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SECTOR SPIGOT COMPRESSIVE LOAD TEST
(EML-58)

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MASTER

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BACKGROUND

Hoop-type compression loading in the reflector nozzle end support ring is believed to have occurred in the NRX-A1 reactor tests due to transient differential thermal contractions between the support ring and pressure vessel. The objective of this test was to determine whether a 1000 lb load of this type could cause sector spigot fracture when applied at room temperature. This load was estimated to be about twice as large as the load required to cause fracture of the spigot at reactor temperature conditions.

TEST PROCEDURE

An end plate, simulating a portion of the reflector nozzle end support ring, was assembled to a sector with tie bolts. The tie bolt nuts were torqued finger tight. The diametral clearance between the outside diameter of the sector spigot and the inside diameter of the simulated support ring spigot bore was 0.0002 in. in the direction of loading.

The end plate was loaded in compression in a tensile testing machine (see Figure 1) and the plate strains, measured with the strain gages shown in Figure 2, were recorded at 50 lb load increments from 0 to 1000 lb.

RESULTS

No fracture of the spigot or yielding of the simulated support ring was observed. However, post-test inspection of the sector spigot revealed that the spigot diameters at $\theta = 0^\circ$, 45° , 90° , and 135° (see Figure 3) had been reduced by 0 in., 0.0004 in., 0.0007 in. and 0.0003 in., respectively. This means that some plastic flow took place without fracture. The stresses measured by the strain gages on the simulated support ring are shown in Figures 4 and 5.

CONCLUSIONS

Since the sector spigot was not cracked at room temperature by a compressive load which was about twice as large as the load estimated to be capable of producing spigot failure at reactor temperature conditions, it is felt that the ductility change which the sector material (beryllium) undergoes when it is cooled from ambient to reactor operating temperature conditions has a very important effect on the load required to crack the spigot. Another test similar to the one described in this report will be performed at 140°R to determine the reflector nozzle end ring compressive load and resulting deflection required to crack the sector spigot under reactor temperature conditions.

FIGURE 1
TEST SETUP SHOWING
END PLATE, SECTOR AND TIE BOLTS

FIGURE 2

SIMULATED REFLECTOR NOZZLE END SUPPORT RING
 STRAIN GAGE LOCATIONS

FIGURE 5
MEASURED PLATE STRESSES, GAGES 4, 5, 6, 7, 8*