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MURRAY R. EDELMAN

VICE PRESIDENT
NUCLEAR

September 30, 1983

Mr. James G. Keppler
Regional Administrator, Region III
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

RE: Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
Hilti Kwik Bolt Adjacent
Installation Spacing Requirements
[RDC 66(83)]

Dear Mr. Keppler:

This letter serves as a final report pursuant to 10CFR50.55(e) concerning violations of specification requirements during installation of adjacent Hilti Kwik bolts. Initial notification of this problem was made to Mr. F. Jablonski of your office on February 7, 1983, by Mr. J. Kerr for The Cleveland Electric Illuminating Company. Subsequently, details of this problem were reported to you by two interim reports dated March 9, 1983, and July 1, 1983. The interim report of July 1, 1983, indicated this final report would be submitted by September 30, 1983.

This report includes a description of the deficiency, an analysis of the safety implications, method of evaluation, and the corrective action taken.

Description of Deficiency

During field inspections of some installed Hilti Kwik bolts, it was determined that the minimum spacing requirements established by the installation attachment specifications, SP108/208, have not been met in all cases. This condition is documented on Nonconformance Report CQC 2644 and involves the spacing between adjacent Hilti bolts, grouted-in bolts and the free edge of concrete members.

Analysis of Safety Implications

Based on the results of our on-site testing of Hilti Kwik bolts in closely spaced patterns of four bolts each, even if the spacing violations of the original specification requirements had gone undetected, acceptable margins of safety against ultimate pullout of the bolts would have been met. The test conditions of the closely spaced patterns of four bolts were extremely severe in that they assumed having four bolts of each size as physically close to one another that standard attachment fixtures used in design would allow. Of all the violations of spacing requirements reported to date, none have been as critical as the conditions tested. The testing has shown that, except for very shallow embedment depths, the ultimate pullout capacity of Hilti Kwik bolts is not a direct function of bolt spacing.

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The edge distance requirements for Hilti Kwik bolts in the original specifications were based on using the ACI 349 Appendix B approach for ductile failure of anchor bolts in 3,000 psi concrete. These edge distance requirements can be reduced by using actual Hilti Kwik bolt pullout and ultimate shear values and PNPP actual concrete strengths.

The spacing of Hilti Kwik bolts to other types of concrete anchors can be reduced based on the closely spaced Hilti Kwik bolt tests which demonstrates that the Hilti Kwik bolts are not sensitive to spacing. The spacing between Hilti Kwik bolts and adjacent other type concrete anchor need only be as required for development of the adjacent other type concrete anchor plus a specified adjustment for the Hilti Kwik bolt.

Method of Evaluation

To evaluate the spacing requirements, a testing program using Hilti Kwik bolts both single and in closely space patterns was conducted. This testing program was utilized to determine ultimate capacities of bolts in actual PNPP concrete. The results of this testing program are summarized in GAI Report #2486, entitled "Perry Nuclear Power Plant Report on Evaluation of Spacing and Edge Distance Violations of Hilti Kwik Bolts and Other Steel Embedments."

Corrective Action Taken

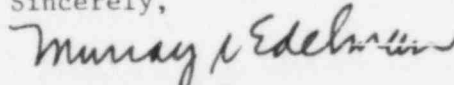
Based on one inch (1") diameter Hilti Kwik bolts not achieving acceptable "closely spaced" pullout results, they will no longer be used on the Project. One half inch ($\frac{1}{2}$ ") diameter Hilti Kwik bolts had previously been prohibited. Revised spacing and edge distance requirements for the other sizes of Hilti Kwik bolts have been transmitted to all site contractors installing bolts to attachment specifications, SP108/SP208/SP110/SP210, by means of Engineering Change Notices.

An inspection program resulting from this evaluation will be implemented by the Project Organization Construction Quality Section to ascertain actual field installed conditions. This inspection will identify all installed $\frac{1}{2}$ " and 1" diameter Hilti Kwik bolts along with all Hilti Kwik bolts which violate the revised spacing and edge distance requirements. The resulting Nonconformance Reports will be dispositioned by Engineering and reworked as necessary.

Necessary rework will be complete prior to November 30, 1984.

Please call if there are any additional questions.

Sincerely,



Murray R. Edelman
Vice President
Nuclear Group

MRE:pab

cc: Mr. M. L. Gildner
NRC Site Office

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