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SUPERINTENDENT  
NUCLEAR OPERATIONS DEPARTMENT

December 7, 1979

BECo. Ltr. #79-266

Mr. Boyce H. Grier, Director  
Office of Inspection and Enforcement  
Region I  
U.S. Nuclear Regulatory Commission  
631 Park Avenue  
King of Prussia, PA. 19406

License No. DPR-35  
Docket No. 50-293

Response to IE Bulletin #79-02 (Revision 2)  
Titled "Pipe Support Base Plate Designs  
Using Concrete Expansion Anchor Bolts"

Dear Sir:

In a letter dated November 8, 1979, you transmitted the subject IE Bulletin #79-02 (Revision 2). Boston Edison was requested to complete Item Nos. 5, 6 and 7 delineated in the subject bulletin within 30 days of the date of its issuance. Appropriate response are provided in this letter.

Item No. 5

Determine the extent that expansion anchor bolts were used in concrete block (masonry) walls to attach piping supports in Seismic Category 1 systems (or safety related systems as defined by Revision 1 of IE Bulletin #79-02). If expansion anchor bolts were used in concrete block walls:

- a. Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether these supports are accessible during normal plant operation.
- b. Describe in detail any design consideration used to account for this type of installation.
- c. Provide a detailed evaluation of the capability of the supports, including the anchor bolts, and block wall to meet the design loads. The evaluation must describe how the allowable loads on anchor bolts in concrete block walls were determined and also what analytical method was used to determine the integrity of the block walls under the imposed loads. Also describe the acceptance criteria, including the numerical values, used to perform this evaluation. Review the deficiencies identified in the Information Notice on the pipe supports and walls at Trojan to determine if a similar situation exists at your facility with regard to supports using anchor bolts in concrete block walls.

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- d. Describe the results of testing of anchor bolts in concrete block walls and your plans and schedule for any further action.

Response

- a. The following Category 1 pipe supports employ expansion type anchor bolts in concrete block walls:

- (1) H-10-1-9SG (RHR System). This is a singular support of a 6 inch line which is connected at one end to a concrete block wall by two 3/4 inch diameter, Phillips shell type concrete fasteners (with 3/4 inch x 1-1/2 inch hex head bolts) and at the other end to a reinforced concrete wall with the same bolt arrangement. This support is inaccessible during normal plant operation.
- (2) H-10-1-75SG (RHR System). This is a singular support of a 4 inch line secured to a concrete block wall at three points. Two 5/8 inch diameter, Phillips Shell type concrete fasteners (with 5/8 inch x 1-1/4 inch hex head bolts) are employed at each of these connections. This support is inaccessible during normal plant operation.
- (3) H-10-1-8SA and H-10-1-13SA (RHR System). These two supports share a common structural bracing system and serve as anchors for two 6 inch lines. Due to a lack of clarity in the drawings of this structural system coupled with its inaccessibility during normal plant operation, certain assumptions were made concerning its composition and configuration. Among these is that 1/2 inch concrete fasteners (with 1/2 inch x 2-1/2 inch bolts) are used to connect the system on one side to concrete block wall and on the other to reinforced concrete.

- b. In general, the practice of supporting Category 1 piping by concrete block walls with expansion type anchor bolts was not intended in the original design of this facility. Although no written documentation supporting that approach is available, it is evidenced by the fact that only three support systems fall into this category. Two of the three supports, H-10-1-9SG and H-10-1-75SG, are subject to such minimal loading conditions as to impose minor loads upon the wall itself. Thus, these exceptions seem to be well within the limits of reasonable design. The third system, H-10-1-8SA and H-10-1-13SA, was originally designed to be supported solely by reinforced concrete, but was apparently revised to resolve a construction interference problem.

- c. The capability of each support system to meet design loads was examined. The structural systems of both H-10-1-9SG and H-10-1-75SG were proven to be capable of supporting the combined effects of thermal, weight and SSE loads. Allowable loads for each size of expansion anchor bolts in reinforced concrete block wall were determined from test results at The Fast Flux Test Facility (FFTF).

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Assuming a Safety Factor of 5, the acceptance criteria is as follows:

2/4" Ø Bolts: T & V = 784 #

5/8" Ø Bolts: T & V = 529 #

Preliminary analysis of the structural system including anchors H-10-1-8SA and H-10-1-13SA indicates an over stressed condition on the part of the concrete expansion anchor bolts. Due to the lack of necessary information in the hanger detail drawings and the inaccessibility of these supports, no final conclusion has been reached regarding the structural capability of this support system. However, an analysis is currently in progress to determine the effects that loss of this support would have on overall system operability. Based on work done to date with respect to IE Bulletin #79-14, no system inoperability problems are expected. When this area is made accessible, a survey will be performed to determine the information required to complete the analysis and a final report will be provided.

The local effect on the walls due to loads from the Category 1 pipe supports, which are only horizontal and vertical shear loads, is determined by shear stresses in mortar and compression stresses in concrete blocks. The resulting stresses did not exceed the allowables set forth in the Uniform Building Code, using an acceptance criteria of 25 psi for shear stresses and 300 psi for compressive stresses.

The estimated horizontal seismic load from all piping and equipment is approximately 20 pounds per square foot. This is less than the load of 50 pounds per square foot which was applied to previously investigated 2 and 3 foot thick reinforced concrete block walls with a more critical span to thickness ratio. Therefore, it can be concluded that the reinforced concrete block walls of concern are adequate to support all loads, including the Category I pipe supports. When this area is made accessible, a survey will be performed to confirm the conservatism of the estimated piping and equipment loads and a final report will be provided.

- d. Testing of Phillips Shell type concrete expansion anchor bolts was conducted at various plant sites. Results are known to vary considerably according to type of block, type of mortar, type of grout, type of workmanship and bond values. However, results at FFTF represented lower bound values and, therefore, were taken as the accepted values.

Item No. 6

Determine the extent that pipe supports with expansion anchor bolts used structural steel shapes instead of base plates. The systems and lines reviewed must be consistent with the criteria of IE Bulletin No. 79-02, Revision 1. If expansion anchor bolts were used as described above, verify that the anchor bolt and structural steel shapes in these supports were included in the actions performed for the Bulletin. If these supports cannot be verified to have been included in the Bulletin actions:

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- a. Provide a list of the systems involved, with the number of supports, type of anchor bolt, line size, and whether the supports are accessible during normal plant operation.
- b. Provide a detailed evaluation of the adequacy of the anchor bolt design and installation. The evaluation should address the assumed distribution of loads on the anchor bolts. The evaluation can be based on the results of previous anchor bolt testing and/or analysis which substantiates operability of the affected system.
- c. Describe your plans and schedule for any further action necessary to assure the affected systems meet Technical Specifications operability requirements in the event of an SSE.

Response

Boston Edison has already included and verified that all seismic pipe supports with expansion anchor bolts using structural steel shapes as well as base plates are included in the actions performed for the Bulletin. Our final report will provide all the information for those actions.

Item No. 7

For those licensees that have had no extended outages to perform the testing of the inaccessible anchor bolts, the testing of anchor bolts in accessible areas is expected to be completed by November 15, 1979. The testing of the inaccessible anchor bolts should be completed by the next extended outage. For those licensees that have completed the anchor bolt testing in inaccessible areas, the testing in accessible areas should continue as rapidly as possible, but no longer than March 1, 1980. The analysis for the Bulletin items covering base plate flexibility and factors of safety should be completed by November 15, 1979. Provide a schedule that details the completion dates for IE Bulletin No. 79-02, Revision 2, Item Nos. 1, 2 and 4.

Response

Boston Edison is expecting to complete the testing of anchor bolts and the analysis for the Bulletin items by the end of the refueling outage scheduled to commence on January 5, 1980.

We believe this letter is responsive to your concerns. However, should you have any further questions or concerns please contact us.

Very truly yours,

*Paul J. ...*  
*...*  
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cc: Director, Division of Operating Reactors  
Office of Nuclear Reactor Regulations  
U.S. Nuclear Regulatory Commission  
Washington, D. C. 20555

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