Astronuclear

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CORROSION TEST CRACKING OF SUPPORT BLOCK

(Title Unclassified)

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Unclassified

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DISCLAIMER

About 50% of the first 30 support block segments used in fuel element corrosion tests revealed cracks after testing. A total of about 30 segments have failed in this manner. These cracks originated at the radius under the dome end interlocking overhang. They extended in both directions along the periphery, approximately normal to the surface, or at a small angle toward the dome end of the block.

The configuration in the corrosion test rig was considerably different from that of the block surroundings in the reactor. The support block segment carried less than 50 pounds of axial pressure loading due to the fuel element (approximately 75% of the reactor loading), through the single interlock extension. A room temperature static load test in the fixture indicated a lobe strength greater than 400 pounds, with the failure occurring in the fixture support ledge and not in the block. Three subsequent tests in a steel support fixture resulted in lobe failure loads greater than 470 pounds.

It was concluded that the failure was probably generated by one of the following:

(1) Mechanical loading due to start-up impact or relative expansions within the test rig.

(2) Thermal shock stresses due to the start-up thermal transient and the close contact of the block segment with the cooler support structure.

These two conditions should not occur in this manner under normal reactor operating conditions.

To eliminate mechanical loading of the ledge, the fixturing was modified to support the block segment under the periphery of the exit face. To date, approximately 70 tests have been run of this configuration with no cracking of the block segments.

These tests have indicated that the failures were apparently caused by a mechanical loading condition (most likely due to relative expansion) which will not occur during normal reactor operation.