POWER AUTHORITY OF THE STATE OF NEW YORK
JAMES A. FITZPATRICK NUCLEAR POWER PLANT

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Mr. Boyce H. Grier, Director
United States Nuclear Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, Pennsylvania 19406

Subject: I & E Bulletin 79-02, Revision 1
Pipe Supports Using Concrete Expansion Anchor Bolts

Dear Sir:

The following information provides the report required by I & E Bulletin No. 79-02, Rev. 1. The numbered paragraphs below correspond to numbered requirements of the bulletin.

1. During our review of the concrete expansion anchors and the pipe support baseplates utilized at the James A. FitzPatrick Nuclear Power Plant it has been determined that baseplate flexibility and cyclic loading was not a design consideration during the original design and construction phase of the plant. Analytical work related to base plate flexibility is currently being performed for the FitzPatrick Plant and the results of the study are expected to become available on or about July 31, 1979. Preliminary findings indicate that flexibility considerations will not be a major problem in qualifying these baseplates.

The following simple formulation has been used to account for increased bolt load as a result of prying action. The edge distance and plate thickness are the variable parameters in the simple formulation.

$$F_{DL} = F_{RP}(1 + Q)$$

$$F_{RP}\left(1 + \frac{3b}{8a} - \frac{t^3}{20}\right)$$

where, F_{DL} = Bolt design load accounting for prying action.

F_{RP} = Bolt load calculated on the basis of rigid plate assumption.

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Q = Increase in bolt load as a result of prying action.

a = Distance from center line of anchor bolt to edge of plate in the direction of interest in inches.

b = Distance from center line of anchor bolt to the edge of the structural member in the direction of interest in inches.

t = Plate thickness in inches.

2. See test program in Item 4 below.

3. See program on Item 4 below.

4. An extensive testing program is being conducted at the site to determine the adequacy of the concrete expansion anchors. The results of this testing program has allowed us to immediately qualify 30% of those expansion anchors used in pipe supports for greater than 2½ inch diameter piping presently installed in areas inaccessible during power operation. Of the remainder, none were found to have failed in service. Approximately 50% of those anchors so tested passed a tension test at five times maximum design load. Of those not passing this test, only one failed at less than maximum design load, failing at approximately 90% maximum design load. No rapid failures were observed. Anchors failing the tension test failed our criteria by exceeding the .125 inch maximum permitted deflection at a load less than 5 times maximum design load as specified in our test procedure. The program has also provided a basis for correcting any deficiencies found in those installations which require upgrading. A corrective action program has been instituted to correct deficiencies as they are found.

During this test program which required careful visual inspection of anchor embedment, bolts, washers, and baseplate hole size; either torque tests or tensile pull tests were applied to the concrete anchor. Bolt test values of 4 (wedge type) or 5 (shell type) times bolt maximum design load were used for base plates in inaccessible areas. The tensile pull test has shown to date that greater than 90% of the tested anchors support their actual design load. A factor of two times design bolt load in accessible areas will be utilized and a 100% inspection program will be conducted in these areas. The visual inspection program which required removal of the bolt from the anchor demonstrated only a very small percentage (~2%) of gross misinstallation. However, during the inspection program in both accessible and inaccessible areas, we are finding the following discrepancies; this data is based on a statistical sampling of 104 expansion anchors.

DISCREPANCY	% of DISCREPANCIES
Embedment length of anchor not as prescribed by manufacturer	4.8%

DISCREPANCY	% of DISCREPANCIES
Wedge in shell type anchor not fully seated	67.8%
Hole in baseplate larger than prescribed for bolt diameter	62.1%
Shoulder of shell type anchor touching baseplate	36.8%
Support baseplate improperly grouted	Less than 1%
Anchor loose in concrete	7.7%

The above discrepancies are being corrected on a support by support basis as the support is inspected. In many cases it has been determined that the quickest corrective action is to replace the presently installed shell type anchor with a larger size wedge type anchor. This program is being implemented to the maximum extent practicable in the inaccessible area supports and after these new anchors are installed, preloading is being applied to eliminate cyclic loads.

Other corrective action consists of replacing present washers with heavy gauge plate type washers on which an engineering analysis has been conducted to show that they can support proper loading, redriving anchors where this can yield satisfactory results, utilizing Belleville washers to insure preload equal to or greater than the design value, and utilizing a beveled washer to insure proper bolt contact with the baseplate if the anchor has been drilled into the concrete at a slight angle. Where Belleville washers cannot be installed, proper bolt preload is established by tightening bolts to specific torque.

It is our intention to fully qualify prior to startup the concrete expansion anchors in areas inaccessible during power operation for piping of more than 2½ inches in diameter. In the case of small piping supports in inaccessible areas, our test data from the actual testing of the other base plates illustrates that operation without inspection is not a safety consideration. More than 90% of the large bore pipe supports inspected have demonstrated that the supports are capable of supporting the required design load. In the case of small bore piping (less than 2½ inches in diameter) because of significantly smaller loads, we would expect a greater percentage. Furthermore, on the basis of the herein described results of inspections to date we believe that the accessible large bore piping supports can be completed during operation at minimal risk to safety. Results of visual inspection during pipe verification has indicated that 99% of the presently installed supports on large bore pipes on safety related systems have successfully performed their function of carrying pipe dead weight loads, absorbing thermal expansion loads, withstanding cyclic loading, and in some cases withstanding large hydraulic pressure transients for a period of at least five years since the preoperational testing and commercial operation of the plant.

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The condition of the hangers and piping upon inspection constitutes prima facie evidence that these supports are fully capable of performing their design functions under normal operating conditions, e.g., they are still supporting the piping after five years of service. The nature of failures observed during testing and the loads at which these failures occurred, give a high degree of confidence that the supports would have functioned during a seismic event. The failures observed by testing indicated primarily that the safety factor above maximum design load was less than desired, not that the anchors are incapable of carrying design load.

The only supports which have not fully performed the support function satisfactorily have been identified and are approximately one percent (1%) of the 1156 supports we have examined during the pipe verification program.

If during the continual inspection repair process, a significant operability problem is determined with respect to a system because of a support; the same consideration for repair of that support will be given as is listed in the Technical Specifications for that system's operability.

We believe that we have a conservative and technically correct program for any remedial action required on the concrete expansion anchors in the plant. We will continue to process this program vigorously to completion. Should you have any further questions regarding this, please contact Mr. Verne Childs, Assistant to the Resident Manager, for additional plant specific information.

Very truly yours,

John D. Leonard, Jr.

JDL:sw

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