

February 29, 1968

Memorandum to File: (Fracture/Cracking)

ORIGINAL SIGNED BY
R. F. FRALEY

From: R. F. Fraley, Executive Secretary, ACRS

Subject: THERMAL SHOCK OF REACTOR PRESSURE VESSELS FROM ECCS INJECTION

Dr. Paris and Dr. Bush discussed the attached reports on February 27, 1968 (during the ACRS-AEC-Industry Meeting on R & D for Large, Water-Cooled Power Reactors) in view of the previous work by Dr. Paris which indicated that a brittle crack in the Three Mile Island reactor pressure vessel would propagate completely through the wall. Dr. Bush indicated that he was examining the effect of various parametric variations related to crack propagation in accordance with attachment 1. The attached curves by Dr. Paris provide an indication of the effects and indicate that a brittle crack would propagate through vessels 3, 8.5 or 12 inches thick, however, that thickness rough etched . Paris

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- 3) Believe E & W is working on the problem. EWL will determine the status in connection with the review of the Crystal River project.

Chap 8
FN 12

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I discussed the status of the topical reports on this item being prepared by Westinghouse, B & W and GE with S. Pawlicki, DRL, to determine the status of these reports. He indicated that:

- 1) Calculations by Westinghouse, using Dr. Paris' model, also indicate that the crack will propagate completely through a PWR vessel. Westinghouse is re-evaluating this question to determine if a more refined model will solve this problem. DRL plans to ask that Westinghouse consider a design change to correct this problem. He plans to summarize the situation in the DRL reports to the ACRS on forthcoming Westinghouse Reactors (Point Beach 2 and Surry).
- 2) GE is continuing to work on the problem. GE has indicated that they will not use the model proposed by Dr. Paris. The status will be summarized in the DRL report on Maine Yankee.
- 3) Bellevue B & W is working on the problem. DRL will determine the status in connection with the review of the Crystal River project.

The question of thermal shock to reactor pressure vessels was discussed during the ACRS-AEC-Industry meeting and Mr. Valerino (GE) indicated that the model used by Dr. Paris was unduly conservative (e.g., a vessel at normal working pressure with a 1/10 inch crack would fail if this model were used). Both B & W (Washer) and GE (Valerino) representatives indicated that they felt crack propagation would be arrested by compressive stresses in the vessel wall.

Attachments: (2)

1. Curves by P. Paris of Applied Stress Intensity Factor, K vs Crack Length for 5" - 8.5" - 12" Thick Vessels
2. Memo from P. E. Bard to S. H. Bush dated February 19, 1968, Subject: A review of the assumptions used in the "Report to ACRS of the AEC on: Analysis of Cracking of Pressure Vessel Walls by Thermal Shock Due to Injection of Water into a Reactor" by P. C. Paris

cc:

C. W. Zabel w/attachments
S. H. Bush w/attachments

File -- Paris w/attachments
Bush w/attachments
Fracture/Cracking w/attachments