

N83. Replacing The Pressurizer Heater Sleeves At Calvert Cliffs 2

On May 5, 1989, in-service inspection identified boron deposits around pressurizer heat sleeves at Calvert Cliffs 2. Closer examination revealed that 23 of the 120 heater penetrations had leaked. Also, one pressurizer upper instrument nozzle had developed a leak.

Destructive examination and material analysis of pressurizer heat sleeves removed from unit 2 revealed that primary water stress corrosion cracking had occurred in the original Alloy 600 sleeve material. It was concluded that pre-reaming during fabrication (possibly combined with other manufacturing and/or fabrication residual stress) had led to high residual tensile stress in the inside diameter, which was responsible for initiation of PWSCC. At Calvert Cliffs unit 2, a program of repair work was embarked upon. All 120 of the unit 2 pressurizer heater sleeves were removed and replaced, as were all four of the upper instrument nozzles.

The replacement sleeve design consisted of dual sleeves made from Alloy 690 material, which has superior resistance to PWSCC. The new design moved from the structural partial penetration attachment weld of the sleeve from the interior to the exterior of the vessel, yet maintained a corrosion-resistant seal between the low alloy steel material and the reactor coolant. The new design has an inner and outer sleeve, which were installed from outside the pressurizer lower head.

Special equipment was designed to carry out the demanding remote machining and welding requirements and the repair project constitutes one of the largest first-of-a-kind repairs to a major nuclear Class 1 vessel yet undertaken.

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