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October 24, 1980
LD-80-055

Mr. Richard P. Snaider
Generic Issues Branch
Division of Safety Technology
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: NUREG-0577, "Potential for Low Fracture Toughness and Lamellar Tearing on PWR Steam Generator and Reactor Coolant Pump Supports"

References: (A) Letter LD-80-041, A. E. Scherer to R. P. Snaider, dated July 9, 1980.

(B) W. G. Clark, Jr., "How Cracks Grow in Structural Steels" Metal Progress, May 1970.

(C) W. G. Clark, Jr., "Stress Corrosion Crack Initiation in High Strength Type 4340 Steel" Westinghouse Scientific Paper 75-1E7-MSLRA-P3, December 30, 1975.

(D) H. H. Johnson and P. C. Paris, "Sub Critical Flaw Growth" Engineering Fracture Mechanics, 1968, Vol. 1.

(E) R. Viswanathan and S. J. Hudak, Jr., "The Effect of Impurities and Strength Level on Hydrogen Inducted Cracking in 4340 Steels", Westinghouse Scientific Paper 75-1D9-MSUBF-P2, July 29, 1975.

Dear Mr. Snaider:

Implementation of the subject document has been delayed pending resolution of the desireability of the EPRI fracture mechanics proposal. In the interim the staff has indicated that they will be reviewing the comments received on the original document as amended by the May 19 and 20, 1980 letters from Darrell Eisenhut. Combustion Engineering (C-E) has transmitted comments to the staff via Reference (A). Further evaluation of the amended report has resulted in additional comments which are presented herein.

Between the May 19 letter, which was addressed to licensees, and the May 20 letter to applicants a notable difference exists. The May 19 letter refers to Table 4.6 in Appendix C of NUREG-0577 to identify the generic material exclusion categories for fracture toughness. Specifically the table was designated as the first step in evaluating materials. No reference is made to this table in the May 20 letter. We believe this step was not intentionally excluded but wish to have this clarification made in the final document. This is important since

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essentially all of the major component supports for all active contracts have been fabricated. Consequently, heat-specific testing cannot be accomplished and is unnecessary for materials considered generically acceptable by the staff for operating plants.

For ferritic materials strengthened by heat treatment (austenitized, quenched, and tempered) the drop weight test, as recognized by Sandia Laboratory, may not yield representative values for all alloys. The reason for this problem is that the weld bead deposited as a crack starter on the drop weight sample could significantly change the microstructure of some materials such that the test does not reflect the condition of the material in service.

Therefore, fracture toughness acceptance standards should be given for either NDTT or CVN tests with selection of the appropriate test method left to the material supplier. Clearly, this would maintain some degree of comparability between widely used industry standards, ASME-B&PV Code, Section III, and the NRC.

Concerning ferritic materials, discussion of stress corrosion cracking in NUREG-0577 is limited to a reference on page C-23 noting "as long as the specified yield strength is less than ~180 KSI, this problem is not considered to be present". C-E would agree that stress corrosion cracking is a concern for high ($\geq$180 KSI) strength ferritic materials under continuous load in the given environment.

However, no basis is given for the ferritic material property curve presented in Figure 2 of NUREG-0577. The value of the critical stress intensity factor (K_{ISCC}) is a strong function of the environment and strength level of the material. Work by Clark (References B and C), Johnson and Paris (Reference D), Viswanathan and Hudak (Reference E), and others has demonstrated this conclusively. The work of Johnson and Paris exhibits higher toughness vs. strength level in flowing seawater than is allowed by Figure 2. The environment of concern (humid air) is considerably more benign than that used to produce any of the data in the cited works. Therefore, C-E recommends that for ferritic materials, consideration of stress corrosion cracking be limited to those materials with minimum yield strengths equal to or greater than 180 KSI.

If any questions arise concerning our comments, please contact me or Ms. J. C. Ennaco of my staff at (203)688-1911, Extension 2595.

Very truly yours,

COMBUSTION ENGINEERING, INC.

A. E. Scherer
Director
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