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POWER BUILDING
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WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

May 12, 1982

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Re: Oconee Nuclear Station
Docket No. 50-270

Dear Mr. O'Reilly:

Please find attached Reportable Occurrence Report RO-270/82-07. This report is submitted pursuant to Oconee Nuclear Station Technical Specification 6.6.2.1.a(9), which concerns the discovery of conditions not specifically considered in the safety analysis report or Technical Specifications that require corrective measures to prevent the existence or development of an unsafe condition, and describes an incident which is considered to be of no significance with respect to its effect on the health and safety of the public.

Very truly yours,

William O. Parker, Jr.

William O. Parker, Jr.

JFK/php
Attachment

cc: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Records Center
Institute of Nuclear Power Operations
1820 Water Place
Atlanta, Georgia 30339

Mr. W. T. Orders
NRC Resident Inspector
Oconee Nuclear Station

Mr. Philip C. Wagner
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Duke Power Company
Oconee Nuclear Station Units 2 and 3

Report Number: RO-270/82-07

Report Date: May 12, 1982

Occurrence Date: April 28, 1982

Facility: Oconee Units 2 and 3, Seneca, South Carolina

Identification of Occurrence: Secondary shield wall vertical tendon found broken in Unit 2.

Conditions Prior to Occurrence: Oconee 2 Hot Shutdown
Oconee 3 Cold Shutdown

Description of Occurrence: On April 28, 1982, during the final Reactor Building interior inspection on Unit 2, one vertical tendon in the secondary shield wall was found broken. Subsequent detailed inspection of the Units 2 and 3 secondary shield walls found one additional failed vertical tendon in Unit 2, no failures in Unit 3 and some vertical tendons exhibiting corrosion in Units 2 and 3.

Apparent Cause of Occurrence: The apparent cause of this occurrence was stress corrosion of the post-tensioning wires near the stressing washers caused by water accumulation in the bottom of the vertical tendon sheaths. The failure which occurred was in the high strength wires near the bottom stressing washer. No other component of the tendon or the shield wall concrete failed. The mode of failure was actual breaking of 90 ¼-inch diameter wires. All vertical tendons were detensioned in order to inspect the wires behind the stressing washer. Pitting of tendon wires near the lower stressing washer was found during the inspection. The probable cause of this pitting was stress corrosion.

Analysis of Occurrence: The function of the secondary shield wall is to resist pressure and jet loads from a pipe rupture in combination with Maximum Hypothetical Earthquake. Also, the walls are designed to provide missile protection for the Reactor Building walls. The secondary shield wall design for the Oconee Station is a unique design. The wall is designed so that sections of the wall can be removed to allow removal and replacement of the steam generators. Space for removal of the steam generators is provided by detensioning the portion of the shield wall which has removable sections, removing the tendons, and moving the wall sections. The design function of the removable sections is assured by the post-tensioning tendons. The result of essential failure of the vertical tendons is the loss of prestressing force in the ve· ical direction of the secondary shield walls. The primary strength of the walls to resist the design loads is provided by conventional concrete reinforcing bars embedded in the concrete, and stressing tendons in the horizontal direction.

In evaluating the structural adequacy of the removable wall for the steam generator's enclosure, it is assumed that the vertical tendons are not effective

in prestressing the wall in that direction. Between El. 812 and El. 861.5, the wall is made up of four feet thick precast reinforced concrete blocks spanning horizontally as one piece between the supports which are cast-in-place reinforced concrete walls. These precast blocks are approximately 7.5 feet wide and are keyed into the adjacent blocks at the horizontal joints. Horizontal prestressing tendons at approximately 1' 8" center-to-center have been provided to post-tension the blocks to the support. Based on the structural configuration, it is evident that these blocks will span horizontally and will be independently stable. In other words, the continuity of the blocks across the horizontal joints is not a structural necessity. The blocks were analyzed as post-tensioned beams and were subjected to applicable design basis loadings. The results of the analysis indicate that these blocks are structurally capable of withstanding the loadings with the horizontal post-tensioning system only.

In the region below El. 812, the wall has both horizontal joints and vertical joints. The support conditions are also nonhomogeneous. A simplified analysis assuming horizontal beam action indicates that the horizontal post-tensioning is adequate to sustain the applicable distributed loadings on the wall. The initial assessment of a postulated cold leg guillotine break outside the reactor cavity indicates that a portion of the jet will impinge on the wall. However, the impinged area of the wall is in the proximity of a rigid structure which provides support to the wall. Preliminary indications are that the joint is capable of transmitting the jet impingement load from the removable wall to the support.

Investigation of the occurrence indicated that in Unit 2, six out of eight vertical tendons should be replaced because of corrosion, based on approved acceptance criteria. Removal of grease caps from the ends of the four lower horizontal tendons in the secondary shield wall of Unit 2 revealed a marked improvement over the conditions found at the lower ends of the vertical tendons. This inspection found slight moisture accumulation and light surface oxidation on the buttonhead ends of the wires, stressing washer, and shims. One of the horizontal tendons (second tendon above El. 796.0), was detensioned, pulled out of its protective sheath approximately one foot on the west end, inspected, then pulled out approximately three feet on the east end and inspected. This inspection resulted in no rejection of any of the components. Two of ninety wires were broken during installation; this datum was documented on installation records and reviewed by engineering for acceptance at that time. All wires behind the stressing washer were free of moisture, oxidation, corrosion, and pitting. Therefore, the primary structural integrity of the wall system and its ability to perform its design function are considered to be intact. Thus, it is considered that this event did not have a significant effect on the health and safety of the public.

Corrective Action: Unit 2 was taken from hot shutdown to cold shutdown after the discovery of the broken tendon. Grease caps were removed from all vertical tendons in Units 2 and 3 and detensioned for inspection. While the loss of the vertical tendons does not prevent the shield wall system from performing its design function, those Unit 2 tendons which did not meet the approved acceptance criteria will be replaced. The bottom grease caps will be modified to provide

drainage of water that may enter the tendon through concrete joints. The split shims will also be placed in such a manner to allow positive drainage of water. A surveillance program will be implemented on the tendons in the secondary shield walls to assure that any future corrosion is detected and corrective action is taken to prevent tendon failure. Unit 1 vertical tendons will be inspected during the next available outage.

A detailed analysis will be performed to confirm the findings of the initial simplified analysis.