



Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Nuclear Department

September 20, 1984

U. S. Nuclear Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, PA 19406

Attention: Mr. Thomas T. Martin, Director
Division of Engineering and Technical Programs

Gentlemen:

SUPPLEMENTAL RESPONSE
NRC COMBINED INSPECTION 50-272/84-05 AND 50-311/84-05
SALEM GENERATING STATION
UNITS NO. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

During the subject inspection conducted on January 30 through February 3, 1984, a number of unresolved items were identified. PSE&G hereby submits additional information on those unresolved items:

Item 272 and 311/84-05-02:

Licensee procedure for evaluation of pipe supports in response to IEB 79-02 entitled "Criteria for Evaluating Expansion Bolt Loads with Flat Plate Supports". The criteria defines a limit for the determination of flexible base plates. Plates with ratio of overhanging plate dimension to plate thickness exceeding the value of (5) are defined as flexible. Plates with flexibility ratio below (5) are considered as rigid. The licensee did not provide justification or information regarding the source from which this flexibility limit was established. This item is unresolved pending NRC review of this justification.

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Reply:

This criterion is based on Technical Report TR-3501-1, Revision 1 issued by Teledyne Engineering Services (TES) on August 30, 1979, and transmitted to Mr. William Rutherford (USNRC), Mr. S. K. Chaudhary and Mr. L. E. Tripp (USNRC, Region 1) on September 7, 1979.

Item 272 and 311/84-05-03:

With regard to the licensee procedure for IEB 79-02 evaluation identified above, only one baseplate and attachment configuration has been addressed. Further information is required as to the extent to which this criteria was utilized for evaluation of various base plate and attachment configurations. This item is unresolved pending other licensee determination of the extent of use on other configurations and NRC review of the results.

Reply:

Although the criterion used for calculation of expansion bolt loads pictorially depicted one configuration, this criterion was adequate for all configurations used at Salem, i.e., channel, angle, pipe, and tube attachments to rectangular plates with four, six or eight bolts.

Item 272 and 311/84-05-06:

Concrete expansion anchors were tested for embedment depth by the licensee in reinforced concrete floor slabs. Although partial test results were supplied to the NRC inspectors, PSE&G has not provided an analysis of the test results. Additionally, the test sampling should provide assurance that the weakest case where anchorage was limited to the unreinforced concrete topping has been considered. This item is unresolved pending NRC review of the completed test results.

Reply:

PSE&G has evaluated the adequacy of certain floor-mounted concrete anchor bolts utilized in base plate type pipe supports at Salem 1 and 2 (Attachment 1).

Based on this evaluation, the eighteen (18) supports which are determined to have anchor bolts embedded in finish concrete will perform their intended function, and no further response is required.

Item 272 and 311/84-05-09:

Criteria for IE/BU 79-02 evaluation: (a) A justification is required for the basis of ATI's (licensee contractor) base plate flexibility criteria. (b) The base plate flexibility criteria from B&R (licensee contractor) is limited in its application to two configurations: other configurations analyzed should be identified along with the criteria employed. This item is unresolved pending NRC review of the ATI basis for the criteria and a determination of the other configurations used by B&R.

Reply:

Associated Technologies, Inc. (ATI) used three different methods including manual calculations, "Base PLT" computer program and "ANSYS" finite element computer program to evaluate base plate flexibility criteria in accordance with the ATI procedure provided as Attachment 2.

Burns & Roe (B&R) utilized a simplified "ANSYS" Finite Element program to evaluate angle and channel type connections. However, for other configurations such as connection to flat plates, Teledyne's "BASEPLATE" program was used for evaluation. B&R's letter, dated February 6, 1984, is provided as Attachment 3.

Items 272 and 311/84-05-04 and -05 concern the use of U-bolts and straps as pipe hangers and anchors. A revised specification for testing the capability of these components and for determining the stiffness coefficients was submitted to you on May 21, 1984. This effort is currently underway at the Franklin Institute Research Laboratory with completion of testing expected in approximately eight weeks.

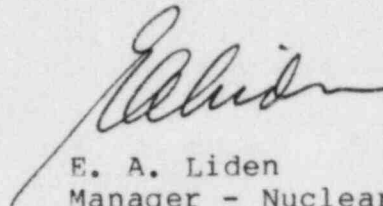
Mr. Thomas T. Martin

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Should you have any questions, please do not hesitate to call us.

Sincerely,

A handwritten signature in dark ink, appearing to read "E. A. Liden", with a long, sweeping horizontal stroke extending to the left.

E. A. Liden
Manager - Nuclear
Licensing and Regulation

Attachments (All)

C Mr. Donald C. Fischer
 Licensing Project Manager

 Mr. James Linville
 Senior Resident Inspector



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~~Nuclear Department~~

TITLE: ANALYSIS ON DETERMINATION OF EMBEDMENT DEPTHS OF CONCRETE
ANCHORS USED FOR SIESMIC I PIPE SUPPORTS, SALEM GENERATING STATION
UNITS 1 AND 2 AUTH. NO. T0060.0

1.0 PURPOSE

This Safety Evaluation addresses the adequacy of certain floor mounted concrete anchor bolts utilized in base plate-type pipe supports.

2.0 REFERENCE

- 2.1 NRC Bulletin No. 79-02 dated November 8, 1979 "Pipe Support Base Plate Design using concrete Anchor Bolts" Para. (4).
- 2.2 SGS/M-DM-112 "Program for determination and evaluation of embedment depths of concrete anchors used for Seismic I pipe support."
- 2.3 SGS/M-DM-106 Appendix I "Procedure for Test Loading Pipe Support Base Plates Employing Concrete Anchors."
- 2.4 NRC Inspection, IE Bulletins 79-02, 79-04, 79-07 and 79-14, January 30 through February 3, 1984. NRC Docket numbers 50-272 and 50-311, dated April 9, 1984.

3.0 SCOPE

Concrete anchor bolting in the scope of this evaluation includes those bolts with embedment within the finish concrete structure as opposed to being within the structural concrete. This has only occurred in isolated cases on floor mounted supports where finish concrete cover was applied over structural concrete flooring.

4.0 DISCUSSION

- 4.1 As a result of questions raised during the reference 2.4 audit, an open item was identified with regard to adequacy of directly drilled-in Hilti Kwik bolts which had embedment in finish concrete as opposed to structural concrete. To address this issue, the total floor mounted anchor bolt embedment length data determined per NRC Bulletin 79-02 was reviewed. The total number of supports falling within the scope of this evaluation is:

13 supports on Salem No. 1
5 supports on Salem No. 2

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Date: May 14, 1984

- 4.2 Part of the program for anchor bolt installation verification in accordance with reference 2.1 consisted of a procedure for test loading a sampling of pipe supports employing concrete anchor bolts as per reference 2.3. This test program called for applying by means of calibrated hydraulic jacks, test loads approximating design loads on the structural attachment transmitting pipe loads to the base plate. During the application of this test load, the bolt strain was measured with calibrated dial indicators and acceptance criteria was conservatively established on the basis of the modulus of elasticity of steel. Because the test loads were applied to the structural attachment on the base plate as opposed to the bolts directly, the test methodology inherently included the bolt load application effects associated with base plate flexibility. The test load sampling included four (4) supports out of eighteen (18), or approximately 22% of the total population for Units 1 and 2 found to exist within the scope of this evaluation. All those supports load-tested had measured bolt deflections which were well within the test acceptance criteria.
- 4.3 The finish concrete in which these bolts are embedded is Nuclear Class and has the same strength as the structural concrete (3500 psi minimum). Appropriate quality controlled measures were taken and documented during the pouring of this concrete. These included performing strength tests of the concrete and witnessing the process of placement by Quality Control personnel.
- 4.4 To further address this issue, a detailed visual reinspection of thirteen (13) supports on Salem No. 1 was conducted. All these supports were found to be structurally sound with no evidence of concrete cracking or bolt loosening. The five (5) supports associated with Salem No. 2 will be reinspected at the first outage opportunity affording access to the supports. No structural instability is expected.

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5.0 CONCLUSION

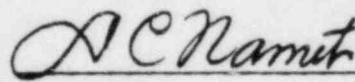
On the basis of load test data sampling, high strength quality concrete utilized in the floors, and satisfactory reinspection results, the eighteen (18) supports which are determined to have anchor bolts embedded in finish concrete will perform their intended function.

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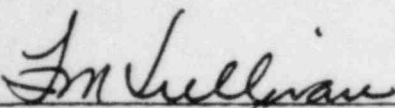
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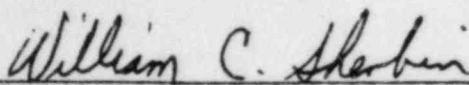
Verifier



Piping, Materials & Stress Group Head



Manager - Nuclear Plant
Engineering



Systems Analysis Group