 of the VCSNS Units 2 and 3, LAR 13-23 R2, "Reinforced Concrete to Steel Plate Composite Construction Connections," submitted to the NRC under correspondence letter number NND-14-0471 (dockets 52-027 and 52-028 respectively).

4. The following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

    a. The information sought to be withheld from public disclosure has been held in confidence by SCE&G and Westinghouse Electric Company.

    b. The information is of a type customarily held in confidence by SCE&G and Westinghouse and not customarily disclosed to the public.

    c. The release of the information might result in the loss of an existing or potential competitive advantage to SCE&G and/or Westinghouse.

    d. Other reasons identified in Enclosure 2 of VCSNS Units 2 and 3, LAR 13-23 R2, "Reinforced Concrete to Steel Plate Composite Construction Connections," submitted to the NRC under correspondence letter number NND-14-0471 (dockets 52-027 and 52-028 respectively), are incorporated here by reference.

5. Additionally, release of the information may harm SCE&G because SCE&G has a contractual relationship with the Westinghouse Electric Company regarding proprietary information. SCE&G is contractually obligated to seek confidential and proprietary treatment of the information.

6. To satisfy the requirements of 10 CFR 2.390(b)(1)(i)(B) and (b)(1)(ii)(E), SCE&G requests that the accompanying enclosures (numbered 6 and 7) for LAR 13-23 R2 be withheld in their entirety as they were generated from proprietary documents. A redacted version is provided in Enclosure 4 and 5 respectively.

7. The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

8. To the best of my knowledge and belief, the information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method.

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

April R. Rice — Executed on 8/28/14 (Date)

SWORN and SUBSCRIBED to before me on this 28th day of August, 2014 in Fairfield county, South Carolina.

Donna S. Griffin

Notary public

My Commission Expires: 06/18/2018

South Carolina Electric and Gas Company

Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3

NND-14-0471

Enclosure 4

Redacted Proposed Changes to the Updated Final Safety Analysis Report

(LAR 13-23 R2)

(Withheld Information Redacted)

UFSAR Section 1.6, Table 1.6-1 - Revise listing of the document APP-GW-GLR-602 in the locations shown below.

DCD Section Number	Westinghouse Topical Report Number	Title
3.8	[*APP-GW-GLR-602*	*AP1000 Shield Building Design Details for Select Wall and RC/SC Connections, Revision ~~1~~4, Westinghouse Electric Company LLC*]*

and

DCD Section Number	Westinghouse Topical Report Number	Title
3H	[*APP-GW-GLR-602*	*AP1000 Shield Building Design Details for Select Wall and RC/SC Connections, Revision ~~1~~4, Westinghouse Electric Company LLC*]*

UFSAR Subsection 3.8.4.5.5.6, Design of Connections - Revise information in the locations shown below.

The shield building steel plate modules are connected to standard reinforced concrete using a connection design satisfying the requirements outlined below. The locations of these connections include the following:

1. At the base of the shield building wall into the concrete below
2. Between SC and RC portions of the shield building wall
3. Where RC floors, roofs, and walls connect to the SC modules.

The steel plate modules are connected to the reinforced concrete by reinforcement or deformed bars directly connected to the modules. These connections are sized using a strength design approach, and the mechanical connection portion of the connection satisfies the requirements of AISC N690. The connection design satisfies the following requirements:

- The connections provide for the direct transfer of forces from the RC reinforcing steel to the SC faceplates. Lap splice type connections between dowels extending out of the RC into the SC adjacent to the headed shear studs are not used to connect the modules to the base concrete.
- Loads are transferred directly from the faceplates to the reinforced concrete using reinforcing bars, mechanical connection, and welds.
- The mechanical connections develop 125 percent of specified yield of the connected reinforcement bar.
- Loads that are out of plane of the wall, such as from roofs or walls, are carried through the full thickness of the shield building walls.

Figures 1, 2, 3, and 4 in APP-GW-GLR-602 (Reference 57) show the typical design details for the connection of the wall modules to the reinforced concrete. ~~Loads are transferred directly from the faceplates to the reinforced concrete using reinforcing bars, mechanical connectors, and welds.~~ Figure 5 in Reference 57 shows the typical design details of the shield building concrete-filled steel module walls.

~~These connections are sized using a strength design approach.~~ Figure 3H.5-7 and Figure 7 in Reference 57 show~~s the~~ typical auxiliary building reinforced concrete roof connections to the shield building SC wall. The details of the connections between the auxiliary building roof and the shield building wall vary because of loads on the connection and the orientation of the wall to the roof reinforcement arrangement as outlined in the notes on Figure 3H.5-7 and in Section 4 of Reference 57. Figure 3H.5-7 also shows examples of the connections between the auxiliary building walls and the shield building SC wall modules. The connection elements used and the design details vary because of the orientation of the auxiliary building wall to the shield building wall. These connection design details satisfy the requirements of AISC N690 and the requirements identified above.

UFSAR Subsection 3.8.7, References - Revise information for Reference 57 in the locations shown below.

57. [*APP-GW-GLR-602, Revision ~~1~~4 (Proprietary) and APP-GW-GLR-603, Revision ~~1~~4 (Non-Proprietary), "AP1000 Shield Building Design Details for Select Wall and RC/SC Connections," Westinghouse Electric Company LLC.*]*

UFSAR Subsection 3H.1, Introduction - Revise the following sentence in the second paragraph as shown.

The exact locations of the critical sections related to the shield building cylinder are shown in Figure 3H.5-16.

UFSAR Subsection 3H.5, Structural Design of Critical Sections - Revise information in item (5) as shown below.

(5) Roof slab at elevation 180'-0" adjacent to shield building cylinder. (This is the connection between the two buildings at the highest elevation.) - see subsection 3H.5.2.1 and Figure ~~3.H.5-7~~3H.5-7

UFSAR Subsection 3H.5.2.1, Roof at Elevation 180'-0", Area 6 (Critical Section is between Col. Lines N & K-2 and 3 & 4 - Revise information in the fourth paragraph to include revised information in the locations shown below.

A typical connection of the roof slab to the shield building is shown in Figure 3H.5-7. The figure shows the arrangement of reinforcement at the connection in the fuel building portion of the auxiliary building roof, the shield building cylindrical wall, and the walls of the auxiliary building just below the roof. The design summary is shown in Table 3~~.~~H.5-10. The details of the connections between the auxiliary building roof and the shield building wall in other locations vary because of loads on the connection and the orientation of the wall to the roof reinforcement arrangement. These connection design details satisfy the requirements identified in Subsection 3.8.4.5.5.6.]*

UFSAR Subsection 3H.5.6, Shield Building Roof and Connections - Revise information in the second and third paragraphs to include revised information in the locations shown below.

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.

[*A detailed ANSYS model was used...*

UFSAR Subsection 3H.5.7.1, Shield Building Cylindrical Wall - Revise information in the second paragraph to include revised information in the locations shown below.

A typical configuration of the SC wall is shown in Figure 3H.5-13. The overall thickness of 36 inches is the same as the RC wall below. The concrete for the SC portion is standard concrete with a compressive strength of 6000 psi. The SC portion is constructed with steel surface plates, which act as concrete reinforcement. The nominal thickness of the steel faceplates is 0.75 inches. The faceplates are thicker (up to 1.0-inch nominal thickness), as necessary, to address loads from connections and attachments in the areas of these local loads. In each module, tie bars…

UFSAR Subsection 3H.5.7.2, Reinforced Concrete (RC)/Steel Concrete Composite (SC) Horizontal and Vertical Connections - Revise information in the second paragraph to include revised information in the locations shown below.

At the horizontal connection at the interface with the RC structure that occurs on the bottom of the lowest SC wall module, ~~each~~ vertical reinforcing bars in the RC basemat wall ~~is~~ are connected to the module with a mechanical ~~coupler~~ connection. A similar vertical connection occurs on the vertical edges of SC wall modules that interface with the RC portion of the shield building wall. In the vertical connection, ~~each~~ hoop reinforcing bars in the RC wall ~~is~~ are connected to a mechanical ~~coupler~~ connection and forces are transferred directly from the hoop bars to the SC liner plate. The mechanical connections are designed to the stress limits of ANSI/AISC N690 for loads in the reinforcing bars equivalent to 125 percent of the specified yield strength of the ~~weaker of the steel plate or~~ reinforcing bar and are proven components used in existing structures. …

UFSAR Subsection 3H.5.8, References - Revise information for Reference 1 in the locations shown below.

1. [*APP-GW-GLR-602, Revision ~~1~~4 (Proprietary) and APP-GW-GLR-603, Revision ~~1~~4 (Non-Proprietary), "AP1000 Shield Building Design Details for Select Wall and RC/SC Connections," Westinghouse Electric Company LLC.*]*

UFSAR Subsection 3H, Table 3H.5-14, Sheet 1 - Revise information in the locations shown below.

Load/Combination	TX kip/ft	TY kip/ft	TXY kip/ft	MX k-ft/ft	MY k-ft/ft	MXY k-ft/ft	NX kip/ft	NY kip/ft	Comments
Dead	-76	-118	15	-25	-187	4	-6	-5	
Live	1	-1	10	0	0	0	0	0	
Seismic	1575	39085	163	301299	21109	35	71	33	
1	-87	-1687	22	-35	-24	5	-8	-7	1.4D + 1.7L
2	1520	27066	179	2764	1942	38	665	28	D + L + Es
3	1520	27066	-1487	-3264	-2286	-31	-776	-38	D + L + E's
4	-1630	-5094	-1487	-3264	-2286	-31	-776	-38	D + L - Es
5	-1630	-5094	179	2764	1942	38	665	28	D + L - E's
6	1520	28378	177	2787	1953	38	66	28	0.9D + Es
7	1520	28378	-15049	-3242	-2274	-31	-776	-387	0.9D + E's
35[2]	20511	39969	23329	44953	303294	694	105	313	0.9D + E's + αTo(W1)
37[2]	2216	38757	2384	4603	31102	684	108	313	0.9D + E's + αTo(W2)
x-direction is horizontal; y-direction is vertical.									
Element number:									12164
[*Plate thickness required for load combinations excluding thermal:*									*0.5043 inches + 2%[1]]**
[*Plate thickness required for load combinations including thermal:*									*0.657 inches + 2%[1]]**
[*Plate thickness provided:*									*0.75 inches]*[3]*
[*Shear reinforcement required for load combinations excluding thermal:*									*0.7264 in²/ft² + 2%[1]]**
[*Shear reinforcement required for load combinations including thermal:*									*01.0093 in²/ft² + 2%[1]]**
Shear reinforcement provided:									See [*APP-GW-GLR-602, Section 4.*]*

UFSAR Subsection 3H, Table 3H.5-14, Sheet 1 - Revise information to include new Note 3 as shown below.

3. The 0.75-inch plate thickness is the nominal plate size for the shield building away from connections, attachments, and other local loads. The plate may be thicker (up to 1.0-inch nominal thickness) in the area around these local loads.

UFSAR Subsection 3H, Table 3H.5-14, Sheet 2 - Revise information in the locations shown below.

Load/Combination	TX kip/ft	TY kip/ft	TXY kip/ft	MX k-ft/ft	MY k-ft/ft	MXY k-ft/ft	NX kip/ft	NY kip/ft	Comments
Dead	-76	-1065	12	-6	5	1	0	2	
Live	0	-1	0	0	0	0	0	0	
Seismic	34	3275	1786	38	25	13	2	8	
1	-9	-15049	17	-9	7	1	0	3	1.4D + 1.7L
2	28	22019	19088	324	30	14	2	10	D + L + Es
3	28	22019	-1664	-454	-210	-12	-3	-6	D + L + E's
4	-40	-4341	-1664	-454	-210	-12	-3	-6	D + L - Es
5	-40	-4341	19088	324	30	14	2	10	D + L - E's
6	28	2320	1897	332	3029	14	2	10	0.9D + Es
7	28	2320	-1676	-44	-210	-12	-3	-7	0.9D + E's
19[2]	757	25127	1686	-396	-10758	-207	-23	-511	0.9D + E's + αTo(W1)
37[2]	757	25138	1686	-396	-10758	-207	-23	-511	0.9D + E's + αTo(W2)
x-direction is horizontal; y-direction is vertical.									
Element number:						11514			
[*Plate thickness required for load combinations excluding thermal:*						*0.450 inches + 2%[1]]**			
[*Plate thickness required for load combinations including thermal:*						*0.450 inches + 2%[1]]**			
[*Plate thickness provided:*						*0.75 inches]*[3]*			
[*Shear reinforcement required for load combinations excluding thermal:*						*0.097 in²/ft² + 2%[1]]**			
[*Shear reinforcement required for load combinations including thermal:*						*0.1208 in²/ft² + 2%[1]]**			
Shear reinforcement provided:						See [*APP-GW-GLR-602, Section 4.*]*			

UFSAR Subsection 3H, Table 3H.5-14, Sheet 2 - Revise information to include new Note 3 as shown below.

3. The 0.75-inch plate thickness is the nominal plate size for the shield building away from connections, attachments, and other local loads. The plate may be thicker (up to 1.0-inch nominal thickness) in the area around these local loads.

UFSAR Subsection 3H, Table 3H.5-14, Sheet 3 - Revise information in the locations shown below.

Load/Combination	TX kip/ft	TY kip/ft	TXY kip/ft	MX k-ft/ft	MY k-ft/ft	MXY k-ft/ft	NX kip/ft	NY kip/ft	Comments
Dead	-42	-1297	0	2	169	0	0	-2	
Live	0	-1	0	0	0	0	0	0	
Seismic	580	48977	2341	2	2016	187	4	87	
1	-52	-1796	0-1	3	236	0	0	-23	1.4D + 1.7L
2	7760	36252	2341	54	365	198	4	75	D + L + Es
3	7760	36252	-2342	01	-42	-187	-4	-109	D + L + E's
4	-8457	-61703	-2342	01	-42	-187	-4	-109	D + L - Es
5	-8457	-61703	2341	54	365	198	4	75	D + L - E's
6	7760	37464	2341	54	343	198	4	75	0.9D + Es
7	7760	37464	-2352	0	-51	-187	-4	-109	0.9D + E's
23[2]	18202	37764	-24038	113	1515	-187	-4	-321	0.9D + E's + αTo(W1)
41[2]	18203	39380	-24038	1123	14953	-17	-4	-321	0.9D + E's + αTo(W2)

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

Element number:	23752
[*Plate thickness required for load combinations excluding thermal:*	*0.656 inches + 2%[1]]**
[*Plate thickness required for load combinations including thermal:*	*0.6658 inches + 2%[1]]**
[*Plate thickness provided:*	*0.75 inches]*[3]*
[*Shear reinforcement required for load combinations excluding thermal:*	*0.086 in^2/ft^2 + 2%[1]]**
[*Shear reinforcement required for load combinations including thermal:*	*0.261 in^2/ft^2 + 2%[1]]**
Shear reinforcement provided:	See [*APP-GW-GLR-602, Section 4.*]*

UFSAR Subsection 3H, Table 3H.5-14, Sheet 3 - Revise information to include new Note 3 as shown below.

3. The 0.75-inch plate thickness is the nominal plate size for the shield building away from connections, attachments, and other local loads. The plate may be thicker (up to 1.0-inch nominal thickness) in the area around these local loads.

UFSAR Subsection 3H, Figure 3H.5-7 - Revise information as shown in the revised figure on the following pages.

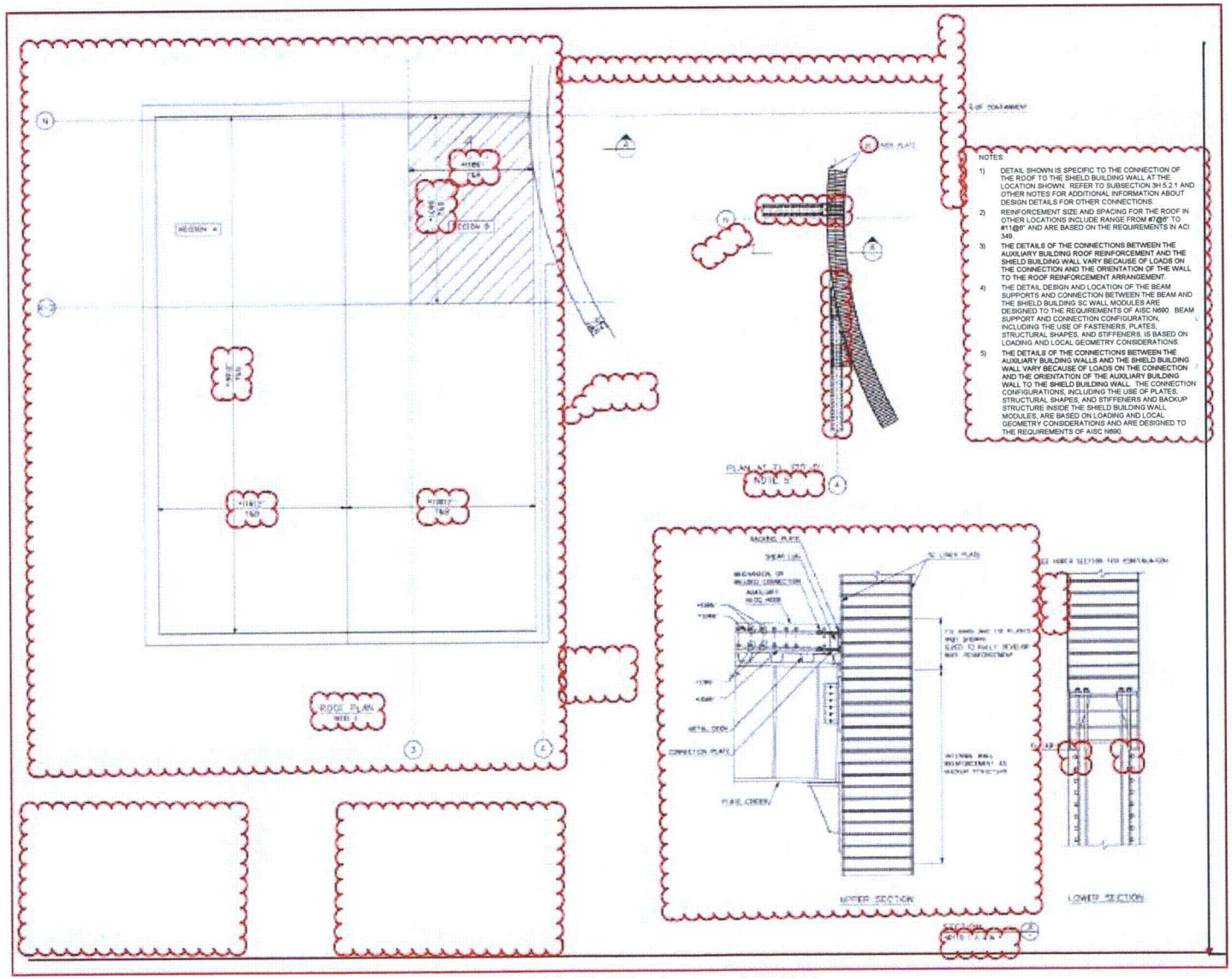
UFSAR Subsection 3H, Figure 3H.5-16, Sheet 1 - Revise information as shown in the revised figure below.

[This figure contains Security-Related Information. See Enclosure 6.]

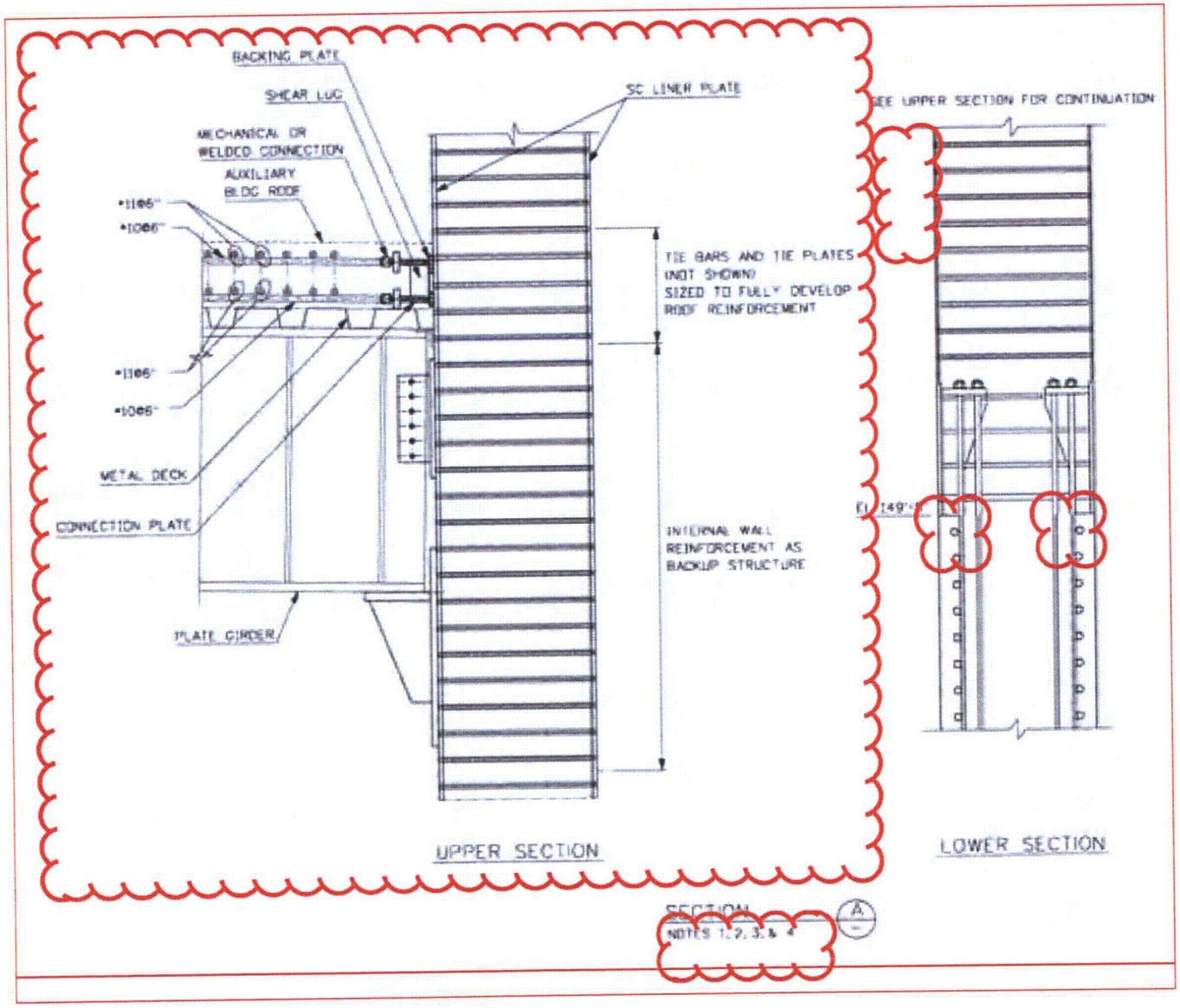
UFSAR Subsection 3H, Figure 3H.5-16, Sheet 2 - Revise information as shown in the revised figure below.

[This figure contains Security-Related Information. See Enclosure 6.]

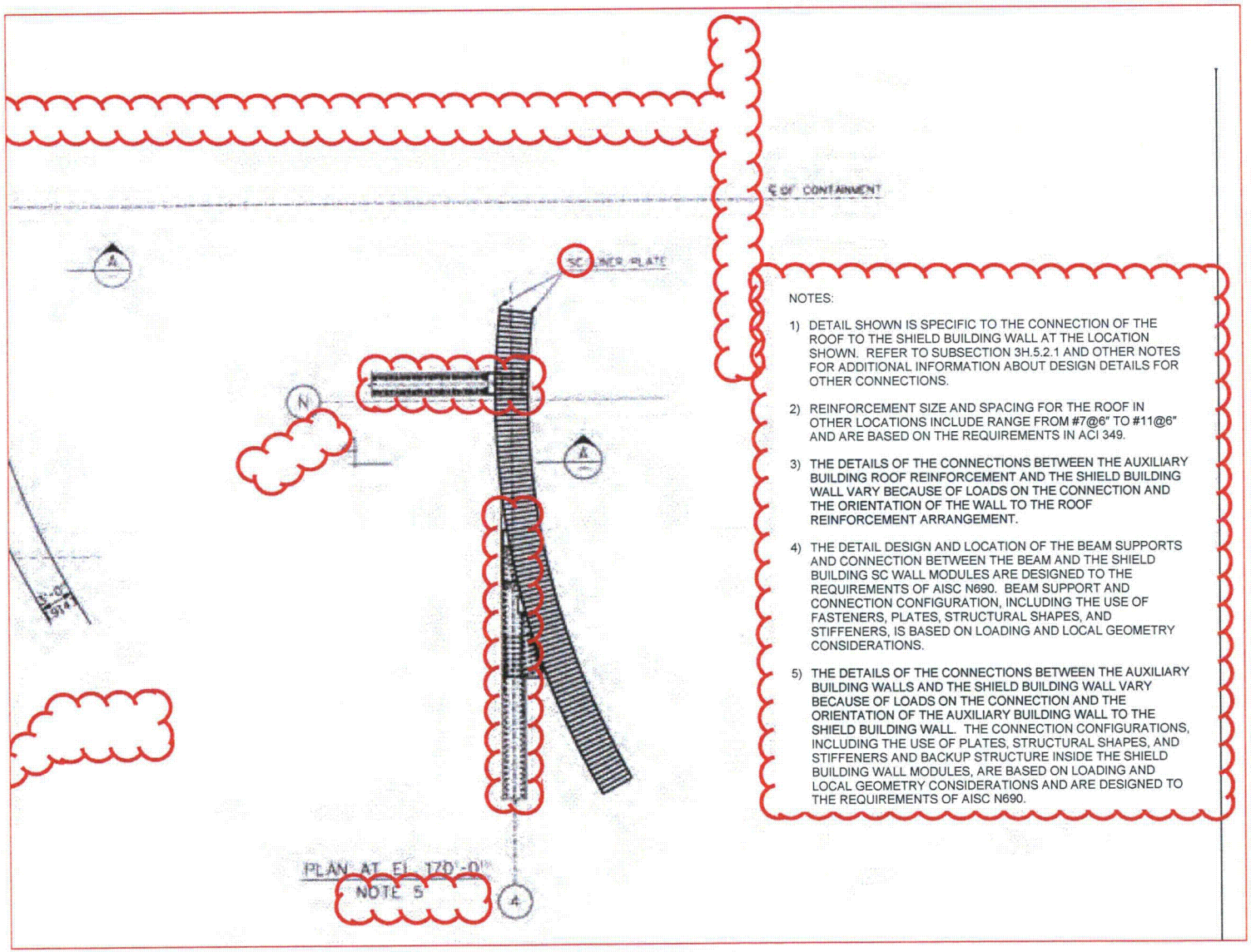
UFSAR Subsection 3H, Figure 3H.5-7 - Revise information as shown in the revised figure below.



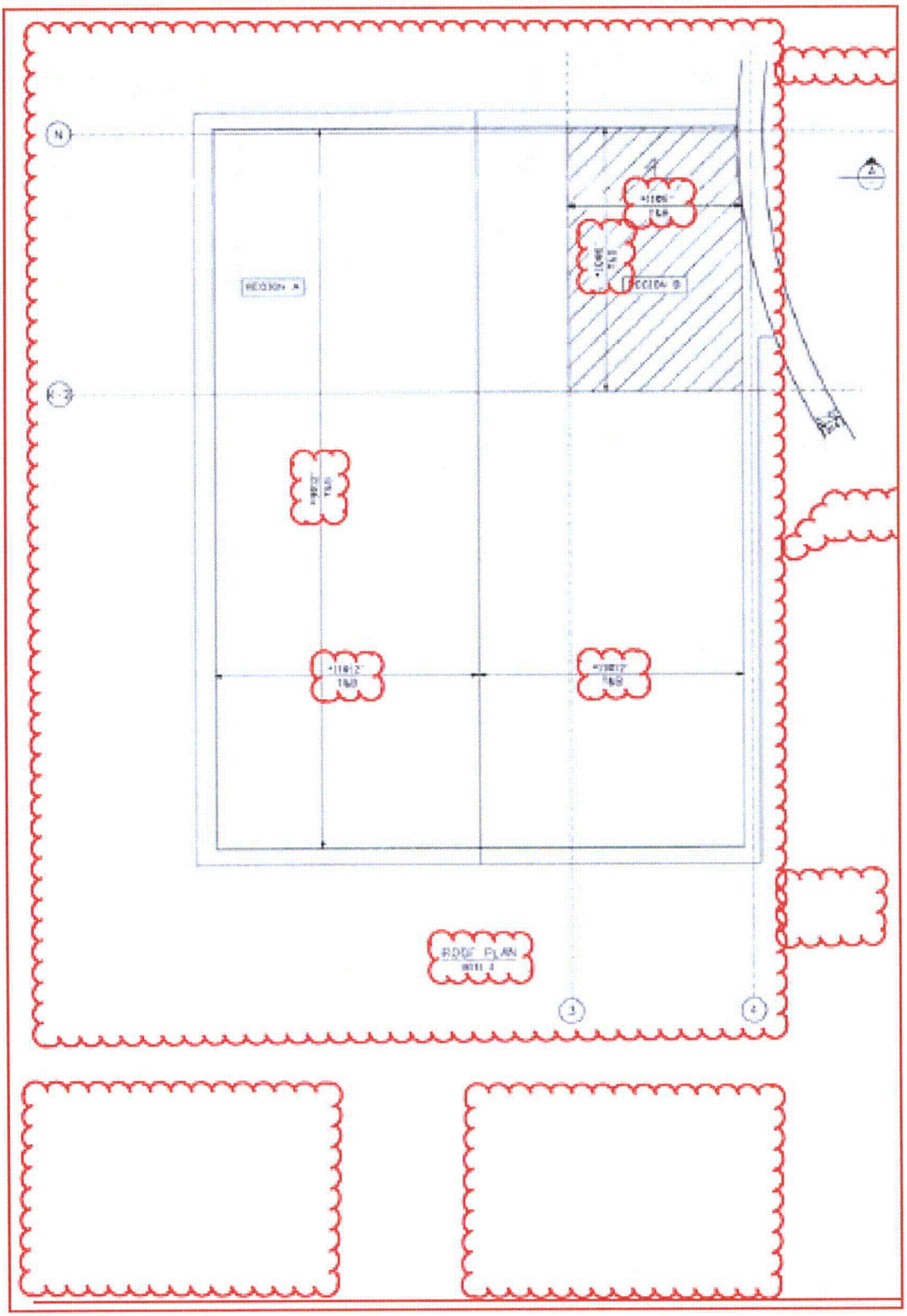
UFSAR Subsection 3H, Figure 3H.5-7, Section A details.



UFSAR Subsection 3H, Figure 3H.5-7, PLAN AT EL. 170'-0" details.



UFSAR Subsection 3H, Figure 3H.5-7, Roof Plan details.



UFSAR Incorporated by Reference Topical Report APP-GW-GLR-602, Rev 1:

Section 1, Introduction, - Revise information in the fourth sentence of the third paragraph to include revised information in the locations shown below.

The NRC staff has ~~determine~~ determined that some of this detailed design information, in particular key design information for the design and construction of the shield building, is of sufficient importance that it should be incorporated into the DCD.

Table 1, List of Components and Material Properties Used in the Shield Building - Revise information in the table to include revised information as indicated below.

Add designation of "RC to SC Connection Components" to first row of table and reformatted list of components under this designation.

Reformat the designation of "~~(~~Connection with Auxiliary Building Roof~~)~~" in the bottom row of the table. Add Connection Plate, Stiffener Plate, and Backing Plate to the list of components under this designation.

Section 4, Technical Background - Revise information in the second paragraph to include revised information in the locations shown below.

This report provides the requisite design details that are contained within selected portions of the auxiliary and shield building significant features and critical sections that are part of DCD Subsections 3.8.4.1, 3.8.4.5.4, 3.8.4.5.5, 3.8.4.6.1.3, and Appendix 3H.

Section 4, Technical Background - Revise information in the first paragraph of the discussion related to the Steel Concrete Composite (SC) Shield Building RC/SC Connection Zone Details (3H.5.7.2) to include revised information in the locations shown below.

Figure 1 shows the representative details for the vertical RC/SC connection zone which are based on Figure 4.1-2 of the enhanced SB design report (Reference 1). The faceplate, support plate, and gusset plates are American Society of Testing Materials (ASTM) A572 Grade 50 or steel with equal or better material properties. The steel faceplate is thickened in this region to 1.0 inch thick. The connection design methodology for the bars connected to the support plates is similar for each of the RC/SC connections~~,~~ and the vertical connections at approximately elevations 100'~~,~~ and 146'-10". ~~and the~~ The lower connection connects reinforcement bars anchored in the base concrete below the shield building with the SC shield building walls. The upper connection connects the reinforcement bars in the RC shield building wall below the auxiliary building roof with the SC shield building wall at and above the auxiliary building roof.

Vertically oriented hoop bar connections with the SC walls located at Azimuths of approximately 340 degrees and ~~177~~ 183 degrees connect the shield building outside the auxiliary building with the RC shield building wall below the auxiliary building roof. ~~A v~~Views of the hoop bar [ ]^{a,c} ~~is~~are shown in Figures 2 and 3. Figure 3 shows the connection above Elevation 103'-6" which uses a support plate inside the module to capture the hoop bars. Over the height of the connection of the vertical bars, from approximately Elevations 100' to 103'-6", a different connection detail using ~~A~~an end plate on the [ ]^{a,c} ~~is~~ is used to allow for welding

of the [ ]^{a,c} ~~that are within the height of the [ ]^{a,c}~~ to the SC modules. The end plate and [mechanical connection]^{a,c} to the plate are shown in Figure 2. [

]^{a,c}

Section 4, Technical Background - Revise information following the revised first paragraph in the discussion related to the Steel Concrete Composite (SC) Shield Building RC/SC Connection Zone Details (3H.5.7.2) to include two new paragraphs and revised information in the location shown below.

The gusset and support plates and connecting welds in the connection modules are sized to satisfy AISC N690 criteria. The connection design elements dimensions may vary from those shown in the figures to address local geometry and loads. In the vicinity of penetrations and other interferences the design elements of the connections may be shifted from the design shown in the figure to avoid the interferences. A penetration near Wall Q (approximately Azimuth 340) is located in a corner connection module (see Figure 4) which includes both vertical and horizontal connections. In this module a portion of the horizontal support plate is shifted down to provide clearance between the penetration and the connection of the vertical reinforcing bars. The vertical endplate (shown in Figure 2) is extended above the area of the penetration because of interference between the penetration and the vertical support bracket which provides connections for the hoop bars in the RC wall. As noted below the penetration structural sleeve is designed to replace the tie bars function in the area of the sleeve.

In the vicinity of the steam line and feedwater line penetrations at approximately Azimuth 0 degrees the vertical connection is different than described above. A welded steel connection assembly carries the load from a vertical connection plate on one side of the penetration to the shield building wall faceplates on the other side. The hoop reinforcement is connected to the vertical connection plate similar to the end plate shown in Figure 2. The vertical connection plate is connected to the wall module faceplates with plates on the inner and outer surface of the wall. The connection assembly is designed as a welded steel assembly satisfying the requirements of AISC N690.

The [ ]^{a,c} that are welded to the steel faceplates in the connection modules are ASTM A706 or steel with equal or better material properties. The…

Section 4, Technical Background - Revise information in the discussion related to the Steel Concrete Composite (SC) Shield Building Wall Panel (3H.5.7.1) to remove the underline from the "Figure 5" at the beginning of the first paragraph.

Section 4, Technical Background - Revise information in the second paragraph of the discussion related to the Steel Concrete Composite (SC) Shield Building Wall Panel (3H.5.7.1) to include revised information in the locations shown below.

Type 1 ~~module~~ modules are fabricated in the same manner except [ ]^{a,c} Type 1 modules…

Section 4, Technical Background - Revise information in the third paragraph of the discussion related to the Steel Concrete Composite (SC) Shield Building Wall Panel (3H.5.7.1) to include revised information in the locations shown below.

... [

]^{a,c} Penetrations through shield building wall panels displace tie bars and studs in the local area. These penetrations through the wall panels and connection modules are designed with the use of a structural sleeve. The structural sleeve is designed to replace the tie bar area and develop the capacity of the tie bars displaced.

Section 4, Technical Background - Revise information in the last paragraph of the discussion related to the Steel Concrete Composite (SC) Shield Building Wall Panel (3H.5.7.1) to include revised information in the locations shown below.

Figure 6 shows the ~~representative details for the~~ locations of Type 1 and Type 2 tie bar spacing provided for global out of plane shear loads in a rolled-out circumferential developed view of the shield building wall. An increase in the tie bar capacity may be provided to handle local attachments and connections in the area of the attachments and connections. The increased capacity is achieved using reduced spacing between the tie bars or bigger tie bars. The modules which have decreased spacing for local connections and attachments are not shown on this figure. The spacing of tie bars in these areas may be equal to the spacing of tie bars in Type 1 modules. The locations of the RC/SC connection zone ~~which~~ modules are also shown in Figure 6. This figure is based on Figure 4.1-1 of the enhanced SB design report (Reference 1). ...

Section 4, Technical Background - Revise information in the paragraph discussion related to the Connection Between the RC Auxiliary Building Roof and the Steel Concrete Composite (SC) Shield Building (3.8.4.1) to include revised information in the locations shown below.

Figure 7 shows ~~the~~ representative details for the ~~connection~~ connections between the RC auxiliary building roof and the SC Shield building wall. The details of the connections between the auxiliary building roof and the shield building wall vary because of loads on the connection and the orientation of the wall to the roof reinforcement grid. The design variations include the use of spacers or other design elements to accommodate the offset in the elevation for different layers of reinforcement. The variations also include the use of [ ]^{a,c} connected to the vertical surface of design elements. The several different configurations have the roof reinforcement directly connected by welding or mechanical connectors to a connector plate that is welded to shield building wall faceplate or to connector plates built up on the faceplate. The design and construction of the connection ~~with in~~ within the reinforced concrete roof is governed by ACI-349 and by AISC N690 for steel and weld stress evaluation. These connections satisfy the supplemental requirements for RC to shield building SC connections identified in Subsection 3.8.4.5.5.6 of plant specific DCDs. [

]^{a,c}

Figure 1, RC/SC Connection Zone Showing Nominal Connection to SC Panel and Reinforcing Bars - Revise information in the bullets and Support Plate dimensions as shown below.

[This figure contains Proprietary Information. See Enclosure 6.]

Figure 4, Typical Interface Between Vertical Bar [ ]^{a,c} and Hoop Bar [ ]^{a,c} at grade. - Revise figure as shown below.

[This figure contains Proprietary Information. See Enclosure 6.]

Figure 6, Rollout View Detailing Nominal Spacing of Tie Bars (Viewed from SB Interior) - Revise figure to include revised information as shown below.

[This figure contains Proprietary Information. See Enclosure 6.]

Figure 7, Typical Auxiliary building RC roof connection to the shield building SC wall - Revise the figure as shown below.

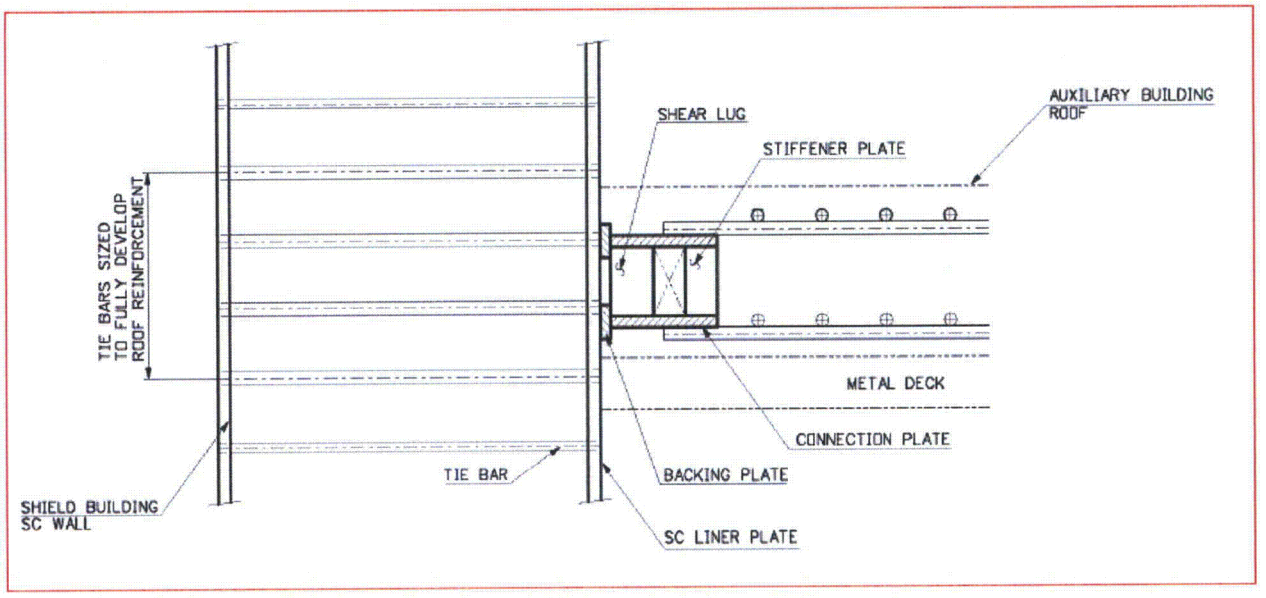


Figure 7, Typical Auxiliary building RC roof connection to the shield building SC wall - Revise the notes to include revised information in the locations shown below.

1. The connection inside the shield building wall is provided by through wall tie bars sized to fully develop the Auxiliary Building Roof ~~a range of~~ reinforcement.~~, [ ]a,c Spacing is determined along the shield building wall.~~
2. This connection is typical of connections in sections of the roof away from discontinuities such as walls or openings and represents the fundamental load path from the Auxiliary Building Roof reinforcement through the connection plates and tie bars to the far face plate of the shield building wall. Details of the connection design between the auxiliary building roof and the shield building wall vary because of loads on the connection and the orientation of the wall to the roof reinforcement grid.
3. See Table 1 for material information for connection reinforcement bars and shear lug.
4. Figure not to scale.

~~5. [ ]a,c~~

~~6~~5. See Section 1, INTRODUCTION for information on Tier 2* requirements.

6. Supplemental design requirements for RC to SC shield building connections are provided in Subsection 3.8.4.5.5.6 of the plant specific DCD.