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FEB 20 1987

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Dr. J. Nelson Grace

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - SUPPLEMENTAL RESPONSE TO VIOLATION 390/86-12-10; 391/86-13-10 - FAILURE TO PROMPTLY IDENTIFY AND CORRECT A CONDITION ADVERSE TO QUALITY AND 390/86-12-08 and 391/86-13-08 - FAILURE TO FOLLOW PROCEDURE

This is a supplemental response to the violations detailed in NRC Inspection Report 390/86-12 and 391/86-13 concerning the interpass temperature corrective action deficiency and the mounting of bolts in long-slotted holes without washers, submitted in response to Gary G. Zech's letter dated December 3, 1986. TVA would like to clarify its position regarding the acceptability of previously completed welds and slotted holes. Enclosed is our response.

If there are any questions, please get in touch with R. D. Schulz at (615) 365-8527.

To the best of my knowledge, I declare the statements contained herein are complete and true.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer, Assistant Director
Nuclear Safety and Licensing

Enclosure
cc: See page 2

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U.S. Nuclear Regulatory Commission

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ENCLOSURE
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
SUPPLEMENTAL RESPONSE TO NRC REGION II LETTER
FROM G. G. Zech TO S. A. WHITE, DATED DECEMBER 3, 1986

Violation 390/86-12-10; 391/86-13-10

10 CFR 50, Appendix B, Criterion XVI, as implemented by TVA's QA Topical Report TVA-TR-75-1A, revision 8, paragraphs 17.1.16, requires that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected.

Contrary to the above, during the period between June 25, 1980, through November 13, 1985 (five years, four months), a weld procedure was used on site with an incorrect interpass temperature specified that went undetected and uncorrected. After the deficiency was identified by the licensee, inadequate corrective actions were taken by the licensee to resolve the FSAR violation regarding interpass temperature controls and analyses were not done to determine the effects of elevated interpass temperatures on stainless steel weldments.

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

SUPPLEMENTAL RESPONSE

1. Reason for the Violation

The initial issue (Rev 0) of D'VP GT88-0-3 was on October 13, 1977. This revision was technically correct in all respects. To provide for an additional size of filler metal, the procedure was revised and reissued as Revision 1 on June 25, 1980. During the retyping of this revision, the abbreviation "min" was inadvertently typed in place of the intended and correct "max" designation for the interpass temperature value. The error was not noticed at the time of issue and was evidently not noticed and/or recognized by subsequent users until November 1985. It should have been recognized as an error. As stated in our initial response, the procedure has been corrected.

The use of 350°F as a maximum interpass temperature in stainless steel welding is standard practice in the industry and in TVA. Engineers and welders expect to see this value and weld within this parameter when reviewing or using such welding procedures. All other TVA welding procedures, in fact, express interpass temperatures as a maximum value of the stated temperature. Because the expected and correct temperature value (350° for this procedure) was present, the unexpected suffix "min" apparently went unnoticed. It would be inconsistent to require a minimum interpass temperature of 350°F in a welding procedure that requires only 60°F preheat. TVA did not intentionally violate the FSAR requirement regarding interpass temperature controls. As explained above, the condition resulted from an inadvertent, typographical error.

After the error in the interpass temperature was discovered and corrected, TVA, in the initial disposition of NCR W-309-P, which was written for both units, failed to consider all the aspects of the nonconformance on previously completed welds. Therefore, TVA, in its response to 390/86-12-10 and 391/86-13-10, committed to revise the initial disposition of NCR W-309-P. The engineer who provided, and the manager who approved, the initial disposition of NCR W-309-P now recognize the inadequacies associated with the initial disposition.

2. Corrective Steps Taken and Results Achieved

The original nonconformance report (NCR) cited two welds which were found during a surveillance of in-process welding where the interpass temperatures were measured at 850°F and 861°F, respectively, much higher than the required maximum of 350°F. The minimization of weld interpass temperature is one of the procedural controls used to control weld heat affected zone sensitization, which is one of several conditions that can be conducive to stress corrosion cracking (SCC). In order to determine the sensitivity of the two welds to SCC, corrosion tests (ASTM A262, Practice A) were performed. Weld 1-067J-T359-12, a two-inch pipe to flange socket weld located in the safety injection pump room, was polished and etched to determine the amount of sensitization. Surface replicas were made and examined at TVA's Singleton Materials Engineering Laboratory, and no sensitization was seen. The same procedure was performed on weld 1-067C-N280-7, a pipe to four- by three-inch reducer located in the Reactor Building. No sensitization was seen in this weldment. These welds passed the ASTM 262, Practice A test. This indicated a low susceptibility to intergranular attack and stress corrosion cracking (SCC).

In order to determine how many other welds were associated with the welding procedure that specified an incorrect (maximum) interpass temperature, a tabulation of all welds made with DWP GT88-0-3 was made by way of the WBN Weld Monitoring Information System. This tabulation identified 15,018 welds made using DWP GT88-0-3. All but 22 were in system 67 (Essential Raw Cooling Water System). These 22 welds are in the following systems: Main Steam - seven welds; Safety Injection System - eight welds; Component Cooling System - five welds; RHR System - one weld; and Primary Water Make-up System - one weld. All welds identified are either in Class 2 systems (16 welds) or Class 3 systems (6 others). All Class 2 welds made with DWP GT88-0-3, Revision 1, except weld Nos. 1-063B-T197-25A and 29A, are in systems or portions of systems with a design temperature of 200°F or less. All Class 3 welds are in systems or portions of systems in which the design temperature is 200°F or less. Temperatures of 200°F or less are not regarded as conducive to intergranular stress corrosion in power plant service. All Class 2 pressure boundary welds are in small lines, 1-1/4" diameter or less. With regard to weld Nos. 1-063B-T197-25A and 29A, both are 3/4" diameter test connection lines located in the Safety Injection System, which has a design temperature of 650°F. Therefore, TVA had two welds that could be conducive to sensitization and potential stress corrosion cracking.

In order to evaluate worst-case conditions for sensitization due to high interpass temperature, two 2-inch diameter butt welds and two 1/2-inch diameter socket weld test assemblies were developed. The two butt welds were made on two-inch, schedule 160, SA 376, type 316 pipe, heat 08285. The test setup provided up to two continuous weld passes to be made without stop and created interpass temperatures in the range of 650°F - 1080°F. Cross sections taken from test samples were sent to Singleton Laboratories, where they were polished through one micron and etched, using ASTM A262, Practice A procedures.

Neither weldment shows complete sensitization as would be evidenced by grains completely surrounded by ditches. On the contrary, both specimens show partial ditching of the grain boundaries, which is an acceptable microstructure under the conditions of A 262, Practice A. Micrographs of the specimens exhibit typical structures at the fusion line and the region of the heat affected zone (HAZ), where maximum sensitization would be seen.

The two socket welds were made on 1/2-inch, schedule 40, SA 312, type 316 pipe, heat 474148, and 1/2-inch 3000-lb, A 182, F 316 fittings, heat BHH. The entire microstructure of each socket was evaluated from weld to weld. Micrographs give typical microstructures from the weld fusion line to the center of the socket. In no case was anything other than minor grain boundary pitting observed. Ditching did not occur.

The results of the investigations and test described justify the use-as-is disposition of welds made from June 25, 1980, to November 13, 1985, without using a leak-before-break rationale.

Although a use-as-is disposition has been justified for all welds in the disposition to W-309-P, TVA has decided to adopt a conservative approach and replace the two welds in the Safety Injection System, 1-063-T197-25A and 29A, described above. The welds will be replaced before fuel load of unit 1.

3. Date of Full Compliance

DWP GT88-0-3 was revised on November 13, 1985, to stipulate the correct weld interpass temperature, and the welds were accepted for use on September 9, 1986. TVA is in full compliance.

Violation 390/86-12-08, 391/86-12-08

During the Nuclear Regulatory Commission (NRC) inspection conducted on April 21 to May 20, 1986, violations of NRC requirements were identified. The violations involved failure to follow procedure and failure to promptly identify and correct conditions adverse to quality. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR 2, Appendix C (1985), the violations are listed below:

- 10 CFR 50, Appendix B, Criterion V as implemented by TVA's QA Topical Report TVA-TR-75-1A, Rev. 8, paragraph 17.1.5 requires that activities affecting quality shall be prescribed by procedures of a type appropriate to the circumstances and shall be accomplished in accordance with these procedures. Tennessee Valley Authority Specification G-53 specifies the requirements of the 1972 ASTM Standard. TVA adopted this requirement in Quality Control Procedure WBN-QCP-1.42-3, Rev. 5.

  Contrary to the above, on May 8, 1986, outer plies of structural steel joints in units 1 and 2 containment buildings and other safety-related buildings were found connected using A325 bolts in long slotted holes without the required plate washers or continuous bars being used to cover the slotted holes. Also, WBN-QCP-1.42-3, Rev. 5, did not fully implement the requirement of G-53.

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

Supplemental Information

TVA has identified and reviewed all connections using long-slotted holes. All slotted hole connections which were identified as using high strength bolts and not welded after erection have been analyzed to determine the design connection stress. A criteria was established to determine which existing connections with slotted holes would be acceptable without plate washers. A maximum value of 50 percent of the AISC (Steel Construction Manual) allowable design stress, was conservatively selected. If the design connection stress exceeded 50 percent of the allowable design stress, rework on the connection will be performed. The decision to use plate washers when its design connection stress exceeds 50 percent of the allowable design stress is based on information contained in Fisher and Struick's Guide to Criteria for Bolted and Riveted Joints. This guide was the basis for the Research Council for Structural Joints' criteria on high strength bolts. The AISC, in 1972, adopted the research council's findings for inclusion in the 1974 edition of their specification.

As documented in NCR W-431-P for unit 1, 324 of the identified connections will be reworked based on the acceptance criteria established. Approximately 155 slotted connections on units 1 and 2, located primarily on access platforms in the Auxiliary Building, have been determined to be acceptable without plate washers and are identified as such on TVA drawings. Section 3.8.4.5.2 of the FSAR states that "Structural steel and welds are designed.....so that the stress in the members and connections do not exceed the allowable stress criteria as set forth in the February 1969 AISC, "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings, as amended through June 12, 1974." Since the 155 slotted connections identified as being adequate have design connection stress which falls well below the AISC allowable (the acceptance criteria is 50 percent of the AISC allowable design stress), they fully meet the commitment in the FSAR. TVA is continuing to review the remaining of the unit 2 connections and will document those findings under SCR WBN 0835-S.

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