Department of Energy
Washington, D.C. 20545

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HQ:S:83:193

JAN 26 1983

Mr. Paul S. Check, Director
CRBR Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Check:

ADDITIONAL INFORMATION - PRIMARY HEAT TRANSPORT SYSTEM (PHTS) HOT LEG PIPING CODE EVALUATION

References: 1) Clinch River Breeder Reactor Plant Preliminary Safety Analysis Report, Section 5.3, PHTS

2) CRBRP-ARD-0185, "CRBRP; Integrity of Primary and Intermediate Heat Transport System Piping In-Containment," October 1977

The purpose of this letter is to provide additional information to supplement the PHTS hot leg piping code evaluation contained in References 1 and 2.

The primary piping is designed and analyzed as an ASME Class 1, Seismic Category I nuclear component in accordance with the ASME B&PV Code, Section III, RDT Standard E15-2NB-T, Class 1 Nuclear Components, RDT Standard F9-4T, Requirements at Elevated Temperature, and ASME Code Case 1592-7, Design for Elevated Temperature Components (see Reference 1). Code Case 1592-7 provides for the use of either elastic analysis or inelastic analysis to satisfy rules for strain, deformation and creep-fatigue damage limits.

Inelastic analysis is generally required to provide a quantitative assessment of deformation-controlled code limits. However, elastic methods of analysis may be used for obtaining an upper bound estimate of ratchetting strains and creep-fatigue damage. Since these elastic rules and procedures conservatively approximate many of the complexities of the creep ratchetting phenomenon and the possible interactions involved, they are often excessively conservative. Nonetheless, the use of these rules does show code compliance at most of the components in the piping loops.

In Reference 2, Section 4.1, the initial evaluation of the primary piping using elastic analysis is given. For the primary hot leg piping, the assessment of ratchetting and creep-fatigue based on elastically calculated

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stresses does not show that code limits are met at the highly stressed elbows. Since the Piping Integrity Report was prepared, an inelastic analysis of the PHTS 24-inch hot leg has been completed, and the results show that the code limits for strain and creep-fatigue are satisfied for all the components within the piping loop.

The enclosed Table 1 is a summary of the inelastic ratchetting and creep-fatigue check for the PHTS 24-inch hot leg. Table 1 shows that the maximum ratchetting strain occurs at the middle of elbow 1 and the maximum creep damage occurs at the girth weld between the primary pump nozzle extension and elbow 1. The calculated strains and creep-fatigue damages are well within Code Case 1592-7 limits. Hence, the analysis results reported in the Piping Integrity Report (Reference 2), when supplemented by these inelastic analysis results, substantiate the compliance of the hot leg creep-fatigue values with the ASME code limits.

If you have any questions concerning this transmittal, contact D. Robinson (FTS 626-6098) or D. Edmonds (FTS 626-6157) of the Project Office Oak Ridge staff.

Sincerely,

John R. Longenecker

John R. Longenecker
Acting Director, Office of
Breeder Demonstration Projects
Office of Nuclear Energy

Enclosure

cc: Service List
Standard Distribution
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ENCLOSURE

TABLE 1

PHTS 24 INCH HOT LEG

INELASTIC ANALYSIS - SUMMARY OF RESULTS FOR CRITERIA CHECK

ELBOW NO.[1]	TOTAL STRAIN ACCUMM. (%)	STRAIN LIMIT (%)	CREEP DAMAGE	FATIGUE DAMAGE	TOTAL DAMAGE	DAMAGE LIMIT
INSIDE SURFACE						
1 B[2],E (@ WELD)	0.446 (PEAK)	2.5 (PEAK)	0.367	0.120	0.487	0.84
1M	1.29	2.0 (LINEAR)	0.214	0.000	0.214	1.0
5M	[illegible]	2.0	0.202	0.000	0.202	1.0
6 (117°)M	[illegible]	2.0	0.091	0.001	0.092	0.9987
6 (195°)M	1.31	2.0	0.217	0.000	0.217	1.0
OUTSIDE SURFACE						
5M	0.50	2.0		0.000	0.414	1.0
6M	0.50	2.0	0.347	0.000	0.347	1.0

NOTES: (1) SEE ATTACHED FIGURE FOR LOCATION OF ELBOWS.

(2) B, M AND E SIGNIFY BEGINNING, MIDDLE AND END OF ELBOW, RESPECTIVELY.

ATTACHMENT

FIGURE 1
PHTS 24-INCH HOT LEG
PIPING LOOP ANALYSIS MODEL