

SAFETY CONCERNS
ASSOCIATED WITH PIPE BREAKS
IN THE
BWR SCRAM SYSTEM

by the
OFFICE FOR ANALYSIS AND EVALUATION
OF OPERATIONAL DATA
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NOTE: This report documents results of studies performed by the Office for Analysis and Evaluation of Operational Data. The findings and recommendations contained in this report are provided in support of other ongoing NRC activities and do not represent the position or requirements of the responsible program offices of the Nuclear Regulatory Commission.

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Enclosure

Response to Notice of Violation

The items of apparent noncompliance identified in Appendix A of the NRC letter dated January 9, 1981, are responded to in the following paragraphs.

ITEM 1

10 CFR 50, Appendix B, Criterion II, states that, "The applicant shall establish at the earliest practicable time consistent with the schedule for accomplishing the activities, a quality assurance program . . ." and Criterion I, states that, "The applicant may delegate to others, such as contractors, . . . the work of establishing and executing the quality assurance program . . ., but shall retain responsibility therefore."

Commonwealth Edison Company Topical Report CE-1A, "Quality Assurance Program for Nuclear Generating Station," Revision 14, dated September 9, 1980, states in Section 2 that, "The quality assurance programs of Commonwealth Edison Company, Architect Engineers and Nuclear Steam Supply System vendors include the requirements of ASME Section III Article NCA-4000, the quality assurance criteria for nuclear power plants for Appendix B to 10 CFR 50 "Quality Assurance Criteria for Nuclear Power Plant," and the mandatory requirements of ANSI N45.2, "Quality Assurance Program Requirements for Nuclear Power Plants" and ANSI N18.7, "Standards for Administrative Control for Nuclear Power Plants." The requirements are implemented by means of detailed quality procedures delineating the means of detailed quality procedures delineating the specific methodology to be used. In addition, individual contractor's, fabricator's and vendor's Quality Assurance programs will include the applicable portions of the Code Standards and Appendix B as they affect the total program."

Contrary to the above, Reactor Control, Inc., (designer and installer of portions of the Control Rod Drive System) did not have a QA/QC program that addressed the areas of organization, interfaces, design control, and document control. In addition, the program also lacked detailed implementing procedures for design, installation, and inspection activities.

CORRECTIVE ACTION TAKEN AND RESULTS ACHIEVED

Based on Audit 1-80-95 (performed November 11, 1980 and November 12, 1980) by CECO QA and CECO Construction review of as-built drawings, a stop work letter dated November 12, 1980 was issued by Project Construction to Reactor Controls, Inc., covering the installation and inspection of safety related CRD piping supports. An expanded stop work letter was written November 13, 1980 to Reactor Controls, Inc., covering all safety related

engineering work since further review of the deficiencies noted in the November 12, 1980 Stop Work Letter were determined to be the responsibility of Reactor Controls, Inc., San Jose Engineering organization. Subsequently, a letter from W. H. Donaldson to J. Millett was written on November 17, 1980 to identify all the open items requiring resolution. The "Action Item List" encompassed the NRC findings and open items, CECO audit findings, the B. R. Shelton letter dated November 6, 1980, and the CECO QA trend analysis letter dated November 14, 1980.

In response to the Stop Work letters and the action item list, Reactor Controls, Inc., has totally reviewed their QA/QC program. As a result, implementation instruction and a QA manual addenda were written addressing areas where their QA/QC program needed improvement. The QA Manual addenda contains an index which indicates where each point of the 18 point criteria are addressed. The instruction book is indexed to provide a cross reference to the Reactor Control, Inc., QA Manual and the 18 point criteria. Specific items identified in the noncompliance report are discussed below:

1. Organizational Interface:

Reactor Controls, Inc., has prepared the following procedures to identify various organizational interfaces:

- 1) QA 1 3-1 Instruction For Interfaces Between Engineering and Stress Analysis.
- 2) QA 1 6-3, Instructions for Document Transmittal for Approval.
- 3) RSDA-1, Procedure for Review of Design or Stress Analysis Reports Submitted by Vendors or Subcontractors.

Additionally, it has been established that the responsibility for the transmittal of engineering and design information will be vested with the Engineering and Construction Manager for Reactor Controls, Inc., and the cognizant LaSalle County Project Construction Engineer.

2. Design Control:

Reactor Controls, Inc., has developed the following procedures to control design:

- 1) QA 1 3-1, Interfaces between Engineering and Stress Analysis; QA 1 3-2, Drawing Changes.

- 2) RSDA-1, Procedure for Review of Design or Stress Analysis Reports Submitted by Vendors or Subcontractors.
- 3) QA 1 5-2, Engineering Drawings and Engineering Change Notices; QA 1 6-2, ECCL control.

3. Document Control:

Reactor Controls, Inc., has recently instituted a computerized system for controlling documents which have been reviewed and approved for use by their Project Engineer. All documents which constitute the Engineering Controlled Checklist (ECCL) will now be included in the computerized system. The following procedures implement Reactor Control's document control system.

- 1) QA 1 3-2 Drawing changes
- 2) QA 1 5-2 Engineering drawings and engineering change notices
- 3) QA 1 5-1 Procedure control
- 4) QA 1 6-1 Document control headquarters
- 5) QA 1 6-2 ECCL control
- 6) QA 1 6-3 Document transmittal for approval.
- 7) QA 1 6-4 Document control site/shop
- 8) QA 1 6-5 Document control system (computer)

4. Installation and Inspection:

Reactor Controls, Inc., has developed QA 1 8-2. Installation of component supports to further cover the installation and inspection of the CRD piping supports. Reactor Controls, Inc., is also developing a final walkdown procedure to be used for final inspection and verification of the as-built CRD piping and support system. This procedure will encompass the requirements of IE Bulletin 79-14.

The LaSalle County Project Construction Engineer and the Site QA Supervisor reviewed the preliminary drafts of the implementation procedures and the QA Manual addenda in San Jose December 9, 1980

through December 12, 1980, in order to determine that all open items were being addressed. Comments on these procedures and their response to the action item list were given to Reactor Controls at that time. The formal transmittal of these procedures was received on site January 12, 1981, and are currently being processed through the formal review by CECO and S&L.

A preliminary review and follow-up of implementation procedures and the QA Manual was performed by the NRC Region III and Region IV inspectors between January 12, 1981, and January 15, 1981, in San Jose and at Earthquake Engineering Systems (EES), Reactor Control's analysis subcontractor, in San Francisco. It was explained to the inspectors that we had not yet initiated formal review and, therefore, no approval of any Reactor Control's procedures had been given. Some procedures were still being developed. The NRC inspectors acknowledged this and indicated their review was solely to keep abreast of the Reactor Control, Inc.,/CECO corrective action progress.

All items raised during this NRC inspection were either in progress or were being reviewed and resolved. The design and acceptance criteria for stiffness, deflection, frequency, loading combinations, are currently being reviewed by S&L and Reactor Controls. Reactor Controls is doing physical testing of clams and unistrut material. These test results will be compared to the calculated values used by EES in the CRD pipe support analysis. Sargent & Lundy is revising specification J-2922 to incorporate ECNs M-283-LS and M-285-LS in an Amendment. These previously transmitted ECNs contained in the design information necessary for RCI to complete the analysis.

CORRECTIVE ACTION TO AVOID FURTHER NONCOMPLIANCE

The contract with Reactor Controls is unique. No other on-site contractor has extensive design and analysis responsibility coupled with the normal material supply and erection contract. The division of responsibility within CECO, that is, Engineering is responsible for design whereas Construction is responsible for administration of contracts which contain major field erection, lead to ambiguous control of the design portion of Reactor Controls scope of work. As a result some of the open items from NRC Report 50-373/80-20; 50-374/80-13 were not adequately followed up to assure successful corrective action prior to the NRC inspection recorded in Report 50-373/80-48; 50-373/80-30. To resolve this problem, LaSalle County Project Construction has been given the responsibility for the overall administration of Reactor Control's contract. Project Engineering and S&L will provide assistance and information

as necessary but all design and engineering information transmitted to Reactor Controls will be transmitted with the knowledge of the LSC Project Construction Engineer to the Reactor Control, Inc., Engineering and Construction Manager. Similarly, Reactor Control's engineering and design information will be transmitted from the Reactor Control Engineering and Construction Manager to the LSC Project Construction Engineer.

The previously discussed Amendment to specification J-2922 will include all outstanding ECNs, thus incorporating all design and technical information in one package. The establishment of the single line responsibility and interface between Reactor Controls, Inc., Engineering and Construction Manager and LSCS Project Construction Engineer combined with the amended specification encompassing outstanding ECNs should improve design control. In addition, review, approval, and implementation of Reactor Control procedures previously referenced will provide the QA/QC controls necessary for design, document control, installation and inspection.

DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

Full compliance is expected to be achieved generally in accordance with the following schedule:

1. Submittal, Review, and Approval of Procedures
2/2/81 - 2/6/81
2. Reactor Control, Inc., Training and Implementation
2/2/81 - 2/6/81 (off site) 2/9/81 - 2/13/81 (on site)
3. Partial Life - Document Control, QC Inspection, HCU Bracing
Detailing and Material Purchase.
2/6/81
4. Partial Life - CEA Installation
2/13/81
5. Partial Life - CRD HCU Bracing Erection
2/13/81
6. Implementation Audit in San Jose
7. Implementation Audit - Site
8. Lift Stop Work
2/20/81

In this regard, we shall provide a copy of the RCI documentation package after final CECO approval has been given in order to expedite your review. We request, therefore, that your verification review be timely so that work can be reinitiated on this project on the schedule defined above.

ITEM 2

10 CFR 50, Appendix B, Criterion XVIII, states that, "A comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program."

Commonwealth Edison Company Topical Report CE-1-A, "Quality Assurance Program for Nuclear Generating Stations", Revision 14, dated September 9, 1980, states in Section 18 that, "Audits will be performed by Commonwealth Edison Company and/or its contractors, subcontractors and vendors to verify the implementation and effectiveness of quality programs under their cognizance" and "Audits will be performed selectively at various stages of contracts on a varying frequency, based on the nature and safety significance of the work being done to verify compliance and determine the effectiveness of procedures, inspections, tests, process controls and documentation."

Contrary to the above, audits of Reactor Controls, Inc., appeared to be inadequate in that there was no systematic evaluation of contractor performance and audit findings were not resolved in a timely manner.

CORRECTIVE ACTION TAKEN AND RESULTS ACHIEVED

1. As indicated in Commonwealth Edison's letter of June 6, 1980, responding to noncompliance items in report 50-373/80-20 and 50-374/80-13, an established program of Audits and surveillances does exist for RCI on-site and off-site activities. RCI's off-site activities had been periodically reviewed during scheduled audits in May, 1977, with follow up and close out June, 1977; in March, 1979, with follow up and close out June, 1979; in March, 1980, with follow up and close out June through August, 1980. This planned evaluation process for off-site activities was in addition to 4 on-site audits of RCI in 1977 4 in 1978, 8 in 1979, and 10 in 1980, as well as numerous surveillance of on-site activities. The structure of the RCI organization is such that many on-site reviews necessitate evaluation of documents prepared off-site and as such, our on-site audits and surveillances were indirectly reviewing off-site activities:

2. The CECO audit of RCI and Earthquake Engineering Systems (EES) conducted on March 25, 26, and 27, 1980, reviewed in detail the RCI design, design control, and design personnel qualifications for the control rod drive (CRD) piping hangers. Four items of noncompliance were identified and later closed out through review of RCI management commitments and documents transmitted to the site. Commonwealth Edison has always had an established program for monitoring corrective action and ultimately closing out the audit noncompliances when resolved to our satisfaction. Commonwealth Edison believes that this program was complied with during the close out of this audit.
3. Commonwealth Edison QA does acknowledge the fact that QA did not follow up and verify effective close out of the items identified during NRC inspector Yin's audit of RCI (San Jose) in April, 1980 (NRC Report 50-373/80-20 and 50-374/80-13). For deficiencies identified by the NRC at off-site vendor locations, it has been the practice, for engineering related items, that the Commonwealth Edison Engineering organization respond to, and be responsible for, follow up and close out of the deficient item. Commonwealth Edison engineering responded to the NRC citations indicating satisfactory resolution had been achieved. In these cases, Quality Assurance would not have initiated any follow-up action to assure satisfactory resolution. This problem is now resolved with the clear identification of the cognizant Construction Engineer as overall contract administrator.
4. In light of RCI's failure to initiate and complete adequate corrective actions as committed in CECO's response of June 6, 1980, QA recognizes the need to establish a system to track the corrective action commitments for NRC Region III Off-Site vendor inspections and verify proper resolution. This would be in addition to our normal practice of monitoring follow up progress for on-site deficiencies. In an effort to provide this coverage, the Quality Assurance Department has established by Memorandum #17 dated January 14, 1981, a program which requires site QA track all NRC items with a monthly status report submitted to the Manager of QA. This monitoring process is expected to assure timely completion of committed corrective action and should improve the effectiveness of the Commonwealth Edison QA program in this area.
5. Relative to the specific matters of concern identified by Mr. Yin during his November, 1980, audit of RCI, San Jose, immediate action was taken by the Commonwealth Edison Engineering organization when it was determined that follow up action was not adequately completed. Separately, Site QA and Project Construction had been pursuing resolution of on-site audit deficiencies prior to Mr. Yin's trip to RCI. On October 21, 1980

site QA scheduled an audit of RCI's on-site organization for the week of November 10. This audit was to include formal review of corrective action taken by RCI in response to earlier CECO on-site audits. That audit identified inadequate corrective action by RCI on CECO items. As a result, installation and inspection for all Safety Related CRD Pipe Supports was stopped on November 12, 1980. This "stop work" was later expanded to include all related Engineering activities in San Jose. The stop work will remain in place until Project Construction, with the concurrence of Commonwealth Edison QA, is satisfied that adequate corrective action has been completed.

6. When Commonwealth Edison was advised by RCI that they had prepared, in draft form, what they considered the majority of procedures necessary to resolve Commonwealth Edison and NRC concerns, the Site QA Superintendent and the cognizant Project Construction Engineer performed an intensive review of the draft documents at San Jose. Comments were provided and in the case of the design interface document, total rewrite of procedure was recommended. The incorporation of all comments has been completed and submittal of required documents began the second week of January. Following review and approval of the necessary procedures, site QA plans to review the corrective action on site and in San Jose prior to allowing RCI to return to work. This will be followed by an extensive audit of RCI's implementation both on site and off site promptly after returning to work.

CORRECTIVE ACTION TO AVOID FURTHER NONCOMPLIANCE

In addition to the Commonwealth Edison QA/QC Program changes addressed in ITEM 1, and the implementation of Quality Assurance Department Memorandum #17 which was discussed above, the Commonwealth Edison QA Department has been reorganized to improve the effectiveness of QA management levels in addressing Quality concerns. Each of the construction sites now has three supervisory level personnel, 2 QA Supervisors and a QA Superintendent rather than a QA Supervisor as in the past. This change should allow the Site QA organization to follow on-site and off-site Quality Items more closely. More management attention to significant quality matters and consequently quicker resolution of Quality Related Problems is expected.

This focusing of the attention of the responsible CECO Field Engineer on the QA/QC activities associated with a project as well as the administrative changes made in the conduct of activities by the CECO QA Department will prevent recurrence of the deficiencies identified.

DATE WHEN FULL COMPLIANCE WILL BE ACHIEVED

The administrative changes in the conduct of review of on-site contractor QA activities has been implemented, including the addition of a Site QA Superintendent. Final review and acceptance of the RCI QA/QC Program changes will be completed as defined in ITEM 1. The CECO QA verification audit of RCI promptly after the stop work order has been lifted.