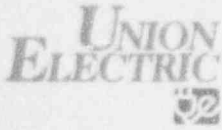


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September 21, 1993

Donald F. Schnell
Senior Vice President
Nuclear

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

ULNRC -2859

Gentlemen:

**REPLY TO NOTICE OF VIOLATION
INSPECTION REPORT NO. 50-483/93010
CALLAWAY PLANT**

This responds to Mr. L. Robert Greger's letter dated August 25, 1993, for events discussed in Inspection Report 50-483/93010. Our response to the violation and the concern discussed in the cover letter is presented in the attachment.

None of the material in the response is considered proprietary by Union Electric Company.

Please inform me if you have any questions regarding this response or if additional information is required.

Very truly yours,

A handwritten signature in cursive script that reads "Donald F. Schnell".
Donald F. Schnell

DFS/tmw

Attachment: 1) Response to Violation

cc: J. E. Martin - Regional Administrator, USNRC Region III
J. Gavula - Acting Chief, Reactor Projects Section 3C, USNRC Region III
L. R. Wharton - USNRC Licensing Project Manager (2 copies)
USNRC Document Control Desk (Original)
Manager - Electric Department, Missouri Public Service Commission
B. L. Bartlett - USNRC Senior Resident Inspector
Shaw, Pittman, Potts, and Trowbridge

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Statement of Violation

During an NRC inspection conducted on June 1 through July 31, 1993, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C, the violation is listed below:

10 CFR 50, Appendix B, Criterion III, Design Control, requires, in part, that measures shall be established to assure the design basis for structures are correctly translated into drawings; that design control measures provide for verifying and checking the adequacy of the design; and that design changes are subject to design control measures commensurate with those applied to the original design.

Contrary to the above, the design basis was not correctly translated into drawings; measures did not provide for verifying and checking the adequacy of the design; and design changes were not subject to design control measures commensurate with those applied to the original design in the following examples:

- A. Hanger Drawing No. 2-GN01-C003/232, Revision 2, specified certain attachment welds that resulted in a fixed connection, whereas, the analysis assumed it was a pinned connection. (483/93010-01B)
- B. Hanger Nos. 2-GN01-C009-252 and 2-GN01-C019-252 could not be constructed using the structural members specified on the drawings. (483/93010-01H)
- C. Hanger Drawing No. 2-GN01-R009/252, Revision 2, specified dimensions that resulted in the support being active in the vertical direction, whereas, the piping analysis did not consider it active in this direction. (483/93010-01I)
- D. Hanger Drawing No. 2-GN01-R014/252, Revision 6, specified member lengths that resulted in an angular dimension of approximately 55°, whereas, the support calculation utilized an angle of 45°. (483/93010-01J)
- E. Calculations No. P-GN01-01CMP, No. P-GN01-07CMP, and No. P-GN02-09CMP, did not calculate a bending moment and did not evaluate the effects of this bending moment on a shear lug weld. (843/93010-01A; 01E; 01F)
- F. Calculation No. P-GN01-01CMP utilized the incorrect torsional properties for the horizontal tube steel member. (483/93010-01C)

- G. The location of an axial restraint, Hanger No. 2-GN01-C020-231, was changed from the original piping analysis location and was not subject to design control measures commensurate with those applied to the original design. (483/93010-01D)
- H. For Hanger Drawing No. 2-GN02-R016-231, the tube steel wall thickness was changed but the effect of the change was not subject to design control measures commensurate with those applied to the original design. (483/93010-01G)

This is a Severity Level IV violation (Supplement I).

Reason for the Violation

The design that this violation addresses is on modification 92-1034 which strengthens the hangers on the ESW system. As corrective action for water hammer events on this system, it was determined that a proactive approach to resolving this issue should be pursued (this concern had previously been inspected by the NRC and documented in Inspection Report 50-483/92016). One of the corrective actions being implemented to address the water hammer problem is the referenced modification.

Modification 92-1034 redesigns the hangers so that the hangers and the piping system can better withstand a water hammer event. Although weaknesses were identified in the NRC inspection concerning the hanger design program, it should be noted that all ASME and AISC Code requirements were met by the hangers as designed.

The approach used to develop this modification, as outlined below, was a contributing factor to the violation. In order to meet refuel design development milestones for the Fall 1993 refueling, it was determined that redesign of the subject pipe hangers would be carried out in the following manner:

- 1) Responsibility for the modification was assigned to three engineers in order to expedite design of the hangers.
- 2) Preliminary conceptual hanger designs were to be developed based on piping isometrics, the original hanger drawings, and the plant design model.
- 3) Walkdowns in containment were conducted to verify designs and identify potential interferences.

- 4) Each engineer was to complete the design of the assigned hangers and develop bounding calculations so that design drawings could be submitted to the modification planning group for review while detailed calculations were being developed. Designs were to be sufficiently conservative so that corrections required in the final calculation review would not require changes to the design drawings which had been submitted to the modification planning group.
- 5) The design engineers utilized finite element analysis to evaluate the effects of the design loading on the subject hanger. The software utilized provides the stresses throughout the structure under each of the loading conditions analyzed. The design engineers utilized the combined worst case stresses from each of the load cases in evaluating the acceptability of the structure. In many of the structures, it was found that the stresses as determined by the finite element analysis were extremely low compared to Code allowables and, therefore, detailed member-by-member evaluations were not performed. Bounding weld sizing calculations were performed, and in at least one case, a weld size slightly less than the calculated weld size was approved based on the conservatism inherent in designing the hanger based on the worst combination of loads.

The objective of approaching the design in this manner was to develop conservative hanger designs which met Code requirements without excessive engineering time so that construction drawings could be completed as soon as possible. Engineering supervision was involved in the development of this approach.

The approach to the design of the pipe supports was not identified internally as a weakness because:

- 1) This was the first modification in which Union Electric designed safety related large bore piping hangers.
- 2) This was the first modification in which a bounding approach was utilized to simplify engineering and expedite the design drawings.
- 3) Constructability problems had not been identified internally because detailed planning for the implementation of the modification, which is an integral step of our design change program, had not been completed at the time of the NRC inspection.
- 4) Quality Assurance had not included this modification or design approach in past audits because:

A) The design approach had not been utilized previously;

- B) Union Electric had not previously designed safety related large bore piping hangers; and
- C) The modification was still in the development/planning stage at the time of the NRC inspection.

Corrective Steps that have been taken and results achieved:

As a result of our debriefings with the NRC inspector at the time of his review of the hangers in modification 92-1034, the specific findings listed in the violation were identified. We subsequently performed a complete review of all hanger designs associated with the modification. This review took into account the findings of the NRC inspector. In addition, to insure that all the necessary elements of hanger design were adequately considered, ABB Impell was retained to perform an independent review of ten of the hanger designs. This review was to insure that our hanger design met Code requirements and followed good hanger design practice. The results of the Impell critique were also factored into our review of the hanger designs. Neither review identified any instances in which ASME or AISC Code allowables for the hangers or for the building structural steel were exceeded. However, the reviews did identify a need to improve the level of supporting documentation over that provided in the original calculations.

As part of the normal design change program planning process, a constructability review was performed. This review identified constructability problems which have subsequently been corrected. Design drawings and calculations have been revised as well.

Corrective steps that will be taken to avoid further violations:

In order to prevent a recurrence of these concerns, the following actions are underway. First, a design guide is under development which will provide a uniform method for designing hangers. This guide will cover analysis of supports, attaching structures (e.g. plates, building steel, etc.), and the use of integral attachments (e.g. lugs, stanchions, etc.). The guide will assure that all elements of the design basis are considered in the design of pipe hangers and supports and will provide for the use of engineering judgment.

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Training will be provided to the design engineers on the hanger design guide and on the use of properly documented engineering judgment.

Date when full compliance will be achieved:

The plant is in full compliance with the regulations and the items to prevent recurrence will be completed by June 1, 1994.