UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

July 3, 1980

Docket No. 50-344

Mr. Charles Goodwin, Jr.
Assistant Vice President
Portland General Electric Company
121 S.W. Salmon Street
Portland, Oregon 97204

Dear Mr. Goodwin:

IE Bulletin 80-11 on the subject of Masonry Wall Design was sent to you for information on May 8, 1980 (copy enclosed). Since the action called for in the bulletin was written for most power reactor facilities, it was felt inappropriate for the identical actions to be taken by you since some of the actions called for by the bulletin have already been performed for Trojan. Because the masonry wall design problem was discovered at Trojan and resulted in the bulletin to other facilities, you are obviously much farther along than others in addressing these concerns.

Nevertheless, there are several items in this bulletin which have not been addressed, and are of sufficient importance to warrant a response.

Therefore, you are requested to provide a written response to Bulletin Items 2.b and 3 within 90 days.

As to Item 2.b, the design criteria for single and double wythe and composite walls for consideration of all in-plane and all out-of-plane loads and the interaction of these loads should be provided and fully justified. Stiffness considerations must be substantiated. All inherent margins in the criteria are to be quantified based on existing test data to the extent possible. The long-range test program shall provide bases for those quantities not established at this time. A description and justification of tornado loads should be provided for all walls. In this regard, we note that Bechtel Topical Report BC-TOP-9 applies to reinforced concrete walls. Its application to concrete masonry must be substantiated.

In addressing Item 2.b, we are mindful of the previous information you have filed regarding the masonry wall problem. Therefore, in responding, you may reference previously filed documents provided that such references are clear and specific. Since previous documents date back to October 1979 and are numerous, part of our objective here is to lay out clearly and in one place the design criteria for all masonry walls, together with a justification for their adequacy and safety margins. It will also provide a clear, referenceable document for updating of the FSAR and related Technical Specifications.

As to Bulletin Item 3, you are requested to submit for our review your long-term confirmatory test program, including its associated schedule for completion and a detailed justification of its adequacy. We suggest the following items be considered in your test program:

1. Wall frequency calculation, dynamic behavior, damping, stiffness, etc.

2. Anchor bolts in composite, double and single wythe masonry under in-plane and out-of-plane loading. Account for cracking.

3. Local load capacity, e.g., tornado missiles, block pull-out from bolted connections, including anchor and through-bolt configurations, etc.

4. Confirmation that smearing local loads over 6t is justified and reasonably conservative.

5. Local bearing stresses for bearing normal to wall.

Please contact us if you have any questions concerning this request.

Sincerely,

R. A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Enclosure: IE Bulletin 80-11

cc w/enclosures: See next page

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SSINS No.: 6820
Accession No.:
7912190695

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

May 8, 1980

IE Bulletin No. 80-11

MASONRY WALL DESIGN

Description of Circumstances:

In the course of conducting inspections pursuant to IE Bulletin Nos. 79-02 and 79-14 at the Trojan Nuclear Plant, Portland General Electric Co. (PGE) identified a problem with the structural integrity of concrete masonry walls with Seismic Category I piping attached to them. This problem was briefly addressed in IE Information Notice No. 79-28, which was sent to all Construction Permit and Operating License holders on November 16, 1979 (Attachment 1).

The problem was that some walls were found which did not have adequate structural strength to sustain the required piping system support reactions. These structural deficiencies were at that time reported to be attributable to two deficiencies:

1) Apparent lack of a final check of certain pipe support locations and reactions to ensure that the supporting elements possessed adequate structural integrity to sustain the required loads.

2) Non-conservative design criteria for the reactions from supports anchored into the face of concrete masonry walls; e.g., relying on the combined strength of double block walls without substantial positive connection between the two walls by means other than the bond provided by a layer of mortar, grout or concrete between them.

Continued investigations into the deficiencies identified at the Trojan Nuclear Plant, engineered by Bechtel, confirmed the deficiencies to be attributable to error in engineering judgment, lack of procedures and procedural detail, and inadequate design criteria (details are in Trojan Nuclear Plant's LER No. 79-15, and supplements). Because of this and the generic implications of similar deficiencies with other operating facilities, we have concerns with regard to the adequacy of design criteria used for the design of masonry walls and an apparent lack of design coordination between the structural and piping/equipment design groups.

IE Bulletin 79-02, Revision 2 issued on November 8, 1979 required a review of pipe supports attached to masonry walls using expansion anchor bolts. For most pipe supports in this category, the expansion anchor bolts were replaced by bolting through the wall or the support was relocated to another structure. Supports that are bolted through masonry walls are also to be considered in the review for this Bulletin.

Action to be taken by all power reactor facilities with an Operating License (except Trojan, Sequoyah Unit 1, North Anna Unit 2, and Salem Unit 2):

1. Identify all masonry walls in your facility which are in proximity to or have attachments from safety-related piping or equipment such that wall failure could affect a safety-related system. Describe the systems and equipment, both safety and non-safety-related, associated with these masonry walls. Include in your review, masonry walls that are intended to resist impact or pressurization loads, such as missiles, pipe whip, pipe break, jet impingement, or tornado, and fire or water barriers, or shield walls. Equipment to be considered as attachments or in proximity to the walls shall include, but is not limited to, pumps, valves, motors, heat exchangers, cable trays, cable/conduit, HVAC ductwork, and electrical cabinets, instrumentation and controls. Plant surveys, if necessary, for areas inaccessible during normal plant operation shall be performed at the earliest opportunity.

2. Provide a re-evaluation of the design adequacy of the walls identified in Item 1 above to determine whether the masonry walls will perform their intended function under all postulated loads and load combinations. In this regard, the NRC encourages the formation of an owners' group to establish both appropriate re-evaluation criteria and where necessary, a later confirmatory masonry test program to quantify the safety margins established by the re-evaluation criteria (this is discussed further in Item 3 below).

   a. Establish a prioritized program for the re-evaluation of the masonry walls. Provide a description of the program and a detailed schedule for completion of the re-evaluation for the categories in the program. The completion date of all re-evaluations should not be more than 180 days from the date of this Bulletin. A higher priority should be placed on the wall re-evaluations considering safety-related piping 2-1/2 inches or greater in diameter, piping with support loads due to thermal expansion greater than 100 pounds, safety-related equipment weighing 100 pounds or greater, the safety significance of the potentially affected systems, the overall loads on the wall, and the opportunity for performing plant surveys and, if necessary, modifications in areas otherwise inaccessible. The factors described above are meant to provide guidance in determining what loads may significantly affect the masonry wall analyses.

   b. Submit a written report upon completion of the re-evaluation program. The report shall include the following information.

      (i) Describe, in detail, the function of the masonry walls, the configurations of these walls, the type and strengths of the materials of which they are constructed (mortar, grout, concrete and steel), and the reinforcement details (horizontal steel, vertical steel, and masonry ties for multiple wythe

construction). A wythe is considered to be (as defined by ACI Standard 531-1979) "each continuous vertical section of a wall, one masonry unit or grouted space in thickness and 2 in. minimum in thickness."

(ii) Describe the construction practices employed in the construction of these walls and, in particular, their adequacy in preventing significant voids or other weaknesses in any mortar, grout, or concrete fill.

(iii) The re-evaluation report should include detailed justification for the criteria used. References to existing codes or test data may be used if applicable for the plant conditions. The re-evaluation should specifically address the following:

(a) All postulated loads and load combinations should be evaluated against the corresponding re-evaluation acceptance criteria. The re-evaluation should consider the loads from safety and non-safety-related attachments, differential floor displacement and thermal effects (or detailed justification that these can be considered self limiting and cannot induce brittle failures), and the effects of any potential cracking under dynamic loads. Describe in detail the methods used to account for these factors in the re-evaluation and the adequacy of the acceptance criteria for both in-plane and out-of-plane loads.

(b) The mechanism for load transfer into the masonry walls and postulated failure modes should be reviewed. For multiple wythe walls in which composite behavior is relied upon, describe the methods and acceptance criteria used to assure that these walls will behave as composite walls, especially with regard to shear and tension transfer at the wythe interfaces. With regard to local loadings such as piping and equipment support reactions, the acceptance criteria should assure that the loads are adequately transferred into the wall, such that any assumptions regarding the behavior of the walls are appropriate. Include the potential for block pullout and the necessity for tensile stress transfer through bond at the wythe interfaces.

3. Existing test data or conservative assumptions may be used to justify the re-evaluation acceptance criteria if the criteria are shown to be conservative and applicable for the actual plant conditions. In the absence of appropriate acceptance criteria a confirmatory masonry wall test program is required by the NRC in order to quantify the safety margins inherent in the re-evaluation criteria. Describe in detail the actions planned and their schedule to justify the re-evaluation criteria used in Item 2. If a test program is necessary, provide your commitment for such a program and a schedule for submittal of a description of the test program and a schedule for completion of the program. This test program should address all

appropriate loads (seismic, tornado, missile, etc.). It is expected that the test program will extend beyond the 180 day period allowed for the other Bulletin actions. Submit the results of the test program upon its completion.

4. Submit the information requested in Items 1, 2a, and 3 within 60 days of the date of this Bulletin. Within 180 days of the date of this Bulletin submit the information requested in Item 2b.

If in the course of the re-evaluation, the operability of any safety related system is in jeopardy, the licensee is expected to meet the applicable technical specifications action statement.

This information is requested under the provisions of 10 CFR 50.54(f). Accordingly, you are requested to provide within the time period specified in Item 4, written statements of the above information, signed under oath or affirmation.

Reports should be submitted to the Director of the appropriate NRC Regional Office and a copy should be forwarded to the NRC Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, D.C. 20555.

The reporting requirements of this Bulletin do not preclude nor substitute for the applicable requirements to report as set forth in the regulations and license.

If you require additional information regarding this matter, please contact the Director of the appropriate NRC Regional Office.

Approved by GAO, B180255 (R0072); clearance expires 7/31/80. Approval was given under a blanket clearance specifically for identified generic problems.

Attachment:
IE Information Notice No. 79-28

Attachment 1
SSINS No.: 6870
Accession No.:
7910250475

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

November 16, 1979

IE Information Notice No. 79-28

OVERLOADING OF STRUCTURAL ELEMENTS DUE TO PIPE SUPPORT LOADS

Description of Circumstances:

Recently, the NRC was informed that, in the course of the inspections pursuant to IE Bulletin No. 79-02 and 79-14 by the Portland General Electric Co. (PGE) at the Trojan Nuclear Plant, some walls were found which did not have adequate structural strength to sustain the required support reactions. Bechtel Corporation was the Architect Engineer for the plant. These structural inadequacies were reported to be attributable to two deficiencies:

1) Apparent lack of a final check of certain pipe support locations and reactions to ensure that the supporting structural elements possessed adequate structural integrity to sustain the required loads.

2) Inadequate design criteria for the reactions from supports anchored into the face of concrete block walls; e.g., relying on the combined strength of double concrete block walls without positive connection between the two walls by means other than the bond provided by layer of grout between them.

The NRC is currently pursuing these issues in detail for the Trojan Nuclear Plant to determine the extnet of these deficiencies and the generic implications for other Bechtel facilities.

This Information Notice is provided as an early notification of a possible significant matter. It is expected that recipients will review the information for possible applicability to their facilities and the actins being performed under IE Bulletin No. 79-02. Specific action is being requested relating to the adequacy of attachments to concrete block walls under IE Bulletin No. 79-02, Revision 2, item 5.c. No specific actions are requested in response to this Information Notice. If NRC evaluations so indicate, further licensee actions may be requested or required. If you have any questions regarding this matter, please contact the Director of the appropriate NRC Regional Office.

No written response to this IE Information Notice is required.