Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

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File No.: G09.16
10CFR50.55a

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

South Texas Project
Unit 2
Docket No. STN 50-499
Request for Relief from ASME Boiler and Pressure Vessel Code
Section XI Requirements (Relief Request RR-ENG-35) (Supplement)

Attached is a supplement to a relief request previously submitted by the South Texas Project in accordance with the provisions of 10CFR50.55a(g)(5)(iii) to obtain relief from IWA-5250 of Section XI of the ASME Boiler and Pressure Vessel Code. Approval will allow code repair of flaws recently identified in the service water Class 3 piping to be deferred. Additional discussion is provided regarding the analyses that have been performed. Clarifying information in the supplemented relief request is identified by change bars in the margin.

If there are any questions, please contact either Mr. P. L. Walker at (361) 972-8392 or me at (361) 972-7162.

S. E. Thomas
Manager,
Design Engineering

PLW
Attachment: Request for Relief from ASME Boiler and Pressure Vessel Code Section XI Requirements (Relief Request RR-ENG-35) (Supplement)

Project Manager on Behalf of the Participants in the South Texas Project

A047

RGN-001

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U. S. Nuclear Regulatory Commission
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SOUTH TEXAS PROJECT
UNIT 2
REQUEST FOR RELIEF FROM ASME BOILER AND PRESSURE VESSEL CODE SECTION XI REQUIREMENTS (RELIEF REQUEST RR-ENG-35) (SUPPLEMENT)

Reference:

Letter to NRC dated November 1, 1988, with attached Bechtel National/Aptech Report 8804-06FA, Revision 3 (ST-HL-AE-2748)

Reference Code: ASME Boiler and Pressure Vessel Code, Section XI
1983 Edition through Summer 1983 Addenda

A. Introduction:

A1. Component for Which Relief is Requested:

(a) Identification: Essential Cooling Water System, Train 2C and Train 2B Essential Chiller Supply Cross-tie Isolation Valve, 10-inch flange-to-pipe weld, line EW2283WT3

(b) Function: The Essential Cooling Water System is designed to supply cooling water to various safety-related systems for normal plant operation, normal shutdown, and during and after postulated design-basis accidents. The subject flange-to-pipe weld is part of a cross-tie between Essential Cooling Water trains for redundant cooling water supply to the Essential Chiller condensers. During normal operation, this cross-connection is isolated by valves that are locked closed.

(c) Class: ASME Code Class 3

(d) Description of the flaw: Recurring discolorations have been found on a 10-inch flange-to-pipe weld at three locations. Discoloration of aluminum-bronze welds indicates through-wall dealloying defects. However, the small size of the discolored areas indicates the dealloying is relatively minor. There is currently no leakage or surface accumulation of moisture at these locations. Ultrasonic testing performed January 20, 2000, at the flaw site revealed no cracks or linear indications.

A2. Code Requirements From Which Relief is Requested:

Relief is requested from IWA-5250 of ASME Section XI in order to defer performing code repair of through-wall flaws in Essential Cooling Water piping until the next Unit 2 outage of sufficient duration.

A3. Basis for Relief Request:

As stated in Generic Letter 90-05, a repair is considered to be impractical if the flaw detected during plant operation is in a section of Class 3 piping that cannot be isolated for completing a code repair within the time period permitted by the limiting condition for operation (LCO) of the affected system as specified in the plant Technical Specifications, and performance of code repair necessitates a plant shutdown. Performance of code repairs within the allowed outage time for the Essential Cooling Water System at the South Texas Project, as permitted by the limiting condition for operation, may not be practical due to the potential for fit-up problems during repair. Therefore, the South Texas Project requests this relief on the basis of impracticality.

B. Scope, Limitations, and Specific Considerations:

B1. Scope:

The scope of this relief request covers three areas of dealloying on a 10-inch flange-to-pipe weld. The flange is part of the Train 2C and Train 2B Essential Chiller supply cross-tie isolation valve. Volumetric ultrasonic examination of the affected area revealed no linear indications or cracking.

B2. Limitations:

Repair of the defect will be deferred until adequate time is available for the repair, but no later than the next Unit 2 refueling outage, providing the condition meets the acceptance criteria of Generic Letter 90-05 and is enveloped by previous studies as described in C3 of this relief request. The next Unit 2 refueling outage is currently scheduled to start March 3, 2001.

B3. Specific Considerations:

Consequences of potential system interactions include flooding, spray on equipment, and loss of flow to the system have been evaluated and are bounded by Appendix 9A of the South Texas Project Updated Final Safety Analysis Report.

The structural integrity of piping with dealloying has been evaluated for all design loading conditions including dead weight, pressure, thermal expansion, and seismic loads. The Essential Cooling Water System is a low-pressure system with normal operating pressures

of approximately 50 psig and a design pressure of 120 psig. The consequences associated with failure of high-energy lines are not applicable to the Essential Cooling Water System. Flaw evaluation is addressed in paragraph C3.

The structural integrity is monitored by the following methods:

- Monthly monitoring for qualitative assessment of leakage (quantitative if measurable leaks are observed). Currently there is no measurable leakage.

- Continuation of Essential Cooling Water System large bore piping periodic walkdowns. This walkdown is a regularly scheduled VT-2 examination. The inspection technique has proven to be an effective means of identifying dealloyed/cracked components prior to deterioration of structural integrity margins below ASME Section XI requirements.

Structural integrity and the monitoring frequency will be reevaluated if significant changes are found during this monitoring.

Additional discussion is provided in the South Texas Project Updated Final Safety Analysis Report, Appendix 9A, "Assessment of the Potential Effects of Through-Wall Cracks in ECWS Piping".

C. Evaluation:

C1. Flaw Detection During Plant Operation and Impracticality Determination:

The flaw was identified on November 22, 1999, during normal Unit 2 plant operations while performing the monthly examination of Essential Cooling Water large bore piping.

Performance of code repairs prior to an extended allowed outage time or refueling outage as permitted by the limiting condition for operation may not be practical due to the potential for fit-up problems during repair. To avoid the risk of an unscheduled shutdown, the South Texas Project prefers to perform the code repair under controlled conditions during a scheduled outage that is long enough to make the necessary repairs as long as the specific considerations listed above are met.

C2. Root Cause Determination and Flaw Characterization:

The root cause of dealloying flaws is a combination of corrosion and stress. The dealloying process normally initiates from a crevice such as the area behind a backing ring, a fabrication-induced flaw, or a casting flaw. Dealloying in this case is believed to be the result of a combination of an existing crevice and susceptible material. The South Texas Project has also performed laboratory analyses, calculations, and proof testing on welded

aluminum-bronze material to address dealloying and cracking in dealloyed aluminum-bronze welds.

Recurring discolorations have been found at three locations on a 10-inch flange-to-pipe weld. Discoloration of aluminum-bronze welds indicates through-wall dealloying defects. However, the small size of the discolored areas indicates the dealloying is relatively minor. There is currently no leakage or surface accumulation of moisture at these locations. Ultrasonic testing performed at the flaw site revealed no cracks or linear indications.

C3. Stress and Fracture Evaluation:

The South Texas Project has analyzed through-wall flaws in Essential Cooling Water piping and found that degradation progresses slowly. Rapid or catastrophic failure due to dealloying defects is not a concern. Dealloying produces detectable leakage before flaws reach a limiting size that would affect the operability of the Essential Cooling Water System. The flaws are monitored and inspected to ensure detection of leakage. Compensatory actions taken following discovery of this condition provide assurance that changes in the condition will be monitored and analyzed for further action as needed.

Previous stress evaluations of flanges by Bechtel assumed 100% of the joint material had been dealloyed. In the evaluations, Bechtel used lower material strengths obtained by actual tensile tests of dealloyed samples. The ASME Code stress allowable is verified using the lower dealloyed material strength. Since dealloying was only visible at three small locations on the 10-inch flange-to-pipe weld, the analysis assuming 100% dealloying conservatively envelopes this condition and demonstrates an acceptable margin with respect to ASME Section III requirements.

For fracture analysis, limit load and fracture mechanics analyses were performed using the methodology of ASME Code Section XI. For this analysis, the dealloyed area is modeled conservatively as a through-wall circumferential crack and then analyzed for fracture. Fracture mechanics analyses correlating critical bending stress versus crack size were performed for all flange sizes. The majority of dealloyed components with leaks have been flanges. Code requirements for margin of safety were found to be satisfied in previous cases in which flanges were cut out and analyzed.

C4. Augmented Inspection:

Augmented monthly inspections have been implemented to detect any changes in the size of the discolored areas or leakage. A significant change in the flaws will require additional engineering attention to confirm that the technical justification of this relief request remains valid.