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JUN 12 1991

U.S. Nuclear Regulatory Commission
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Gentlemen:

In the Matter of)	Docket Nos. 50-259
Tennessee Valley Authority)	50-260
		50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - CORRECTIVE ACTION PLAN AND DESIGN
CRITERIA FOR LOWER DRYWELL STEEL PLATFORMS AND MISCELLANEOUS STEEL

- Reference:
1. NRC letter, dated July 26, 1988, Interim Operability Criteria for Seismic Design Program for the Browns Ferry Nuclear Plant, Unit 2
 2. NRC letter, dated January 23, 1991, NUREG-1232, Volume 3, Supplement 2, Safety Evaluation Report on Tennessee Valley Authority: Browns Ferry Nuclear Performance Plan
 3. TVA letter, dated January 9, 1991, Plans for the Return to Service of BFN Units 1 and 3

References 1 and 2 document two post-Unit 2 restart TVA/NRC action items: 1) To address the adequacy of applying the 1978 edition of the American Institute of Steel Construction (AISC) specification for the restart evaluation of the lower drywell steel platforms, and 2) The NRC staff will review the design criteria to determine if they conform with the FSAR requirements. In addition, as part of Reference 3, TVA committed to provide the NRC staff with the action plan and criteria for dispositioning the lower drywell steel platforms issue on Units 1 and 3. This is a BFN Nuclear Performance Plan special program for which TVA is proposing different criteria than the criteria used for the restart of BFN Unit 2. This criteria will become the design criteria applicable to all three BFN units. TVA determined that it would be prudent to consolidate the design criteria for both the lower drywell steel platforms and miscellaneous steel. This submittal completes TVA's actions for the two post-Unit 2 restart action items and the Units 1 and 3 commitment.

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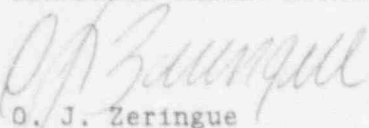
Enclosure 1 to this letter: 1) Describes the lower drywell steel platforms and miscellaneous steel, 2) Summarizes the seismic design issue for these commodities, 3) Reviews the Unit 2 interim resolution, 4) Discusses lessons learned, 5) Describes the final resolution of the issue, and 6) Proposes and justifies the design criteria for the final resolution of this issue.

The design criteria for the seismic qualification of the lower drywell steel platforms and miscellaneous steel is provided for review as Enclosure 2. The enclosed criteria does not reduce the overall design margin embodied in the Browns Ferry FSAR. These changes will provide a consistent acceptance criteria for allowable stresses for platform structural steel and miscellaneous steel at Browns Ferry. Expeditious NRC review of this criteria and issuance of a supplemental Safety Evaluation Report are requested in order to support the design of modifications which are required to be completed on Unit 2 prior to the restart from the next refueling outage and prior to the restart of Unit 3.

A summary list of commitments contained in this letter is provided in Enclosure 3. If you have any questions, please telephone Patrick P. Carrier at (205) 729-3566.

Very truly yours,

TENNESSEE VALLEY AUTHORITY


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DESCRIPTION OF LOWER DRYWELL STEEL PLATFORMS AND MISCELLANEOUS STEEL

There are two lower drywell access platforms. The flooring is standard grating, with 1- $\frac{1}{2}$ inch by $\frac{3}{16}$ inch load bars. The grating and support steel extend from the reactor pedestal to the drywell shell for the lowest platform and from the sacrificial shield wall to the drywell shell for the other platform. The platforms are supported by 24 inch deep, wide flange beams projecting from the reactor pedestal and sacrificial shield wall to the drywell shell. The radial support beams for the lowest platform are bolted to embedded plates in the outside face of the reactor pedestal. The other platform's radial support beams are welded to header beams in the sacrificial shield wall. The radial beams for each platform are supported by beam seats which are welded to the drywell shell. Lubrite pads under the radial beams allow for drywell shell expansion. Shear bars are welded to the bottom flange of the radial beams on both sides of the beam seat to prevent lateral movement of the beams. Intermediate grating support beams are framed between the radial beams at a maximum spacing of 6 feet 6 inches. Additional support beams are framed between both the radial and grating support beams for equipment, HVAC, cable tray, and piping system attachments.

There are three other drywell steel platforms which are located at higher elevations. These platforms have previously been qualified as miscellaneous steel components. Miscellaneous steel support frames were installed throughout the plant based on typical framing details. These frames were intended primarily for piping supports although HVAC, conduit, and cable tray supports were also attached. These typical steel frames are not part of the plant's main structural framing. Miscellaneous steel consists of components which include:

- Crane rails, stops, and accessories,
- Monorails,
- Main stairs, access stairs, access ladders, and platforms,
- Hatch covers, shield plugs, access doors,
- Stainless steel liner plates,
- Tank supports,
- Handrails,
- Grating and decking,
- Stairwell fire protection partitions,
- Blowout and/or dropout panels, frames, and anchorages,

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Embedments,

Instrument mountings on racks, electrical panels, and monitoring devices, and

Other miscellaneous steel as required to assure that the structure and associated systems perform their intended functions.

ISSUE SUMMARY

While dispositioning a Nonconforming Condition Report, it was determined that the lower drywell steel platforms had not been re-evaluated for loads which were added or revised since the plants' original design. It was also determined that the structural behavior of these platforms under various loading combinations was either not completely evaluated or documented and some as-built configurations did not match the as-designed drawings. These findings were subsequently found to also be applicable to the upper drywell steel platforms and miscellaneous steel support frames. In addition, a Corrective Action Report identified weld and steel details which were not included on the design drawings for miscellaneous steel support frames. A corrective action program was initiated on Unit 2 to review the lower drywell steel platforms and the miscellaneous steel support frames concurrent with ongoing evaluations of torus attached piping and the seismic analysis for as-built safety-related piping (Bulletin 79-14).

REVIEW OF THE UNIT 2 RESOLUTION

In summary, the following program was implemented on Browns Ferry Unit 2 to ensure the adequacy of the lower drywell steel platforms:

- 1) A detailed walkdown of the lower drywell platforms was performed to document the as-built configuration.
- 2) A detailed analysis of each platform was performed. All attached support loads were considered and included the maximum values for the Operating Basis Earthquake (OBE) and the Design Basis Earthquake (DBE).

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- 3) If the lower drywell steel platform did not meet the interim (one cycle) operability criteria, modifications were made to the design criteria. Modifications were required for beams and connections as a result of increased piping loads associated with the Bulletin 79-14 program. Modifications were also performed to correct original construction/installation problems which were observed during the walkdowns.

In summary, the following program was implemented on Browns Ferry Unit 2 to ensure the adequacy of miscellaneous steel support frames:

- 1) A detailed walkdown of miscellaneous steel support frames was performed to document the as-built configuration.
- 2) A detailed analysis was performed for miscellaneous steel support frames which carried loads associated with the Bulletin 79-14 or long term torus integrity programs. In addition to the evaluations which were performed for specific miscellaneous steel support frames, some generic calculations were performed to develop capacities for these types of frames. These frames were also evaluated against the support loads.
- 3) If the miscellaneous steel support frames did not meet the operability criteria, modifications were made to the design criteria.

The following is a summary of the more significant TVA/NRC correspondence which documents the resolution of these issues. This summary is provided, in part, to assist the NRC Staff if additional detailed historical information is required.

TVA's program for the seismic qualification of the lower drywell steel platforms was described in letters, dated March 10, 1988, May 26, 1988, and March 15, 1989. TVA's program for the seismic qualification of miscellaneous steel was describe in separate TVA letters, dated March 10, 1988, May 26, 1988, and April 28, 1988.

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By letter dated July 26, 1988, NRC provided a safety evaluation report (SER) on the acceptability of the interim operability criteria for both the lower drywell steel platforms and miscellaneous steel. The SER contained two post-Unit 2 restart action items:

- 1) TVA is required to address the adequacy of applying the 1978 edition of the American Institute of Steel Construction (AISC) specification for the restart evaluation of the platforms with respect to the Final Safety Analysis Report (FSAR) design criteria which were based on the 1963 AISC specification.
- 2) It is the staff's understanding that the design criteria (or long-term criteria) conform with either the FSAR requirements or the criteria generally applied in the nuclear industry such as AISC specification, ASME code, etc. However, some exceptions were identified during the staff review of TVA 7100 series criteria. Therefore, as a post-restart action item, the staff will review the design criteria to determine if they conform with the FSAR requirements.

These action items are also reflected in NUREG-1232, Volume 3, Supplement 2, dated January 23, 1991, Sections 2.2.2.2.3 and 2.2.2.6 and in Enclosure 5 to Inspection Report 89-42, dated February 26, 1990. TVA responded to the July 26, 1988 SER by letter dated August 23, 1988. Monitoring and evaluation of TVA's corrective actions is also documented in:

Inspection Report 88-38, dated April 19 1989,
Inspection Report 88-39, dated June 14, 1989,
Inspection Report 89-29, dated September 20, 1989,
Inspection Report 89-32, dated November 8, 1989, and
Inspection Report 89-42, dated February 26, 1990.

Acceptability of TVA's programs for the interim seismic qualification of the lower drywell access platforms and miscellaneous steel is also documented in Supplements 1 and 2 to the SER on the Browns Ferry Nuclear Performance Plan - NUREG-1232, Volume 3, dated October 24, 1989 and January 23, 1991, respectively. The applicable sections are Section 2.2.2.5 for the lower drywell access platforms and Section 2.2.2.6 for miscellaneous steel. By letter dated April 16, 1991, TVA notified NRC that the restart commitments for the interim seismic qualification of the drywell steel platforms and miscellaneous steel were complete.

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In addition to the post-Unit 2 restart action items discussed above, NUREG-1232, Volume 3, Supplement 2, Section 2.2.2.2.3, documents the following Unit 2 post-restart actions:

- 1) For lower drywell platforms, TVA should evaluate and upgrade, as needed, those structural steel elements, connections, and anchorages, qualified to the interim criteria, against the design criteria.
- 2) For miscellaneous steel frames, TVA should evaluate and upgrade, as needed, those structural steel elements, base plates, connections, and anchorages, qualified to the interim criteria, against the long-term design criteria.

LESSONS LEARNED FROM THE UNIT 2 RESOLUTION

The Unit 2 program for the interim seismic qualification of the lower drywell steel platforms and miscellaneous steel resulted in two major lessons learned:

- 1) In addition to the evaluations which were performed for specific miscellaneous steel support frames, some generic calculations were performed to develop capacities for these types of frames. These calculations are also applicable to the evaluation of miscellaneous steel support frames in Units 1 and 3.
- 2) The historical basis for having different allowable stresses for lower drywell steel platforms and miscellaneous steel is indeterminate. The long-term design criteria should be the same for these two commodities.

FINAL RESOLUTION OF THE ISSUE

The final seismic qualification of the lower drywell steel platforms and miscellaneous steel at Browns Ferry will be accomplished in the following manner:

- 1) Obtain NRC acceptance of the design criteria for the lower drywell steel platforms and miscellaneous steel.

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- 2) Evaluate and modify, as required, the lower drywell steel platforms and miscellaneous steel to meet the design criteria. The qualification of the miscellaneous steel will utilize the previously performed calculations to determine load capacities. Otherwise, the qualification of the lower drywell steel platforms and the miscellaneous steel will be in accordance with the Unit 2 implementation precedent. The evaluation and modifications, if required, to the lower drywell steel platforms and miscellaneous steel will be completed prior to the restart of Units 1 and 3, respectively.
- 3) The FSAR will be revised to specifically reference the 1978 AISC specification.

DESIGN CRITERIA AND JUSTIFICATION

The design criteria for lower drywell steel platforms and miscellaneous steel is provided as Enclosure 2. This criteria utilizes the 1978 AISC specification with no increase in the basis AISC stress allowables for the OBE load cases and a 1.5 increase factor of the AISC specification for the DBE load cases. This criteria also includes an upper cap on the allowable stress of 0.9 times the minimum specified yield stress as committed to in the Browns Ferry FSAR.

TVA has made a detailed comparison between the 1978 AISC specification and the FSAR design criteria which were based on the 1963 AISC specification. The differences have been identified and are justifiable. In summary, TVA has determined that the use of the 1978 AISC specification for the lower drywell steel platforms and the miscellaneous steel is justified since:

- 1) The 1978 AISC specification was revised to provide a more balanced set of margins than the 1963 AISC specification. Increases made to the individual allowable stresses discussed below are still bounded by the controlling margin (for bending) which is specified in the Browns Ferry FSAR.

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- 2) The revised allowable stresses are based on a large body of test data which confirms that the specified increases in allowable stresses in fillet welds and bolting do not violate the controlling margins in the structural capacity. This is accomplished without changes in design methods, material specification, fabrication or construction techniques from the 1963 AISC specification.
- 3) Additional strength was recognized by the AISC Specification Committee due to a favorable shape factor which provides increases in allowable stresses for weak axis bending of doubly symmetrical compact sections. This does not affect the controlling margins in structural capacity and does not require changes in design methods, material specification, fabrication or construction techniques from the 1963 AISC specification requirements.

The use of the 1978 AISC specification allowable stresses for the OBE load cases for the lower drywell platforms is justified since:

- 1) The normal allowable stresses included in the AISC specification establishes basic margins of safety. The uniform application of these AISC allowable stresses maintains a consistent set of margins for all stress components at normally accepted limits.
- 2) Criteria for OBE stresses included in the FSAR have a lower than normal AISC allowable stress primarily to account for live loads which were not specifically included in the original analysis. Live and other loads, the majority resulting from piping, have been well defined and tracked. Therefore, this additional margin is no longer necessary.
- 3) This change makes the lower drywell platform criteria consistent with the criteria for other steel structures at Browns Ferry.

The consistent application of a 1.5 increase factor of the AISC specification for the DBE load cases is justified since:

- 1) Its use does not affect the overall margin of safety which is controlled by strong axis bending. The increase factor for shear stress is limited to $0.52 F_y$. Compression is limited to 0.9 times the critical buckling stress.

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- 2) Its use is consistent with commitments contained in the Browns Ferry FSAR.

CONCLUSION

This submittal satisfies TVA's action for two post-Unit 2 restart commitments for the lower drywell steel platforms and miscellaneous steel:

- 1) TVA has addressed the adequacy of applying the 1978 AISC specification with respect to the FSAR requirements which were based on the 1963 AISC specification.
- 2) TVA has demonstrated compliance of the design criteria with the FSAR requirements.

The enclosed criteria does not reduce the overall design margin embodied in the Browns Ferry FSAR. These changes will provide a consistent acceptance criteria for allowable stresses for platform structural steel and miscellaneous steel at Browns Ferry. Expeditious NRC review of this criteria and issuance of a supplemental Safety Evaluation Report is requested in order to support the design of modifications which are required to be completed on Unit 2 prior to the restart from the next refueling outage and prior to the restart of Unit 3.

ENCLOSURE 2
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