Nuclear Operating Company

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

May 14, 2008
NOC-AE-08002293
File No.: G25
10CFR50.55a

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2746

South Texas Project
Unit 2
Docket No. STN 50-499
Response to Request for Additional Information:
Request for Relief from ASME Boiler and Pressure Vessel Code,
Section XI Requirements for the Essential Cooling Water System
(Relief Request RR-ENG-2-49) (TAC No. MD7495)

Reference: Correspondence from David W. Rencurrel to NRC Document Control Desk, "Request for Relief from ASME Boiler and Pressure Vessel Code, Section XI Requirements for the Essential Cooling Water System (Relief Request RR-ENG-2-49)," dated September 6, 2007 (NOC-AE-07002189) (ML072600151)

In accordance with the provisions of 10 CFR 50.55a(g)(5)(iii), the South Texas Project requested relief from IWA-5250 of Section XI of the ASME Boiler and Pressure Vessel Code to allow deferral of code repair of a flaw identified in the Unit 2 Essential Cooling Water (ECW) Class 3 piping, as referenced above. 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. Attached are responses to an NRC request for additional information provided via email on February 12, 2008.

There are no commitments in this submittal.

If there are any questions, please contact either Mr. P. L. Walker at (361) 972-8392 or me at (361) 972-7867.

David W. Rencurrel
Vice President,
Engineering & Strategic Projects

PLW

Attachment: Request for Relief from ASME Boiler and Pressure Vessel Code, Section XI Requirements for the Essential Cooling Water System (Relief Request RR-ENG-2-49)

A047
NRR

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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-2-49)

1. In section 6.2.1 Scope of the subject relief request, the licensee stated that an indication of through-wall dealloying was identified on SBDG #23 cast aluminum-bronze ECW return flow balance throttle valve 2-EW-0204. The licensee also stated that the dealloying indication is a spot with residue buildup on the seat retainer.

Please provide the following additional information:

(a) Provide a sketch to show how the seat retainer was connected to the valve 2-EW-0204 and the ECW piping.

Figure 1 shows the configuration of the specific valve. Figure 2 is a typical representation of a valve showing how a seat retainer is installed. Figure 3 is a photograph of the actual valve showing its position relative to the attached ECW piping.

(b) Provide a sketch to show the dimensions of the referenced seat retainer (ID, OD, wall thickness and the length of component).

The dimensions of the parts illustrated in Figure 1 are as follows:

Outside diameter of seat retainer	= ~8.6"
Inside diameter of seat retainer	= ~5.9" to 6.2" (the ID is chamfered)
Thickness (radial) of seat retainer	= ~1.2" (the ID is chamfered)
Thickness (longitudinal) of seat retainer	= ~0.55"

(c) From the photographs you provided in the e-mail, it appears that the materials of the components adjacent to the seat retainer are different from that of the seat retainer. Identify the adjacent components and its materials.

The adjacent components are a red rubber gasket, pipe flange (SB-271 CA-952 cast aluminum-bronze), and the valve body (SB 148 CA 954). The seat retainer material is also SB 148 CA 954. The difference in appearance between the seat retainer and the valve body may be due to machining of the seat retainer surface while the valve body is closer to its original as-cast appearance.

(d) Is the referenced valve made of cast aluminum-bronze material? Also discuss the previous service experiences of such valves and associated ECW piping in both units regarding the degradation due to dealloying.

The valve body is cast aluminum-bronze (SB 148 CA 954).

Dealloying previously occurred in a 6-inch Posi-Seal valve in 2000/2001. Incidents of apparent through-wall dealloying are not known to have previously occurred in Hills-McCanna valves at the South Texas Project.

2. **Provide detailed discussion regarding the compensatory action mentioned in 6.1 Proposed Alternative.**

   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. Structural integrity and the monitoring frequency are re-evaluated if monitoring identifies significant changes in the condition of the dealloyed area.

3. **Provide details regarding the limiting condition for operation of the affected system as specified in the plant technical specification as discussed in section 5.0 Impracticality Determination.**

   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 will be repaired at the time of discovery. Repairs of dealloyed section of piping require that the affected ECW loop be made inoperable. However, repairs can 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, but could require months from time of discovery.

   As stated in the South Texas Project Technical Specifications, the three independent essential cooling water 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.

   The South Texas Project 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 can be applied that take into account real-time plant status to keep overall risk below 10E-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.

4. **Provide detailed discussion to support the statement that this assessment is bounding for the condition under consideration as stated in 6.2.2 Specific Considerations.**

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 analyses have been performed for specific regions of the South Texas Project, taking into consideration the local worst case flood source and the potential impact on plant equipment. Flooding is addressed in Updated Final Safety Analysis Report Appendix 9A.

Water in a diesel generator bay can be tolerated up to a maximum level of 4 inches above the floor. Should that level be reached, the affected diesel would be declared inoperable. Technical Specifications require three diesel generators to be operable in Modes 1-4 and two diesel generators to be operable in Modes 5 and 6. The Diesel Generator Building design precludes flooding in one bay from impacting the other two bays. Plant operators monitor the diesel sump levels for increases that could be indicative of ECW leakage.

Flooding due to ECW dealloying 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.

5. **Provide detailed discussion regarding the methodology used in flaw evaluation in section 6.2.4, particularly with regard to the methodology described in GL 90-05. Also provide detailed quantitative information regarding the calculated safety margins for the various loading conditions.**

The methodology used in flaw evaluations is described in Section 5.0 of ATPECH analysis document AES-C-1964-1, "Calculation of Critical Bending Stress for Dealloyed Aluminum-Bronze Castings in the ECW System." This was previously submitted to the NRC as an attachment to STPNOC correspondence dated August 10, 2000 (ML003742174).

Safety margins are determined from stresses on the affected region using postulated stresses due to pipe breaks as well as loads transferred from the pipe to the valve body.

- **Postulated Pipe Break**

Postulated pipe break stresses are determined using ASME Section III, subsection ND-3652.2, equation 9, and subsection ND-3652.3, equation 10, for occasional loads and thermal expansion, respectively. The seat retainer is treated as a section of 6-inch diameter schedule 40 pipe.

Postulated Pipe Break Stresses				
Eq. 9 (PSI)	Eq. 10 (PSI)	Eq. 9+10 (PSI)	Allowable (PSI)	Safety Margin
978	3593	4571	19440	4.25*

* NOTE: Dealloying reduces material strength. However, the body of the valve is not degraded; therefore, safety margins for the valve are not reduced. The retaining ring

evaluation is performed separately and accounts for the impact of reduced material strength.

- **Pipe-to-Valve Body Loads**

Valve body loads are determined according to ASME Code Section III, Subsection ND (for Class 3 piping), where:

M_a = torsional moment

M_b, M_c = bending moment(s)

Safety margins are determined by comparing allowable moment (6) to the calculated load (5).

The results are summarized below:

Valve Body Loads						
Loading Condition (1)	Moment M_a (Ft-Lb) (2)	Moment M_b (Ft-Lb) (3)	Moment M_c (Ft-Lb) (4)	$(M_b^2+M_c^2)^{1/2}$ (Ft-Lb) (5)	Allowable Moment (Ft-Lb) (6)	Safety Margin [(6)/(5)] (7)
Normal	1531	1293	1662	2106	4149	1.97
Upset	1666	1550	1958	2498	8297	3.32
Faulted	1702	1557	1958	2502	14007	5.59

Although dealloying reduces the strength of the affected material, safety margins for the valve are not reduced because the body of the valve is not degraded.

- **Seat Retainer Design**

For evaluation purposes, the seat retainer is treated as 6-inch diameter schedule 40 pipe. The combined primary membrane stresses due to pressure plus bending loads are compared to the primary bending stress at incipient plastic collapse. The combined primary stresses as determined as follows:

The seat retainer is fabricated from SB 148 CA 954. Tensile strength and yield strength are listed as 86 ksi and 36 ksi, respectively.

Taking into account the circumferential bolt holes, the effective diameter of the retainer is 7.905 inches, with an effective thickness of 0.925 inch. The seat retainer has significant radial thickness available to resist pressure. The pressure stress determined by PD/2T (640 psi) is small compared to a dealloyed material allowable value of 7500 psi.

Primary membrane stress due to bending is calculated from the resultant moment. Using square root of the sum of the squares (SRSS), the resultant moment is calculated from orthogonal faulted moment loads, which are those loads used in qualifying flange in the pipe stress calculation. These loads are normal (thermal plus dead weight) plus seismic plus waterhammer combined as an absolute sum.

Loads:	M_a = 1702 ft-lb M_b = 1557 ft-lb M_c = 1958 ft-lb
Combined load (SRSS):	M_r = 3026 ft-lb
Section modulus of pipe:	Z = 8.5 in3
Membrane stress:	M_r*12/Z = 4272 psi (due to bending loads)

Combined primary membrane stress due to pressure plus bending loads = 4912 psi.

The code allowable stress for aluminum-bronze is 18,700 ksi. Dealloyed aluminum-bronze has an allowed stress value of 7,500 ksi. These allowed values are significantly higher than the calculated combined primary membrane stress given above.

6. **Provide detailed discussion to support your findings in section 6.2.6 Conclusion regarding the statement that the referenced degradation that progresses slowly.**

Periodic monitoring and inspection by STPNOC provide confidence in the ability to detect changes in the leakage rate before leakage becomes a safety issue. Flawed areas are inspected monthly, instead of every six months, and none has shown sufficient change from the time of discovery to warrant accelerated implementation of corrective measures.

FIGURE 1: LINE DRAWING OF ROCKWELL VALVE

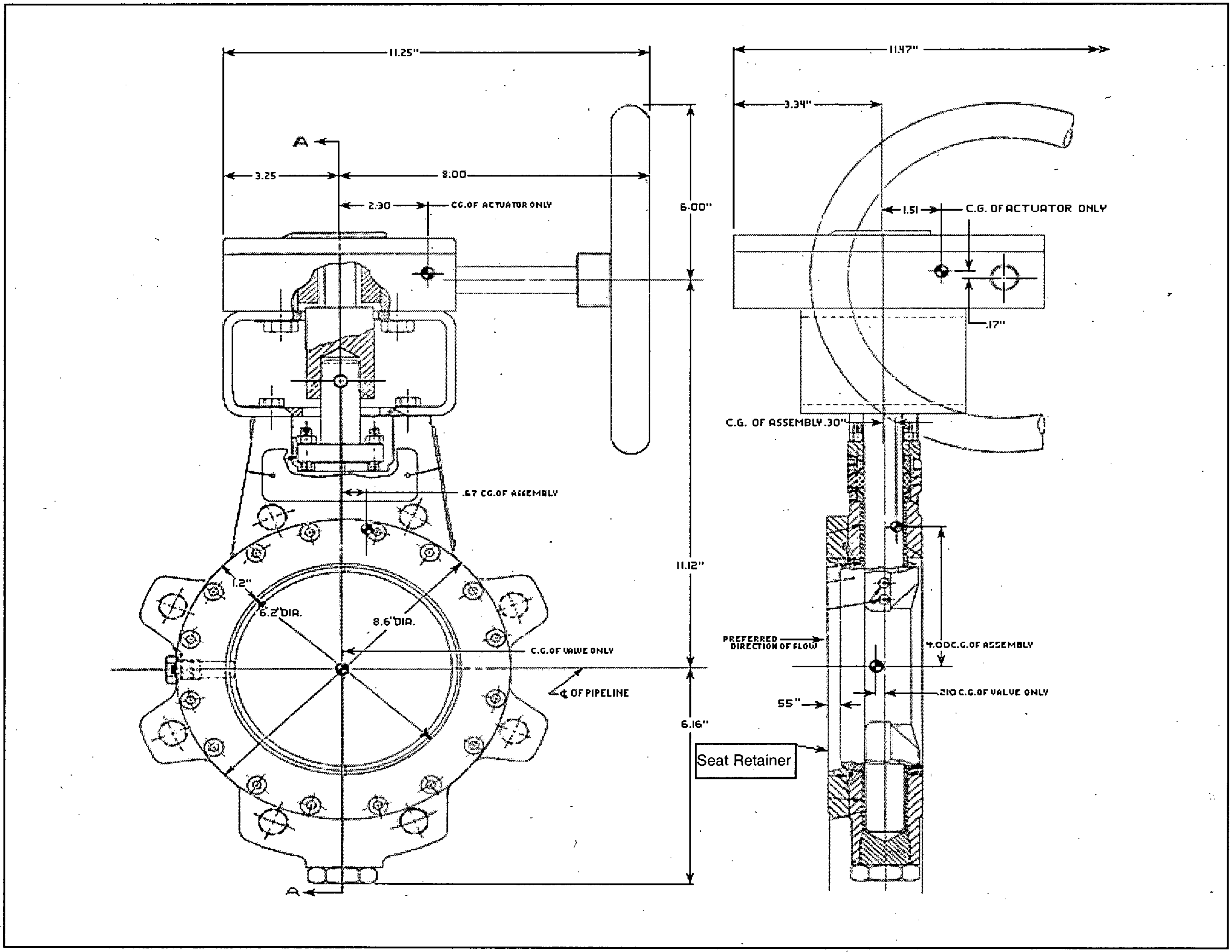
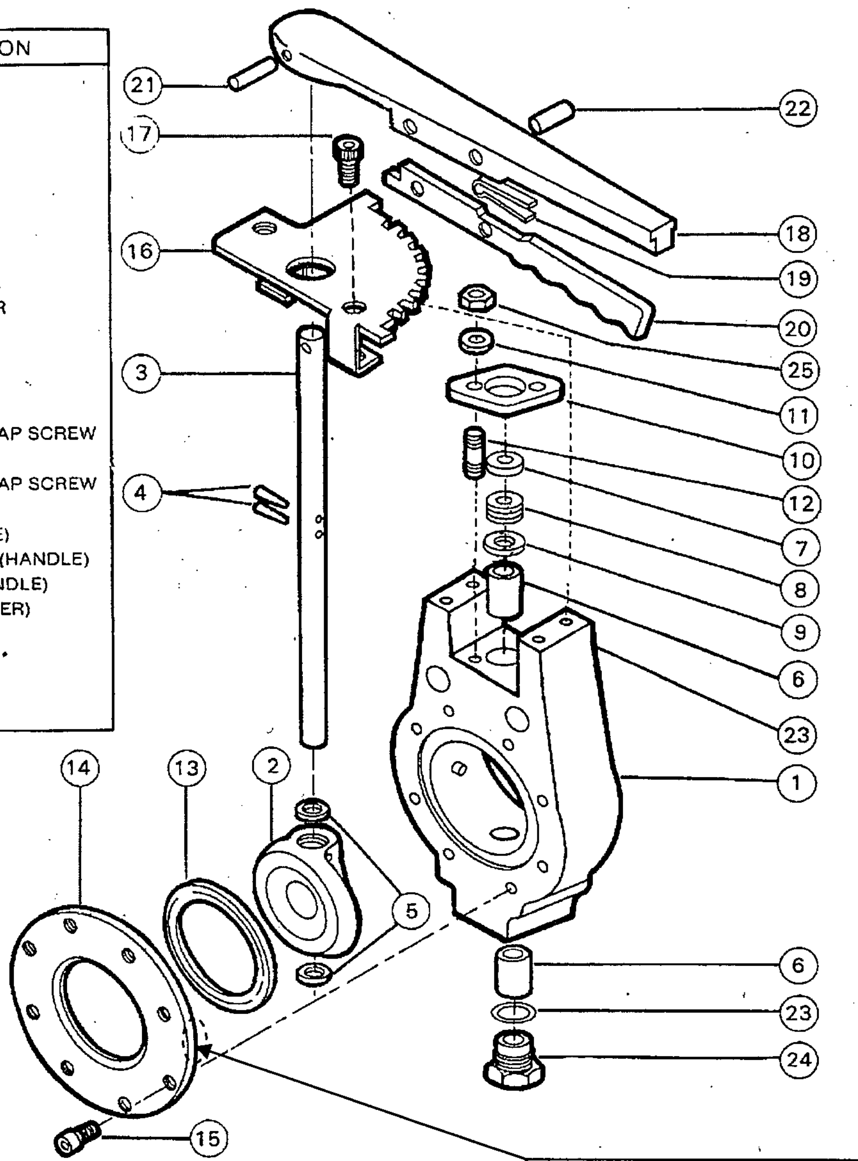


FIGURE 2: EXPLODED DRAWING OF TYPICAL VALVE

NO.	DESCRIPTION
1.	BODY
2.	DISC
3.	STEM
4.	TAPER PIN
5.	DISC SPACER
6.	BEARING ASS'Y
7.	GLAND RING
8.	STEM SEAL
9.	THRUST WASHER
10.	GLAND RETAINER
11.	LOCK WASHER
12.	STUD
13.	SEAT ASS'Y
14.	SEAT RETAINER
15.	SOCKET HEAD CAP SCREW
16.	INDEX PLATE
17.	SOCKET HEAD CAP SCREW
18.	HANDLE
19.	SPRING (HANDLE)
20.	RELEASE LEVER (HANDLE)
21.	SPRING PIN (HANDLE)
22.	SPRING PIN (LEVER)
23.	GASKET *
24.	LOCATING PLUG*
25.	HEX NUT

* NOT APPLICABLE TO SIZES 3" and 4"



EXPLODED VIEW

McCANNALOK BUTTERFLY VALVE

MODEL II CONFIGURATION

FIGURE 3: PHOTOGRAPH OF AFFECTED VALVE