

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

March 1, 1982

USNRC REGION II
ATLANTA, GEORGIA
82 MAR 2 AIO: 51

WBRD-50-390/81-58
WBRD-50-391/81-54

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



Dear Mr. O'Reilly:

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - IMPROPER ANCHOR INSTALLATION -
WBRD-50-390/81-58, WBRD-50-391/81-54 - THIRD INTERIM REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. V. Crlenjak on June 24, 1981 in accordance with 10 CFR 50.55(e) as NCR 3289R. Interim reports were submitted on July 31 and October 21, 1981. Enclosed is our third interim report. We expect to submit our next report by May 24, 1982.

If you have any questions, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure

cc: Mr. Richard C. DeYoung, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

8203180378 820301
PDR ADOCK 05000390
S PDR

OFFICIAL COPY
IE 27
1/1

ENCLOSURE
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
IMPROPER ANCHOR INSTALLATION
WBRD-50-390/81-58, WBRD-50-391/81-54
10 CFR 50.55(e)
THIRD INTERIM REPORT

Description of Deficiency

TVA General Construction Specification No. G-32 requires that qualification tests be performed at the project on all sizes and brands of expansion anchors to be used on a project. The qualification requirements were added to G-32 in revision 5 dated July 1977. Qualification tests were not performed at that time because anchor installation had been in progress for several years, and the revision was not retroactive.

In December 1979, the construction project was requested by the Division of Engineering Design (EN DES) to perform qualification tests on expansion anchors. The tests were performed as part of the resolution to NRC-OIE Bulletin 79-02. The tests were performed during September 1980. All sizes of Phillips self-drilling anchors (snapoff type), except the 3/8-inch, met the qualifications. However, the tests on 3/8-inch anchors were never repeated. The NCR was written in May 1981 when the oversight was discovered.

In June 1981, additional qualification tests were performed on 3/8-inch anchors installed in in-place concrete. The anchors developed only 75 percent of the required ultimate tensile capacity.

Since submittal of our first interim report, TVA has identified the following additional problems relating to qualification of expansion anchors.

1. The additional qualification tests on the 3/8-inch self-drilling anchors which did not meet requirements were performed in in-place concrete with a specified strength of 3000 lb/in² at 90 days. The acceptable qualification tests on other sizes were performed in concrete with a specified strength of 4000 lb/in² at 28 days. All qualified sizes may not be acceptable in the lower strength concrete.
2. Several sizes of unqualified Bulldog self-drilling anchors were installed, and the anchor installation was not in accordance with the manufacturer's recommendations.
3. Several sizes of Phillips self-drilling anchors (flush-type) were used. The flush-type differs slightly from the snapoff type and has not yet been qualified.

4. Several sizes and brands of nondrilling expansion shell anchors were installed. This type of anchor is not equivalent to the specified self-drilling anchors and has not yet been qualified.
5. Several sizes of Hilti Kwik-bolt wedge anchors were installed and were subsequently suspected to be unqualified.

Interim Progress

EXPANSION SHELL ANCHORS

Except for item 5 above, all deficiencies covered by this NCR are related to the qualification of expansion shell anchors. The qualification tests in G-32 were included to ensure that, when properly installed in project concrete, expansion shell anchors are capable of carrying the design loads with the intended level of safety. Since deviations in qualification exist, it is appropriate to determine the acceptability of the expansion shell anchors on the basis of an analysis of tests on the in-place anchors.

Two independent sets of data are available on the in-place anchors. The first set is for the random proof load tests required by G-32 and performed for in-process evaluation of expansion shell anchors. The second set is for an independent program performed at WBN for resolution of NRC-OIE Bulletin No. 79-02.

The G-32 testing consisted of loading the anchors in tension to a proof load which is approximately 140 percent of the maximum allowable design load. For the proof load tests, the anchor was considered to have failed if it exhibited sudden slip or slipped slowly without an increase in load. The tests were performed on a specified portion of the anchors in a lot. A lot was generally defined as a group of anchors installed by the same crew in one system or over a period of time.

A tabulation of the results of the proof load tests has been made. It includes virtually all the test results on expansion shell anchors from the beginning of construction. The analysis of the test data resulted in the following proof load failure rates.

<u>Size</u>	<u>Tested</u>	<u>Number of Failures</u>	<u>Failure Rate (%)</u>
All	17548	349	1.99
3/8	3005	19	0.63
1/2	8666	230	2.65
5/8	1871	16	0.86
3/4	2788	72	2.58
7/8	1218	12	0.99

Even without reducing the failure rates to account for the fact that the proof load is 40 percent greater than the maximum design load, the proportion of defective anchors is less than 5-percent limit recommended in IEB 79-02.

The investigation to date indicates that even though some unqualified anchors were used, the overall acceptability of the in-place anchors is satisfactory. We are presently comparing the results of this analysis with the results of the 79-02 inspection. If the results are comparable, the construction project will be informed that all sizes of Phillips self-drilling anchors (snap-off type) are qualified for use at WBN in concrete with a specified strength of 3000 psi or greater at 28 or 90 days. The other brands and types of expansion shell anchors will be used as-is. However, future expansion shell anchor installations will be restricted to the qualified Phillips anchors.

WEDGE BOLT ANCHORS

Item 5 above covers the suspected use of unqualified Hilti-Kwik bolts. Subsequent informal information from the field indicates that 260 3/4- by 4-1/4-inch Hilti-Kwik bolts were issued by the project warehouse. Six 1/2- by 7-inch Hilti-Kwik bolts were also issued. Formal verification of these quantities will be obtained.

G-32 did not include requirements for wedge bolt anchors until revision 5 which was issued in July 1977. Current information from the field indicates that the 3/4-inch anchors were installed before issue of revision 5. If installed before revision 5, they were designed and installed in accordance with manufacturer's instructions and may be used as-is.

The 1/2-inch anchors were issued in 1980, and the installation was therefore subject to G-32. The location of the anchors is being verified. The anchors will be evaluated to determine their acceptability.