PHILADELPHIA ELECTRIC COMPANY

2301 MARKET STREET

PHILADELPHIA, PA. 19101

(215) 841-4500

V. S. BOYER
VICE-PRESIDENT

JAN 07 1980

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

Subject: NRC Region I Letter dated November 8, 1979
RE: IE Bulletin No. 79-02 Revision No. 2
Limerick Generating Station - Units 1 and 2
Docket Nos. 50-352 and 50-353

File: GOVT 1-1 (IE Bulletin 79-02)

Dear Mr. Grier:

Philadelphia Electric Company has reviewed IE Bulletin No. 79-02, Revision 2, submitted with the subject letter received on November 8, 1979.

Our responses to the action to be taken by construction permit holders are listed below:

2. Verify that the concrete expansion anchor bolts have the following minimum factor of safety between the bolt design load and the bolt ultimate capacity determined from static load tests (e.g. anchor bolt manufacturer's) which simulate the actual conditions of installation (i.e., type of concrete and its strength properties):

   a. Four - For wedge and sleeve type anchor bolts,
   b. Five - For shell type anchor bolts.

   The bolt ultimate capacity should account for the effects of shear-tension interaction, minimum edge distance and proper bolt spacing.

   If the minimum factor of safety of four for wedge type anchor bolts and five for shell type anchors cannot be shown then justification must be provided. The Bulletin factors of safety were intended for the maximum support load including the SSE. The NRC has not yet been provided adequate justification that lower factors of safety are acceptable on a long-term basis. Lower factors of safety are allowed on an interim basis by the provisions of Supplement No. 1 to IE Bulletin No. 79-02. The use of reduced factors of safety in the factored load approach of ACI 349-76 has not yet been accepted by the NRC.

Response In our response of July 6, 1979, it was stated that under extreme environmental loads factors of safety of three or two are considered acceptable. Any such cases have since been revised to factors of safety of four or five. All expansion anchor bolts now conform to factors of safety of four for wedge and sleeve type bolts and five for shell type bolts.

4. Verify from existing QC documentation that design requirements have been met for each anchor bolt in the following areas:

(a) Cyclic loads have been considered (e.g. anchor bolt preload is equal to or greater than bolt design load). In the case of the shell type, assure that it is not in contact with the back of the support plate prior to preload testing.

(b) Specified design size and type is correctly installed (e.g. proper embedment depth).

If sufficient documentation does not exist, then initiate a testing program that will assure that minimum design requirements have been met with respect to sub-items (a) and (b) above. A sampling technique is acceptable. One acceptable technique is to randomly select and test one anchor bolt in each base plate (i.e. some supports may have more than one base plate). The test should provide verification of sub-items (a) and (b) above. If the test fails, all other bolts on that base plate should be similarly tested. In any event, the test program should assure that each Seismic Category I system will perform its intended function.

The preferred test method to demonstrate the bolt preload has been accomplished is using a direct pull (tensile test) equal to or greater than design load. Recognizing this method may be difficult due to accessibility in some areas an alternative test method such as torque testing may be used. If torque testing is used, it must be shown and substantiated that a correlation between torque and tension exists. If manufacturer's data for the specific bolt used is not available, or is not used, then site specific data must be developed by qualification tests.

Bolt test values of one-fourth (wedge type) or one-fifth (shell type) of bolt ultimate capacity may be used in lieu of individually calculated bolt design loads where the test value can be shown to be conservative.

The purpose of Bulletin No. 79-02 and this revision is to assure the operability of each seismic Category I piping system. In all cases an evaluation to confirm system operability must be performed. If a base plate or anchor bolt failure rate is identified at one unit of a multi-unit site which threatens operability of safety related piping systems of that unit, continued operation of the remaining units at that site must be immediately evaluated and reported to the NRC. The evaluation must consider the generic applicability of the identified failures.

Appendix A describes two sampling methods for testing that can be used. Other sampling methods may be used but must be justified. Those options may be selected on a system by system basis.

Justification for omitting certain bolts from sample testing which are in high radiation areas during an outage must be based on other testing or analysis which substantiates operability of the affected system.

Bolts which are found during the testing program not to be preloaded to a load equal to or greater than bolt design load must be properly preloaded, or it must be shown that the lack of preloading is not detrimental to cyclic loading capability. Those licensees that have not verified anchor bolt preload are not required to go back and establish preload. However, additional information should be submitted which demonstrates the effects of preload on the anchor bolt ultimate capacity under dynamic loading. If it can be established that a tension load on any of the bolts does not exist for all loading cases, then no preload or testing of the bolts is required.

If anchor bolt testing is done prior to completion of the analytical work on base plate flexibility, the bolt testing must be performed to at least the original calculated bolt load. For testing purposes factors may be used to conservatively estimate the potential increase in the calculated bolt load due to base plate flexibility. After completion of the analytical work on the base plates, the conservatism of these factors must be verified. For base plate supports using expansion anchors, but raised from the supporting surface with grout placed under the base plate, for testing purposes it must be verified that leveling nuts were not used. If leveling nuts were used, then they must be backed off such that they are not in contact with the base plate before applying tension or torque testing.

Bulletin No. 79-02 requires verification by inspection that bolts are properly installed and are of the specified size and type. Parameters which should be included are embedment depth, thread engagement, plate bolt hole size, bolt spacing, edge distance to the side of a concrete member and full expansion of the shell for shell type anchor bolts.

If piping systems 2 1/2-inch in diameter or less were computer analyzed, then they must be treated the same as the larger piping. If a chart analysis method was used and this method can be shown to be highly conservative, then the proper installation of the base plate and anchor bolts should be verified by a sampling inspection. The parameters inspected should include those described in the preceding paragraph. If small diameter piping is not inspected, then justification of system operability must be provided.

Response Preloading of anchor bolts is not required as stated and explained in our reply of July 6, 1979.

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 No. 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.

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

Response No Seismic Category I large pipe is or will be supported from concrete block walls with expansion bolts.

Small pipe may be attached to concrete block walls with expansion bolts under the design criteria stated in paragraphs 5b. and 5c.

   a. A list of systems, number of supports, etc. cannot be furnished because all piping systems designs have not been completed.

b. & c. The design criteria permits the use of Phillips sleeve type anchors only in concrete block walls. The capability of these expansion anchors in block walls was based on a test program performed at the Limerick job site. The allowable design load is based on a factor of safety of five to the lowest value of failure load in shear or tension as determined by the test program.

In all cases a minimum of 6 samples per size was used.

The Analytical Method used for block wall design is the working stress method of the Uniform Building Code-1970.

Additional design details are as follows:

. Walls are designed for seismic inertia loads normal to wall.
. OBE allowable stress increase - 1.25
. SSE allowable stress increase - 1.33
. Seismic loads are computed as per enveloping floor response spectra for 6% damping
. Natural frequencies are computed using uncracked section.
. Relative floor deflections were considered.
. Typical design height is 15'.
. Typical design thickness is 18".
. Majority of the walls are non-shear, non-bearing walls. Shear walls are for one story structure within the building.
. Loads imposed by Category I small pipe were not included in the block wall design. However, if small pipes are to be supported from block walls, those walls will be evaluated to determine their capability.
. In plane and out of plane loads were not considered concurrently.

d. Phillips sleeve type expansion anchor bolts in concrete block walls were proof-tested after installation and will be tested in future installations to twice the allowable design loads. The testing frequency is one in five bolts with a minimum of one test for each plate or structural support.

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:

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.

Response All pipe supports whether they consisted of plates or structurals fastened by expansion bolts were included in the original analysis.

Sincerely,

V S Boyer

Copy to: U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Division of Reactor Operations Inspection
Washington, D. C. 20555