

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-254/85028(DRS); 50-265/85031(DRS)

Docket Nos. 50-254; 50-265

License Nos. DPR-29; DPR-30

Licensee: Commonwealth Edison Company
P. O. Box 767
Chicago, Illinois 60690

Facility Name: Quad Cities Nuclear Power Station, Units 1 and 2

Inspection At: Cordova, Illinois

Inspection Conducted: October 1-3, 1985

Inspector: J. F. Norton

C. C. Williams for

11/21/85
Date

Approved By: C. C. Williams, Chief
Plant Systems Section

Cordell C Williams

11/21/85
Date

Inspection Summary

Inspection on October 1-3, 1985 (Report Nos. 50-254/85028(DRS); 50-265/85031(DRS))

Areas Inspected: Licensee action on IE Bulletins 79-02, "Pipe Support Baseplate Design Using Concrete Expansion Anchors," and 80-11, "Masonry Wall Design."

The inspection involved a total of 22 inspector-hours by one NRC inspector.

Results: No violations or deviations were identified during this inspection.

DETAILS

1. Persons Contacted

- *R. Bax, Production Supervisor
- *H. Lihou, Technical Staff Supervisor
- *A. Scott, Quality Assurance Engineer
- *L. Soth, Staff Engineer, Nuclear Stations Division

*Denotes those present at the exit interview on October 3, 1985.

2. Action on IE Bulletins

- a. (Closed) IE Bulletin 79-02: Based on review of all relevant data, it is concluded that the design and construction of pipe support baseplates using concrete expansion anchors in Units 1 and 2 are in compliance with safety requirements. See Section 3 of this report for details.
- b. (Closed) IE Bulletin 80-11: Based on review of all relevant data, it is concluded that the masonry wall design and construction at Quad Cities, Units 1 and 2, are in compliance with safety requirements. See Section 4 of this report for details.

3. Details of Licensee Action on IE Bulletin 79-02

- a. IE Bulletin 79-02 addresses the design and construction of pipe support baseplates with concrete expansion anchors. The bulletin was issued March 3, 1979, and supplemental revisions were issued July 21, August 20, and November 8, 1979. The primary purpose of the bulletin was to assure that licensee's had appropriately considered baseplate flexibility and its potential effects on anchor loads.
- b. A mixture of wedge and self-drilling type concrete expansion anchors were used in safety-related areas at Quad Cities, Units 1 and 2. The minimum embedment depth for wedge type anchors is 4 1/2 anchor diameters. Self-drilling anchors were predominantly used prior to 1977. All concrete expansion anchors were specified to be installed in accordance with manufacturer's recommendations.
- c. Testing Program
 - (1) Commonwealth Edison Company (CECo) committed to perform static, dynamic and relaxation testing of expansion anchors to verify that the static and dynamic characteristics and capacities of the anchors conform to IE Bulletin 79-02. (CECo letter Cordell Reed to J. G. Keppler dated July 5, 1979.) A summary report entitled, "Static, Dynamic, and Relaxation Testing of Expansion Anchors in Responses to NRC IE Bulletin 79-02," was issued July 20, 1981.

- (2) The purpose of the test program was to supplement previous responses which had referred to these tests. The specific items addressed by the tests were ultimate static capacities of various types of expansion anchors; load-displacement relationships for these anchors; behavior of expansion anchors subjected to simulated seismic events and other cyclic loads; baseplate flexibility and its effect on anchor loads; and the phenomenon of relaxation (loss of anchor preload) with time.
- (3) These tests were divided into 4 phases (A through D), and provided a clear understanding of anchor behavior under a wide range of static and dynamic loadings and the effect of various parameters on that behavior.
 - (a) Phase A involved static tension tests of single anchors and provided an understanding of individual anchor behavior. This series of tests proved that the level of preloading of the anchor at the time of testing does not affect the ultimate capacity of the anchor.
 - (b) In phase B type tests, wedge, sleeve, and shell type anchored plate assemblies were cyclically loaded to simulate seismic or pipe transient type loadings. These tests were performed in reinforced concrete and concrete blocks walls, and confirmed that anchors embedded in concrete block and mortar can withstand cyclic load levels of at least 25% of the anchor ultimate static capacity. Tests in reinforced concrete demonstrated that anchors could withstand cyclic loads up to 50% of the anchor ultimate static capacity. Also, it was determined that preload was not a determining factor as far as capacity of the anchor was concerned.
 - (c) Phase C tests were static tests on anchored baseplate assemblies for purposes of determining the effects of prying action on flexible plates. The results of these tests revealed that prying action is in the order of 15% to 20% of the applied load. This increase was lower than originally anticipated due to lower stiffness modulus of expansion anchors installed in concrete.
 - (d) Phase D tests were run to determine the amount of relaxation of load that occurs in an anchor after it has been preloaded. After the cyclic tests were completed, which demonstrated that preload is not required to withstand cyclic loading, it was subsequently determined that the relaxation phenomenon is not of significant concern.
- d. A major finding resulting from the testing is that loss of preloading in an anchor does not affect the static ultimate load capacity of the anchor, nor is preload required for an anchor to withstand cyclic loadings.

- e. The licensee field inspected and tested anchor installations as follows:

Load Test:	308 tested	2 failures
Thread Engagement:	469 tested	10 failures
Shell Projection:	492 tested	8 failures
Angularity:	1007 tested	25 failures

This data represents a 95% confidence level. This is consistent with CEC's commitments to the NRC regarding the "95-5" criteria presented in D. L. Peoples letter to J. G. Keppler, dated February 19, 1980. The NRC inspector, based on this review, concluded that the actions set forth in IE Bulletin 79-02 have been complied with.

4. Details of Licensee Action on IE Bulletin 80-11

- a. The Station Nuclear Engineering Department (SNED) approved modification M4-1/2-82-7 to reinforce and strengthen masonry walls at Quad City Station, Units 1 and 2, as a result of IE Bulletin 80-11.
- b. In accordance with IE Bulletin 80-11, all masonry walls at Quad Cities were inspected and classified as either safety or non-safety related. There were 25 walls classified as safety-related which did not meet the acceptance criteria as identified in the Bechtel response (180 Day Report, Revision 1, dated November 23, 1981) to the bulletin.

Those walls which did not meet the acceptance criteria and are safety-related were modified in accordance with design drawings B1734 through B1748.

- c. Two walls (Nos. 15 and 171) were qualified by the "Arching Theory" of structural analysis. Due to NRC objection to this analysis method, these walls were subsequently modified to meet the acceptance criteria.
- d. The modifications have been completed on all walls. All work was accomplished in accordance with Bechtel Specification 13524-088-CP11, Revision 2, and the contractor's approved safety-related work procedures. Certificates of conformance were obtained on material procurement. The NRC inspector, based on this review, concluded that the actions set forth in IE Bulletin 80-11 have been complied with.

5. Exit Meeting

The inspector met with licensee representatives (denoted under Persons Contacted) at the conclusion of the inspection on October 3, 1985. The inspector summarized the purpose and findings of the inspection. The licensee acknowledged the findings as reported herein. The inspector also discussed the likely informational content of the inspectors report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any such documents/processes as proprietary.