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June 20, 1997
OG-1661

Project No. 683

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Ms. Marylee Slosson, Director
Division of Reactor Program Management

Subject: B&WOG Generic License Renewal Program Topical Report BAW-2251, "Demonstration of the Management of Aging Effects for the Reactor Vessel" (Responses to RAI #18 and 19)

Reference: Letter from P. T. Kuo to David J. Firth, dated April 2, 1997; Subject: Request for Additional Information in the Case of BAW-2251, "Demonstration of Aging Effects for the Reactor Vessel," (RAI Nos. 18 through 26)

Gentlemen:

The above reference contains the third set of Request for Additional Information (RAIs) on the subject document. The GLRP responses to RAI numbers 18 and 19 are attached. We are currently performing analysis to answer RAIs 20 through 26. Our plan is to submit a response to those RAIs on August 15, 1997.

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PDR TOPRP EMVBW
C PDR

We are prepared to work with the Staff over the next several weeks to appropriately resolve any additional questions raised by the Staff following your review of the attached response.

Please call me at 804/832-3635 if you need any additional information.

Very truly yours,

David J. Firth
Program Director
B&WOG Generic License Renewal Program

DJF/bcc

c: R. J. Prato/NRR
B&WOG GLRP

NRC RAI	NRC Comment	GLRP Response	Status	Proposed Revision	Remarks
Regarding Appendix B (BAW-2275)					
18.	**Page 3-, 3.2 Mechanical Properties of Weld Metals**—Provide bases for using a yield strength of 71 ksi and Young's modulus of 27450 ksi for weld materials in the current low upper-shelf toughness analysis. Include a discussion for not using a yield strength of 85.1 ksi and Young's modulus of 26975 which were used in a similar analysis reported in BAW-2178P.	The yield strength and modulus of elasticity referenced in Section 3.2 of BAW-2275 were obtained from recent tests of irradiated SA-1585 specimens (at 550 °F) from Capsule CR3-LG2, as reported on page C-34 of BAW-2254P (BAW-2254P and BAW-2254 were submitted to the NRC in January 1996). The CR3-LG2 capsule and associated specimens received an average fluence of 1.59 E19 n/cm2 (E > 1.0 MeV), which is approximately equivalent to the maximum 48 EFPY fluence predicted at the inside surface of the RV. The impact of using the revised yield strength and Young's modulus reported in BAW-2275 is estimated to have less than a 1% change in $J_{applied}$, which is considered negligible.	Open	<u>**Page 3-1, Section 3.2, Line 29**</u> Line 29 contains a reference to BAW-2253 (i.e., Reference 5) instead of BAW-2254 (Reference 6). Replace [5] with [6].	
19.	**Page 6-1, 6.2 Limiting Level C and D Service Loading**--For level C and D conditions, meeting the acceptance criteria of Appendix K has not been demonstrated for cracks with a depth less than one tenth of the the wall thickness (1/10T). Provide a quantitative analysis to demonstrate that the analysis on a crack depth of 1/10T flaw depth is bounding.	Appendix K states the analysis for Level C and D service conditions shall consider flaw depths up to one-tenth of the base metal wall thickness. By demonstrating that the Level C and D service loads decrease with decreasing flaw size, it can be shown that analysis based on a 1/10T flaw depth is bounding. From Table 6-1 of BAW-2275, the limiting weld for Level C and D service conditions is SA-1526; and, from Figure 6-5 of BAW-2275, the limiting transient is the Hot Leg Loss of Coolant Accident (HL-LOCA). Figure 6-5 also shows that at the critical time of the transient (5 minutes), the stress intensity factor for a 1/10T flaw is well below the material fracture toughness at a crack tip temperature of 400 °F. A set of curves for the HL-LOCA transient, similar to Figure 6-5, can be constructed to include the original 1/10T flaw depth as well as	Open	No change to the report.	

NRC RAI	NRC Comment	GLRP Response	Status	Proposed Revision	Remarks
		three lesser flaw depths (1/40T, 1/20T, and 3/40T). The PCRIT code that was used to compute stress intensity factors for the HL-LOCA was re-run to obtain output at additional flaw depths. Results from this re-analysis are shown in Figure 1 (see attachment to RAI responses). The critical transient times for the various flaw depths (times of maximum stress intensity factor) are: Flaw Depth / Critical HL LOCA Time / K (ksi$\sqrt{in}$) 1/40T 3.4 min. 53.4 2/40T 3.7 min. 69.0 3/40T 4.1 min. 77.8 4/40T 5.0 min. 83.6 Figure 1 demonstrates that the bounding flaw depth is 4/40T, or 1/10T. Figure 1 also reveals how the ASME Code fracture toughness curves, K_{Ic}, vary with RT_{NDT}, or indirectly, with flaw depth. It is noted that the upper shelf fracture toughness values, K_{Jc}, derived from the J-Resistance model for Linde 80 weld material at a flaw extension of 0.1 in., are also a function of flaw depth, based on fluence at the crack tip. However, this is a weak dependence on flaw depth, and only the limiting upper shelf toughness values (for the shallow 1/40T flaw) are plotted.			

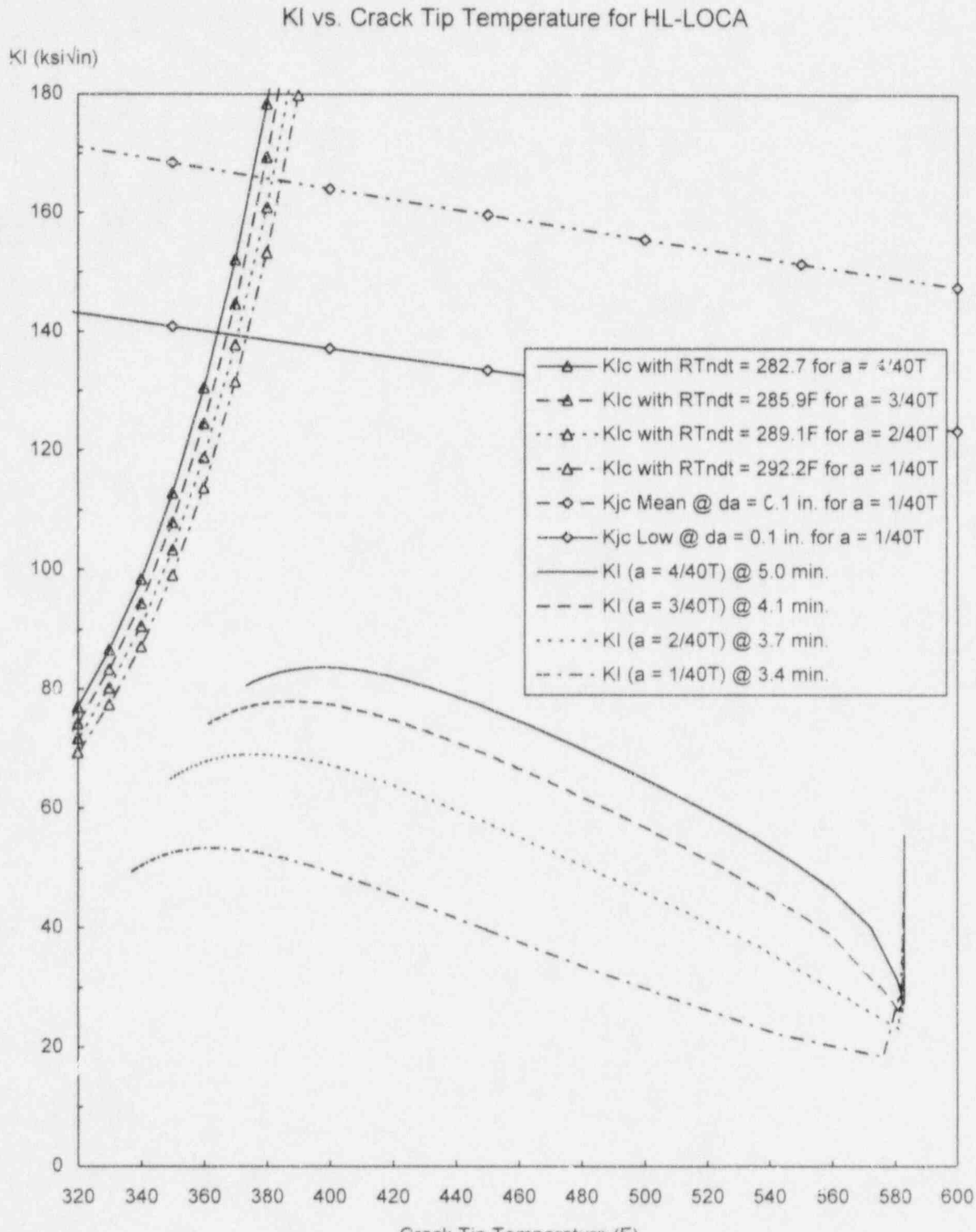

Figure 1. KI vs. Crack Tip Temperature for HL-LOCA