ENCLOSURE

PERRY NUCLEAR POWER PLANT, UNITS 1 & 2
DOCKET NOS. 50-440/441

MATERIALS APPLICATION
MATERIALS ENGINEERING BRANCH

Fracture Prevention of Containment Pressure Boundary

Our safety evaluation review assessed the ferritic materials in the Perry Nuclear Power Plant, Units 1 & 2 containment system that constitute the containment pressure boundary to determine if the material fracture toughness is in compliance with the requirements of General Design Criterion 51, "Fracture Prevention of Containment Pressure Boundary".

GDC 51 requires that under operating, maintenance, testing and postulated accident conditions, (1) the ferritic materials of the containment pressure boundary behave in a nonbrittle manner and (2) the probability of rapidly propagating fracture is minimized.

The Perry Units 1 & 2 containment system includes a freestanding containment vessel enclosed by a reinforced concrete shield building.

The ferritic materials of the containment pressure boundary which were considered in our assessment are those which have been applied in the fabrication of the containment vessel, equipment hatch, personnel locks, penetrations and fluid system components, including the valves required to isolate the system. These components are the parts of the containment system which are not backed by concrete and must sustain loads during the performance of the containment function under the conditions cited by GDC 51.

We have determined that the fracture toughness requirements contained in ASME Code editions and addenda typical of those used in the design of the Perry Units 1 & 2 containment may not ensure compliance with GDC 51 for all areas of the containment pressure boundary. We have elected to apply in our licensing reviews of ferritic containment pressure boundary materials, the criteria for Class 2 components identified in the Summer 1977 Addenda of Section III of the ASME Code. Because the fracture toughness criteria that have been applied in construction typically differ in Code classification and Code edition and addenda, we have chosen the criteria in the Summer 1977 Addenda of Section III of the Code to provide a uniform review, consistent with the safety function of the containment pressure boundary materials. Therefore, we reviewed the materials of the components of the Perry Units 1 & 2 containment pressure boundary according to the fracture toughness requirements of the Summer 1977 Addenda of Section III for Class 2 components.

Considered in our review were components of the containment system which are load bearing and provide a pressure boundary in the performance of the containment function under operating, maintenance, testing and postulated accident conditions as addressed in GDC 51. These components are the containment vessel, equipment hatch, personnel airlocks, penetrations and elements of specific containment penetrating systems.

Our assessment of the fracture toughness of materials is based on the metallurgical characterization of these materials and fracture toughness data presented in NUREG-0577, "Potential for Low Fracture Toughness and Lamellar Tearing in PWR Steam Generator and Reactor Coolant Pump Supports", USNRC, October 1979 and ASME Code Section III, Summer 1977 Addenda, Subsection NC.

The metallurgical characterization of these materials, with respect to their fracture toughness, was developed from a review of how these materials were fabricated and what thermal history they experienced during fabrication. The metallurgical characterization of these materials, when correlated with the data presented in NUREG-0577 and the Summer 1977 Addenda of the ASME Code Section III, provided the technical basis for our evaluation of compliance with the Code requirements.

Based on our review of the available fracture toughness data and materials fabrication histories, and the use of correlations between metallurgical characteristics and material fracture toughness, we conclude that the ferritic materials of the components of the Perry Units 1 & 2 containment pressure boundary meet the fracture toughness requirements that are specified for Class 2 components by the 1977 Addenda of Section III of the ASME Code. Compliance with these Code requirements provides reasonable assurance that the Perry Units 1 & 2 reactor containment pressure boundary will behave in a nonbrittle manner, that the probability of rapidly propagating fracture will be minimized, and that the requirements of GDC 51 are satisfied.