

TENNESSEE VALLEY AUTHORITY NRC REGION II
CHATTANOOGA, TENNESSEE 37401 ATLANTA, GEORGIA
400 Chestnut Street Tower II

November 9, 1981 NOV 13 A 8:27

BLRD-50-438/81-23
BLRD-50-439/81-25

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303



Dear Mr. O'Reilly:

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2 - EXPANSION ANCHOR FAILURES -
BLRD-50-438/81-23, BLRD-50-439/81-25 - REVISED FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. V. Crlenjak on March 10, 1981 in accordance with 10 CFR 50.55(e) as NCR 1381. This was followed by our first interim report dated April 9, 1981 and our final report dated July 27, 1981. As discussed with R. V. Crlenjak on October 30, 1981, enclosed is our revised final report.

The report has been revised because the commitment closure date of October 30, 1981 was not met. The reason for this is we experienced difficulty in finding an acceptable location for the last few wedge bolts/grouted anchors. Closure of the commitment will be completed by November 10, 1981.

If you have any questions concerning this matter, please get in touch with R. H. Shell at FTS 857-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

cc: Mr. Victor Stello, Jr., Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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ENCLOSURE
BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2
EXPANSION ANCHOR FAILURES
BLRD-50-438/81-23, BLRD-50-439/81-25
10 CFR 50.55(e)
REVISED FINAL REPORT

Description of Deficiency

TVA General Construction Specification No. G-32 covers the installation and testing of expansion shell anchors installed into hardened concrete. It requires inprocess testing of samples of anchors installed by a specific crew either in a specific location or over a period of time. The anchors are proof loaded in tension to about 2.3 times the maximum design service load for the particular size of anchor.

For anchors installed in the M and P line walls of the Control Building between column lines C8 and C10, the rate of proof load failures was excessive. A total of 36 of 68 3/4-inch anchors failed the proof load test. Except for a few 1/4-inch anchors installed for small conduit, 3/4 inch was the only size used in these walls.

Safety Implications

Failure of these anchors could lead to failure of the systems being supported by the anchors. As these systems may be safety related or their failure could affect safety-related functions, the failure of the systems could adversely affect safety of operations of the plant.

Corrective Action

Six cores were taken from the M- and P-line walls in the area where the excessive failures occurred. Three cores were also taken from a wall where anchor failure rates were acceptable. The results showed that some areas of the M- and P-line walls had unexpectedly low strength. The cores were 3-inch diameter by 3 inches long with one end being the wall surface. The compressive strengths of the six cores ranged from 2200 to 4100 lb/in² (corrected for length effects). Visual examination of some cores revealed that about a 1-inch layer adjacent to the surface had a slightly different color than the remainder of the core.

Review of concrete placement records indicates that the concrete was not damaged by freezing and was apparently cured in accordance with specifications. The records also showed that the air contents were at near the specified maximum. The color difference probably indicates a significant difference in the degree of hydration near the surface.

This may indicate that curing compound was not uniformly applied or some localized drying occurred before application of the compound. The combination of reduced strength resulting from surface drying and high air content is the probable cause for the excessive failures.

The proof load test reports for the period October 1980 through December 1980 were reviewed. There was no evidence that a problem existed with the 3/4-inch Phillips self-drilling anchor or that the crew used improper installation procedures.

All 3/4-inch self-drilling anchors in the M- and P-line walls between column lines C8 and C10 and between elevation 680 and 687 will be replaced with wedge bolt or grouted anchors. The wedge bolts and grouted anchors are embedded deep enough to ensure that the reduced strength of the surface will not affect their capacity. Replacement will be completed by November 10, 1981.

As overall concrete strength is adequate to perform its safety function, no corrective action is required for the lower strength concrete areas.