Duke Energy®

DAVE BAXTER
Vice President
Oconee Nuclear Station

Duke Energy
ONO1VP / 7800 Rochester Highway
Seneca, SC 29672

864-873-4460
864-873-4208 fax
dave.baxter@duke-energy.com

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

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station, Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287,
Renewed Operating Licenses DPR-38, DPR-47, and DPR-55
Tornado Mitigation License Amendment Request - Response to Request for Additional Information

References:

1. Letter from Dave Baxter, Site Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to the U. S. Nuclear Regulatory Commission, "License Amendment Request to Revise Portions of the Updated Final Safety Analysis Report Related to the Tornado Licensing Basis," dated June 26, 2008.
2. Letter from Dave Baxter, Site Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to the U. S. Nuclear Regulatory Commission, "Responses to Request for Additional Information for the License Amendment Request to Revise Portions of the Updated Final Safety Analysis Report Related to the Tornado Licensing Basis," dated May 6, 2010.
3. Letter from John Stang, Senior Project Manager, Office of Nuclear Reactor Regulation, Nuclear Regulatory Commission to Dave Baxter (Duke), "Request for Additional Information (RAI) Regarding the Licensee Amendment Request for Upgrading the Licensing Basis for Tornado Mitigation," dated May 25, 2010.
4. Letter from Dave Baxter, Site Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to the U. S. Nuclear Regulatory Commission, "Tornado Mitigation License Amendment Request - Response to Request for Additional Information," dated June 10, 2010.

On June 26, 2008, Duke Energy Carolinas, LLC (Duke Energy) submitted a License Amendment Request (LAR) to revise certain sections of the Oconee Updated Final Safety Analysis Report (UFSAR) associated with the tornado licensing basis [Ref. 1]. This LAR proposes a number of plant modifications to enhance the station's capability to withstand the effects of a damaging tornado, revises the UFSAR sections associated with the tornado licensing basis (LB), and incorporates a NRC-approved tornado missile probabilistic methodology called TORMIS.

On July 6, 2009, Duke Energy received a Request for Additional Information (RAI) and responded to this request on September 9, 2009. On May 25, 2010, Duke Energy received a second RAI [Ref. 3]. By letter dated June 10, 2010 [Ref. 4], Duke Energy notified the NRC that additional time would be needed to respond to several of the items. This submittal contains Duke Energy's responses to the remainder of the RAI questions.

A001
NRR

If you have any questions in regard to this letter, please contact Stephen C. Newman, Regulatory Compliance Lead Engineer, Oconee Nuclear Station, at (864) 873-4388.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 24, 2010.

Sincerely,

Dave Baxter,
Site Vice President,
Oconee Nuclear Station

Enclosure: Responses to RAI
Attachment: Supporting Documentation.

cc: (w/enclosure/attachment)

Mr. J. F. Stang, Project Manager
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop 8 G9A
Washington, D. C. 20555

Mr. L. A. Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission - Region II
Marquis One Tower
245 Peachtree Center Ave., NE, Suite 1200
Atlanta, GA 30303-1257

Mr. Andy Sabisch
NRC Senior Resident Inspector
Oconee Nuclear Station

S. E. Jenkins, Manager
Infectious and Radioactive Waste Management Section
2600 Bull Street
Columbia, SC 29201

Enclosure

Responses to RAI

RAI 2-1

[Lead-in information omitted]

a) Provide documentation that the NRC staff ":...acknowledged Duke Energy's specific application of the TORMIS methodology" and explaining the basis for LAR 2006-009 saying it contains "...an expansion of the use of the tornado missile probabilistic methodology (TORMIS)...", or
b) Failing "a", the licensee is requested to revise LAR 2006-009 to remove all references to the prior approval/acknowledgement/use of the TORMIS methodology or other probability analysis when discussing the ONS CLB.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-2

[Lead-in information omitted]

a) Revise the LAR to clearly state that the TORMIS methodology is only used to justify not providing positive tornado missile protection and then only when the conditions spelled out in the SER approving the use of the TORMIS methodology are met.
b) Revise the LAR to be in compliance with the staff's position regarding the use of the TORMIS methodology to evaluate plant upgrades (modifications). Identify what plant upgrades/modifications were evaluated using the TORMIS methodology and what changes/modifications will be required as a result of complying with the staff's position.
c) Revise the proposed first sentence in Enclosure 2, Section 3 of the LAR to remove reference to "...expansion of the use of the tornado missile probabilistic methodology (TORMIS)..." (Also requested in RAI 2-1)

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-3

[Lead-in information omitted]

a) Provide a description of the qualifications and training the SRO receives that qualifies the SRO to make the decision on when to man the SSF in case of a tornado warning in the area of ONS.
b) Provide a description of any guidelines/action statements contained in the "Severe Weather" emergency procedure that provide guidance to the SRO on when the SSF is to be manned.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-4

[Lead-in information omitted]

a) Notify the NRC when the wind analysis reconstitution is completed and available for NRC staff review.

b) Identify all structures and components requiring protection from tornado missiles. Provide the bases and descriptions for all modifications required to protect the BWSTs and the associated flow paths. Include a description and bases for what portions of the BWSTs are protected and not protected from tornado missiles.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-5

Provide a detailed justification for not providing restoration procedures for the SSF ASW flow and reactor coolant system (RCS) indication. Include a basis for using the TORMIS methodology.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-6

[Lead-in information omitted]

a) Clarify the cited sentence.

b) If the sentence is correct, provide a description of the consequences of compromising the walls.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-7

[Lead-in information omitted]

Revise the Enclosure 2, Section 4.4 to correct the statement regarding the use of the TORMIS methodology.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-8

[Lead-in information omitted]

a) Provide a description of the scenarios for which frequencies are reported in Table 5. What is the end state of the scenarios; damage of important SSCs, failure of mitigation functions, or core damage? Do these scenarios include; tornado damage to any individual important SSC, tornado damage to combinations of important SSCs, or combinations of tornado damaged and randomly failed SSCs (including failures of operator actions)?
b) Provide all logic models linking the failures of individual SSCs (including random failures if used) to the quantified scenarios. These logic models could include event trees, fault trees, and/or logical equations.
c) Provide the failure parameters (both tornado caused failures and random failures) used as inputs to the probabilistic analysis and the results of the probabilistic analysis (if different than Table 5-1).
d) Provide a discussion on how the technical adequacy of the logic models and failure parameters has been assessed. If multiple SSC failures are required (i.e., any AND gates are used) before an end state or top event is reached, please summarize how the scenarios requiring multiple failures were developed.

Duke Energy Response

Previously answered in Duke Energy submittal dated May 6, 2010 [refer to cover letter: Ref. 2].

RAI 2-9

As stated in the June 29, 2009, LAR, the fiber reinforced polymer (FRP) system will be applied to the exterior surface of the masonry brick walls. Page 5 of Enclosure 1 of the LAR states that the proposed FRP system will be exposed to ambient temperature and humidity conditions associated with the local climate. Considering that the temperature and humidity in the confined space between the metal siding and the brick walls are not controlled and will rise during summer months, please provide further information to justify the acceptance of the proposed FRP system.

Duke Energy Response

The sol-air temperature of the west-facing ONS Auxiliary Building wall was calculated. From ASHRAE® Handbook Fundamentals 2009, "sol-air temperature" is defined as follows: "Sol-air temperature is the outdoor air temperature that, in the absence of all radiation changes gives the same rate of heat entry into the surface as would the combination of incident solar radiation, radiant energy exchange with the sky and other outdoor surroundings, and convective heat exchange with outdoor air." Using ASHRAE® data (50-year maximums for Anderson, SC) for July 21 and the actual location and orientation of the ONS site, the sol-air temperature was found to be 139.7° F. This is a calculated maximum outside temperature based on solar position, wall orientation, and specific time of day, which is used for building heat load calculations. This represents the maximum expected outside building surface temperature calculated on the hottest day of the year based on solar position. With the interior surface of the Auxiliary Building wall being at a lower temperature, the internal cavities of the wall will be at some temperature lower than the calculated sol-air temperature. It cannot be greater. The only way that an internal wall cavity can achieve an internal temperature greater than that as described above is if there is a window that allows the solar component to enter the cavity. Since the ONS Auxiliary Building west-facing wall is a solid-sided wall, this condition is not applicable.

To demonstrate the conservative nature of the above calculation, the surface temperature of the existing siding of the west-facing Auxiliary Building walls has been sampled using two independent thermometers. These siding surface temperatures were compared to ambient air temperatures taken using a separate thermometer. Temperatures were taken in full, direct sunlight at the peak time of the year as well as the peak hours of the day for acquiring maximum temperatures. Siding temperatures averaged 15° F greater than ambient air. If the ASHRAE® 50 year maximum air temperature of 106.3° F is used, then the expected maximum siding temperature would not exceed 121.3° F.

The temperatures calculated and measured above are well below the manufacturer's stated FRP glass transition temperature of 180° F, or the point at which the modular ratio of the FRP composite begins to degrade, transforming from an elastic state to a quasi-plastic state.

The new siding installed after the FRP installation will be 0.0359-inch ASTM A653 steel with a nominal stand-off distance from the Auxiliary Building masonry walls of 15.875 inches for Units 1 and 2 and a range of between 15.75 inches to 18.875 inches for Unit 3. This compares to the older siding which was 0.050-inch aluminum with a nominal stand-off distance of 9.5 inches for all units. With respect to the heat transfer model, the increased siding standoff distance of the post-FRP installation siding configuration is an improvement over the current siding-to-wall configuration.

Although high humidity affects the rate of curing of the freshly installed FRP, it does not affect the installed FRP once it has fully cured. It should be noted that the temporary technical procedures (TN's) that control installation of the FRP system require that both humidity and ambient air temperature be monitored and evaluated during the installation activity.

RAI 2-10

Page 5 of Enclosure 1 of the June 29, 2009, LAR states that the proposed FRP system will not be exposed to significant radiation levels when applied to the exterior surfaces of masonry walls. Please provide further information to justify the acceptance of the proposed FRP system for the expected radiation levels.

Duke Energy Response

A review of recent radiological surveys in the vicinity of FRP applications shows dose rates are generally less than 1 mrem per hour during on-line periods and up to 3 mrem per hour during outage periods. The primary contributor in these surveys is the Borated

Water Storage Tanks for each of the three Oconee units. The post-exposure durability of Tyfo® glass fiber reinforced polymer and Tyfo® carbon fiber reinforced polymer test coupons, tested to average doses of 291 kGy (2.9 E7 rads) at the University of Toronto's Structures Laboratory, as evaluated by Homam and Sheikh [Reference 21 of Enclosure 2 of the FRP LAR] revealed no adverse effects in the mechanical properties of the FRP.

RAI 2-11

Page 4 of Enclosure 1 of the June 29, 2009, LAR states that the installation of the FRP system will not adversely affect the current structural qualification of the brick walls by significantly increasing the stiffness. Contrary to this statement, based on a review of out-of-plane displacement test results for control wall C3-1.2 (Figure 47) and FRP modified wall S5-1.2-SR (Figure 111), there is an appreciable increase in the out-of-plane stiffness of the FRP modified wall which, in turn, will change the frequency content of the brick wall. Please address the effects of the installation of the FRP system on the in-plane and out-of-plane stiffness of the brick walls. Also, discuss your plan and subsequent actions to evaluate the effects on the seismic analyses performed in response to the NRC Bulletin 80-11 (IEB 80-11), Masonry Wall Design.

Duke Energy Response

Duke Energy acknowledges that, with respect to the stiffness of the in-fill masonry walls, the following statement contained in Enclosure 2 of the LAR was an ambiguous generalization:

> *Installation of the FRP system will not adversely affect the current structural qualification of the masonry walls (e.g., seismic) by significantly increasing mass or stiffness nor will it have any immediate or long-term deleterious effect on the masonry wall materials of construction.*

In-plane forces resulting from a seismic event and acting on the in-fill masonry walls of the Auxiliary Building structures were addressed as part of the re-evaluation of the structural adequacy of masonry walls as required by IE Bulletin 80-11. Excluding local effects associated with wall openings and / or attachments, these in-plane forces are produced by inter-story drift (i.e., maximum differential displacements) of the Auxiliary Building structural framing system when subjected to a seismic event. For IE Bulletin 80-11, the consequences of inter-story drift were considered on the basis of gross panel shear strain, where ultimate gross panel shear strain for concrete masonry construction was taken to be $\gamma = 0.0001$, and the minimum factor of safety was 1.8. Based on these criteria and analytical approach, the in-fill masonry walls in question were found to be structurally adequate. Design-basis tornado wind loads, when applied to the Auxiliary Building frame, produce forces ranging from 12% to 15% of the seismic inertial forces for which the consequences of inter-story drift have already been evaluated. As such, tornado-induced inter-story drift and, hence, in-plane forces acting on the in-fill masonry walls of the Auxiliary Building structures are acceptable by comparison.

Based on the above discussion, the influence of FRP on the in-plane stiffness of the in-fill masonry walls has no bearing on their structural qualification for either the design-basis seismic or tornado events. Although the installation of FRP has the potential to increase the in-plane stiffness of the masonry walls, thereby improving their in-plane load-bearing capacity, the effect has not been credited or quantified.

Out-of-plane forces resulting from a seismic event and acting on the in-fill masonry walls of the Auxiliary Building structures were also addressed as part of the re-evaluation of the structural adequacy of masonry walls as required by IE Bulletin 80-11. With the exception of those masonry walls qualified by arching action theory, IE Bulletin 80-11 analyses for out-of-plane effects were performed by the working stress design method. Because the masonry walls were unreinforced, allowable flexural tensile stress, F_t, controlled the flexural capacity (where $F_t \leq 44.8$ psi for the SSE seismic loading condition). Accordingly, the wall's fundamental frequency range was calculated using the wall's gross moment of inertia (i.e., moment of inertia for uncracked masonry) and either a one-way or two-way action assumption. Using the wall's fundamental frequency range, the appropriate seismic acceleration was selected from the in-structure response spectra curves. In all cases, the computed fundamental frequency range was to the higher frequency side of the response spectra curves' peaks. A review of these computations reveals that the observed increase in masonry walls' stiffness resulting from the application of FRP would yield lower seismic accelerations than those for which the walls were previously qualified.

As documented in Duke Energy's corrective action program report (PIP O-09-01358), a review of the original IE Bulletin 80-11 computations has revealed that arching action theory was applied to several double-wythe brick walls that will be strengthened with FRP: two (2) walls in Auxiliary Building Units 1 and 2 and five (5) walls in Auxiliary Building Unit 3. The resolution to one (1) of these walls in Auxiliary Building Units 1 and 2 is addressed in the response to RAI 2-18 below. The remaining six (6) walls require additional evaluation to determine if arching action theory is applicable for double-wythe brick walls or if they can be qualified by the working stress design method using either a one-way or two-way action assumption and to address the influence of the application of FRP on their seismic qualification.

RAI 2-12

Page 3 of Enclosure 1 of the June 29, 2009, LAR states that the existing brick walls will be analyzed in accordance with the Standard Review Plan, Section 3.8.4. Appendix A to the Standard Review Plan, Section 3.8.4, states that the analysis should consider both in-plane and out-of-plane loads, and interstory drift effects. The LAR and the experimental testing program only address the effects of the out-of-plane loading on the FRP modified walls. During a design basis tornado event, these in-fill brick walls will also be subjected to the in-plane forces due to the tornado wind acting on the auxiliary building structural framing system. Please discuss the effects of the in-plane forces concurrent with the out-of-plane forces acting on the FRP modified walls.

Duke Energy Response

In-plane forces resulting from a seismic event and acting on the in-fill masonry walls of the Auxiliary Building structures were addressed as part of the re-evaluation of the structural adequacy of masonry walls as required by IE Bulletin 80-11. Excluding local effects associated with wall openings and / or attachments, these in-plane forces are produced by inter-story drift (i.e., maximum differential displacements) of the Auxiliary Building structural framing system when subjected to a seismic event. For IE Bulletin 80-11, the consequences of inter-story drift were considered on the basis of gross panel shear strain, where ultimate gross panel shear strain for concrete masonry construction was taken to be $\gamma = 0.0001$, and the minimum factor of safety was 1.8. Based on these criteria and analytical approach, the in-fill masonry walls in question were found to be structurally adequate. Design-basis tornado wind loads, when applied to the Auxiliary Building frame, produce forces ranging from 12% to 15% of the seismic inertial forces for which the consequences of inter-story drift have already been evaluated. As such, tornado-induced inter-story drift and, hence, in-plane forces acting on the in-fill masonry walls of the Auxiliary Building structures are acceptable by comparison.

RAI 2-13

a) The June 29, 2009, LAR does not discuss the acceptability of the out-of-plane displacement of the brick walls due to tornado differential pressure load. Please provide further information and discuss the potential spatial interaction with safety-related components.
b) Page 2 of Enclosure 2 of the LAR states that qualification testing will be conducted as part of the commercial grade dedication process. Please confirm that the qualification testing of the FRP constituents will be performed by an independent laboratory and that these tests are in addition to the tests performed by the FRP system manufacturer.

Duke Energy Response

a) Duke Energy performed field walk-downs of the Auxiliary Building West Penetration Room exterior masonry walls in August 2009 and repeated these walk-downs in April 2010 in order to compare the current state of wall attachments to the conditions previously evaluated and documented in Duke Energy calculation OSC-1419-series for Units 1 and 2 [Reference 19 of Enclosure 2 of the LAR] and Duke Energy calculation OSC-1430-series for Unit 3 in the resolutions of IE Bulletin 80-11 and USI A-46. The comparisons are documented in attached Table RAI 2-13. In summary, no safety-related attachments would be adversely affected by outward deflection of the masonry walls resulting from the design-basis tornado differential pressure loading condition.

b) In accordance with Duke Energy Specification OSS-308.00-00-0009, Duke Energy has procured, by commercial grade dedication for QA Condition 1 application, the FRP primer and saturant epoxies and fiberglass fabric through independent qualification testing by Nuclear Logistics, Inc. (NLI). NLI's 10CFR 50, Appendix B, program has been reviewed, audited, and approved in accordance with Duke Energy's Supply Chain Directive SCD230 [Reference 7 of Enclosure 2 of the FRP LAR]. NLI's overall "Inspection and Testing Plan" and individual component "Verification Plans" were approved by Duke Energy prior to qualification testing. Qualification testing was performed in accordance with ICC AC125 [Reference 5 of Enclosure 2 of the FRP LAR] using ASTM standard test methods for each selected parameter. Pre-installation qualification tests were performed by NLI in accordance with these plans and reference standards. Test results were accepted by Duke Energy and were consistent with the component manufacturer's stated values.

RAI 2-14

Page 4 of Enclosure 1 of the June 29, 2009, LAR states that the licensee will utilize technical procedures to control testing of concrete substrate and installation and inspection of the FRP system in accordance with ICC AC125, ACI 440.2R-02 and ICC AC178. Please provide further information relative to the conformance of the FRP installation and associated testing with the requirements of the licensee's quality assurance and quality control programs for safety-related applications.

Duke Energy Response

To control installation of the FRP system on each unit's Auxiliary Building exterior masonry walls, temporary technical procedures (TN's) have been written, reviewed, inspected, and approved in accordance with Duke's Energy Quality Assurance Program requirements as set forth in Nuclear System Directives (NSD) 703. In accordance with Section 17.3.2.14 of the QA Topical Report, NSD-703 defines the requirements for preoperational test, permanent, and temporary technical procedures.

The TN's are identical for each unit (except for unit-specific information) and address installation of the FRP strengthening system on the wall elements as well as Quality Control inspections and tests, including both in-process and post-installation testing. Testing incorporated in the TN meets ASTM standards invoked by ICC AC178 [Reference 8 of Enclosure 2 of the FRP LAR] and the quality requirements specified by the FRP manufacturer. Although not finalized, a DRAFT copy of the Unit 1 temporary technical procedure has been made available for informational purposes on the Duke Energy SharePoint site.

RAI 2-15

Page 4 of Enclosure 2 of the June 29, 2009, LAR states that as part of the long term surveillance program, visual inspections will be performed on selected portions of FRP strengthened brick walls and adjacent test walls. Please provide further clarification relative to the term "selected portions."

Duke Energy Response

Four (4) FRP test panels will be installed on Auxiliary Building masonry walls for in-service surveillance of the FRP system (i.e., visual inspections and tension adhesion testing (destructive examination)). Their locations are shown in Figure RAI 2-15, Sheets 1 through 6. FRP test panels will be installed in the same manner as the design applications. FRP test panels will be subject to the same environmental conditions as the design FRP-strengthened wall elements (i.e., located on a west-facing wall behind removable siding). In-service surveillance of the FRP system will be performed only on the FRP test panels, not on the design FRP-strengthened wall elements. Should this surveillance reveal any adverse condition, the design FRP-strengthened wall elements would be inspected and / or tested by removing the external structural siding; however, removal of this siding would present a degraded condition with respect to design-basis tornado wind loading and would be managed under Oconee Site Directive (SD) 3.2.16.

RAI 2-16

Page 4 of Enclosure 2 of the June 29, 2009, LAR states that the test walls will be more accessible for tension adhesion testing, implying that the test walls are not configured the same as the FRP modified walls (e.g., there is no siding to remove). Considering RAI 2-9 please provide further discussion to justify that the test walls are exposed to the same environmental conditions as the FRP modified walls.

Duke Energy Response

Four (4) FRP test panels will be installed on Auxiliary Building masonry walls for in-service surveillance of the FRP system. Their locations are shown in Figure RAI 2-15, Sheets 1 through 6. FRP test panels will be installed in the same manner as the design applications. FRP test panels will be subject to the same environmental conditions as the design FRP-strengthened wall elements (i.e., located on a west-facing wall behind removable siding). To facilitate in-service surveillance of the FRP test panels, small, readily removable portions of siding will be installed; however, no such access points will be provided for the design FRP-strengthened wall elements.

RAI 2-17

Please discuss how ACI 530R-02, referenced on Page 4 of Enclosure 2 and in Attachment 2.2 of Enclosure 2 of the June 29, 2009, LAR, will be used in tension adhesion testing. There appears to be a typographical error in the designation of the ACI standard.

Duke Energy Response

Duke Energy agrees that a typographical error exists in referencing ACI 530R-02. The correct reference should have been ACI 503R, *Use of Epoxy Compounds with Concrete*. ACI 440.2R-02, Section 6.2.5, specifies using the methods in ACI 503R or ASTM D4541 for tension adhesion testing for bond-critical applications. Because ASTM D4541 is the test method for performing adhesion pull-off tests for *metal* substrates, Duke Energy will instead use the more appropriate ASTM D7234 as the test method for performing adhesion pull-off tests for *concrete* substrates.

RAI 2-18

Please confirm that the height of the existing Unit 2 masonry brick wall, located at Elevation 809'-3" and designated as Line X, Column Line 78a to U2 RB in Enclosure 3 of the June 29, 2009, LAR, will be modified so that its aspect ratio is within the range used in the experimental testing program. Also, please discuss the applicability of the experimental test results to the modified configuration of this wall.

Duke Energy Response

The existing Unit 2 double-wythe brick masonry wall located along column line 'X' between column '78a' and the Unit 2 Reactor Building having a bottom elevation of 809 + 3 will not be modified to reduce its aspect ratio. To provide restraint and support for the southern vertical edge of this wall (i.e., the existing free edge of the wall located adjacent to the Unit 2 Reactor Building), a steel support was sized using finite element analysis which incorporated deflection compatibility between the existing masonry wall using the effective cracked section properties and the new steel support member. Resulting moments in the wall from the finite element analysis were checked against the newly developed FRP-reinforced capacities of the wall. To complete development of the necessary boundary conditions for this masonry wall, perimeter shear restraints were designed for the top and northern vertical edges of the wall. Because of the wall's relatively severe aspect ratio (h:w = 3.0), the primary FRP reinforcing was designed to enable the wall to carry the entire out-of-plane load produced by the design-basis tornado differential pressure force as a one-way span in the horizontal (short) direction. Secondary vertical FRP reinforcing was sized to carry any moment in the wall's vertical direction resulting from two-way plate action under the same loading condition.

In addition to the modifications described above, the existing Unit 2 double-wythe brick masonry wall located along column line 'X' between column '78a' and the Unit 2 reactor building having a bottom elevation of 809 + 3 will be modified to address seismic integrity concerns arising from the lack of an intermediate support at elevation 822 + 6 for this wall. The modification consists of the installation of a seismic barrier that is designed to restrain debris, resulting from a postulated wall collapse, from impacting safety-related equipment located within the wall proximity zone. This barrier would also preclude any damage to safety-related equipment were the wall to fail under the design-basis tornado differential pressure force.

RAI 2-19

Enclosure 4 of the June 29, 2009, LAR states that the structural steel shear restraint system will be installed along the top and sides of the masonry walls since the performance testing program demonstrated that potential shrinkage cracks along the sides or settlement cracks along the top edge of the masonry walls may exist. The design methodology proposed in this LAR uses a simply supported plate on all four sides. The bottom edge of the wall could also be affected by shrinkage cracks and may not provide shear resistance. Considering this uncertainty, relative to the as-built wall boundary condition, to maximize the flexural demand on the FRP system and to maximize the reaction force on the shear restraint system, please provide discussion on the design methodology if the bottom edge of the wall is considered free.

Duke Energy Response

Duke Energy recognized the need for perimeter shear restraints for the FRP-strengthened masonry wall elements when shrinkage cracks were observed along the side edges and settlement cracks were observed along the top edge of the test specimens constructed for the FRP Performance Testing Program. Shrinkage cracks were created as the mortar cured after construction of the walls. Settlement cracks occurred due to shrinkage of the mortar and gravity acting on the masonry mass while the fresh mortar was still plastic. In a similar fashion, gravity acting on the masonry mass during construction precluded shrinkage and / or settlement cracks along the bottom edge of the test specimens. Moreover, the integrity of the bottom edge of the test specimens was validated during testing of the shear restrained test specimens. Based on these observations, the comparable fabrication methods employed during construction of the Auxiliary Building in-fill masonry walls, and the computed shear stresses resulting from the design-basis tornado differential pressure loading, structural steel shear restraints will only be required to restrain the top and side edges of the FRP-strengthened wall elements to justify the design assumption of the wall acting as a simply supported plate on all four sides.

RAI 2-20

Specimen S7-1.2-SR was tested to failure with shear restraints in place. The failure mode is noted as shear sliding. Please provide further detail relative to the failure mechanism (shear restraint failure, anchorage failure, etc.) that caused the shear sliding failure of the wall. Also, it is stated that up to a pressure of 3.9 psi, no visible signs of damage were observed. Referring to Figure 143, of the June 29, 2009, LAR at location V1, the measured FRP strain exhibits a non-linear behavior beyond 2.4 psi pressure. Please discuss and provide further information regarding this discrepancy.

Duke Energy Response

Shear sliding "failure" was observed along the unrestrained bottom edge of test specimen S7-1.2-SR only after the applied pressure exceeded 3.9 psi. Loads were continued to be applied, and shear sliding along the bottom edge continued, up to 7.5 psi when the test was stopped to prevent catastrophic failure of a) the masonry wall, b) the shear restraint system components, or c) test frame anchorage (any of which could potentially injure personnel or damage facility equipment) if taken to unnecessarily high pressures.

FRP strain measurements are taken at selected locations in order to provide a measure of the local behavior at those locations. From Figure 143, it appears that FRP in the center of the wall, as represented by strain gauge V1, began to develop increased levels of strain at applied pressures exceeding 2.4 psi. This may indicate the initial formation of a minor crack at mid-span; however, the presence of FRP would have made visual observation of this minor crack impossible.

The strains presented in Figure 143 are quite small in comparison to the rupture strain of the FRP. In addition, the best indication of global behavior is provided by the load-deflection curves presented in Figure 139 which does not indicate a substantial loss in stiffness prior to the elastic limit of 5.7 psi. Despite the local increase in strain (represented by strain gauge V1 in Figure 143), the global behavior of the wall (represented by the load-deflection curves in Figure 139) indicated very little damage prior to reaching the elastic limit of 5.7 psi.

RAI 2-21

The experimental testing program was conducted using one FRP ply and a maximum coverage of 100 percent. Considering the fact that the experimental testing program was conducted to support the design methodology for the FRP strengthened brick walls, please provide further discussion if the modifications of the existing Oconee brick walls require more than one ply of FRP reinforcement, which will be outside the parameters of the tested conditions.

Duke Energy Response

In developing the goals of the performance testing program, and in consideration of the design methodology, Duke Energy and the testing laboratory determined that the use of multiple layers in excess of 100% coverage was not necessary, based on the understanding that the layer-to-layer bond was greater than the layer-to-substrate bond. The conservative nature of Duke Energy's design methodology, as demonstrated in the performance testing program and supported by the independent reviewer, ensures sufficient margin against wall failure or excessive deflection at the maximum design load. As stated in the independent review's remarks [Enclosure 6, Part B of the LAR], the conservative nature of the design methodology results in FRP amounts in excess of what would actually be needed for the 1.2 psi applied pressure.

RAI 2-22

Page 10 of Enclosure 4 of the June 29, 2009, LAR includes a note relative to the shear capacity of unreinforced masonry and limitation of net section, An, to the compression portion of the wall cross section as required in Section 11.2.1.1 of ACI 531-79. Please discuss how this provision is incorporated in the proposed design methodology for the FRP modified walls.

Duke Energy Response

Duke Energy agrees that, with respect to shear stress for unreinforced masonry, Section 11.2.1.1 of ACI 531-79 does limit the net section, A_n, to that portion which is in compression. However, use of the FRP system as both horizontal and vertical tensile reinforcement supports treatment of the in-fill walls as reinforced masonry and is consistent with the design methodology used to determine the wall's flexural capacity. Moreover, Duke conservatively elected to consider the contribution of only a single wythe when evaluating shear capacity. Thus, the value of 'A_n' for the double-wythe brick masonry walls reported in Enclosure 4, Attachment 4.3, of the LAR in the table entitled "Masonry Material Properties" is the net section (vertical or horizontal) computed as the product of the effective depth, *d*, of masonry in compression (where d = 3 5/8 (or 3.625) inches) and the effective width, *b*, (where b = 12 inches).

RAI 2-23

Pages 15 and 16 of Enclosure 4 of the June 29, 2009, LAR state that the shear restraints will be designed based on deflection criteria. Please provide further information and discuss how this deflection design criterion is the controlling case, when compared with the reaction force due to the design basis tornado and seismic loads.

Duke Energy Response

Shear restraints were designed using various combinations of structural steel plate and angle and concrete expansion anchors. All shear restraints were designed to resist masonry wall reactions resulting from the design-basis tornado differential pressure loading while meeting Code allowable stresses. (It should be noted that reactions resulting from the design-basis tornado envelope those associated with the design-basis seismic event.) By virtue of their geometry, shear restraints designed using structural plate and concrete expansion anchors are more flexible (i.e., allow greater displacement within the range of allowable stresses) than those designed using structural angle and concrete expansion anchors; therefore, these restraints were also evaluated to ensure that their deflection (at the design loading) would not exceed the prescribed deflection criterion of 1/16 (0.0625) inch.

RAI 2-24

The installation of shear restraints is the primary parameter required for the validity of the methodology and boundary conditions used in the analysis of the existing brick walls. Please discuss why the list of regulatory commitments in Attachment 2.2 of Enclosure 2 of the June 29, 2009, LAR and the flow chart shown in Attachment 4.1 of Enclosure 4 of the LAR do not include the installation of shear restraints.

Duke Energy Response

Duke Energy recognized the need to install shear restraints during the course of the FRP Performance Testing Program, given that the construction deficiencies observed in the test specimens could potentially exist in plant walls subject to FRP strengthening. The omission of a regulatory commitment pertaining to the installation of shear restraints was unintentional and will be rectified by added this item to the commitments listed in Attachment 2.2 of Enclosure 2 of the FRP LAR. The completion date for this commitment will be upon completion of the installation of the overall natural phenomena barrier system (NPBS) program activities, which corresponds to the completion of siding installation.

The flowchart presented in Attachment 4.1 of Enclosure 4 of the FRP LAR is intended as an outline of the design methodology (discussed in detail in Enclosure 4 of the FRP LAR), with the last step describing evaluation of the wall's shear capacity and including a provision for increasing the shear strength through "conventional modification," implying installation of shear restraints where required. In Enclosure 4 of the FRP LAR, under "Verify masonry wall's shear capacity is commensurate with flexural strengthening and boundary conditions, and provide conventional modification to increase shear strength," it is specifically stated that shear restraints will be added for the double-wythe solid concrete brick walls strengthened with FRP.

RAI 2-25

The use of the FRP system to modify selected masonry block walls in the auxiliary building, included in your LAR dated June 1, 2006, was approved by the NRC staff and documented in SEs dated February 21, 2008 (ADAMS Accession No. ML080320065), and March 26, 2008 (ADAMS Accession No. ML080720414). The installation of shear restraints should also be applicable to these walls to ensure the validity of the boundary conditions used in the analysis. Please discuss your plans and subsequent actions to incorporate the installation of shear restraints for these masonry block walls.

Duke Energy Response

The installation of shear restraints is applicable to the masonry block walls to ensure the validity of the boundary conditions used in the analysis, and Duke Energy will design and install shear restraints on the masonry block walls. The masonry block walls were evaluated as a one-way span. Accordingly, shear restraints will be installed along the top edge. This requirement for the installation of shear restraints on masonry block walls will be added to the list of regulatory commitments.

RAI 2-26

Attachment 2.1 of Enclosure 2 of the June 29, 2009, LAR includes the UFSAR mark-ups. Please discuss the differences between the UFSAR mark-ups in this LAR and the previous LAR approved by the NRC staff and documented in SEs dated February 21, 2008 and March 26, 2008.

RAI 2-27 through RAI 2-36 were previously requested in an NRC letter dated July 6, 2009 (ADAMS Accession No. ML091700738). Your response to the RAIs was in the licensee's letter dated September 2, 2009 (ADAMS Accession No. ML092520189). Your response to each of the questions indicated that the design of the PSW system was not completed and indicated additional information would be available in the future. Please provide completed answers to these previously requested RAIs. In some responses you indicated the PSW will be designed and installed in accordance with industry guidance and standards. In response to these questions please provide specific references.

Duke Energy Response

Duke Energy recognizes the difficulty in comparing the UFSAR mark-ups presented in LAR 2006-006 and those provided in LAR 2009-05. For clarification purposes, a comparison of the UFSAR mark-ups of LAR 2006-006 and UFSAR mark-ups of LAR 2009-05 is provided in Figure RAI 2-26, Sheets 1 through 10 (attached). For the UFSAR mark-ups of LAR 2006-006, text highlighted and underlined in Red indicates items "deleted from" or "not included in" UFSAR mark-ups of LAR 2009-05. For the UFSAR mark-ups of LAR 2009-05, text highlighted in Yellow indicates items "added to" UFSAR mark-ups of LAR 2006-006.

Other than RAI questions 2-31 and 2-35, which are addressed as part of this submittal, questions 2-27 through 2-30, 2-32 through 2-34, and 2-36, will be addressed in a future RAI response (refer to cover letter: Ref. 4).

RAI 2-27

Provide the following information for the new PSW transformer, switchgear, load center and the circuit breakers: 1) equipment design ratings, 2) a summary of the analyses performed to show the loading, short circuit values and the interrupting ratings, voltage drop, and protection and coordination, 3) the existing station ASW switchgear ratings, and 4) the periodic inspection and testing requirements for electrical equipment. Provide applicable schematic and single line diagrams.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-28

Provide the following information concerning the proposed PSW instrumentation and control (I&C) power and the interface with the existing plant vital I&C power: 1) design of the direct current (DC) system for the PSW system including how the DC control power for the new PSW load center, switchgear and the transformer will be provided, 2) the impact on existing DC vital system including loading on the existing battery and the battery charger, 3) describe the analysis performed to determine the capacity of the batteries and the battery charger, voltage requirements at the equipment terminals, electrical protection and co-ordination, and 4) the periodic inspection and testing requirements. Provide applicable schematic and single line diagrams.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-29

In Enclosure 2, Section 3.3.4 of the June 26, 2008, LAR, the licensee states that the Keowee Hydroelectric Units (KHUs) will provide power supply to the PSW switchgear through underground cables. Provide analyses to show the kilo volt ampere (kVA) loading, new circuit breaker rating, short circuit values, and voltage drop. In addition, provide information on the electrical protection and coordination, and the periodic inspection and testing requirements. Further, explain how the redundancy and independence of the Class 1E power system is maintained as a result of the proposed modification. Provide applicable schematic and single line diagrams.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-30

The licensee states in the June 26, 2008, LAR that the PSW system will be fully operational from the respective unit's main control room and will be activated when existing redundant emergency systems are not available. Describe how the alarms, indications, and the electrical controls will be provided from the main control rooms of Units 1 and 2 to the proposed PSW switchgear. Explain how the controls are provided for Unit 3. Provide applicable electrical schematics and evaluations highlighting the design features.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-31

Provide information on how the licensing basis for physical independence and separation criteria are met for the PSW electrical system.

Duke Energy Response

The licensing basis for cable physical independence and separation criteria for the PSW electrical system will be located in the UFSAR. As proposed in LAR 2008-005, submitted on June 26, 2008, new UFSAR Section 9.7 describes the Protected Service Water System which includes a statement that the PSW system will not comply with single failure criteria. Existing Section 8.3.1.3 of the UFSAR has a pending change which adds a new cable use/channel color that includes PSW-related cables.

Implementation of the physical independence and separation criteria for the PSW electrical system will be controlled by Duke Energy Design Criteria DC 3.13, "Oconee

Nuclear Station Cable and Wiring Separation Criteria." DC 3.13 provides guidance for cable routing and installation which has been revised to include PSW-related cables.

RAI 2-32

The licensee states in the June 26, 2008, LAR that the new PSW system switchgear will receive power from the KHUs via a tornado-protected underground feeder path. Provide the following information:

1) the type of underground cable installation, i.e., direct burial or in duct banks, manholes etc., 2) how the licensee will ensure that the proposed new underground cables remain in an environment that they are qualified for, 3) periodic inspections and testing planned for cables to monitor their performance, and 4) details regarding cable size, type, maximum loading requirements, and cable protection devices.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-33

Provide information concerning the design details for the new 100/13.8 kV substation, the PSW transformer and switchgear building power feeds, its protection, controls and alarms features. Provide applicable single line diagram and electrical schematics.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-34

The licensee states in Enclosure 2, Figure 1 of the June 26, 2008, LAR, that two new power feeds will be installed to the auxiliary building (AB) with one power supply to the Unit 1, 2, and 3 AB equipment high pressure injection (HPI) pumps and vital I&C normal battery chargers and other power supply to the backup power to the Units 1, 2, and 3 pressurizer heaters. Provide the following information concerning this installation: 1) compare and contrast the existing power supply requirements for the above loads, 2) how the electrical separation, independence, and redundancy requirements are maintained, 3) summary of the voltage analyses for the equipment/components affected by this modification, 4) design details for the new power feeds to AB, 5) periodic inspections and testing schedule for the these cables to monitor their performance, and 6) provide the electrical schematics and one-line drawings for these power feeds.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-35

Provide confirmation that the maximum float/equalizing voltage does not exceed the equipment maximum dc voltage rating.

Duke Energy Response

The maximum battery float voltage will not exceed the DC voltage ratings of the equipment connected to the PSW DC system. During battery equalization, the battery being equalized will be disconnected from the PSW DC system by isolation breakers therefore downstream equipment will not be affected by the maximum equalization voltage. The maximum battery equalization voltage will not exceed that battery isolation breaker DC voltage rating. Float and equalization voltage settings will be based on vendor recommendations and controlled by maintenance procedures to ensure that equipment maximum DC voltage ratings will not be exceeded.

RAI 2-36

Describe in detail how the 125 vdc vital I&C primary and backup power cables and the KHU emergency start circuitry will be rerouted from the turbine building (TB) to the AB.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-37

The new tornado mitigating strategies make the use of the RETRAN 3D code. The NRC staff's SE that generically approved RETRAN-3D for licensing analyses contains 45 conditions and limitations. In light of the licensing basis reconstitution, the Oconee plant design is expected to be significantly different, and these differences will likely result in RETRAN-3D model changes. Provide a disposition for each condition and limitation to indicate that modeling any proposed facility modifications remains within the conditions and limitations of the RETRAN-3D as approved by the NRC.

Duke Energy Response

The new tornado mitigating strategy relies upon the Standby Shutdown Facility (SSF) to bring the affected unit(s) to a safe shutdown condition with the ability to maintain the unit(s) in a safe shutdown condition for up to 72 hours. The new strategy relies upon main steam (MS) piping upstream of the committed Main Steam Isolation Valves (MSIVs) to remain intact, while piping downstream of the MSIVs (inside the Turbine Building) is not required to remain intact. Duke Energy completed the analysis for MS line breaks downstream of the committed MSIVs with mitigation being provided by the SSF. The results of the analysis were submitted as part of the High Energy Line Break (HELB) License Amendment Request 2008-007 dated June 29, 2009. Duke Energy has previously demonstrated compliance with the 45 conditions and limitations identified by NRC staff in their generic approval of RETRAN-3D.

The NRC's concurrence of Duke Energy's position is documented in the Safety Evaluation associated with NRC approval of Duke Energy Topical Report DPC-NE-3000-P, Revision 3, dated September 24, 2003 [ADAMS Accession No. ML032670816]. The RETRAN-3D calculations supporting the mitigation of main steam line breaks downstream of the committed MSIVs using the SSF were performed in accordance with Duke Energy Topical Report DPC-NE-3000-PA, "Thermal-Hydraulic Transient Analysis

Methodology," and remain in compliance with the 45 conditions and limitations identified by NRC staff.

RAI 2-38

For the worst case main steam line break following a tornado, provide the following information:

a. Tabulate significant parameters, initial conditions, and results to facilitate comparison among analyzed cases.
b) Provide plots of significant parameters for the analyzed cases.

Duke Energy Response

The new tornado mitigating strategy does not postulate pipe breaks in the main steam (MS) piping upstream of the committed Main Steam Isolation Valves (MSIVs). Piping downstream of the committed MSIVs is not credited in the new tornado mitigating strategy. Duke Energy completed the analysis for MS line breaks downstream of the committed MSIVs. The results of the analysis were submitted as part of the High Energy Line Break (HELB) License Amendment Request 2008-007 dated June 29, 2009. One of the scenarios analyzed for the HELB LAR is consistent with the new tornado mitigating strategy, where the Standby Shutdown Facility (SSF) and the MSIVs are relied upon for establishing and maintaining safe shutdown. This scenario assumes a double main steam line break (DSLB), a rupture of both main steam lines, inside the Turbine Building. The 4kV Essential Auxiliary Power System is assumed to be lost as a result of the event.

The rupture of both MS lines initiates a simultaneous blowdown of both steam generators. The rapid blowdown is terminated upon closure of the MSIVs, based upon a low pressure setpoint consistent with the current Automatic Feedwater Isolation System (AFIS) setpoint of 550 psig. The analysis assumes an MSIV closing setpoint of 520 psig to account for instrumentation uncertainty. AFIS is not credited in this scenario. A rapid increase in the heat removal from the primary system results from this event, which causes a depressurization and rapid cooldown of the RCS prior to the closure of the MSIVs. An immediate reactor trip is conservatively assumed. This causes a rapid reduction of heat load on the RCS and maximizes the overcooling aspect of the event. Initial conditions and boundary conditions are selected to maximize the RCS overcooling.

The Protected Service Water (PSW) system is assumed to be lost or is unavailable, resulting in the need to use the SSF for safe shutdown, consistent with the new tornado mitigation strategy. Although the turbine driven emergency feedwater pump (TDEFWP) is not credited for safe shutdown in the new tornado mitigation strategy, it is assumed that the pump operates to maximize the RCS overcooling. Three cases are evaluated for this scenario, with different assumptions on time to trip the RCPs. The first case assumes the RCPs are tripped at 3 minutes after the event. The second case assumes the RCPs are tripped off two minutes after a loss of indicated subcooled margin occurs. The third case assumes the RCPs are tripped off at the same time as the reactor trip, at 0.1 second after the event.

The analyses demonstrate that for a double steam line break inside the Turbine Building, coincident with a loss of the 4kV Essential Auxiliary Power System, the SSF can maintain the plant in Mode 3, with $T_{ave} \geq 525°$ F without interruption of single-phase natural circulation with MSIVs installed in the MS headers. Table 1 identifies the significant parameters for these cases. See Figures 1-12 for plots of significant parameters for this scenario. These plots include a 5 second null transient prior to the DSLB initiating event.

Table 1 – Significant Parameters and Initial Conditions for DSLB With Loss of the 4kV Essential Auxiliary Power, Closure of Both MSIVs, SSF Restoration

Initial Conditions	Target Value	Comment
Core Power (% of 2568 MWt)	102.0	2% uncertainty
RCS pressure (psig)	2095.0	Low value, conservative for RCS depressurization
RCS Tave (°F)	577.0	Low value, maximize overcooling
PZR level (in)	195.0	Low value, maximize overcooling
RCS flow (gpm)	371,360	105.5% Design Flow; not significant parameter due to early RCP trip
Fuel Tave (°F)	950.0	Low value, maximize overcooling
SG Level (%OR)	93%	High value, maximize overcooling
RCP Operation	Varies	See above description
ECCS (HPI)	Unavailable	Loss of 4kV
ECCS (LPI)	Not modeled	
BWST Boron Concentration	N/A	HPI not credited
Main Feedwater	Trip at start of event	MFW pumps coastdown following trip on loss of suction pressure
Emergency Feedwater	Only TDEFW	EFW flow to both SGs, levels controlled to natural circulation setpoint after RCP trip
SSF Auxiliary Service Water	350 gpm/unit (175 gpm/SG)	SSF-ASW initiated 14 minutes after reactor trip, powered by SSF
SSF RC Makeup Flow	8 gpm	Conservative low flow, initiated 20 minutes after reactor trip, powered by SSF

Figure 1

ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 3 minutes after event

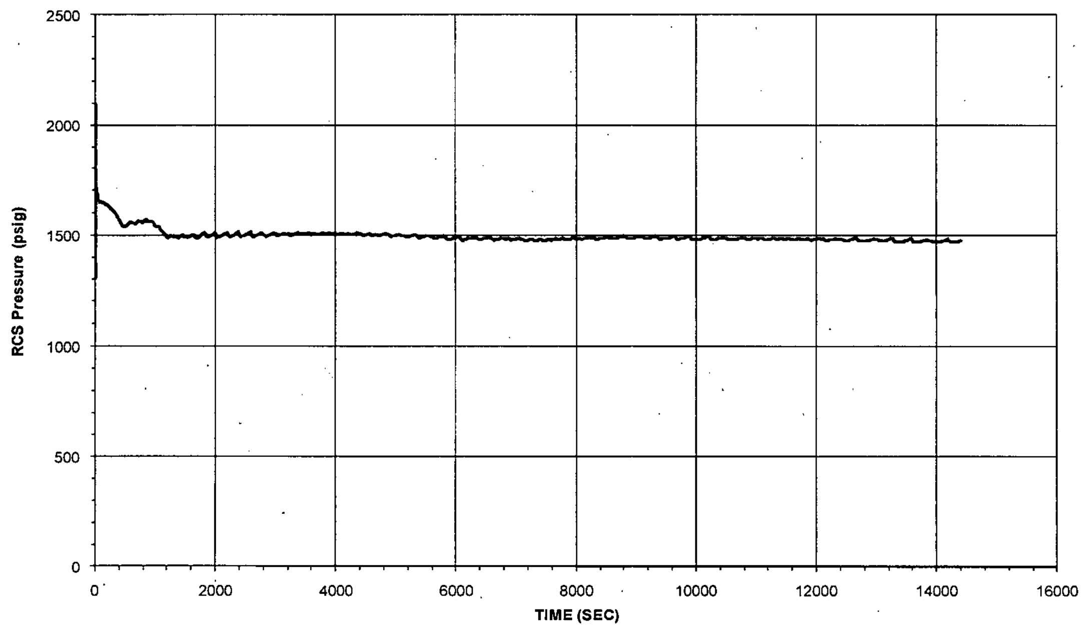


Figure 2

ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 3 minutes after event

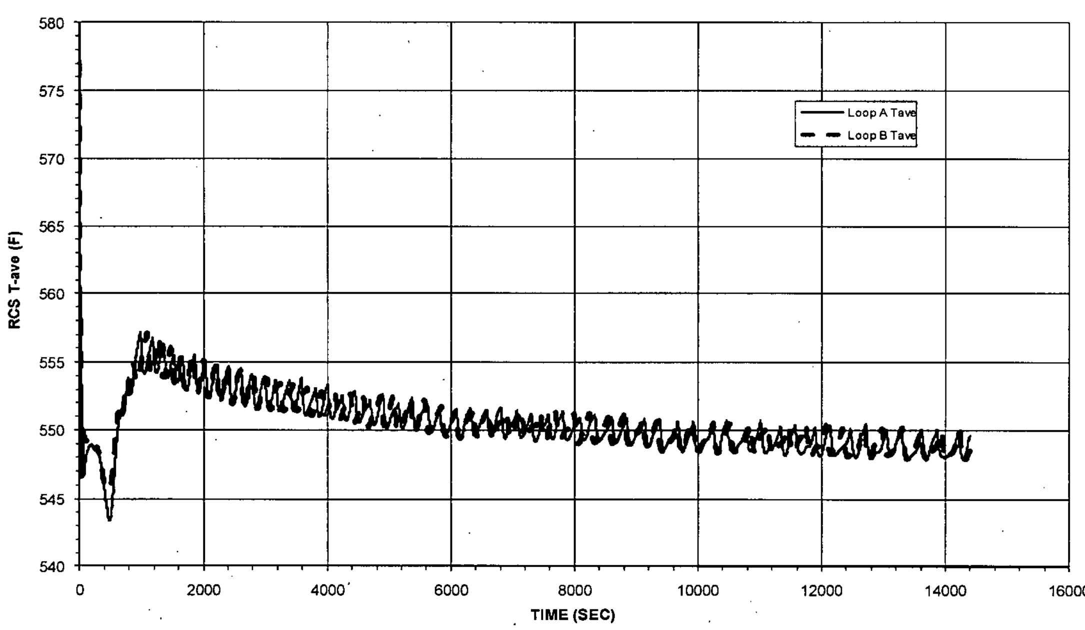


Figure 3

**ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 3 minutes after event**

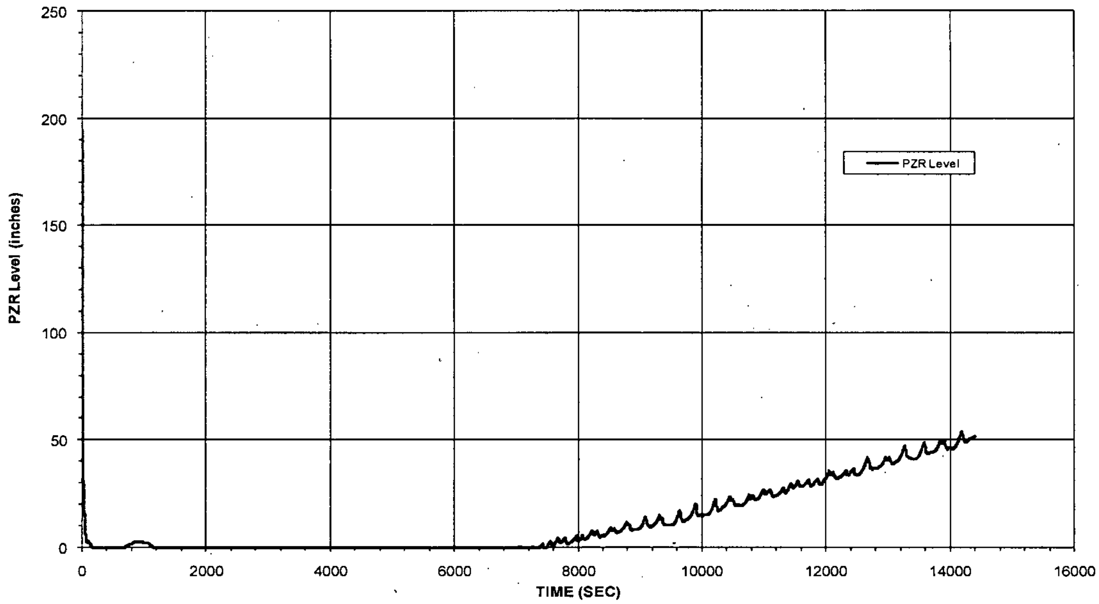


Figure 4

**ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 3 minutes after event**

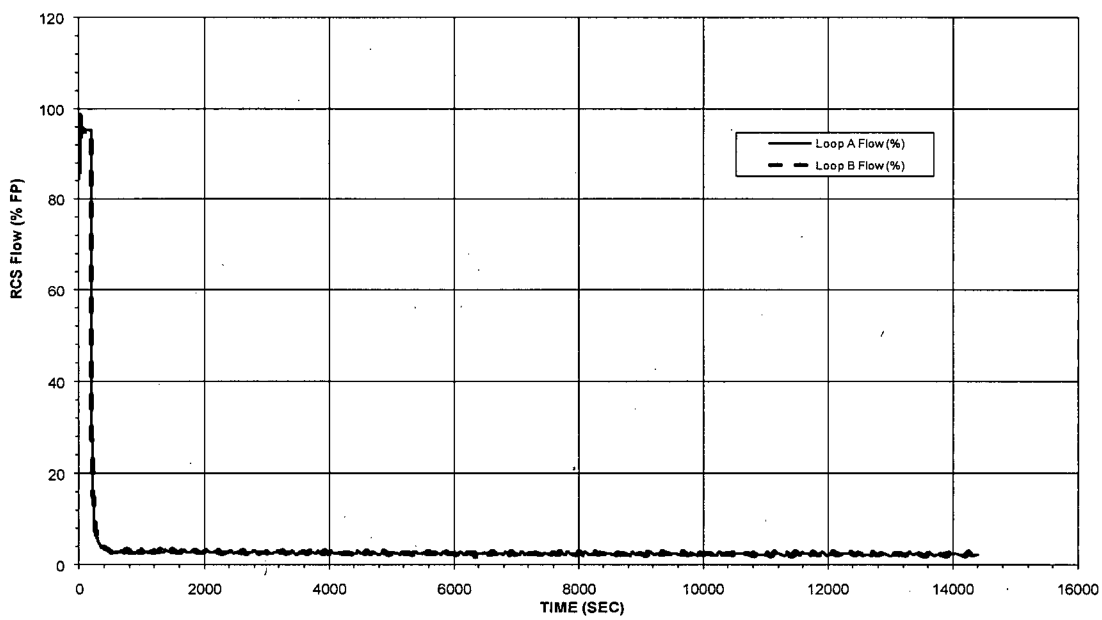


Figure 5

**ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 3 minutes after event**

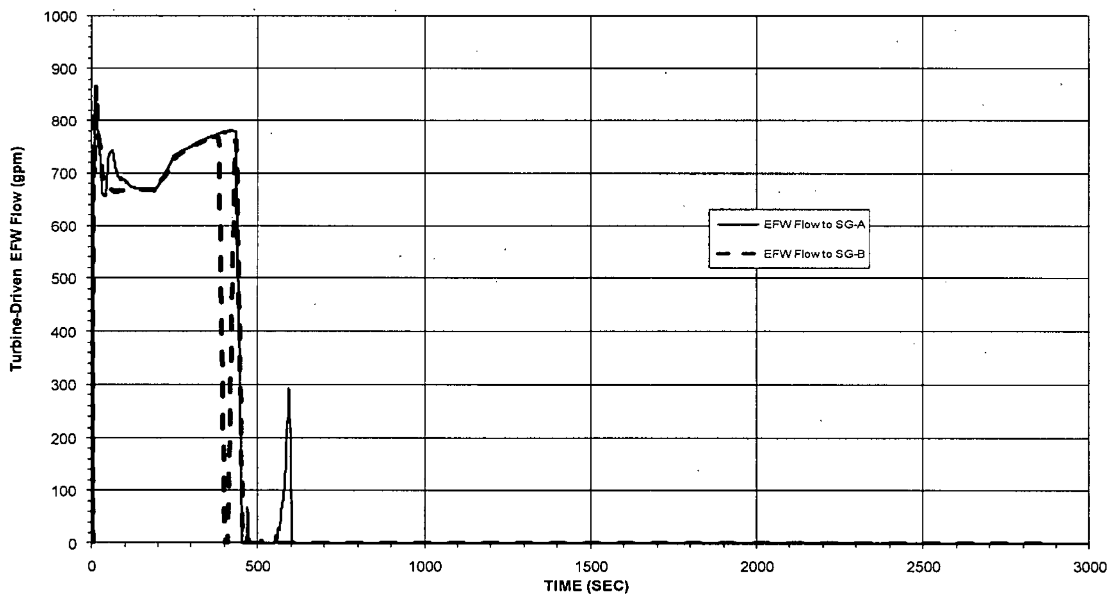


Figure 6

**ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 3 minutes after event**

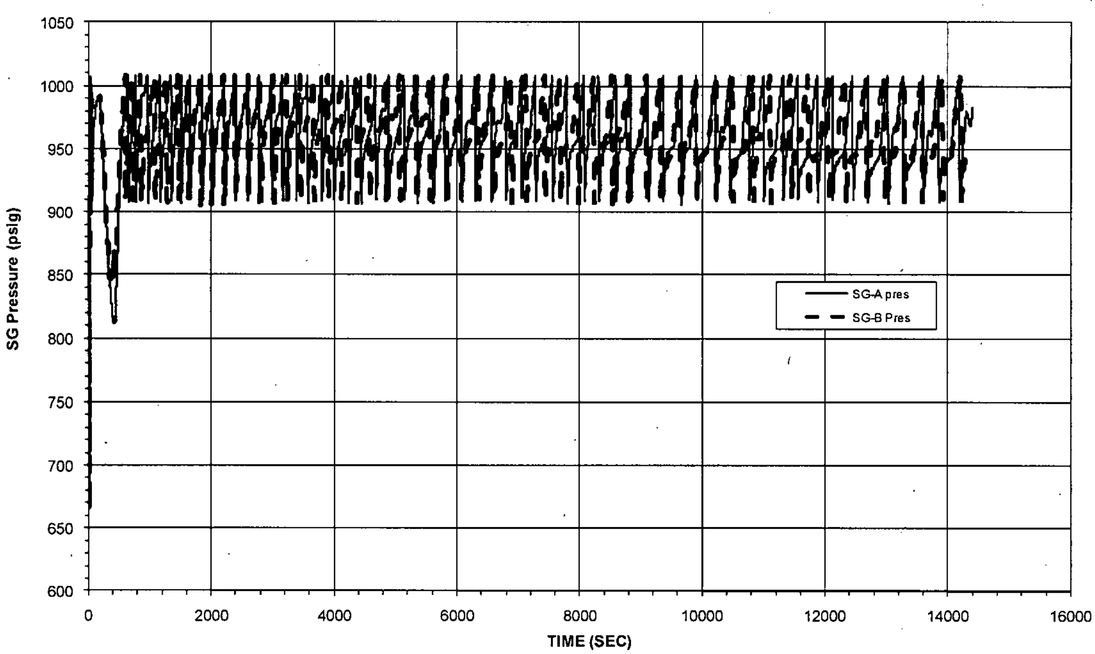


Figure 7

ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 2 minutes after Loss of SCM

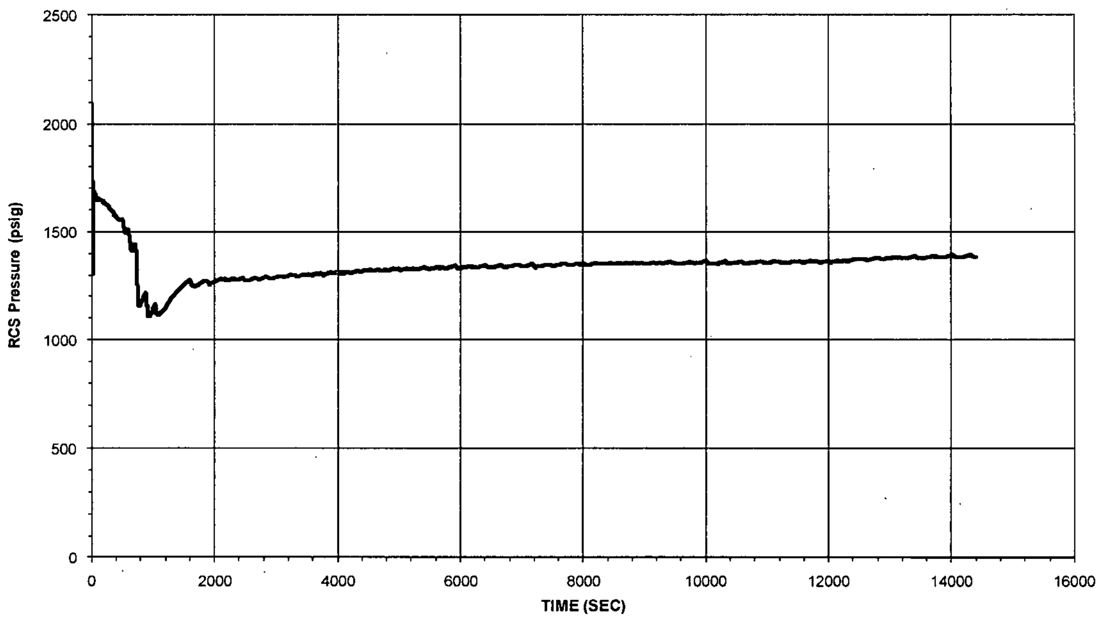


Figure 8

ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 2 minutes after Loss of SCM

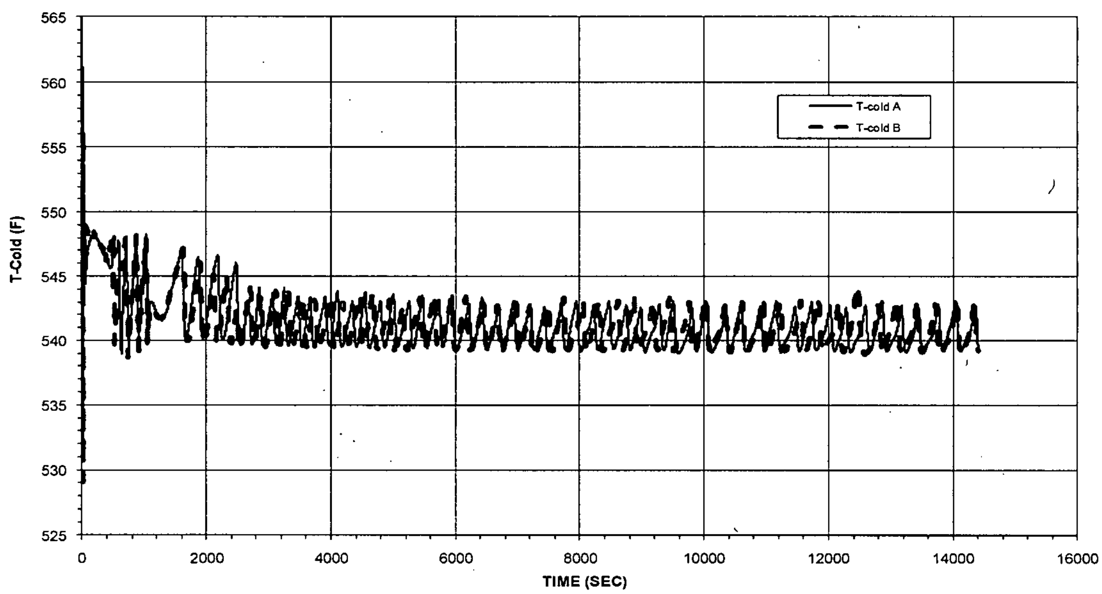


Figure 9

ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped 2 minutes after Loss of SCM

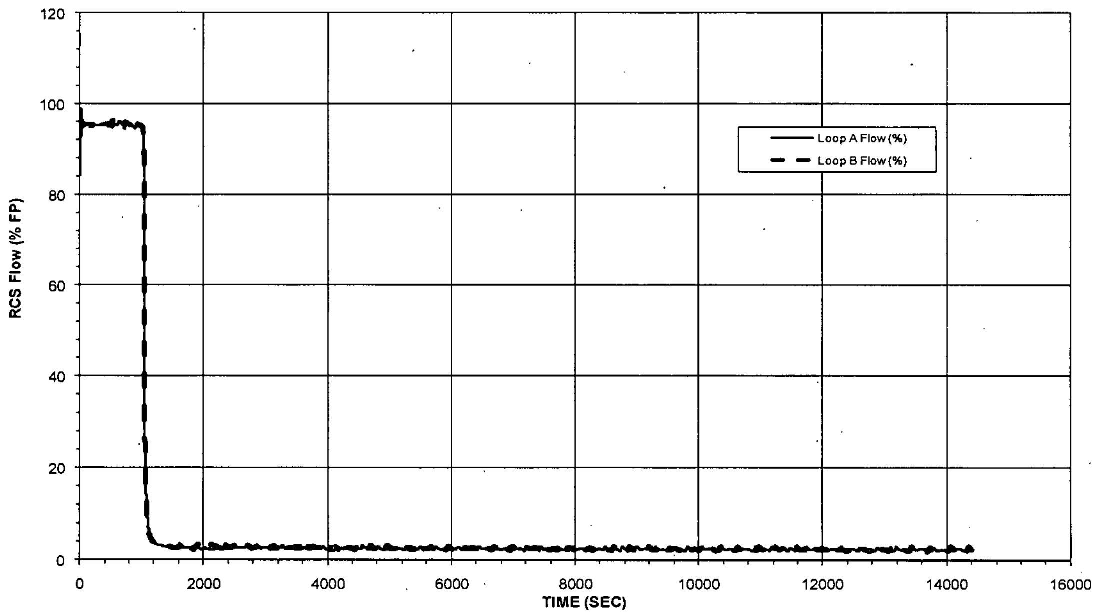


Figure 10

ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped at start of event

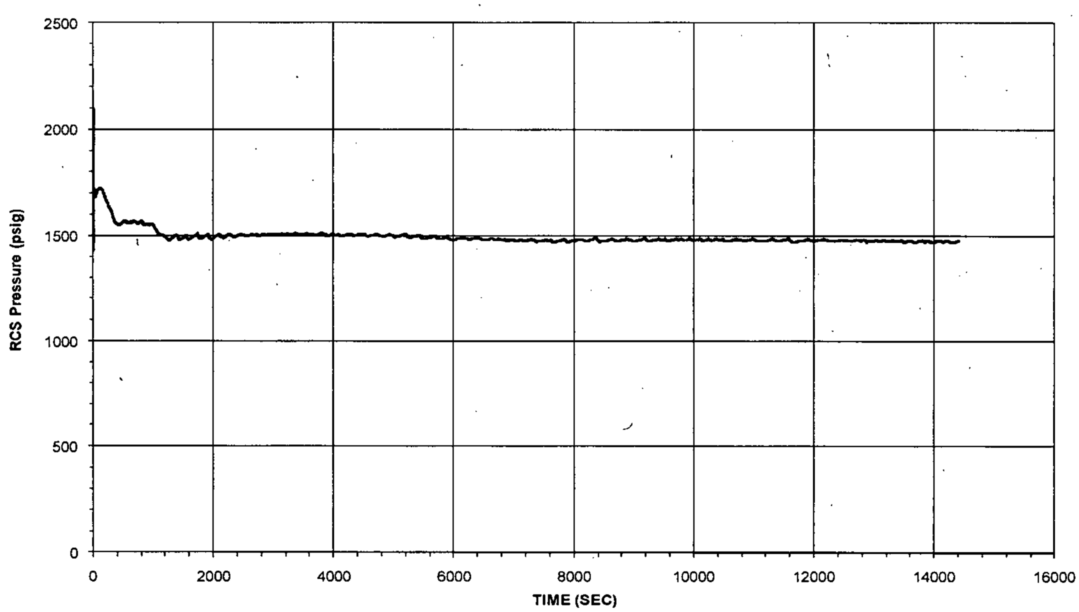


Figure 11

**ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped at start of event**

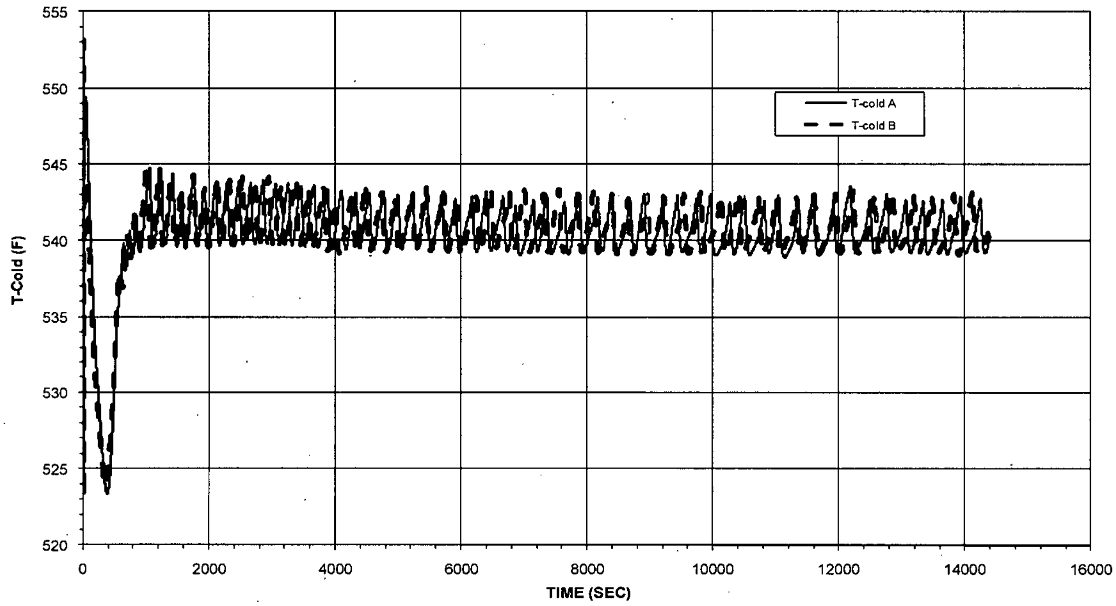
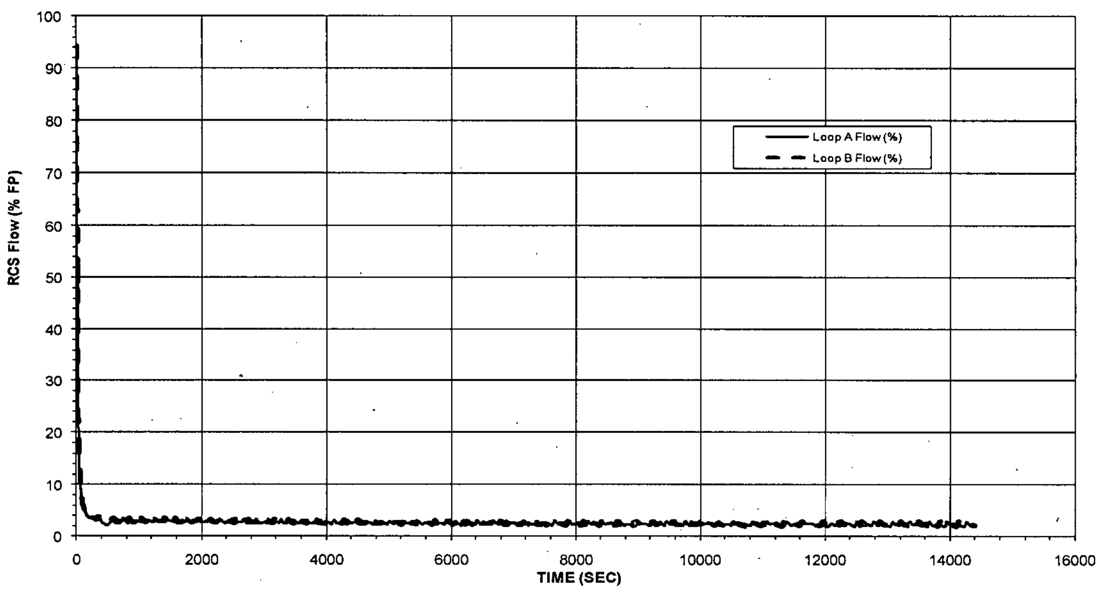


Figure 12

**ONS Double Steam Line Break HELB with MSIVs:
SSF w/ Loss of 4160V; Case w/ RCPs tripped at start of event**



RAI 2-39

In the new tornado mitigation strategies the SSF is credited for achieving and maintain hot standby conditions and cooling the reactor coolant pump seals. In order for the SSF to be credited, operators have to be dispatched to the SSF to man it. The operators are dispatch during a tornado warning and not during a tornado watch. Once a tornado warning has been declared, if the tornado hits the Oconee site, before the SSF can be manned the SSF would not be readily accessible and it would be potentially too late to man the SSF until the tornado has passed. Provide the justification for not manning the during a tornado watch.

Duke Energy Response

Duke Energy developed an event tree analysis to evaluate affects of tornado warning time. The ONS natural disaster procedure dispatches one licensed operator to the SSF upon acknowledgement of a tornado warning or as directed by the operations shift manager. The average response time is 3.6 minutes and the average travel time to SSF is 4 minutes. Based on National Weather Service (NWS) data, the average tornado warning time is 13 minutes; consequently, there is adequate margin to man the SSF prior to an actual tornado strike to the station.

RAI 2-40

To ensure licensing-basis clarity and component operability, Technical Specifications (TSs) need to properly address the tornado mitigation systems (e.g., protected service water/ standby shutdown facility, etc.) in a manner that is consistent with the Standard TS requirements that have been established for the functions that are being performed by these systems. For example, the minimum required mission time should be 7 days and the Completion Times should be limited to 72 hours in most cases for the SSF and the PSW including maintenance. Justify the existing limiting condition for operation (LCO) (e.g. the SSF can be maintained out of service for 45 days for all 3 units while maintenance is being performed on the system) times for the SSF in the current TSs and the proposed LCO for the PSW system. The proposed tornado mitigation strategy relies solely on the SSF and the repair of the PSW system to achieve and maintain hot standby and entry into cold shutdown following a design basis tornado.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-41

Portions of the reactor coolant system (RSC) and other high energy lines in the plants could possibly be damaged by tornado-generated missiles, resulting in a significant loss-of-coolant accident or high energy line break. Discuss how this vulnerability is being addressed in the new tornado mitigating strategies.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-42

Provide a list of any new analyses, codes, and/or models being utilized for the proposed tornado mitigating strategies that need to be integrated into the Updated Final Safety Analysis Report (UFSAR). Provide the justification for their use.

Duke Energy Response

The only new analysis, code, and/or model being utilized as part of the revised tornado mitigation strategy, is the NRC-approved **TORMIS** [**TOR**nado/**MIS**sile] methodology. The TORMIS methodology is used to establish compliance with the Standard Review Plan (SRP) guidance for tornado missile protection by demonstrating that the probability of significant damage, resulting from a missile strike to systems, structures or components (SSCs) required to prevent a radioactive release in excess of 10 CFR Part 100, is less than a mean value of 1E-06/year (assuming a loss of offsite power). For a multi-unit site, this criterion is applied to each unit individually, i.e., 1E-06/reactor-year for each unit.

For this evaluation, the prevention of a "release in excess of 10CFR100" is accomplished by utilizing the Standby Shutdown Facility (SSF) to establish safe shutdown conditions following a tornado strike and maintaining these conditions for up to 72-hours. The following safety functions are required for safe shutdown of all three Oconee units for up to 72-hours:

1) Secondary Side Decay Heat Removal (SSDHR),
2) Reactor Coolant Makeup (RCMU),
3) Reactor Coolant System (RCS) pressure boundary integrity.

With some exceptions, the SSF was designed to Regulatory Guide 1.76 (Rev. 0) tornado protection requirements. The following SSCs are not physically protected from the effects of tornado missiles and have been evaluated probabilistically using the TORMIS methodology:

- Certain electrical penetrations and vertical cable trays in the West Penetration Room (WPR) and Cask Decontamination Tank Rooms (CDTR),
- SSF ASW piping in the WPR/CDTR (all in guard pipe except for feedwater check valves and CCW-125),
- SSF cable trench at north end of SSF building,
- SSF double door (south end of SSF structure),
- SSF Diesel Service Water (DSW) Discharge Pipe (at west wall).

The TORMIS UFSAR description wording, as provided in the tornado LAR, will be added to [new] UFSAR Section 3.5.1.3.1 and titled, "TORMIS Methodology."

RAI 2-43

Provide the following information concerning the ability to achieve and maintain hot standby (TS MODE 3) following the worst case design basis tornado:

a. List of equipment that will be used
b. Initial plant conditions
c. Discuss any scenarios where with use of only the SSF to achieve and maintain hot standby would this cause any of the units to operate outside the normal

operating boundaries as described in the UFSAR (i.e. the RCS does not stay sub-cooled with a pressurizer steam bubble)

d. Provide the basis for the SSF initiation times and confirmation that human factors assessment has been completed that is consistent with the Nuclear Regulatory Commission (NRC) review standards and guidance to validate operator actions and times
e. Provide a list of all operator actions, a timeline for achieving hot standby and the systems that will be available and the amount time when other systems (PSW/HPI) will have to be repaired/restored to maintain the units in a safe and stable condition following a tornado.

Duke Energy Response

a) The tornado mitigation strategy utilizes the tornado-protected Standby Shutdown Facility (SSF) for secondary-side decay heat removal (SSDHR) and reactor coolant make-up (RCMU) following a loss of all normal and emergency systems which usually provide these safety functions. The SSF is designed to maintain the reactor(s) in a safe shutdown condition with average Reactor Coolant System (RCS) temperature ≥ 525^0 F (unless the initiating event causes the unit(s) to be driven to a lower temperature) for up to 72 hours while additional systems, structures, and components (SSCs) required to cooldown the units to cold shutdown, are restored.

The SSF is a seismic Category I structure housing subsystems that provide SSDHR and RCMU to all three units. The SSF Auxiliary Service Water (ASW) and RCMU subsystems are not designed to meet the single failure criterion but are designed such that failures in these systems do not cause failures or inadvertent operations in existing plant systems. The subsystems are manually initiated such that multiple actions must be performed to provide flow to existing safety systems. SSF functions are completely controlled from the SSF. Additional SSF design features and functions are given in UFSAR Section 9.6, "Standby Shutdown Facility."

b) Initial plant conditions are all 3 units operating at 100% of rated full power.

c) Analysis has been completed assuming the availability of systems, structures and components described in the revised UFSAR section 3.2.2 to demonstrate safe shutdown capability in the tornado design of ONS. The results of that analysis were provided in response to RAI 2-38.

d) In order to avoid damaging the RC Pump seals, SSF RC Make-Up System seal injection flow shall be established within 20 minutes after a loss of HPI seal injection flow and component cooling to the RC pump thermal barrier heat exchanger.

If both the Feedwater System and the Emergency Feedwater System are unable to provide flow to a unit's steam generators, the SSF ASW System shall provide flow to the steam generators within 14 minutes after a loss of RC pump seal cooling (HPI seal injection flow and component cooling flow to the RC pumps). This will ensure that RCS natural circulation flow is not interrupted due to excessive voiding in the RCS hot legs.

All Oconee Emergency and Abnormal procedure changes go through a three step Validation and Verification (V&V) process as defined in an Operations Management procedure. The first step is Written Correctness which is a check to ensure the procedure meets the Procedure Writer's Guide which has had a human factors review. The second step is Verification of Technical Accuracy. This step has two parts. One for Control Room based steps and one for field based steps. In each part, the procedure steps are checked to ensure they can be performed as written. The Technical Accuracy checklist includes checks for labels, adequate lighting, access to the component, gauge readability, etc. The third step of the V&V process is Validation. This step checks the flow of the procedure and team interaction. This step is also where task timing is evaluated and documents step timing if the change could negatively affect the time to perform time critical tasks.

Oconee Nuclear has a time critical action program defined in NSD-514 (Control of Time Critical Tasks). The Duke Energy program is consistent with the Pressurized Water Reactor Owners Group (PWROG) approved WCAP guidance document. The time critical tasks associated with SSF activation were time validated in the following manner. The tasks were broken down into three parts: 1-Recognition, 2-Main Control Room actions and travel to SSF, and 3-Starting of the specific SSF system. For each of the three parts, three different operators were timed and, although not required by NSD-514, the worst case time for each segment was taken and summed for the total time to complete the task. In each case, the operators were successful in establishing secondary side heat removal within 14 minutes and reactor coolant pump seal injection within 20 minutes. In accordance with NSD-514, these time critical actions are re-validated every five years. In addition to the time critical action program, all shift licensed operators and nuclear equipment operators are required to perform quarterly SSF proficiency drills as specified in OMP 2-23 (Operations Shift Manager Rules of Practice). Two of the four yearly drills can be performed on the SSF simulator at the Operations Training Center. Also, Operators are trained and evaluated using written exams and Job Performance Measures (JPM) for time critical tasks associated with the SSF as part of the Operator requalification program.

e) The actions taken by operators at the SSF to achieve and maintain hot standby are described in the applicable SSF emergency operating procedure. Provided below is a summary of those actions listed in order of performance:

1. Transfer the 600VAC SSF Motor Control Center power supply from the affected unit to the SSF.
2. Emergency start the SSF Diesel Generator.
3. Transfer the SSF 4160VAC power supply from the plant to the SSF Diesel Generator.
4. Energize the 600VAC SSF Load Centers.
5. Start the SSF Diesel Engine Service Water Pump.
6. Start the SSF ASW Pump.
7. Start the SSF RC Makeup Pump for the affected unit.
8. Isolate possible RCS leakage pathways for the affected unit.
9. Energize pressurizer heaters for the affected unit when the pressurizer water level is restored to 90 inches (or above).
10. Throttle SSF ASW flow to the affected unit's steam generators to maintain RCS pressure between 1950 psig and 2250 psig.

The timeline for completion of the above operator actions is to provide SSDHR and RCMU to the affected unit within 14 and 20 minutes, respectively. These SSF systems can maintain all three units in a safe shutdown condition for up to 72 hours while damage control measures are completed to restore any unavailable PSW System equipment needed to cooldown the units to approximately 250^0 F. This mission time is in accordance with the SSF current licensing basis.

RAI 2-44

Discuss how cold shutdown will be achieved following a design basis tornado including, a.) Define a time for achieving cold shutdown based on the worst case repairs that will need to be made following a tornado; b.) recognition of the strategy/systems to be used (e.g., residual heat removal (RHR), low-pressure service water, high-pressure injection (HPI), pressurizer heaters, atmospheric dump valves, instruments, etc.;.) identification of specific vulnerabilities that need to be addressed, equipment to be staged (e.g., cable); and, c.) a human factors assessment of effort/repair that is consistent with the NRC review standards/guidance.

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-45

Discuss the operator needed communications following a tornado for assuring that the necessary action times are not exceeded for establishing hot standby, secondary heat removal and reactor coolant pump (RCP) seal injection.

Duke Energy Response

If the loss of function occurs prior to leaving the main control room, the SSF could be activated without communication with the main control room. However, if an operator was staged in the SSF, communication with the main control room would be required to direct activation of SSF systems. The procedure directs establishing communication with the main control room. The procedure step provides the phone number to the SSF Control Room. Thus, the first option for communication is use of the plant telephone system. This system is designed with an uninterruptable power supply (UPS) and a diesel generator is provided to restore power to the Oconee Office Building which houses the computers for the telephone system. The next option, which is typical operator response when the phone communication is not available, is the use of plant radio channel 1. This radio channel has a power backed up repeater located on the 6th floor of the Auxiliary Building. Although an external antenna is mounted on the roof of the Turbine Building, the antenna infrastructure is available for communication with the SSF due to its close proximity and the fact that the SSF has a Bi-directional Amplifier system to enhance radio communication. A radio is staged in the SSF control room and radio communication is verified from the SSF to the main control room weekly.

Although not proceduralized, other communications options exist such as dedicated AT&T line in the main control room to Security Central Alarm Station (CAS) cell phones, Plant Radio Channel 6 which has a power backed repeater located in a different location, Plant Radio Channel 2 (line of sight only), and ITAC-4 radios.

RAI 2-46

Justify the proposed tornado mitigation strategy conclusion that equipment in the plant necessary to achieve and maintain hot standby is protected by adjacent structures and is not hardened to prevent a tornado missile strike [i.e., EPR].

Duke Energy Response

To be answered in a future RAI response submittal [refer to cover letter: Ref. 4].

RAI 2-47

Describe any dependencies related to the PSW and the high-pressure injection (HPI) pumps (e.g., cooling, lubrication) and justified as appropriate.

Duke Energy Response

The PSW System is designed to provide 10 gpm per unit to the HPI Pump Motor Bearing Coolers for all three units simultaneously. The cooling water flow supplied to each unit's HPI pumps is divided among the three HPI pumps. The flow rate to each HPI pump is balanced between the pumps. The design requirement for 10 gpm flow to each unit's HPI pump motors ensures that a minimum flow rate of 1.5 gpm is delivered to each HPI pump. Cooling water flow from PSW to the HPI pump motor bearing coolers is provided as an emergency backup to the Low Pressure Service Water (LPSW) System which normally provides this function as well as the High Pressure Service Water (HPSW) System which also provides a backup cooling source. A minimum flow rate of 1.5 gpm to each HPI pump motor bearing cooler has previously been established as an acceptance criterion for the LPSW and HPSW sources.

RAI 2-48

Describe the most limiting tornado-related main steam line ruptures and their impact to the overall tornado mitigation strategy, including any plant modifications deemed necessary to preclude adverse effects, the schedule for the modifications, and the compensatory measures in place until the modifications have been completed.

Duke Energy Response

The tornado mitigation strategy, as proposed in the license amendment request, relies upon the Standby Shutdown Facility (SSF) to establish and maintain hot standby conditions following tornado damage that render safe shutdown systems unavailable. The installation of MS Isolation Valves (MSIVs) just downstream of the MS relief valves significantly reduces the scope of MS piping requiring physical protection to support the proposed tornado mitigation strategy. The analysis for a loss of both main steam lines' pressure boundaries downstream of the MSIVs was provided in the response to RAI 2-38. Other changes include physical protection for the MSIVs and Atmospheric/Power Operated Atmospheric Dump Valves (ADVs/POADVs) branch lines to provide assurance of MS pressure boundary integrity to support SSF mitigation following a tornado event. The committed completion dates for the MSIV modifications are provided in a Duke

Energy letter to the NRC dated May 18, 2010. No compensatory measures are required to be implemented pending completion of the modifications. The modifications are considered necessary to support the tornado mitigation strategy as proposed in the license amendment request.

RAI 2-49

Describe the borated water storage tank (BWST) critical level and the basis for this level (e.g., cool down, RCS leakage, RCP seal leakage, high point vent loss, etc.). Also, describe how foreign material (e.g., insulation via missile impact, etc.) will be kept from entering the BWST above the critical protected areas.

Duke Energy Response

There is no "critical level" associated with the BWST during a tornado event. The lower portions of the BWST are vulnerable to Class 1 missiles. After physical modifications are implemented to protect these lower areas (commitment 4T), the Technical Specification (3.5.4.2) required minimum volume (350,000 gallons) will be preserved for event mitigation. Since the BWST will not be vulnerable after the modifications are complete, no openings will be created via Tornado missiles and thus the introduction of foreign material is not a concern.

RAI 2-50

Since the reactor head and/or high-point vents will be used for RCS inventory control, describe how using these vents will affect containment pressure and discuss the environmental effects on the SSF makeup pump.

Duke Energy Response

The reactor vessel head vents and the RCS high point vents are not credited for RCS inventory control while safe shutdown is being maintained from the SSF. The RCS high point vents and/or reactor vessel head vents would only be utilized, as necessary, for RCS inventory control once PSW and HPI has been restored. Once HPI has been restored, the SSF reactor coolant makeup pump would not be required.

RAI 2-51

Describe what instrumentation will be available following the worst case tornado. Describe all instrument failures (e.g., pressurizer level, etc.) and how they will be discerned in support of main control room and/or SSF control.

Duke Energy Response

The tornado mitigation strategy credits the SSF for establishing and maintaining safe shutdown during the initial 72 hours following the event. The instrumentation needed to support safe shutdown from the SSF control room is either physically protected or analyzed as a target in TORMIS as described in the license amendment request.

The available instrumentation with indications in the SSF control room includes the following for all three Oconee units:

RCS Loop A Pressure
RCS Loop B Pressure
RCS Loop A Hot Leg Temp
RCS Loop B Hot Leg Temp
RCS 'A1' Cold Leg Temp
RCS 'A2' Cold Leg Temp
RCS 'B1' Cold Leg Temp
RCS 'B2' Cold Leg Temp
Pressurizer Water Level
Pressurizer Pressure
'A' SG Water Level
'B' SG Water Level
SSF ASW Flow (to each unit)
SSF RCMP Suction Press
SSF RCMP Discharge Press
SSF RCMP Suction Temp
SSF RCMP Discharge Flow

RAI 2-52

Describe how a sufficient water supply for the SSF make-up pumps is provided and also describe how cooling of the spent fuel pools will be provided. Also describe how criticality concerns associated with the spent fuel pool are addressed following a tornado.

Duke Energy Response

An adequate supply of borated water is provided to the SSF RCMUPs from the Spent Fuel Pool (SFP) for each respective unit for the 72 hour mission time. This inventory is assured based upon minimum required SFP levels and maximum allowed SFP temperatures.

Cooling of the SFP is accomplished by ensuring adequate inventory is available for heat transfer via natural convective cooling. Though not required for the 72 hour mission time, inventory makeup is provided by adding lake water into the Spent Fuel Pools.

There are no criticality concerns associated with the SFP during SSF event mitigation. There is sufficient boron concentration in the SFPs to assure the minimum boron credit limit is not exceeded during drawdown and/or boil off and throughout subsequent refilling using lake water.

RAI 2-53

Discuss the how the RCP seals are protected following a tornado by the SSF.

Duke Energy Response

The SSF RCMU pump is capable of providing RCP seal cooling by means of seal injection within 20 minutes after a loss of High Pressure Injection pump (HPI) and Component Cooling (CC) system flow. Since seal injection flow is established within 20 minutes after a loss of HPI seal injection and CC system flow, seal degradation or failure will not occur and flow rates associated with a seal loss of cooling accident (LOCA) will not occur.

Attachment

Supporting Documentation

List of Tables and Figures

Table RAI 2-13, Review of Attachments to FRP-Strengthened Brick Walls (2 pages).

Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, (6 pages).

Figure RAI 2-26, UFSAR Mark-ups (10 pages).

Table
RAI 2-13, Review of Attachments to FRP-Strengthened Brick Walls
(2 pages)

RAI 2-13: Review of Attachments to FRP-Strengthened Brick Masonry Walls, Sheet 1 of 2.

Wall Location			I. E. B. 80-11 Wall Description			I. E. B. 80-11 Attachment Description and Resolution		8/26/2009 Review and Assessment		
Bldg / Rm	Elev (bottom of wall)	Column Lines	Wall Desig.	Att.	Calc	Description of Attachment	Resolution	QA Att.	Review *(H=horizontal, V=vertical)	Assessment
U1 AB / WPR	809'-3"	Line X, U1 RB to Col. 67a	1307	N	OSC-1419.002			N	Unistrut supports for lightweight cable tray (H+V)*. 1 ea. 3" thru-wall penetration.	Negligible load of tray has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 67a to 69a	1308	N	OSC-1419.002			N	2 ea. 1" flex. conduit to wall-mounted box (H). 2 ea. small thru-wall penetrations.	Negligible load of conduit has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 69a to 70a	1309	Y	OSC-1419.002	1" conduit for non-safety cable	Negligible load - ignored	N	1" conduit for non-safety cable (H).	Negligible load has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 70a to 71	1310	Y	OSC-1419.009	Att#1: 100# vert load places tension on wall; Door Frame in wall 1303. Interior has edge angles.	Att#1:Analyzed as OK; No load on wall due to door frame.	Y	Att#1: Fire Piping & Hose Reel supports; Door frame in wall 1303 at right angle to wall 1310; Lightweight angle support for 1/4" ss tubing (V); Inside stairwell: 1/2" conduit/tubing (H).	Att#1: Fire piping & hose reel support analyzed as OK; No load on wall due to door frame; Lightweight angle support has no effect on wall and is not affected by wall deflection.
	822'-6"	Line X, U1 RB to Col. 67a	1317F	N	OSC-1419.002			N	No attachments.	
		Line X, Col. 67a to 69a	1318F	N	OSC-1419.002			N	No attachments.	
		Line X, Col. 69a to 70a	1319F	N	OSC-1419.002			N	No attachments.	
		Line X, Col. 70a to 71	1320F	N	OSC-1419.002			N	No attachments. (Stairwell wall 1303 at right angle to 1320F)	
U2 AB / WPR	809'-3"	Line X, Col. 75 to 75a	1312	Y	OSC-1419.010	Att#1 + Att#2: Vert loads place tension on wall; Door Frame in wall 1306. No interior edge angles.	Att#1 + Att#2: Overburden effects of brick above offset flexural tension stress, wall not in tension; No load due to door frame.	Y	Att#1 + Att#2: Fire Pipe attached to wall; 2 ea. 1" conduits for lighting in stairwell landing; Door frame in wall 1306 at right angle to wall 1312.	Att#1 + Att#2: Overburden effects of brick above offset flexural tension stress; Negligible load of conduits has no effect on wall nor is attachment affected by wall deflection. No load on wall due to door frame.
		Line X, Col. 75a to 76a	1313	Y	OSC-1419.002	1" conduit for non-safety cable	Negligible load - ignored	N	2 ea. lightweight conduits; 1" conduit to outside; lightweight flex. conduit in lightweight tray (horiz. & vert.).	Negligible loads of conduit have no effect on wall nor are attachments affected by wall deflection.
		Line X, Col. 76a to 78a	1314	N	OSC-1419.002			N	2 ea. Lightweight flex. Conduits & connection box.	Negligible load of conduit has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 78a to U2 RB	1315/1321F	N/N	OSC-1419.002			N/N	1315: 2 ea. 1" ground wire. 1321F: lightweight tray - end attached from above, not to wall.	Negligible loads of cable or tray have no effect on wall nor are attachments affected by wall deflection.
	822'-6"	Line X, Col. 75 to 75a	1324F	N	OSC-1419.002			N	Lightweight tray (H+V) outside stairwell. No attachments inside stairwell.	Negligible load of tray has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 75a to 76a	1323F	N	OSC-1419.002			N	Lightweight tray (H+V).	Negligible load of tray has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 76a to 78a	1322F	N	OSC-1419.002			N	Lightweight tray (H).	Negligible load of tray has no effect on wall nor is attachment affected by wall deflection.
		Line 75, Col. U to V	1335F	Y	OSC-1419.012	Att#1: No loads under normal loading conditions.	No load under normal loading conditions.	Y	Att#1: L3x3 w/ 2 bolts supports cable tray.	Att#1: No loads under normal loading conditions.
		Line 75, Col. V to W	1336F	N	OSC-1419.002			Y	Att#1: L3x3 w/ 2 bolts supports cable tray; Small lightweight tray carrying tubing.	Att#1: No loads under normal loading conditions; Lightweight tray imposes no load on wall and is not affected by wall deflection.

RAI 2-13: Review of Attachments to FRP-Strengthened Brick Masonry Walls, Sheet 2 of 2.

Wall Location			I. E. B. 80-11 Wall Description			I. E. B. 80-11 Attachment Description and Resolution		8/26/2009 Review and Assessment		
U3 AB / WPR	809'-3"	Line X, Col. 90 to 90a	721	Y	OSC-1430.002	Door Frame in wall 719.	No load from door frame.	Y	Door frame in wall 719 at right angle to wall 721; 1" conduit for non-safety cable; telephone cable.	No load on wall due to door frame; Negligible loads of conduit on have no effect on wall nor are attachments affected by wall deflection.
		Line X, Col. 90a to 91a	722	Y	OSC-1430.005	Att#1: 105# vert. load places tension on wall; 1" conduit for non-safety cable.	Att#1: Analyzed as OK; Negligible load - ignored	Y	Att#1: Fire piping & hose reel attached to wall; 1" conduit for non-safety cable; telephone cable.	Att#1: Fire piping & hose reel support analyzed as OK; Negligible load of conduit has no effect on wall nor is attachment affected by wall deflection.
		Line X, Col. 91a to 93a	723	N	OSC-1430.002			N	No attachments.	
		Line X, Col. 93a to U3 RB	724	Y	OSC-1430.006	3 angles, but no edge angles.	Angles impose no load to wall.	N	Platform support notched into wall.	Angles impose no load on wall and are not affected by wall deflection.
		Line 90, Col. U to V	716	N	OSC-1430.002			N	Unistrut supports for lightweight cable tray (V); Flex cable routed to junction box on wall; lighting cable.	Negligible loads of tray have no effect on wall nor are attachments affected by wall deflection.
		Line 90, Col. V to W	717	N	OSC-1430.002			N	Unistrut supports for lightweight cable tray (H+V); Flex cable routed to junction box on wall (H); lighting cable (H).	Negligible loads of cable have no effect on wall nor are attachments affected by wall deflection.
		Line 90, Col. W to X	718	N	OSC-1430.002			N	Lightweight tray (H).	Negligible load of tray has no effect on wall nor is attachment affected by wall deflection.
	822'-6"	Line X, Col. 90 to 90a	728F	N	OSC-1430.002			N	No attachments.	
		Line X, Col. 90a to 91a	729F	N	OSC-1430.002			N	No attachments.	
		Line X, Col. 91a to 93a	730F	N	OSC-1430.002			N	No attachments.	
		Line X, Col. 93a to U3 RB	731F	N	OSC-1430.002			N	Corner of platform notched into wall.	Platform support has no effect on wall nor is it affected by wall deflection.
		Line 90, Col. U to V	725F	Y	OSC-1430.007	Att#1: Hanger w/no load; Att#2: Hanger w/300# vert. load.	Hangers impose no load to wall.	Y	Att#1: Shim plate against brick wall supporting lightweight tray from wall below; Att#2: Cable tray hanger support (V); Lightweight tray (H+V); ground cable (H);	Att#1 + Att#2 impose no loads on wall.
		Line 90, Col. V to W	726F	Y	OSC-1430.008	Att#1; Att#2; 1 1/2" pipe field routed.	Attachments and pipe impose no load to wall under normal loading conditions per 79-14 Field Survey.	Y	Att#1 + Att#2: Air valve station (1 1/2" pipe) mounted to brick at top & middle, supported on floor beam at bottom (V); 2 ea. Lightweight tray (H+V).	Att#1 + Att#2: Pipe attachments impose no load to wall under normal loading conditions per 79-14 Field Survey; Lightweight trays have no effect on wall nor are they affected by wall deflection.
		Line 90, Col. W to X	727F	N	OSC-1430.002			N	No attachments.	

Figure
RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3
(6 pages)

Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, Sheet 1 of 6.
Unit 1 Test Panel designated as U1-AC (Highlighted in Yellow).

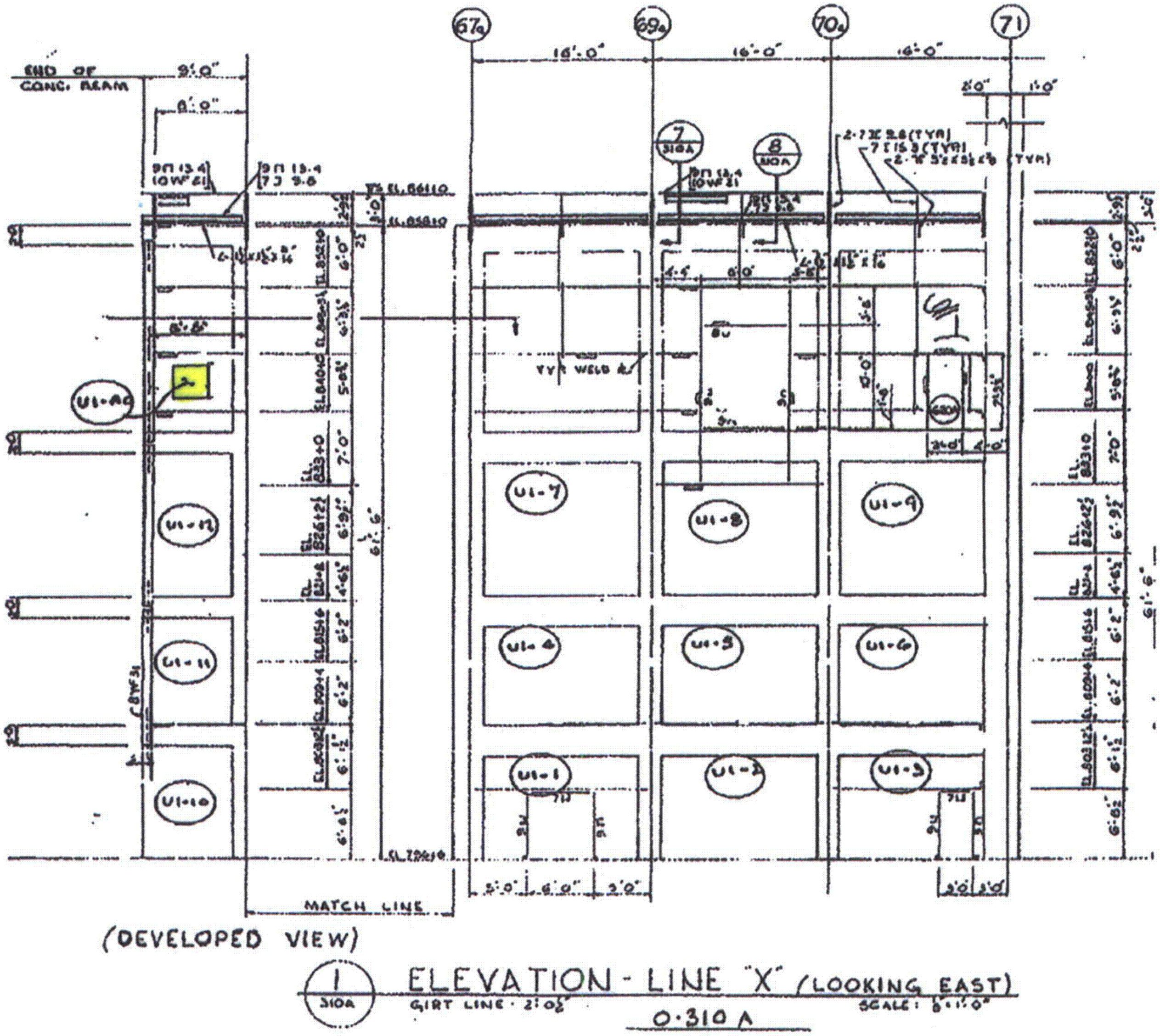
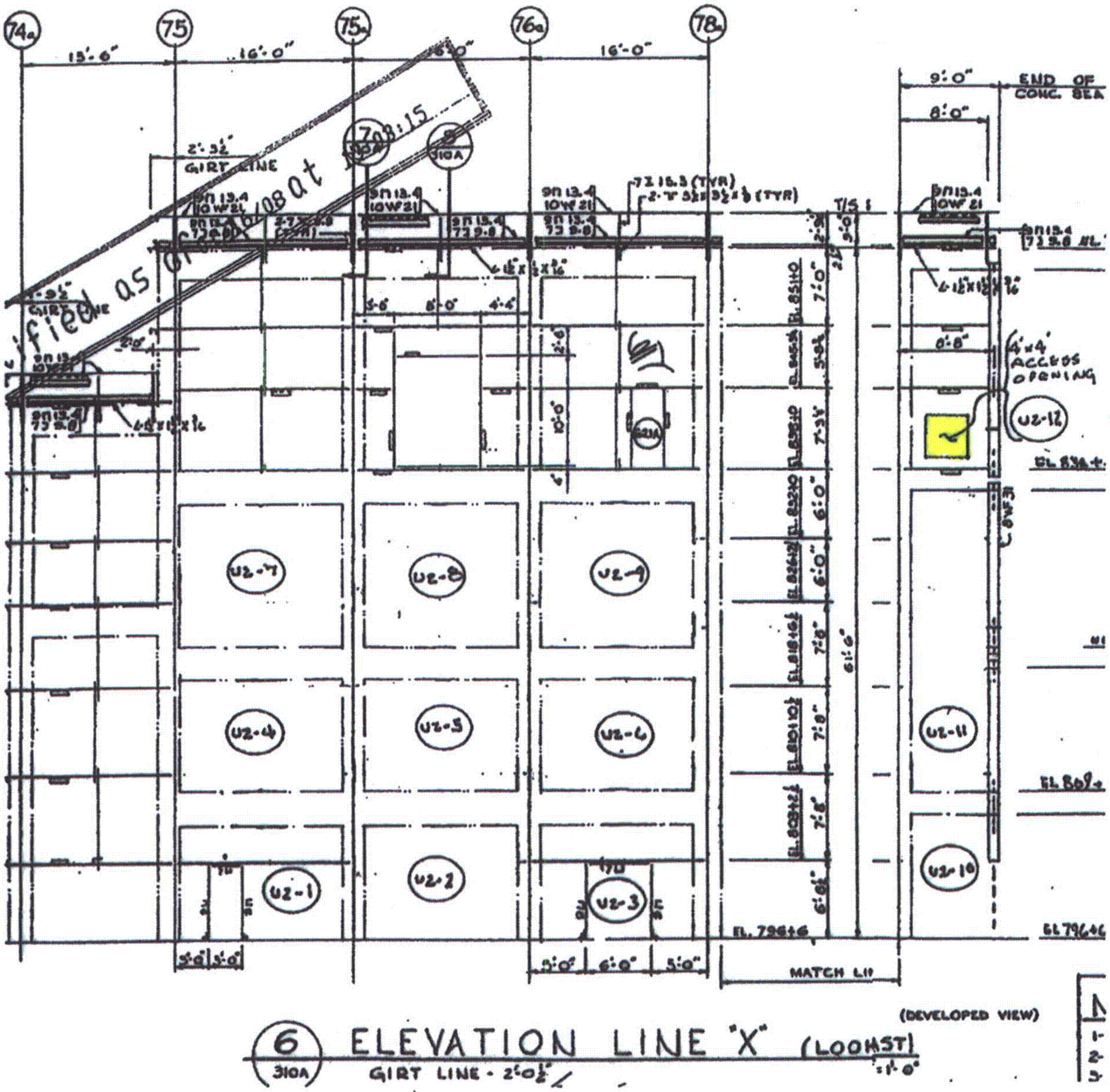


Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, Sheet 2 of 6.
Unit 2 Test Panel is Wall Element designated U2-12 (Highlighted in Yellow).



(U#-X) – Panel Identifier Symbol
U# = Unit Number
-X = Specific Panel Number

(U2-4) = 4th Panel on Unit 2

Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, Sheet 3 of 6.
No Test Panel this section. Unit 2 Wall Elements shown for information only.

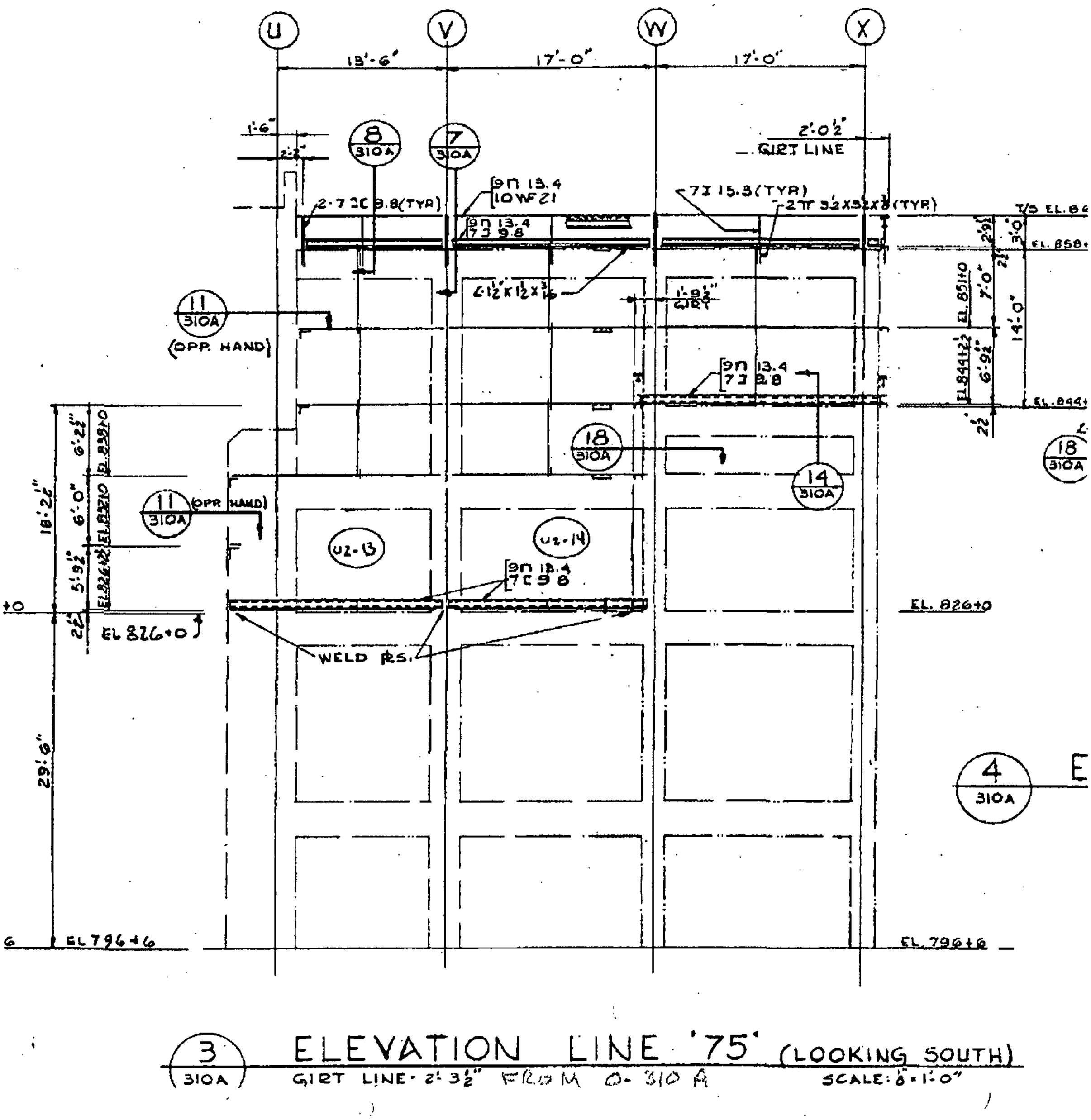


Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, Sheet 4 of 6. Unit 2 Test Panel is Wall Element designated U2-15 (Highlighted in Yellow).

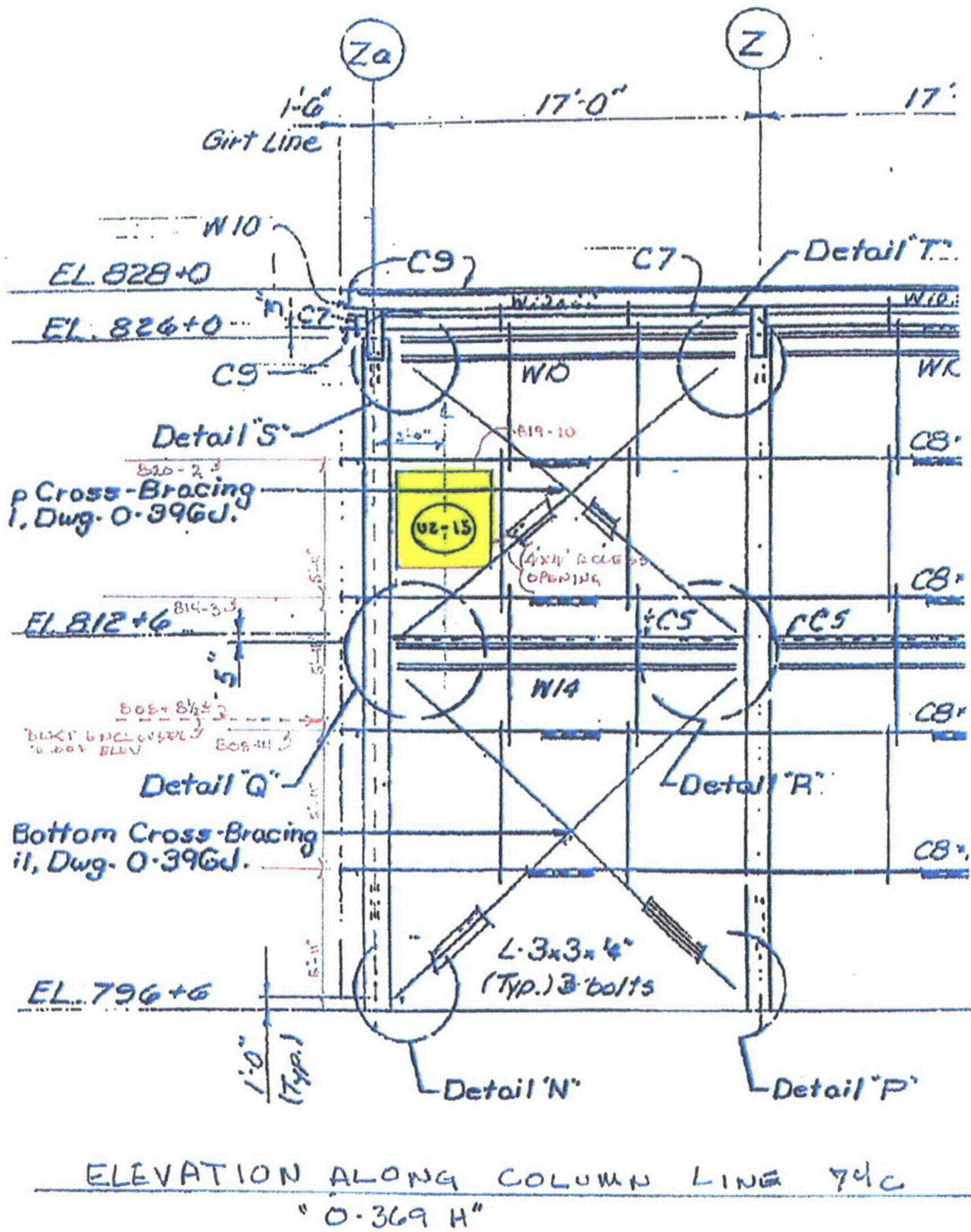


Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, Sheet 5 of 6.
Unit 3 Test Panel is Wall Element designated U3-AC (Highlighted in Yellow).

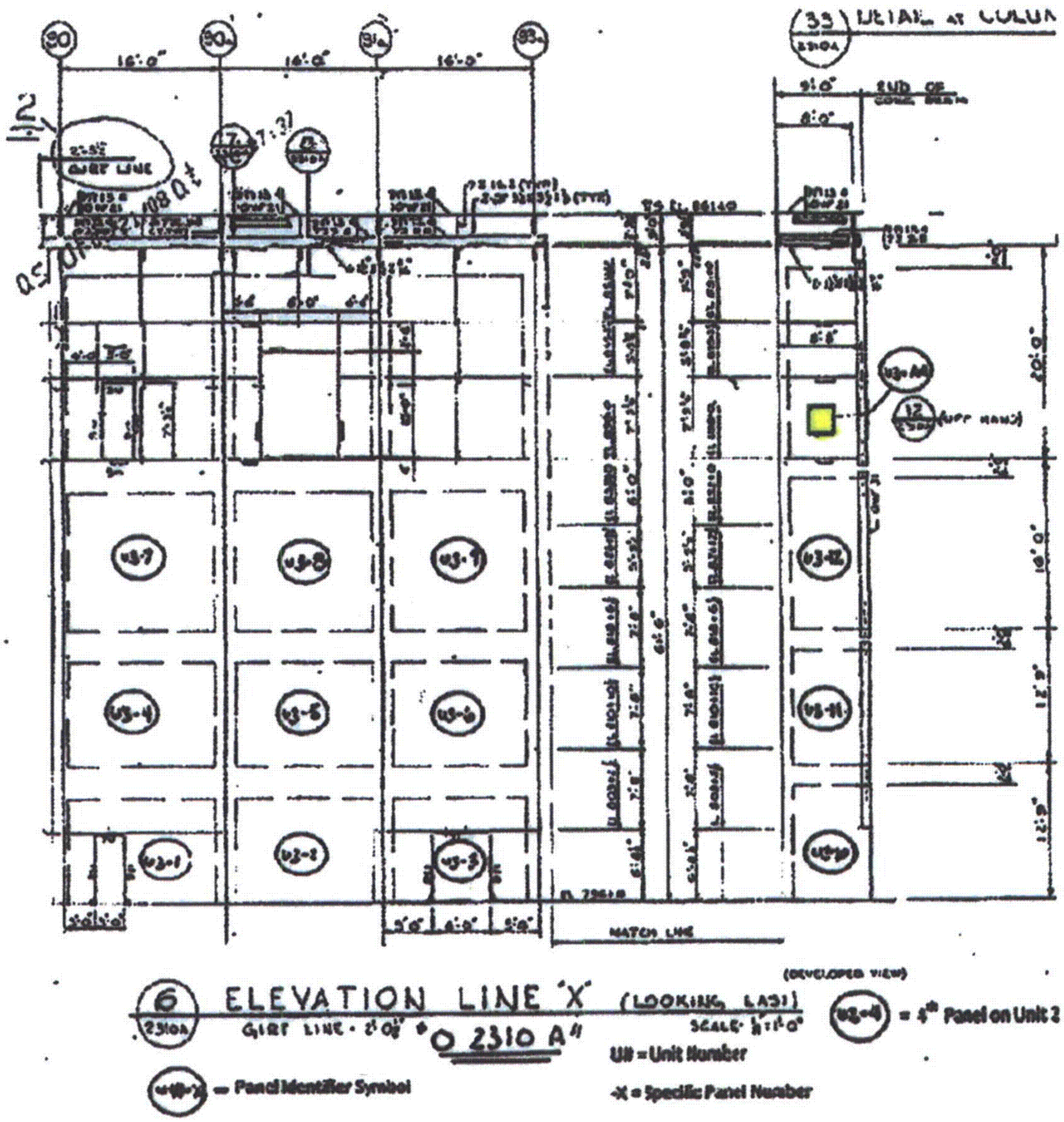


Figure RAI 2-15, Location of FRP Test Panels for Units 1, 2, and 3, Sheet 6 of 6.
No Test Panel this section. Unit 3 Wall Elements shown for information only.

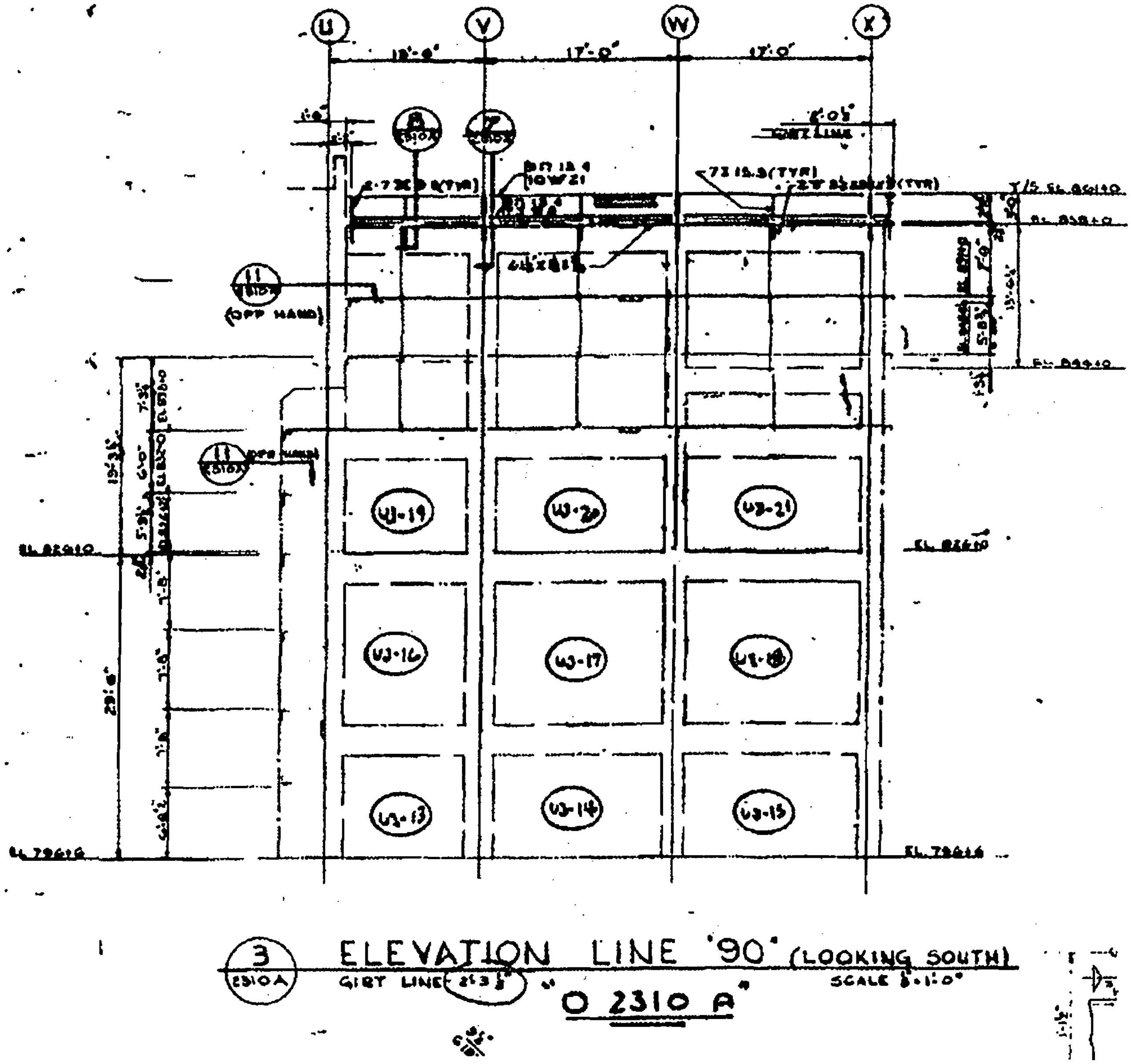


Figure
RAI 2-26, UFSAR Mark-ups
(10 pages)

Figure RAI 2-26, UFSAR Mark-ups, Sheet 1 of 10.
Note: Text highlighted and underlined in RED indicates text deleted from or not included in LAR 2009-05.

Attachment 1 - UFSAR - Mark Ups
License Amendment Request No. 2006-006
June 1, 2006
Page 1

UFSAR Chapter 3 Oconee Nuclear Station

{UFSAR Section 3.8.4.5 and Section 3.8.4.6 not shown}

3.8.4.7 Concrete Masonry Walls

The masonry walls are in-fill panels serving as partitions with some walls having pressure, fire and radiation barrier applications. The walls are single or multiple wythe and ~~multiwythe,~~constructed of hollow or grouted concrete blocks or solid concrete blocks or bricks. All masonry walls are non-structural and constructed on a structural support system.

Pursuant to I.E. Bulletin 80-11, a safety re-evaluation of all masonry walls was undertaken by Duke Power Company. As a result of this reevaluation effort certain masonry walls were modified to meet minimum factors of safety.

Certain masonry walls that are part of the Units 1, 2, and 3 Auxiliary Buildings were evaluated for tornado-induced differential pressure and tornado wind loadings. The walls were subsequently strengthened to meet these loads using a fiber-reinforced polymer (FRP) system.

3.8.4.7.1 Applicable Codes and Standards

The criteria used for the re-evaluation of masonry walls pursuant to I. E. Bulletin 80-11 are ~~is~~ contained in Attachment 4 of Reference 14. These ~~This~~ criteria identify ~~uses~~ the American Concrete Institute "Building Code Requirements for Concrete Masonry Structures," ACI 531-79, as the governing code with supplemental allowables specified for cases not directly addressed in the code.

The criteria used for the re-evaluation of masonry walls to resist tornado-induced loadings are contained in Enclosure 3 of Reference 34 as approved by the NRC in Reference 36. These criteria specify ACI 531-79 and International Code Council *Interim Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) Composite Systems*, ICC AC125 (Reference 35), as the governing codes for this evaluation.

3.8.4.7.2 Loads and Load Combinations

The design loadings for the masonry walls at Oconee are those specified in portions of Section 3.8.4. The only thermal effects which a masonry wall experiences are those pertinent to normal operation, and these are not considered a significant design consideration.

In addition, the design differential pressure and external wind force for masonry walls evaluated for tornado-induced loadings are contained in Section 3.3.2.1. The load combinations for tornado-induced loadings are contained in NUREG-0800, *Standard Review Plan*, Section 3.8.4.

3.8.4.7.3 Upgrade and Modification of Masonry Walls

A program of repairs was performed on selected masonry walls pursuant to I. E. Bulletin 80-11. The walls included in this program were not found to be unsafe in their original configuration; however, an added margin of safety was desired for
~~3.8 - 60 (31 DEC 2004)~~

~~Oconee Nuclear Station UFSAR Chapter 3~~
-these walls. The repairs provide increased factors of safety by either upgrading the walls to meet the allowable stresses set forth in the re-evaluation criteria or by shielding the safety related equipment located in proximity of the walls from damage, assuming the masonry walls

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Note: Text highlighted and underlined in RED indicates text deleted from or not included in LAR 2009-05.

were to collapse. References 12 through 24 pertain to I.E. Bulletin 80-11.

Certain masonry walls that are part of the Units 1, 2, and 3 Auxiliary Buildings were modified to resist tornado-induced differential pressure and tornado wind loadings. These walls were strengthened using a fiber-reinforced polymer (FRP) system.

3.8.5 Nonclass 1 Structures

The Turbine Building, the condenser circulating water structures, the Essential Siphon Vacuum System Intake Dike Trench, the Essential Siphon Vacuum Cable Trench, the Essential Siphon Vacuum Building, and the Keowee structures as listed in Section 3.2.1.1.2 are Class 2 structures.

Class 3 structures include all structures not included in Class 1 and 2.

3.8.5.1 Description of the Structures

1. Turbine Building

   The building was constructed of reinforced concrete below grade consisting of substructure walls and a mat foundation. Above grade, the building consists of structural steel with metal siding.

2. Keowee Structures

   The Keowee Structures considered are Powerhouse, Power and Penstock Tunnels, Spillway, Service Bay Substructure, Breaker Vault, and Intake Structure.

3. Dams and Dikes

   The Keowee Dam, the Little River Dam and Dikes, and the Oconee Intake Canal Dike impound the waters of Lake Keowee to provide the source of flowing water for the Keowee hydroelectric power plant.

4. Oconee Intake Structure

   The intake structure supports the CCW pumps, intake screens, and inlets of the CCW pipes.

5. Oconee Intake Underwater Weir

   The underwater weir retains an emergency water supply in the event that the waters of Lake Keowee are released by the failure of a dam or dike.

6. CCW Intake Piping

   The CCW Intake Piping conveys water from the CCW pumps on the intake structure to the condenser, supplies water to the LPSW Pumps, and serves as the reservior for the Auxiliary Service Water System.

{UFSAR Section 3.8.5.1(7) through Section 3.8.6 not shown}

Figure RAI 2-26, UFSAR Mark-ups, Sheet 3 of 10.
Note: Text highlighted and underlined in RED indicates text deleted from or not included in LAR 2009-05.

3.8.7 References

1. Eringen, A. C., and Naghdi, A. K., "State of Stress in a Circular Cylindrical Shell with a Circular Hole."

2. Levy, Samuel, McPherson, A. E., and Smith, F. C., "Reinforcement of a Small Circular Hole in a Plane Sheet Under Tension," *Journal of Applied Mechanics*," June 1948.

3. Wichman, K. R., Hopper, A. G., and Mershon, J. L., "Local Stress in Spherical and Cylindrical Shells Due to External Loadings," *Welding Research Council Bulletin No. 107*, August 1965.

4. HTGR and Laboratory Staff, Prestressed Concrete Reactor Vessel, Model 1, *GA7097*.

5. Advance HTGR Staff, Prestressed Concrete Reactor Vessel, Model 2, *GA7150*.

6. Hardingham, R. P., Parker, J. V., and Spruce, T. W., *Liner Design and Development for the Oldbury Vessels*, London Conference on Prestressed Concrete Pressure Vessels, Group J, Paper 56.

7. Amirikian, A., Design of Protective Structures, Bureau of Yards and Docks, Department of the Navy, *NAVDOCKS P-51*, 1950.

8. AEC Publication TID-7024, *Nuclear Reactors and Earthquakes*.

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~~Oconee Nuclear Station UFSAR Chapter 3~~

9. Housner, G. W., *Design of Nuclear Power Reactors Against Earthquakes*, Proceedings of the Second World Conference on Earthquake Engineering, Volume 1, Japan 1960, Page 133.

10. Housner, G. W., *Behavior of Structures During Earthquakes*, Journal of the Engineering Mechanics Division, Proceedings of the American Society of Civil Engineers, October 1959, Page 109.

11. Task Committee on Wind Forces, *Wind Forces on Structures*, ASCE Paper No 3269.

12. IE Bulletin 80-11, "Masonry Wall Design," NRC, May 8, 1980.

13. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC), July 7, 1980.

14. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC), November 4, 1980.

15. A. C. Thies (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC), May 22, 1981.

16. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to H. R., Denton (NRC),

Figure RAI 2-26, UFSAR Mark-ups, Sheet 4 of 10.
Note: Text highlighted and underlined in RED indicates text deleted from or not included in LAR 2009-05.

July 13, 1981.

17. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC) September 30, 1981.

18. W. O. Parker, Jr. (Duke Power Company) Letter with attachment to J. F. Stolz (NRC), December 29, 1981.

19. W. O. Parker, Jr. (Duke Power Company), Letter with attachments to H. R. Denton (NRC), May 18, 1982.

20. W. O. Parker, Jr. (Duke Power Company), Letter with attachments to H. R. Denton (NRC), June 15, 1982.

21. Standard Review Plan, Section 3.8.4, Appendix A, "Interim Criteria for Safety-Related Masonry Wall Evaluation," NRC, July 1981.

22. Uniform Building Code, International Conference of Building Officials, 1979.

23. ACI 531-79 and Commentary ACI 531R-79, "Building Code Requirements for Concrete Masonry Structures," American Concrete Institute, 1979.

24. Letter with attachment from John F. Stolz (NRC) to H. B. Tucker (Duke) dated March 14, 1985.

    Subject: Safety Evaluation Report on Masonry Wall Design

25. NCIG-01, Visual Weld Acceptance Criteria

26. PSAR, Supplement No. 4, Answer to Question 11.2, May 25, 1967.

27. PSAR, Supplement No. 4, Answer to Question 11.4, May 25, 1967.

28. PSAR, Supplement No. 4, Answer to Question 12.2, May 25, 1967.

29. PSAR, Supplement No. 5-11, June 16, 1967.

30. PSAR, Supplement No. 6-1, March 26, 1969.

31. M. S. Tuckman (Duke) letter dated November 11, 1998 to Document Control Desk (NRC), "Response to Generic Letter 98-04: Potential Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment." Oconee Nuclear Station, Units 1, 2, and 3, Docket Nos. 50-269, -270, and -287.

~~(31-DEC-2004) 3.8-69~~

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Note: Text highlighted and underlined in RED indicates text deleted from or not included in LAR 2009-05.

Attachment 1 - UFSAR - Mark Ups
License Amendment Request No. 2006-006
June 1, 2006 Page 5

UFSAR Chapter 3 Oconee Nuclear Station

32. *Application for Renewed Operating Licenses for Oconee Nuclear Station, Units 1, 2, and 3*, submitted by M. S. Tuckman (Duke) letter dated July 6, 1998 to Document Control Desk (NRC), Docket Nos. 50-269, -270, and -287.

33. NUREG-1723, *Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3*, Docket Nos. 50-269, 50-270, and 50-287.

34. Duke Fiber Reinforced Polymer License Amendment Request dated June 1, 2006.

35. *Interim Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) Composite Systems*, International Code Council (ICC) AC125, June 2003.

36. NRC Safety Evaluation for Duke's June 1, 2006 FRP License Amendment Request dated December xx, 2006.

THIS IS THE LAST PAGE OF THE TEXT SECTION 3.8.

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Note: Text highlighted in YELLOW indicates text added to LAR 2006-006.

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UFSAR Chapter 3 **Oconee Nuclear Station (31 Dec 2007)**

3.8.4.7 Concrete Masonry Walls

The masonry walls are in-fill panels serving as partitions with some walls having pressure, fire and radiation barrier applications. The walls are single or ~~multiwythe,~~ multiple wythe and constructed of hollow or grouted concrete blocks or solid concrete blocks or bricks. All masonry walls are non-structural and constructed on a structural support system.

Existing text restated as stand-alone paragraph:
Pursuant to I.E. Bulletin 80-11, a safety re-evaluation of all masonry walls was undertaken by Duke Power Company. As a result of this reevaluation effort, certain masonry walls were modified to meet minimum factors of safety.

Certain masonry walls that are part of the Units 1, 2, and 3 Auxiliary Buildings were evaluated for tornado-induced differential pressure loading. The walls were subsequently strengthened to meet these loads using a fiber-reinforced polymer (FRP) system. Walls strengthened with FRP are not to be credited for resisting tornado loading until the Safety Evaluation is issued by the NRC.

3.8.4.7.1 Applicable Codes and Standards

The criteria used for the re-evaluation of masonry walls pursuant to I.E. Bulletin 80-11 ~~is~~ are contained in Attachment 4 of Reference 14. These ~~This~~ criteria identify ~~uses~~ the American Concrete Institute "Building Code Requirements for Concrete Masonry Structures," ACI 531-79, as the governing code with supplemental allowables specified for cases not directly addressed in the code.

The criteria used for the re-evaluation of masonry walls to resist tornado-induced loadings are contained in References 35, 36, 37, 38, 40 and 41. These criteria specify ACI 531-79 as the governing code for this evaluation with supplemental working stress allowables specified for the fiber-reinforced polymer (FRP) system.

3.8.4.7.2 Loads and Load Combinations

The design loadings for the masonry walls at Oconee are those specified in portions of Section 3.8.4. The only thermal effects which a masonry wall experiences are those pertinent to normal operation, and these are not considered a significant design consideration.

In addition, the design differential pressure for masonry walls evaluated for tornado-induced loadings is contained in Reference 39. The load combinations for tornado-induced loadings are contained in NUREG-0800, *Standard Review Plan*, Section 3.8.4, "Other Seismic Category I Structures," Rev.1 – July 1981.

3.8.4.7.3 Upgrade and Modification of Masonry Walls

A program of repairs was performed on selected masonry walls pursuant to I.E. Bulletin 80-11. The walls included in this program were not found to be unsafe in their original configuration; however, an added margin of safety was desired for these walls. The repairs provide increased

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Note: Text highlighted in YELLOW indicates text added to LAR 2006-006.

factors of safety by either upgrading the walls to meet the allowable stresses set forth in the re-evaluation criteria or by shielding the safety related equipment located in proximity of the walls from damage, assuming the masonry walls were to collapse. References 12 through 24 pertain to I.E. Bulletin 80-11.

Certain masonry walls that are part of the Units 1, 2, and 3 Auxiliary Buildings were modified to resist tornado-induced differential pressure loading. These walls were strengthened using a fiber-reinforced polymer (FRP) system. Walls strengthened with FRP are not to be credited for resisting tornado loading until the Safety Evaluation is issued by the NRC.

3.8.7 References

1. Eringen, A. C., and Naghdi, A. K., "State of Stress in a Circular Cylindrical Shell with a Circular Hole."
2. Levy, Samuel, McPherson, A. E., and Smith, F. C., "Reinforcement of a Small Circular Hole in a Plane Sheet Under Tension," *Journal of Applied Mechanics*," June 1948.
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4. HTGR and Laboratory Staff, Prestressed Concrete Reactor Vessel, Model 1, *GA7097*.
5. Advance HTGR Staff, Prestressed Concrete Reactor Vessel, Model 2, *GA7150*.
6. Hardingham, R. P., Parker, J. V., and Spruce, T. W., *Liner Design and Development for the Oldbury Vessels*, London Conference on Prestressed Concrete Pressure Vessels, Group J, Paper 56.
7. Amirikian, A., Design of Protective Structures, Bureau of Yards and Docks, Department of the Navy, *NAVDOCKS P-51*, 1950.
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11. Task Committee on Wind Forces, *Wind Forces on Structures*, ASCE Paper No 3269.
12. IE Bulletin 80-11, "Masonry Wall Design," NRC, May 8, 1980.
13. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC), July 7, 1980.

Figure RAI 2-26, UFSAR Mark-ups, Sheet 8 of 10.
Note: Text highlighted in YELLOW indicates text added to LAR 2006-006.

14. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC), November 4, 1980.

15. A. C. Thies (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC), May 22, 1981.

16. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to H. R., Denton (NRC), July 13, 1981.

17. W. O. Parker, Jr. (Duke Power Company), Letter with attachment to J. P. O'Reilly (NRC) September 30, 1981.

18. W. O. Parker, Jr. (Duke Power Company) Letter with attachment to J. F. Stolz (NRC), December 29, 1981.

19. W. O. Parker, Jr. (Duke Power Company), Letter with attachments to H. R. Denton (NRC), May 18, 1982.

20. W. O. Parker, Jr. (Duke Power Company), Letter with attachments to H. R. Denton (NRC), June 15, 1982.

21. Standard Review Plan, Section 3.8.4, Appendix A, "Interim Criteria for Safety-Related Masonry Wall Evaluation," NRC, July 1981.

22. Uniform Building Code, International Conference of Building Officials, 1979.

23. ACI 531-79 and Commentary ACI 531R-79, "Building Code Requirements for Concrete Masonry Structures," American Concrete Institute, 1979.

24. Letter with attachment from John F. Stolz (NRC) to H. B. Tucker (Duke) dated March 14, 1985.

    Subject: Safety Evaluation Report on Masonry Wall Design

25. NCIG-01, Visual Weld Acceptance Criteria

26. PSAR, Supplement No. 4, Answer to Question 11.2, May 25, 1967.

27. PSAR, Supplement No. 4, Answer to Question 11.4, May 25, 1967.

28. PSAR, Supplement No. 4, Answer to Question 12.2, May 25, 1967.

29. PSAR, Supplement No. 5-11, June 16, 1967.

30. PSAR, Supplement No. 6-1, March 26, 1969.

31. M. S. Tuckman (Duke) letter dated November 11, 1998 to Document Control Desk (NRC), "Response to Generic Letter 98-04: Potential Degradation of the Emergency Core Cooling

Figure RAI 2-26, UFSAR Mark-ups, Sheet 9 of 10.
Note: Text highlighted in YELLOW indicates text added to LAR 2006-006.

System and the Containment Spray System After a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment," Oconee Nuclear Station, Units 1, 2, and 3, Docket Nos. 50-269, -270, and -287.

32. *Application for Renewed Operating Licenses for Oconee Nuclear Station, Units 1, 2, and 3*, submitted by M. S. Tuckman (Duke) letter dated July 6, 1998 to Document Control Desk (NRC), Docket Nos. 50-269, -270, and -287.

33. NUREG-1723, *Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3*, Docket Nos. 50-269, 50-270, and 50-287.

34. License Amendment No. 338, 339, and 339 (date of issuance - June 1, 2004); Adoption of Alternate Source Term.

35. Letter from Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC to U. S. Nuclear Regulatory Commission, "Oconee Nuclear Docket Numbers 50-269, 50-270, and 50-287 – License Amendment Request to Incorporate Use of Fiber-Reinforced Polymer System to Strengthen Existing Auxiliary Building Masonry Walls for Tornado Loadings – License Amendment Request No. 2006-006," dated June 1, 2006.

36. Letter from Duke Power Company, LLC, d/b/a Duke Energy Carolinas, LLC, to U. S. Nuclear Regulatory Commission, "Oconee Nuclear Docket Numbers 50-269, 50-270, and 50-287 – Duke Response to NRC Request for Additional Information in regard to License Amendment Request to Incorporate Use of Fiber-Reinforced Polymer System to Strengthen Existing Auxiliary Building Masonry Walls for Tornado Loadings – License Amendment Request No. 2006-006," dated March 14, 2007.

37. Letter from Duke Power Company, LLC, d/b/a Duke Energy Carolinas, LLC, to U. S. Nuclear Regulatory Commission, "Oconee Nuclear Site, Units 1, 2, and 3, Docket Numbers 50-269, 50-270, and 50-287, Duke Response to NRC Request for Additional Information in regard to License Amendment Request to Incorporate Use of Fiber-Reinforced Polymer System to Strengthen Existing Auxiliary Building Masonry Walls for Tornado Loadings, License Amendment Request No. 2006-006," dated October 8, 2007.

38. Letter from Duke Power Company, LLC, d/b/a Duke Energy Carolinas, LLC, to U. S. Nuclear Regulatory Commission, "Oconee Nuclear Site, Units 1, 2, and 3, Docket Numbers 50-269, 50-270, and 50-287, Duke Response to NRC Request for Additional Information in regard to License Amendment Request to Incorporate Use of Fiber-Reinforced Polymer System to Strengthen Existing Auxiliary Building Masonry Walls for Tornado Loadings, License Amendment Request No. 2006-006," dated October 30, 2007.

39. Regulatory Guide 1.76, *Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants*, Revision 1.

40. Letter from U. S. Nuclear Regulatory Commission to Duke Power Company, LLC, "Oconee Nuclear Station, Units 1, 2, and 3, Issuance of Amendments Regarding Use of Fiber-Reinforced Polymer (FRP) (TAC Nos. MD2129, MD2130, and MD2131)" dated February 21, 2008.

Figure RAI 2-26, UFSAR Mark-ups, Sheet 10 of 10.
Note: Text highlighted in YELLOW indicates text added to LAR 2006-006.

41. Letter from U. S. Nuclear Regulatory Commission to Duke Power Company, LLC, "Correction to Amendment Nos. 360, 362, and 361 for Oconee Nuclear Station, Units 1, 2, and 3, (TAC Nos. MD2129, MD2130, and MD2131)" dated March 26, 2008.