



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

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10CFR50.55a

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
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Rockville, MD 20852-2746

South Texas Project
Unit 2
Docket No. STN 50-499
Request for Relief from ASME Boiler and Pressure Vessel Code
Section XI Requirements for the Essential Cooling Water System
(Relief Request RR-ENG-2-52)

In accordance with the provisions of 10 CFR 50.55a(g)(5)(iii), the South Texas Project requests relief from IWA-5250 of Section XI of the ASME Boiler and Pressure Vessel Code. Approval will allow deferral of code repair of a flaw identified in the Unit 2 Essential Cooling Water (ECW) Class 3 piping. Repair of the flaw with a code repair at this time is impractical. In accordance with the guidance provided in NRC Generic Letter 90-05 and subject to Nuclear Regulatory Commission approval, code repairs will be implemented no later than the next scheduled Unit 2 refueling outage.

An indication of a through-wall flaw was identified on the downstream flange of ECW return throttle valve 2-EW-1004 from Essential Chiller 22B. The flaw is a linear indication (approximately 3/8-inch long) with residue buildup on the downstream flange side of a flange-to-piping weld. The root cause of the flaw is dealloying. Evaluation of the flaw using fracture mechanics methodology provided by Generic Letter 90-05 determined that the structural integrity of the ECW piping is not adversely affected.

The attached relief request addresses the piping section, and implementation of compensatory and corrective actions in accordance with the guidelines provided in Generic Letter 90-05. Operability and functionality of the system have been maintained, and deferring repair of the flaw will not affect the health and safety of the public.

A list of commitments in the request is attached.

If there are any questions, please contact either Mr. P. L. Walker at (361) 972-8392 or me at (361) 972-7566.

G. T. Powell
Vice President, Engineering

PLW

- Attachments: 1) Request for Relief from ASME Boiler and Pressure Vessel Code Section XI Requirements for the Essential Cooling Water System (Relief Request RR-ENG-2-52)
2) List of Commitments

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**SOUTH TEXAS PROJECT
UNIT 2
REQUEST FOR RELIEF FROM ASME BOILER AND PRESSURE VESSEL CODE
SECTION XI REQUIREMENTS FOR THE ESSENTIAL COOLING WATER SYSTEM
(RELIEF REQUEST RR-ENG-2-52)**

1. Component for Which Relief is Requested

(a) Description:

Aluminum-bronze flange downstream of Essential Cooling Water (ECW) return throttle valve 2-EW-1004 from Essential Chiller 22B

(b) Function:

The ECW 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. Valve 2-EW-1004 provides manual throttling capability and is locked in place to control the fluid flow rate through the Essential Chiller.

(c) Class:

ASME Code Class 3

(d) Description of the flaw:

An indication of a through-wall flaw is located on the downstream flange of Essential Chiller 22B ECW return throttle valve 2-EW-1004. Leakage residue buildup in a line parallel to the circumferential weld was found at the weld on the downstream flange of the valve, with an underlying flaw of approximately 3/8-inch in length. The flaw appears to be a tight crack as leakage is not readily measurable. The attached pictures show the location (Figure 1) and the appearance (Figure 2) of the residue buildup.

2. Applicable Code Edition and Addenda:

ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition

3. Applicable Code Requirement:

ASME Section XI, IWA-5250(a)(3) requires that the source of leakage be evaluated for repair or replacement in accordance with IWA-4000 or IWA-7000. Relief from the requirements of IWA-5250(a)(3) is requested so that code repair of the through-wall flaw at this location may be deferred until the next outage of sufficient duration but not later than the next refueling outage provided the conditions of Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping," are met.

4. Flaw Detection

The flaw was identified on December 2, 2008, during periodic examination of ECW large bore piping.

5. Impracticality Determination

As stated in Generic Letter 90-05, an ASME Code repair is required for Code Class 1, 2, and 3 piping unless specific written relief is granted by the NRC. Relief from ASME Code requirements is appropriate when performing the repair at the time of discovery is determined to be impractical.

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 to complete a code repair within the time period permitted by the limiting condition for operation of the affected system as specified in the plant Technical Specifications, and
- Performance of code repair necessitates a plant shutdown.

STPNOC applies risk-managed Technical Specifications in accordance with the Configuration Risk Management Program. If there is a need to extend the allowed outage time for the affected ECW loop, risk analysis techniques are applied that take into account real-time plant status to keep overall risk below $1.0E-5$ up to a maximum of 30 days. However, taking an otherwise operable ECW loop out of service while at power not only increases overall risk to the plant, but also limits flexibility in dealing with other plant equipment issues that may arise in the interim.

Performance of code repairs within the allowed outage time for the ECW system, as permitted by the limiting condition for operation, is not practical due to the amount of time required to implement the repair, and the potential for fit-up problems during repair. A plant shutdown may be necessary to complete the repair. Therefore, relief is requested on the basis of impracticality.

6. Proposed Alternative and Basis for Use

6.1 Proposed Alternative

Repair of the defect is to be performed when adequate time is available for the repair, but no later than the next Unit 2 refueling outage. The next Unit 2 refueling outage is currently scheduled to begin in March 2010 (2RE14). Compensatory action has been implemented to detect changes in the condition of the flaw until a repair can be implemented.

6.2 Basis for Use

6.2.1 Scope

Evidence of a through-wall flaw was identified on an 8-inch flange of Essential Cooling Water (ECW) return line from the essential chiller 3V112VCH005. There is a residue buildup that provides a linear indication located on the flange side of the flange-to-pipe weld. The flaw appears to be a tight crack approximately 3/8-inch long. This portion of pipe is subjected to normal operating pressure of the ECW system. The residue buildup suggests ongoing seepage through the flaw, although the leakage is not readily measurable.

6.2.2 Specific Considerations

ASME Section XI, IWA-5250, requires that leakage be evaluated for corrective action and implies that any component with through-wall leakage must be repaired or replaced regardless of the leakage rate. The expectation of ASME Section XI is that through-wall

leaks are repaired at the time of discovery. The process for repair of the affected piping requires that the affected ECW loop be made inoperable. However, repairs could not be initiated immediately upon discovery of a flaw due to time required for obtaining parts, staging materials, and repair crew preparation, with the time for actual repair beyond that. The amount of time needed for resolution will vary depending upon individual circumstances.

As stated in the South Texas Project Technical Specifications, the three independent ECW loops shall be operable in Modes 1, 2, 3, and 4. With only two of the essential cooling water loops operable, all three are to be operable within seven days. If only one loop remains in service, one loop is to be returned to service within one hour. If these requirements are not met, the affected unit is to be in Hot Standby within the next six hours, or the requirements of the Configuration Risk Management Program are to be applied.

Consequences of potential system interactions, including flooding, spray on equipment, and loss of flow to the system, are addressed in Appendix 9A of the South Texas Project Updated Final Safety Analysis Report, "Assessment of the Potential Effects of Through-Wall Cracks in ECWS Piping." The assessment assumes the effects of spray from a moderate energy line (10-inch diameter). Safety-related equipment is either designed to operate in a spray environment, or protected if sensitive to spray. Flooding in a given area due to the ECW system is enveloped by worst case flow from an opening in a local pipe due to a "critical crack," with an area equivalent to a rectangle of length one-half the pipe diameter and a width equal to one-half the pipe wall thickness. This assessment is bounding for the condition under consideration. Flooding due to the ECW system was reviewed by NRC inspectors during an inspection conducted January 25 through February 12, 1999. This is documented in NRC Inspection Report No. 50-498/98-19; 50-499/98-19, dated March 26, 1999. Flooding is addressed in Updated Final Safety Analysis Report Appendix 9A.

Flooding calculations indicate a potential flooding rate of approximately 14.5 cu ft/min through a postulated crack in the ECW pipe. However, the maximum flood rate is approximately 80 cu ft/min due to a postulated crack in the Component Cooling Water line in Mechanical Auxiliary Building room 067E, the location of the flawed ECW pipe. Nearby safe shutdown equipment are not affected by postulated leakage/spray effects. The ECW pumps and the cooling reservoir have adequate design margin and make-up capability to account for postulated leakage and are therefore fully capable of fulfilling the design-basis functions and mission times during a design-basis accident.

The condition of the ECW piping and the leakage is monitored by operator/personnel rounds. Sump level alarms are available to warn operators if unanticipated, sudden leakage were to develop. Makeup capacity is available from the ECW pond inventory.

The ECW system is a low-pressure system with normal operating pressures of approximately 50 psig and a design pressure of 120 psig. Normal system temperature is 47 to 100 degrees F. Temperature following a design-basis accident is not expected to exceed 120 degrees F. Therefore, the consequences associated with failure of high-energy lines are not applicable to this relief request.

The structural integrity is monitored by the following methods:

- Monthly monitoring for qualitative assessment of leakage (quantitative if measurable leaks are observed). There is no measurable leakage at this time.

- Continuation of large bore ECW piping periodic walkdowns. These walkdowns are regularly scheduled VT-2 examinations at six-month intervals. These inspections have proven to be an effective means of identifying flaws in ECW components prior to deterioration of structural integrity margins below ASME Section XI requirements.

Structural integrity and the monitoring frequency are re-evaluated if significant changes in the condition of the flawed area are found during this monitoring.

6.2.3 Root Cause Determination

The flaw is due to dealloying. The root cause of dealloying 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 similar to dealloying seen in other susceptible aluminum-bronze components. The process by which dealloying of aluminum-bronze occurs has been described in previous communications with the NRC (Reference 8.1).

6.2.4 Flaw Evaluation

The structural integrity of the flanged piping was assessed using the through-wall flaw evaluation approach in Section C-3a of NRC Generic Letter 90-05. This approach assumes a through-wall flaw and evaluates the flaw stability using Linear Elastic Fracture Mechanics (LEFM). Enclosure 1 to NRC Generic Letter 90-05 details this methodology.

To summarize the results:

$$s = \text{Predicted bending stress}$$

$$s = 11.5 \text{ ksi}$$

$$K = \text{Stress intensity factor}$$

$$K = 32.239 \text{ Ksi-in}^{1/2}$$

For flaw stability, this methodology specifies "K" should be less than the critical stress intensity factor representing the fracture toughness of the material. Fracture toughness for this material ranges from 63.5 to 95.1 ksi-in^{1/2}.

| STRESSES | PRESSURE + DEAD WEIGHT | FAULTED | THERMAL |
|------------------------|---------------------------|---------|---------|
| STRESS (psi) | 1090 | 4703 | 4804 |
| ALLOWABLE STRESS (psi) | 18000 | 43200 | 27000 |
| SAFETY MARGIN | 16.5 | 9.18 | 5.62 |

The calculated safety margins are adequate for the various loading conditions.

6.2.5 Augmented Inspection

Normally, walkdowns of ECW piping are performed at intervals of six months. In the event a flawed area is discovered, augmented monthly inspections are performed to monitor the flaw to detect changes in the size of the discolored area or leakage rate. Inspectors look for: change from residue buildup to active dripping; new indication at a different area on the component; or, a substantial change (about 2x or more) in the area of the original indication. Periodic monitoring and inspection by STPNOC provide confidence in the ability to detect changes in the leakage rate before leakage becomes a safety issue. Structural integrity and the monitoring frequency are re-evaluated if monitoring identifies significant changes in the condition of the flawed area. None has shown sufficient change from the time of discovery to warrant accelerated implementation of corrective measures.

6.2.6 Conclusion

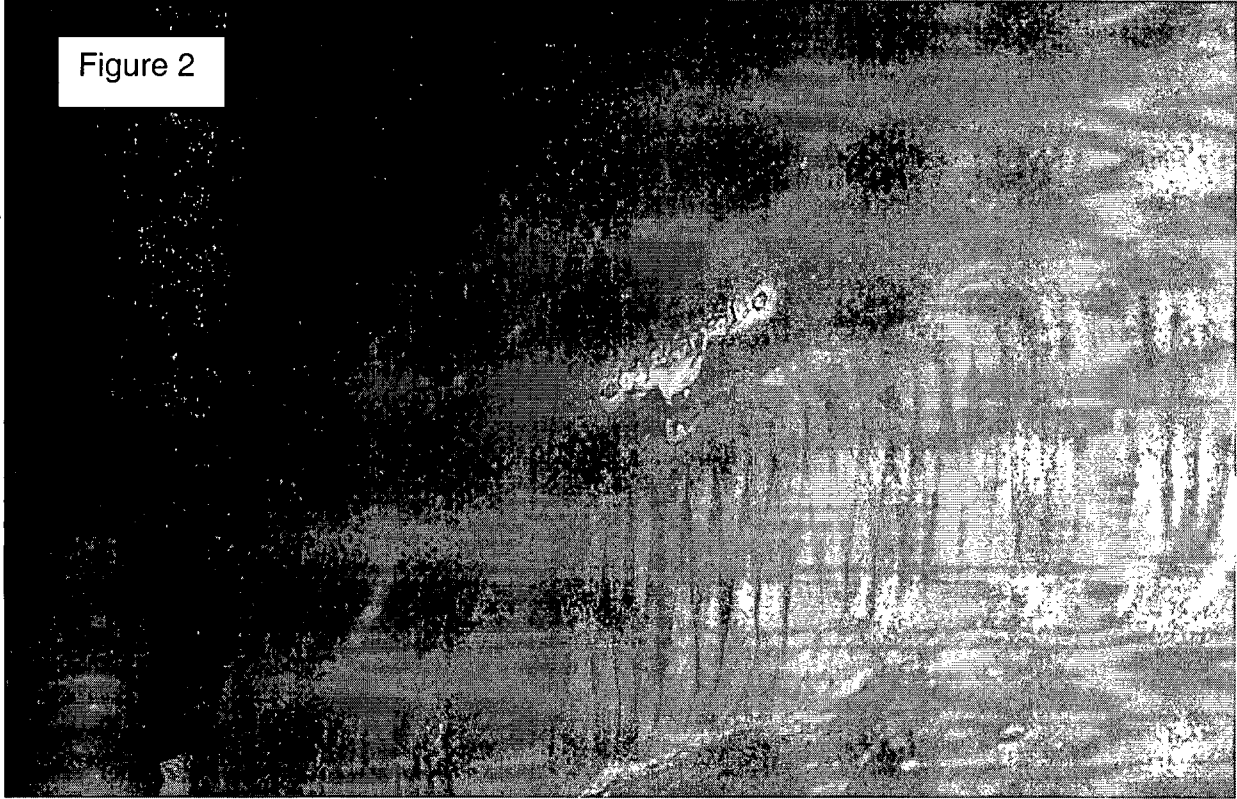
The South Texas Project has analyzed through-wall flaws in ECW piping and found that degradation progresses slowly. Detectable leakage is produced before flaws reach a limiting size that would affect the operability of the Essential Cooling Water System. Rapid or catastrophic failure is not a concern. Flaws are monitored and inspected to ensure detection of leakage. Continued inspection provides assurance that changes in the condition of the flaws will be identified and assessed for further action as needed. Evaluation of the flaw using fracture mechanics methodology provided by NRC Generic Letter 90-05 concludes that the structural integrity of the ECW piping is not adversely affected. Operability and functionality of the system have been maintained, and deferring repair of the flaw will not affect the health and safety of the public.

7. Duration of Proposed Alternative

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, provided the condition continues to meet the acceptance criteria of Generic Letter 90-05. The next Unit 2 refueling outage is scheduled to begin in March 2010.

8. Reference:

- 8.1 M. A. McBurnett (Houston Lighting & Power) to NRC Document Control Desk, "Status of Corrective Actions in the ECW System," dated November 1, 1988 (ST-HL-AE-2748)



LIST OF COMMITMENTS

The following table identifies the actions in this document to which the STP Nuclear Operating Company has committed. Statements in this submittal with the exception of those in the table below are provided for information purposes and are not considered commitments. Please direct questions regarding these commitments to Philip Walker at (361) 972-8392.

| Commitment | Expected Completion Date | CR Action No. |
|--|---------------------------------|----------------------|
| Perform monthly walkdowns of dealloying location to detect changes in size of the discolored area or leakage until a code repair is performed. Structural integrity and the monitoring frequency will be re-evaluated if significant changes in the condition of the dealloyed area are found during this monitoring. | 05/04/2010 | 08-18477-4 |
| Rework of the defect will be deferred until adequate time is available for the repair, but no later than the next Unit 2 refueling outage, 2RE14. | 05/05/2010 | 08-18477-5 |