

January 4, 1968

MEMORANDUM

To : R. F. Fraley, Executive Secretary, ACES
From : Harold Etherington, ACES Member ^{151 RFF for HE}
Subject: OYSTER CREEK

A few more thoughts on the Oyster Creek vessel.

1. Distortion Measurements. Measurement of the variation of thimble I.D. and stub tube O.D. as a function of length can be used to confirm the proposed stress analysis. The I.D. measurement should be easily made but the O.D. measurement may be more difficult. The λ values show that the axial wave-length of the radial displacement is about 3 in., so measurements close to the weld should be made at frequent intervals. Out-of-round measurements should also be made. I expect the applicant is making such measurements on representative tubes, but it is important to confirm that this will be done while the opportunity still exists.

2. Other Stresses. My previous memorandum (December 20) discussed axial bending stress because this stress appears to be most affected by change in length of stub tube. Bending shear stress was also mentioned incidentally, and will be developed by the same analysis. Other stresses should also be investigated.

(a) In my simple calculated example, the hoop stress (not given) is actually greater than the bending stress. However, this will probably not be true in the short stub tubes with which we appear to be particularly concerned.

(b) The asymmetry of stub tube length in the outer circle should cause an out-of-round condition near the weld, and this could produce a large circumferential bending stress.

3. Corrections to My Memo of December 20, 1967.

(a) There should be a β (beta) in front of all the K's in the equation on p.3. The "B" in the tabulation and formulas on p.2 should also be β (to distinguish from "B" in the equation on p.3).

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(b) On page 3, item 6, the last word should be "sleeves" instead of "shields".

(c) It was not intended to imply that the present failures could have occurred without corrosion - they almost certainly could not. There are really three questions:

(i) if stress corrosion occurred under conditions of combined excessive stress and improper environment, are we going to be complacent about the excessive stress if the environmental condition is corrected?

and (ii) what will be the range of cyclic thermal stresses in the outer circle where the thermal sleeve is almost non-existent on one side?

(iii) is the design satisfactory for Oyster Creek and for future reactors.

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