U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-440/84-17(DRS)

Docket No. 50-440 License No. CPPR-148

Licensee: Cleveland Electric Illuminating Company
Post office Box 5000
Cleveland, Ohio 44101

Facility Name: Perry Nuclear Power Plants, Units 1

Inspection At: Perry Site, Perry, Ohio and Gilbert Associates, Inc., Office, Reading, Pennsylvania

Inspection Conducted: August 13 thru 23, 1984

Inspectors: P. D. Kaufman — Date: 9/12/84

for D. E. Keating — Date: 9/12/84

Approved By: D. H. Danielson, Chief
Materials & Processes Section — Date: 9/13/84

Inspection Summary

Inspection on August 13 thru 23, 1984 (Report No. 50-440/84-17(DRS)
Areas Inspected: Routine, announced safety inspection on previously identified items and inspection findings. Also, a special safety inspection was initiated following receipt of an allegation and concern relating to safety-related pipe support designs. The inspection involved a total of 64 inspector-hours onsite by two NRC inspectors. An inspection at Gilbert associates Office in Reading, Pennsylvania involved a total of 15 inspector-hours by one NRC inspector.
Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

Cleveland Electric and Illuminating (CEI)

*C. M. Shuster, Manager, Quality Assurance
*E. Riley, General Supervisor, Construction Quality Services
*M. R. Kritzer, Unit Supervisor, CQS - Civil/Structural
*J. W. Messenger, CQS - Lead Seismic Inspector
*E. Schaumbaugh, CQS - Lead Structural QE
*R. Matthys, CQS - Lead Piping/I&C QE
*R. Litka, CQS - Lead Engineer - SCV
*J. H. Wilcox, Lead Piping/Welding Engineer
*K. C. Kaplan, PAOS - Senior Engineering Technician
W. Miles, COS - Hanger Supervisor
B. O'Donnell, Lead Pipe Support Engineer
J. E. Meyer, Engineer

Gilbert Associates Inc. (GAI)

P. Gudikunst, Consulting Enginer
C. N. Rentschler, Section Manager, Pipe Supports
C. W. Whitehead, Project Engineer, Piping
H. A. Manning, Manager, Corporate QA Programs
R. W. Alley, Project Engineer, Structures
C. C. Paschall, Manager, Quality Management
B. Stevens, Lead Pipe Support Designer

PBI Kelly

J. Anulies, Manager, Construction QA
C. Burnette, Supervisor, Construction QA

*Denotes those present at the onsite exit interview on August 17, 1984.

2. Functional and Program Areas Inspected

The functional and program areas inspected are covered in paragraphs 3, 4, 5, 6, and 7 of this report.

3. Licensee Action on Previous Identified Items

a. (Closed) Noncompliance (440/83-31-06; 441/83-30-06): Seismic Clearance Violations. This item was initially identified in a Construction Appraisal Team (CAT) inspection as a finding for both Units 1 and 2. Based upon the finding the Region issued a Severity Level V violation.

The initial review of this item and the associated records was documented in reports 50-440/84-12 and 50-441/84-12. During this inspection several additional inspection reports were reviewed along with other related documents presented for close out of this item. The following inspection reports were reviewed:

- SCV 1003/1973
- SCV 153/770
- SCV 1029/2133
- SCV 1027/2121
- NIR C-18621
- NIR C-18622, 23, 24, 25, and 26
- Field Question FQ-37878
- NIR C-17876, C-17985, C-18029, C-18388, C-18823, C-18859, C-19081, C-19081, C-19115, C-19118, C-19119, C-19123, 24, and 25

The inspector reviewed radiographs associated with Field Question FQ-27878. This FQ requested guidance regarding verification of thread engagement in solid couplings. The engineering recommended one (1) rod dia. min. which was to be verified by RT. There were thirty four (34) couplings which were covered by inspection report C-19579. These radiographs were reviewed and were found acceptable.

The inspector also performed a walkdown in Unit 1 and Unit 2 to verify that identification and inspection tags were attached to the proper items.

b. (Closed) Open Item (440/84-03-01; 441/84-03-01): During a previous inspection it was identified that the licensee evaluate Pullman Power Products (PPP) Procedure VI-4, Section 3.0, which deals with receipt and initial issuance of pipe support drawings. Pipe support fabrication of onsite supports could be completed by the fab shop prior to installation verification by a field engineer. The procedure has been clarified to delineate that onsite fabrication is generally of small bore type supports. The inspector concluded revision dated July 27, 1984 to PPP Procedure VI-4 satisfactorily addressed the support fabrication concern. The inspector had no further questions.

c. (Closed) Unresolved Item (440/84-03-03; 441/84-03-03): This item concerns GAI dynamic pipe support drawings and failure to specify either a hot piston setting or thermal movement in a particular direction. The inspector was informed by the licensee that the drawings which he had reviewed during the previous inspection were pipe support erection drawings, which only specify cold piston position snubber settings. The GAI pipe support design drawings and data sheets list the predicted directional pipe movement in inches. The inspector reviewed the following pipe support design drawings to assure that, in fact, pipe movements were shown on the drawings:

- 1E22-H001, Revision E
- 1G33-H030, Revision C
- 1E12-H192, Revision A

Verification of thermal pipe movements on the above design drawings was confirmed and considered acceptable to the inspector.

No violations or deviations were identified.

4. Licensee Action on 10 CFR 50.55(e) Items

a. (Closed) 50.55(e) Item (440/83-21/EE) DAR 143 (441/83-21-33): Region III site inspection conducted on October 18-21, 1983 (Inspection Report Nos. 440/83-32; 441/83-31) identified this as an open item pending a GAI engineering evaluation for design adequacy of Power Piping Company's (PPCo) placement of partial rather than full penetration welds on safety-related piping supports. The 50.55(e) was telephonically reported to Region III on September 21, 1983. The inspector reviewed the CEI final report dated January 30, 1984, GAI's Corrective Action Request (CAR) No. 17, and Pullman Power Products Deviation Requests (DR) Nos. 79, 80 and 81. A total of 132 supports requiring one or more full penetrations welds were fabricated by PPCo with only partial penetration welds. Of the 104 shipped to the jobsite, 62 of these supports had been installed in the field and 42 were awaiting installation. The other 28 supports in question remained in PPCo's fab shop. GAI's review included an evaluation of each support assuming partial penetration welds where full penetration welds were intended. Thirty (30) of the 132 supports were reworked or repaired for the following reasons:

(1) Sixteen (16) supports were not acceptable due to violation of the minimum effective throat (te) thickness requirements of ASME Section III, subsection NA, Appendix XVII, Paragraph XVII 2454. These 16 supports were repaired to meet ASME requirements.

(2) Fourteen (14) were not acceptable because loads could, under certain conditions, result in weld stresses in excess of code allowables. These 14 supports were repaired, even though the repair did not require full penetration welds, these supports were repaired to meet their intended design and code allowables.

The remaining 102 supports were designated acceptable as-is and required no rework. The welds met all code design requirements in the as-welded condition. The inspector selected a sample of pipe support traveler packages from the affected supports to verify that the repairs had been done and completed for the following supports:

. 1C11-H638, ECN-14944-44F-4368, Revision B
. 1C1-H637, ECN-15001-44-4425, Revision B
. 1C11-H642, ECN-15289-44-4560, Revision B

The licensee's documentation and GAI's engineering evaluations dealing with this problem has been reviewed and found to be acceptable.

b. (Closed) 50.55(e) Item (440/84-02-EE) DAR-154 (441/84-02-EE): This item concerns the use of ASME Class 2 and Class 3 material on fabrication/installed Class 1, subsection NF pipe supports. The inspector reviewed PPP Corrective Action Request 06, dated December 28, 1983 and (Updated April 30, 1984) and CEI's Deviation Analysis Report (DAR) No. 154. A total of 116 Class 1 supports were affected, for which nonconformance reports have been issued. PPP issued Design Change Requests (DCR), which were required to remove non ASME Class 1 material and replace it with ASME Class 1 material. The inspector

also reviewed the revised material control process in PPP's Procedure IV-34, "Site Purchasing", dated February 6, 1984. The revision modified the Purchase Order Qulaity Requirements (POQR), Form BY, clarified procurement requirements and provided for more detailed receipt inspection. A Class 1 material identification and control log has also been established listing all acceptable material. Only material listed in the log is issued to construction for installation in Class 1 supports. Even though, completion of all work required to close the nonconformance reports is not expected to be finished until January 4, 1985, the licensee's corrective action program and procedures to deal with this problem were in order and found to be satisfactory to the inspector and this matter is considered closed.

c. (Open) 50.55(e) Item (440/83-24-EE) DAR-148 (441/83-24-EE): Defective capstan spring tangs in mechanical snubbers supplied by Pacific Scientific. After reviewing the documentation dealing with this problem the inspector asked the licensee to evaluate the quantity of mechancial snubbers (PSA-1's and PSA-3's) received on site and then returned for repairs. The licensee agreed to evaluate both Nonconformance Report No. (TAS-071) and the Extension Letter dated June 29,1984, to their final 50.55(e) report. This item remains open pending a further inspection.

No violations or deviations were identified.

5. Review of Activities Regarding Safety Related Penetrations

The inspector reviewed the quality assurance plans, instructions, and procedures as established in the QA manual against the QA program as outlined and described in Chapter 17 of the SAR.

The inspector performed a walkdown of selected areas of containment and randomly identified certain items for further document review.

The following penetrations were selected:

- P105 - Drawing 1E12-25, ECN 5384-44-320/NR PPP - 450, Revision 1
- P104 - Drawing 1E51-502
- P406 - Drawing 1P54-10
- P407 - Drawing 1E12-39
- P409 - 1E22-2
- P412 - 1E12-41

For the above listed penetrations the inspection reports were reviewed to verify proper welding and NDE methods and proper fitup. These were reviewed to determine if they met the requirements of welding procedure WPS 13A-III-1-OB-2-F3/F4, Revision 3.

Based upon this review and the walkdown performed no items of noncompliance or deviations were identified.

6. Review of Activites Regarding Safety Related Structures

The inspector reviewed the following structural drawings, associated inspection reports, and installation packages:

- Drawing D-512-021, Revision E, sheets 1 of 2 and 2 of 2 Auxiliary Building - Unit 1 - Steel Framing.
- Drawing D-511-022, Revision F - Containment Building - West Half - Steel Framing.
- Drawing D-511-023, Revision F - Containment Building _ East Half - Steel framing.
- Drawing D-511-035, Containment Auxiliary Steel - West Half - Steel Framing.
- Drawing D-511-036, Containment Auxiliary Steel - East Half - Steel Framing.

The drawings were reviewed to determine that the requirements of AISC and AWS were properly called for on the details, and that the most current revision was identified and in use. The inspector also verified that the deviations and nonconforming conditions were identified and cross-referenced to inspection reports in the installation packages.

The following bolting reports, NCR's and FVA's were reviewed:

FVA	NCR
2606-84-113	PBI 144
8248-79-1	PBI 184
8242-79-4	PBI 190
8243-81-2, 2M, 27 and 27M	PBI 241
8233-81-73	PBI 250

Bolting Reports
B8-287-87-1
B8-316-79-2
B8-74-80-2
B8-74-80-1
B8-203-80-1
B8-210-80-1
B8-189-83-1

In addition to the review referred to above, a walkdown of the areas in the containment and the auxiliary building was performed. The beam connections were inspected particularily the bolted connections to make certain no loose connections or missing nuts or bolts existed.

Based upon this review and the walkdown peformed, no items of nonconformance or deviations were identified.

7. Allegation

Background

On June 28, 1984, RIII received information concerning the accuracy of assumptions and calculations by Gilbert Associates during the design and

verification of pipe supports for the Perry Nuclear Power Plant.

The concern was described as structural beams, internal to the pipe supports and also the attaching supplementary building steel that may not have been designed to consider whether web stiffners were required inside the beams at points of heavy concentrated loading and that if the beams are not properly stiffened the load will not transfer properly to the web. The alleger termed this a "local stress problem". Crippling might be brought about by a failure in bearing of the metal at the web toe of the fillet in the beam and the resulting tendency of the flange and web to fold over on each other at the plane. The alleger had stated during a telephone call on July 2, 1984, to Region III that he knew of 35 pipe support designs involved. The inspector queried the alleger as to which 35 pipe support designs were his concerns during the August 14, 1984 telephone call. The alleger could not identify any of the 35 specific examples.

Since the alleger could not identify any specific support numbers involved, the inspector during a site visit on August 13 through 17, 1984, walked down and visually examined and selected ten (10) pipe supports which the inspector determined to be of heavy, concentrated loading on structural beams. These were selected because it appeared Gilbert may not have considered web crippling, vertical buckling, and combined stresses in addition to bending and shearing stresses which could cause web failure due to localized bearing stress concentration.

The following pipe supports were selected during the field walkdown for review:

- 1B21-H184
- 1B21-H162
- 1B21-H020
- 1B21-H021
- 1B33-H354
- 1E12-H270
- 1E12-H031
- 1E21-H219
- 1E12-H173
- 1E12-H308

On August 22-23, 1984, a followup inspection was conducted at the Gilbert Office in Reading, PA. The inspector queried the Gilbert personnel as to the other Gilbert offices' involvement with pipe support designs for the Perry project. The inspector was informed that during 1982, a procedural change resulted in the need to verify all pipe supports which had been issued for construction. Of the approximate 6,500 safety-related pipe supports for Perry Unit 1 and Common, 3500 were verified in Jackson, MI. The primary mechanism of verification was by alternate calculations. In addition a total of 355 supports on eleven (11) subsystems were originated in Jackson. These supports were originated and verified in Jackson but sent to Reading for interface review, a general overview, and issue for construction.

NRC Findings

While performing the calculational review on the above ten (10) pipe supports the inspector noted that on one of the supports he had selected, 1E21-H031, a verifier from the Jackson office, while doing a support verification check by alternate calculations, found that a W8x24 flange was overstressed and stiffeners were required. RAP-6431 was initiated by the verifier which identified, to the designer, the need to add stiffeners. Subsequently, ECN-14046-44-3908, Revision A, was transmitted to the field to get the work completed.

Neither Gilbert's Project Pipe Support Design Instruction Manual nor the Piping Engineering Standards Manual contained any information directly addressing web crippling or flange buckling. It is considered normal engineering practice to check structural beams for web crippling or flange buckling, thus procedures don't normally contain any specifications relating to that subject. The inspector determined from the calculational design review that Gilbert does have a program instituted and it is being implemented to have the designers check beams for local overstressing.

Conclusion

After completing the calculational review of these ten (10) pipe support designs the inspector could not identify any of the support designs as requiring bearing stiffeners which had not already been accounted for in the pipe supports or supplementary building steel. Gilbert's Design Control Procedure (DCP) 1.35, "Piping Design", addresses the required interface reviews which shall be performed and documented for support and restraint drawings. The inspector was assured the design interface requirements were being performed and met by reviewing some structural framing detail drawings which depict pipe support loading applied to the supplemtary steel (confirmation load mapping). It is apparent that Gilbert's designers and verifiers have and do check beams for web crippling or flange buckling and the calculations have been verified in accordance with Gilbert's Procedure DCP-2.05, "Design Verification." The inspector concluded that the ASME Class 1, 2, and 3 supports for Perry, Units 1 & 2 are designed in accordance with ASME, Section III, Subsection NF (component supports), 1974 Edition, including Addenda through Winter of 1975 and the supports meet the allowable stresses as defined in ASME Code Section III, Subsection NA, including Appendix I, tables I-1 through I-13.

Thus, this allegation could not be substantiated.

8. Exit Interview

The inspectors met with licensee representatives (denoted in Paragraph 1) at the conclusion of the onsite portion of the inspection and discussed the scope and concerns of this inspection. The licensee acknowledged the inspection findings without significant comment. Additional information was discussed with a licensee representative at the Gilbert Reading Office on August 23, 1984.