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Edison**

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November 28, 1983

EF2-66480

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

Subject: Interim Report on 10CFR50.55(e) Item on Questionable Quality Control (QC) Acceptance of Pipe Hanger Installations (#82)

Dear Mr. Keppler:

On December 1, 1982, Detroit Edison communicated to Region III that as a result of analyses it had been concluded that a potentially reportable 10CFR50.55(e) deficiency existed involving the adequacy of contractor's quality control (QC) inspection of pipe supports. Region III Inspector, Mr. I. Yin, investigated the matter, which resulted in a "Confirmatory Action Letter" issued by Region III on December 10, 1982.

This is an interim report involving the first two action items of the letter, including the recently issued final report on one of the tasks undertaken by Stone and Webster (S&W). The task involved an engineering evaluation of pipe supports, exclusive of the inspection of strut assemblies and inspection of close-clearance and axial restraints. These inspections are being completed as separate tasks, and will be reported upon at completion.

A meeting was held at the Fermi 2 site on May 20, 1983, where S&W reported to Mr. Yin the results of the inspection and evaluation of 26 percent of supports installed before December 9, 1982. Included in this report, was S&W's recommendation to Edison that the program be terminated because of the favorable statistical results. Mr. Yin tentatively concurred.

The attached report includes the results obtained by S&W for 53 percent of all safety-related supports installed before December 9, 1982. Please note that only "Attachment 2" of the attachments referenced in the S&W report is included with the copy of the report. Also, note that the inspection and engineering evaluation by S&W was terminated after 53 percent of the supports had been inspected.

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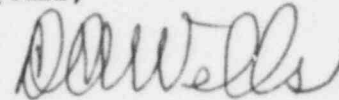
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If you have questions concerning this matter, please contact
Mr. T.A. Alessi, Director - Project Quality Assurance.

Very truly yours,

A handwritten signature in cursive script, appearing to read "DA Alessi".

DAW/TAA/pn

cc: Mr. Richard DeYoung, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Paul Byron, Senior Resident Inspector
U.S. Nuclear Regulatory Commission
6450 North Dixie Highway
Newport, Michigan 48166

J.O.No. 13067.64

REPORT ON
THE ENGINEERING EVALUATION OF
PIPE SUPPORTS

J.O.NO. 13067.64
ENRICO FERMI ATOMIC POWER PLANT - UNIT 2
DETROIT EDISON COMPANY

Approvals:

Date

Frederick C. Ogden
Lead Engineer

W. E. Winge
Project Engineer

11/21/83

11/21/83

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ENGINEERING EVALUATION OF PIPE SUPPORTS

1 INTRODUCTION

Stone & Webster Michigan, Incorporated (SWMI) performed an Engineering Evaluation of QA Level 1 Pipe Supports for the Detroit Edison Company's Enrico Ieremi Atomic Power Plant - Unit 2 (EF2). This report summarizes the procedure, findings, and conclusions of the evaluation, relative to the safety of the as-installed QA Level 1 piping systems in EF2.

As a result of the engineering evaluation and Detroit Edison's commitment to specific corrective actions addressed in this report, SWMI concludes that the EF2 QA Level 1 piping systems will serve their intended function.

2 HISTORY OF EVENTS

Detroit Edison Project Quality Assurance Department (PQA) reviewed surveillance reports of contractor Quality Control (QC) activities on nuclear safety-related pipe supports installed in the EF2 plant. This review resulted in a concern for the adequacy of the QC pipe support inspection. This concern was made known to the NRC - Region III. The result of the investigation that followed was the issuance of a confirmatory action letter (CAL) by the NRC (Attachment 1) on December 10, 1982.

SWMI was retained by Detroit Edison to address Items 1 and 2 of the CAL, Engineering Inspection of Previously Installed Pipe Supports. From February to June 1983, under Task No. 13067.64, SWMI performed an Engineering Inspection and Evaluation of QA Level 1 Pipe Supports installed at EF2.

In a meeting held on May 20, 1982, SWMI presented to the NRC Inspector at the EF2 site the results of the inspection and evaluation of 1,841 QA Level 1 supports (26 percent) (Attachment 2).

SWMI had established that these supports were well distributed by contractor, pipe size, and support type, and that the trends and results were representative of the entire 7,049 pipe supports. In this meeting, SWMI concluded that, with Detroit Edison's commitment to implement the recommended corrective actions, the balance of the supports need not be reinspected.

Subsequent to this meeting, SWMI and Detroit Edison jointly agreed to terminate this program with the firm understanding that Detroit Edison would implement and control two separate programs:

1. Reinspect 100 percent of all strut assembly installations.

2. Reinspect all close-clearance restraints and axial restraints not reviewed by SWMI. In October 1983, Detroit Edison retained SWMI to complete this task.

Deficient installations discovered by either program are to be repaired.

3 PROCEDURE

This task was performed in accordance with the procedure outlined in SWMI Project Instruction PI-22 (Attachment 3), which was reviewed and accepted by Detroit Edison PQA for QA Level 1 services (Attachment 4). A brief description of that procedure follows.

SWMI performed and documented an engineering review and evaluation of QA Level 1 pipe supports installed prior to December 9, 1982, on the Detroit Edison EF2 project. The review included an onsite evaluation of the pipe supports by experienced pipe support engineers. The installation was evaluated against the design documents of record (sketches, DCRs, ABMs, specifications, etc) using a checklist of pertinent engineering attributes as a guide. Deviations from the design documents were noted in the checklist. The noted deviations were evaluated on the basis of engineering judgment and/or calculations. All judgments rendered and calculations performed were submitted through Detroit Edison to the responsible design organizations for their review at the completion of this task for incorporation into their calculation of record.

Deviations that were found to be unacceptable (i.e., those which prevent the support from serving its intended function) were documented on the checklist and on a Deviation Disposition Request (DDR) prepared by the SWMI Field Evaluation Group. The DDRs were presented to Detroit Edison PQA for issue and disposition by the appropriate design organization. The unacceptable installations will be reworked in accordance with the disposition of the DDR, thus ensuring the adequacy of the pipe support.

4 DATA, TRENDS, AND CORRECTIVE ACTIONS

At the close of the program, SWMI had inspected and evaluated 3,718 (53 percent) of the 7,049 QA Level 1 pipe supports. The supports were inspected for the attributes of the engineering checklist (Attachment 5). Attachment 6 is a printout of the total data base.

SWMI identified 345 supports that require enhancement to bring them within code compliance; they are listed in Attachment 7 and were dispositioned by DDR-M-11824. Attachment 8 is a legend to be used in reading Attachments 6 and 7.

During the inspection, three generic trends were identified that require corrective action. They were:

4.1 UNQUALIFIED FILLET WELDS PROCEDURE

The field welding procedure used an unqualified technique for 3/16-in. fillet weld connecting plates with thicknesses greater than 1/2 in.

4.2 STRUT ASSEMBLIES (PIN-TO-PIN)

Many unacceptable deviations of the installed strut assemblies (pin-to-pin) were found.

4.3 GAP CLEARANCES

The gaps on close-clearance supports and the gap between the pipe clamp and the lug on axial restraints often deviated beyond acceptable tolerances.

SWMI suggested the following specific corrective actions for the above generic problems, which Detroit Edison has implemented:

a. Unqualified Fillet Welds Procedure

Detroit Edison will qualify a weld technique sheet for a 3/16-in. fillet weld for greater than 1/2-in. thick materials.

Detroit Edison's field welding engineer qualified the procedure used in compliance with AWS D1.1-75, Section 5, Part B.

b. Strut Assemblies

Detroit Edison will reinspect 100 percent of all struts installed and will rework defective installations.

c. Gap Clearances

Detroit Edison will reinspect the balance of all supports with engineered gaps that were not already reinspected by SWMI under this program and implement corrective actions, as required. In October 1983, Detroit Edison retained SWMI to complete this task.

5 INSPECTION ATTRIBUTES

All supports were inspected using the checklist of pertinent engineering attributes (Attachment 5). However, as discussed in Section 5.8.2 of the procedure (Attachment 3), the attributes reviewed on each support were modified as generic trends and/or generic solutions developed. On April 20, 1983, SWMI stopped inspection of strut-related attributes 4B and 6A through 6D. This decision was made to reflect Detroit Edison's commitment to a 100-percent reinspection of the strut assemblies (pin-to-pin).

On May 12, 1983, SWMI stopped inspection of all pipe support attributes, except for gap attributes 2A and 5A through 5C. This decision was based on SWMI's firm opinion that only these attributes were of further concern.

On June 3, 1983, SWMI stopped inspecting supports. This decision was based on Detroit Edison's commitment to inspect all the remaining supports for gap attributes.

6 NRC PRESENTATION

On May 20, 1983, SWMI presented to the NRC Inspector at the EF2 site the results of the inspection and evaluation of 1,841 QA Level 1 pipe supports (26 percent). In this meeting, SWMI recommended the termination of this task. This meeting is summarized in Attachment 2. Copies of the presentation material are provided in Attachment 9.

SWMI's conclusion that 100 percent of the QA Level 1 piping systems on the EF2 plant will serve their intended function is based on the data presented in this meeting. Although SWMI inspected and evaluated an additional 1,977 supports (27 percent) beyond those discussed in this meeting, the conclusion of that meeting is still valid for the following reasons:

1. SWMI demonstrated that the sample upon which the conclusions were drawn was representative of the entire population.
2. SWMI's review of the additional 1,977 supports indicated that the same trends and conclusions presented at the meeting held on May 20, 1983, have continued without change and still are valid.

7 SAFETY OF QA LEVEL 1 PIPING SYSTEM

Based on the results of this program, and the implementation by Detroit Edison of the Corrective Action Programs recommended by SWMI, SWMI concludes, with a 95-percent confidence level, that 99.5 percent of all QA Level 1 pipe supports and 100 percent of all QA Level 1 piping systems will serve their intended functions.

REPORT ON
THE ENGINEERING EVALUATION OF
PIPE SUPPORTS

ATTACHMENT 2

NOTES OF MEETING, NRC PRESENTATION
ON MAY 20, 1983

Under Task 13067.64, Stone & Webster Michigan, Inc. (SWMI) performed an Engineering Inspection and Evaluation of QA Level I Pipe Supports installed at the Detroit Edison Enrico Fermi - Unit 2 (EF2) power plant.

SWMI established through the use of Detroit Edison Field Hanger Engineer Group's Pipe Support Monitoring Report (EFHR 100) that 7,050 QA Level I pipe supports were installed and contractor QC-accepted prior to December 10, 1982. These 7,050 supports define the total scope of the task. The inspection and evaluation effort was conducted in accordance with a SWMI Project Instruction and SWMI Engineering Mechanics Division technical guidelines.

SWMI divided the personnel assigned to this effort into two groups, the Field Evaluation Group and the Calculation Group.

The Field Evaluation Group was organized into teams consisting of a primary team member (a pipe support engineer) and a secondary team member (an engineer or designer). The function of the Field Evaluation Group was to perform an onsite inspection of the pipe support and evaluate it against the design documents of record (pipe support sketches, design change requests [DCRs], as-built memoranda [ABMs], specifications, etc), using a checklist of pertinent engineering attributes as a guide. Deviations from the design documents were noted on the checklist. The noted deviations were evaluated based on a review of the calculation and the disposition was annotated on the checklist. Deviations requiring a more extensive evaluation were referred to the Calculation Group.

The Calculation Group consisted of pipe support engineers. They evaluated all deviations that required a more extensive review and/or the preparation of supplemental calculations.

Members of both groups received training specific for this task, as defined in SWMI's Enrico Fermi II Project Instruction.

The results of each day's inspection and the evaluation of deviations were entered daily into the computer monitoring data base. Stone & Webster Engineering Corporation's Computer Program, Pipe Hanger Information System (PHIS, IS-202), was used to monitor the progress of this task, evaluate the program results, and identify trends in the data.

During the course of this task, Detroit Edison and SWMI Management reviewed the results and trends of this program and gave concurrence to all changes in task direction. Through this management involvement, the results of this task were presented to the NRC inspector at the EF2 site on May 20, 1983.

All deviations were evaluated by pipe support engineers and were determined to be acceptable or unacceptable. Acceptable deviations indicate that the pipe support would serve its intended function and meet the requirements of the governing code. As indicated above, methods of acceptance, including supplemental calculation number, have been clearly documented on the applicable section of the checklist.

Pipe supports with unacceptable deviations have been identified and will be enhanced to bring them into code compliance. However, additional analysis has been performed to assess the impact on plant safety had these deviations in the supports gone undetected.

First, the structural and functional integrity of the support was verified by allowing the support stress to increase beyond code limits, but not to exceed yield. If the support did not pass this level of evaluation, the piping system integrity was verified either by reanalyzing the piping system to reflect the as-installed conditions, or by reanalyzing the piping system assuming that the subject support was not present. In both cases, after the reanalysis, the integrity of the piping system, and the pipe supports in the vicinity of the subject support, was verified.

Summary of Results

The results of the inspection and evaluation of 1,841 pipe supports was presented to the NRC inspector at the EF2 site on May 20, 1983. These 1,841 supports represent 26 percent of the 7,050 QA Level I pipe/tubing support in the scope of this task.

SWMI has established that the supports inspected are well distributed by contractor, pipe size, and support type, and that the trends and results are representative of the entire 7,050 pipe supports.

Of the 1,841 supports inspected, 744 supports (40 percent) had no deviations from the design documents. Of the 1,097 supports (60 percent) with deviations from the design documents, 899 were determined to serve their intended function and in full compliance with code allowables. The remaining 198 supports with unacceptable deviations are grouped by deviation type, as follows:

- o 83 supports had deviations with the strut element
- o 91 supports had deviations with gaps on close-clearance frames and/or lug-to-clamp fitup
- o 24 supports had other deviating attributes

The 24 supports with other deviating attributes were evaluated for structural and functional integrity and/or system integrity. Of the 24 supports:

- o 16 supports had their structural and functional integrity verified
- o 8 supports had their system integrity verified.

All 198 supports will be brought into compliance with the design documents. Detroit Edison will establish separate programs to deal with the strut and gap situations.

Conclusions

Detroit Edison will establish separate programs to deal with the gap and strut situations. Recognizing this, SWMI has shown that the current program can be terminated with a 95-percent confidence level that 99.5 percent of the uninspected supports and 100 percent of the piping systems will serve their intended function.