

NOTICE OF VIOLATION  
AND  
PROPOSED IMPOSITION OF CIVIL PENALTY

Commonwealth Edison Company  
Quad Cities Station, Units 1 and 2

Docket Nos. 50-254 and 50-265  
Licenses Nos. DPR-29 and DPR-30  
EA 87-82

During NRC inspections conducted at Quad Cities Nuclear Power Station, Units 1 and 2, on December 9, 1986 and June 8 through July 28, 1987, a violation of NRC requirements was identified. In accordance with the Modified Enforcement Policy Relating to 10 CFR 50.49, "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants," contained in Generic Letter 88-07, the Nuclear Regulatory Commission proposes to impose a civil penalty pursuant to Section 234 of the Atomic Energy Act of 1954, as amended (Act), 42 U.S.C 2282, and 10 CFR 2.205. The particular violation and associated civil penalty are set forth below:

10 CFR 50.49(f) requires each item of electrical equipment important to safety to be environmentally qualified by testing and/or analysis.

10 CFR 50.49(h) specifies that requalification of electric equipment important to safety is not required if the Commission has previously required qualification in accordance with "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 (DOR Guidelines).

DOR Guidelines, Section 5.2.2, states that type tests should only be considered valid for equipment identical in design and material construction to the test specimen and any deviations should be evaluated as part of the qualification documentation.

Contrary to the above, from November 30, 1985 until December 6, 1986, AMP nylon-insulated butt splices, used in numerous items of electrical equipment important to safety, were not properly environmentally qualified in accordance with DOR Guidelines by type testing. While a type test was done, the tested splices were not demonstrated to be identical to the installed AMP splices and this deviation was not evaluated as part of the documentation in the qualification file.

This is an EQ Category B violation.

Civil Penalty - \$150,000 (This EQ violation existed in excess of 100 days of plant operation).

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Pursuant to the provision of 10 CFR 2.201, Commonwealth Edison Company is hereby required to submit a written statement or explanation to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, within 30 days of the date of this Notice. This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each alleged violation: (1) admission or denial of the alleged violation, (2) the reasons for the violation if admitted, (3) the corrective steps that have been taken and the results achieved, (4) the corrective steps that will be taken to avoid further violations, and (5) the date when full compliance was or will be achieved. If an adequate reply is not received within the time specified in this Notice, an order may be issued to show cause why the license should not be modified, suspended, or revoked or why such other action as may be proper should not be taken. Consideration may be given to extending the response time for good cause shown. Under the authority of Section 182 of the Act, U.S.C. 2232, this response shall be submitted under oath or affirmation.

Within the same time as provided for the response required above under 10 CFR 2.201, the Licensee may pay the civil penalty by letter to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, with a check, draft, or money order payable to the Treasurer of the United States in the amount of the civil penalty proposed above, or the cumulative amount of the civil penalties if more than one civil penalty is proposed, or may protest imposition of the civil penalty in whole or in part by a written answer addressed to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission. Should the Licensee fail to answer within the time specified, an order imposing the civil penalty will be issued. Should the Licensee elect to file an answer in accordance with 10 CFR 2.205 protesting the civil penalty, in whole or in part, such answer should be clearly marked as an "Answer to a Notice of Violation" and may: (1) deny the violation(s) listed in this Notice in whole or in part; (2) demonstrate extenuating circumstances; (3) show error in this Notice, or (4) show other reasons why the penalty should not be imposed. In addition to protesting the civil penalty, such answer may request remission or mitigation of the penalty.

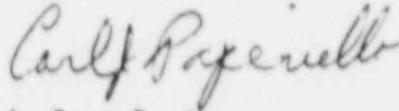
In requesting mitigation of the proposed penalty, the factors addressed in Modified Enforcement Policy Relating to 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," contained in Generic Letter 88-07, should be addressed. Any written answer in accordance with 10 CFR 2.205 should be set forth separately from the statement or explanation in reply pursuant to 10 CFR 2.201, but may incorporate parts of the 10 CFR 2.201 reply by specific reference (e.g., citing page and paragraph numbers) to avoid repetition. The attention of the Licensee is directed to the other provisions of 10 CFR 2.205, regarding the procedure for imposing a civil penalty.

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Upon failure to pay any civil penalty due which subsequently has been determined in accordance with the applicable provisions of 10 CFR 2.205, this matter may be referred to the Attorney General, and the penalty, unless compromised, remitted, or mitigated, may be collected by civil action pursuant to Section 234C of the Act, 42 U.S.C. 2282c.

The responses to the Director, Office of Enforcement, noted above (Reply to a Notice of Violation, letter with payment of civil penalty, and Answer to a Notice of Violation) should be addressed to: Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555 with a copy to the Regional Administrator, Region III, U.S. Nuclear Regulatory Commission, 799 Roosevelt Road, Glen Ellyn, IL 60137, and a copy to the NRC Resident Inspector at Quad Cities Station.

FOR THE NUCLEAR REGULATORY COMMISSION

*for*   
A. Bert Davis  
Regional Administrator

Dated at Glen Ellyn, Illinois  
this *20~~th~~* day of October 1988



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

April 7, 1988

TO ALL POWER REACTOR LICENSEES AND APPLICANTS

SUBJECT: MODIFIED ENFORCEMENT POLICY RELATING TO 10 CFR 50.49, "ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT IMPORTANT TO SAFETY FOR NUCLEAR POWER PLANTS" (GENERIC LETTER 88-07)

Background:

Generic Letters, Bulletins, and Information Notices have been issued to provide guidance regarding the application and enforcement of 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants." Generic Letter 85-15, issued August 6, 1985, and Generic Letter 86-15, issued September 22, 1986, provided information related to the deadlines for compliance with 10 CFR 50.49 and possible civil penalties applicable to licensees who were not in compliance with the rule as of the November 30, 1985 deadline. Upon review, the Commission found that the EQ Enforcement Policy promulgated in Generic Letter 86-15, could result in imposition of civil penalties that did not properly reflect the safety significance of EQ violations with respect to civil penalties imposed in the past. In the interest of continuing a tough but fair enforcement policy, the Commission determined that the EQ Enforcement Policy should be revised. The purpose of this letter is to provide a modification to the NRC's enforcement policy, as approved by the Commission, for environmental qualification (EQ) violations. This letter replaces the guidance provided in Generic Letters 85-15 and 86-15.

Modified EQ Enforcement Policy

The details of the modified EQ enforcement policy are provided in the enclosure. Generally, the changes made to the policy are to: (1) aggregate significant EQ violations together, rather than consider each separate item of unqualified electrical equipment, for assessment of a civil penalty, (2) assess a base civil penalty according to the number of systems or components which are affected by the unqualified equipment in a graded approach by assignment of the aggregate EQ problem into one of three categories, (3) establish a maximum EQ civil penalty of \$750,000 for most cases, (4) maintain a minimum civil penalty of \$50,000 for a significant EQ violation in most cases, and (5) consider mitigation or escalation of the base civil penalty based on the factors of identification and reporting, best efforts to complete EQ within the deadline, corrective actions, and duration of the violation.

This modified policy should not be interpreted as a lessening of the NRC's intention to assure that all plants comply with EQ requirements. The modified policy is intended to give a significant civil penalty to those licensees with significant EQ violations. The NRC's view is that the modified policy more closely reflects the relative safety importance of EQ violations with other enforcement issues.

Safety Issues

When a potential deficiency has been identified by the NRC or licensee in the environmental qualification of equipment (i.e., a licensee does not have an

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adequate basis to establish qualification), the licensee is expected to make a prompt determination of operability (i.e., the system or component is capable of performing its intended design function), take immediate steps to establish a plan with a reasonable schedule to correct the deficiency, and have written justification for continued operation, which will be available for NRC review.

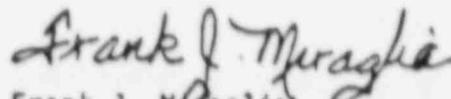
The licensee may be able to make a finding of operability using analysis and partial test data to provide reasonable assurance that the equipment will perform its safety function when called upon. In this connection, it must also be shown that subsequent failure of the equipment, if likely under accident conditions, will not result in significant degradation of any safety function or provide misleading information to the operator.

The following actions are to be taken if a licensee is unable to demonstrate equipment operability:

- a. For inoperable equipment which is in a system covered by plant technical specifications, the licensee shall follow the appropriate action statements. This could require the plant to shut down or remain shut down.
- b. For inoperable equipment not covered by the plant technical specifications, the licensee may continue reactor operation:
  1. If the safety function can be accomplished by other designated equipment that is qualified, or
  2. If limited administrative controls can be used to ensure the safety function is performed.

The licensee must also evaluate whether the findings are reportable under 10 CFR 50.72 and 50.73, 10 CFR Part 21, the Technical Specifications or any other pertinent reporting requirements, including 10 CFR 50.9(b), particularly if equipment is determined to be inoperable.

This letter does not require any response and therefore does not need approval of the Office of Management and Budget. Comments on burden and duplication may be directed to the Office of Management and Budget, Reports Management Room 3208, New Executive Office Building, Washington, DC 20503. Should you have questions on this letter, the staff contact is Howard Wong, Office of Enforcement. He can be reached on (301) 492-3281.

  
Frank J. Maglia  
Associate Director for Projects  
Office of Nuclear Reactor Regulation

Enclosure: As stated

## MODIFIED ENFORCEMENT POLICY FOR EQ REQUIREMENTS

This enclosure provides the details of the modified enforcement policy for EQ requirements for those licensees who were not in compliance with 10 CFR 50.49 as of the November 30, 1985 deadline.

I. Scope of the Enforcement Policy for EQ Requirements

If violations of the EQ rule identified at plants operating after November 30, 1985 existed before the deadline and the licensee "clearly knew or should have known" of the lack of proper environmental qualification, then enforcement action may be taken as described in Sections III and IV. If the licensee does not meet the "clearly knew or should have known" test, no enforcement action will be taken.

This enforcement policy applies to violations of the EQ rule identified after November 30, 1985 which relate back to action or lack of action before the deadline. Violations which occurred after November 30, 1985 (either as a result of plant modifications or because the plant was licensed after November 30, 1985) will be considered for enforcement action under the normal Enforcement Policy of 10 CFR Part 2, Appendix C. In addition, EQ violations which are identified after the NRC's last first-round inspection, <sup>1/</sup> approximately mid-1988, will also be considered under the normal Enforcement Policy.

II. Application of the "Clearly Knew, or Should Have Known" Test

Licensees who "clearly knew" they had equipment for which qualification could not be established may have committed a deliberate violation of NRC requirements. This situation will be evaluated on a case-by-case basis.

The NRC will examine the circumstances in each case to determine whether the licensee "clearly should have known" that its equipment was not qualified. The factors the NRC will examine include:

1. Did the licensee have vendor-supplied documentation that demonstrated that the equipment was qualified?
2. Did the licensee perform adequate receiving and/or field verification inspection to determine that the configuration of the installed equipment matched the configuration of the equipment that was qualified by the vendor?
3. Did the licensee have prior notice that equipment qualification deficiencies might exist?
4. Did other licensees identify similar problems and correct them before the deadline?

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<sup>1/</sup> First-round inspections are special team inspections to review licensees' compliance with 10 CFR 50.49.

In assessing whether the licensee clearly should have known of a deficiency, the information provided to the licensees by the NRC and the industry on specific deficiencies will be taken into consideration. This information, and the timeliness of it being provided to licensees prior to the EQ deadline are relevant factors. If one licensee determined that a specific EQ deficiency existed, it would not be assumed that all licensees should have also come to the same conclusion unless information about the specific deficiency had been widely disseminated within the industry or by the NRC. The staff will carefully consider these criteria when evaluating whether a licensee clearly should have known of a deficiency prior to the deadline.

III. EQ Violations not Sufficiently Significant to Merit a Civil Penalty Under the Modified Policy

Any failure to adequately list and demonstrate qualification of equipment required by 10 CFR 50.49 may constitute a violation of the rule. This does not require, however, that all violations of the rule be considered for escalated enforcement or be assessed a civil penalty. For example, if the qualification file presented to the inspector during an inspection did not demonstrate or support qualification of equipment, the equipment would be considered unqualified <sup>2/</sup> and 10 CFR 50.49 requirements would be violated. However, although not in the qualification file, if sufficient data exists or is developed during the inspection to demonstrate qualification of the equipment or, based on other information available to the inspector, the specific equipment is qualifiable for the application in question, the qualification deficiency is not considered sufficiently significant for assessment of civil penalties. These violations would be considered to be Severity Level IV or Severity Level V violations based on a violation of 10 CFR 50.49 requirements at the time of the inspection.

Programmatic violations or problems that are identified as a result of the EQ inspections that involve several EQ violations which themselves would not be considered sufficiently significant to merit a civil penalty under the modified EQ enforcement policy nonetheless may be aggregated and evaluated for escalated enforcement action (generally Severity Level III) for the failure to satisfy applicable requirements of 10 CFR 50.49 and/or 10 CFR Part 50, Appendix B. The civil penalties for these violations would be assessed under the normal Enforcement Policy of 10 CFR Part 2, Appendix C (Supplement I).

IV. Basis for Determining Civil Penalties

A. Base Civil Penalty

Significant EQ violations, for which the licensee clearly should have known that they had equipment for which qualification had not been established,

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<sup>2/</sup> For purposes of enforcement, "unqualified equipment" means equipment for which there is not adequate documentation to establish that this equipment will perform its intended functions in the relevant environment.

are to be considered together, in the aggregate, and the base civil penalty assessed in a graded approach based on the number of systems or components affected. 3/

The base civil penalty would be determined as described below.

<u>EQ Violation Category</u>	<u>Base Civil Penalty</u>
A. Extensive; EQ violations affecting many systems and many components.	\$300,000
B. Moderate; EQ violations affecting some systems and some components.	\$150,000
C. Isolated; EQ violations affecting a limited number of systems and components.	\$ 75,000

The three EQ violation categories reflect the overall pervasiveness and the general safety significance of significant EQ violations. The NRC considers violations of EQ requirements to be safety significant because the electrical equipment required to be qualified were those which have importance to safety. The violation categories do not include those EQ violations which have been determined to be not sufficiently significant standing alone to be considered for escalated enforcement and which will be normally considered as Severity Level IV or V violations, as described in Section III. As stated in Section III, however, programmatic problems may be the subject of escalated enforcement action under the NRC's normal Enforcement Policy.

The significance of the EQ violations is considered when the NRC evaluates the number of systems affected by the EQ violations and determines the EQ violation category. The NRC will assume, for escalated enforcement cases, that the unqualified equipment could affect operability of the associated system. The NRC will not consider refinements on the operability arguments such as the actual time the equipment is required to be operable, administrative measures or controls available to ensure the safety function is accomplished, the degree to which the operability of a system is affected, or, that through additional analyses or testing, the equipment may be demonstrated to be qualified or qualifiable. This assumption is made for enforcement purposes in order to reduce the resources anticipated to be spent by licensees and the NRC to evaluate in detail whether system operability was in question.

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3/ The EQ violation categories (A-C) will be used rather than the severity levels in the normal Enforcement Policy of 10 CFR Part 2, Appendix C. The base civil penalty for the violations will be applied consistent with the statutory limits on civil penalties under Section 234 of the Atomic Energy Act.

Because the NRC is considering enforcement action rather than a justification for continued operation and the EQ deficiencies have been corrected in most instances, the NRC will make a conservative judgment as to the overall safety significance of the EQ violations based on the number of safety systems affected. This approach has the benefits of a relatively quick, though conservative, view on the safety consequences of unqualified equipment and will focus on the underlying cause of the EQ violations.

Cases involving deliberate violations or very serious EQ violations (more safety significant than considered in this modified enforcement policy such as widespread breakdowns or clearly inoperable systems) will be evaluated on a case-by-case basis and may be subject to more severe sanctions than those described in this policy.

#### B. Mitigation/Escalation Factors

Mitigation and escalation of the base civil penalty determined in Section IV.A will be considered in the determination of the civil penalty amount. The NRC will consider the EQ violations in aggregate, not based on individual violations. Adjustment of the base civil penalty will be considered as described below:

<u>Mitigation/Escalation Factors</u>	<u>Maximum Mitigation/ Escalation Amount (from base civil penalty)</u>
1. Identification and prompt reporting, if required, of the EQ violations (including opportunities to identify and correct the deficiencies).	± 50%
2. Best efforts to complete EQ within the deadline.	± 50%
3. Corrective actions to result in full compliance (including the time taken to make an operability or qualification determination, the quality of any supporting analysis, and the nature and extent of the licensee's efforts to come into compliance).	± 50%
4. Duration of violation which is significantly below 100 days.	- 50%

In order to be fair and equitable to those licensees who took appropriate actions prior to November 30, 1985 or shut down prior to this date to be in compliance, civil penalties generally should not be less than \$50,000 to emphasize that a significant environmental qualification failure is unacceptable.

The NRC will, however, consider full mitigation (no civil penalty) for those EQ violations which satisfy all of the five following criteria: (1) violations which are isolated and affect a limited number of systems and components, (2) violations which are identified by the licensee, (3) violations which are promptly reported to the NRC, if required, (4) violations which are corrected and actions taken will result in full compliance within a reasonable time, and (5) violations for which the licensee has demonstrated best efforts to complete EQ within the deadline.

The intent of full mitigation of the civil penalty for EQ violations which meet all five criteria is to increase the incentive for self-identification of EQ deficiencies which might not otherwise be found by NRC. The NRC will generally issue only a Notice of Violation for violations which meet all these criteria.

If the licensee is able to convincingly demonstrate at the time of the inspection, or shortly thereafter, that an item is not required to be on the EQ list, then the item would not be considered for enforcement action. The NRC does not intend to consider for enforcement purposes the results of a licensee's after-the-fact testing for mitigation where the licensee clearly should have known that its documentation was not sufficient.

LIST OF RECENTLY ISSUED GENERIC LETTERS

Generic Letter No.	Subject	Date of Issuance	Issued To
GL 88-06	REMOVAL OF ORGANIZATION CHARTS FROM TECHNICAL SPECIFICATION ADMINISTRATIVE CONTROL REQUIREMENTS	03/22/88	ALL POWER REACTOR LICENSEES AND APPLICANTS
GL 88-05	BORIC ACID CORROSION OF CARBON STEEL REACTOR PRESSURE BOUNDARY COMPONENTS IN PWR PLANTS	03/17/88	ALL LICENSEES OF OPERATING PWRs AND HOLDERS OF CONSTRUCTION PERMITS FOR PWRs
GL 88-04	DISTRIBUTION OF GEMS IRRADIATED IN RESEARCH REACTORS	02/23/88	ALL NON-POWER REACTOR LICENSEES
GL 88-03	RESOLUTION OF GENERIC SAFETY ISSUE 93, "STEAM BINDING OF AUXILIARY FEEDWATER PUMPS"	02/17/88	ALL LICENSEES, APPLICANTS FOR OPERATING LICENSES, AND HOLDERS OF CONSTRUCTION PERMITS FOR PRESSURIZED WATER REACTORS
GL 88-02	"INTEGRATED SEFETY ASSESSMENT PROGRAM II (ISAP II)"	01/20/88	ALL POWER REACTOR LICENSEES
GL 88-01	"NRC POSITION ON IGSCC IN BWR AUSTENITIC STAINLESS STEEL PIPING"	01/25/88	ALL LICENSEES OF OPERATING BOILING WATER REACTORS AND HOLDERS OF CONSTRUCTION PERMITS FOR BWRs
GL 87-16	NUREG-1262, "ANSWERS TO QUESTIONS AT PUBLIC MEETINGS RE IMPLEMENTATION OF 10 CFR55 ON OPERATORS LICENSES"	11/12/87	ALL POWER AND NONPOWER REACTOR LICENSEES AND APPLICANTS FOR LICENSES
GL 87-15	POLICY STATEMENT ON DEFERRED PLANTS	11/04/87	ALL HOLDERS OF CONSTRUCTION PERMITS FOR A NUCLEAR POWER PLANT
GL 87-14	REQUEST FOR OPERATOR LICENSE SCHEDULES	08/04/87	ALL POWER REACTOR LICENSEES

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/86021(DRS); 50-265/86021(DRS)

Docket Nos. 50-254; 50-265

Licenses No. DPR-29; DPR-30

Licensee: Commonwealth Edison Company  
P.O. Box 767  
Chicago, IL 60690

Facility Name: Quad Cities Nuclear Power Station, Units 1 and 2

Inspection At: Cordova, Illinois

Inspection Conducted: December 9, 1986

Inspector: R. A. Westberg

*James W. Muffett*

12/19/86  
Date

Approved By: J. W. Muffett, Chief  
Plant Systems Section

*James W. Muffett*

12/19/86  
Date

Inspection Summary

Inspection on December 9, 1986 (Reports No. 50-254/86021(DRS);  
No. 50-265/86021(DRS))

Areas Inspected: Special, announced inspection by one regional  
inspector of environmental qualification of electrical splices.

Results: No violations or deviations were identified.

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## DETAILS

### 1. Persons Contacted

#### Commonwealth Edison Company (CECo)

D. Box, Station Manager  
R. Roben, Services Superintendent  
D. Gibson, Quality Assurance Superintendent  
M. Kool, Regulatory Assurance  
M. Slevert, Technical Staff (E.Q.)

#### US NRC

A. Morrongiello, Resident Inspector  
J. Jacobson, Vendor Programs Branch

### 2. Review of Repair of Unqualified Electrical Splices

On December 5, 1986, the licensee notified Region III that it was shutting down Unit 1 because the electrical splices in the Drywell Penetrations did not meet environmental qualification requirements. These splices were in-line nylon insulated butt splices that were supplied by General Electric (GE) during the original construction of the plant. The splices were manufactured by AMP, Hollingsworth, or T&B Products.

The splices were determined to be unqualified on the basis of tests conducted December 4 and 5, 1986. These tests were conducted because of concerns raised by the NRC staff during the environmental qualification inspection at Dresden. After the splices failed the tests, the licensee declared an Unusual Event and shut down Unit 1 (Unit 2 was already shutdown for a refueling outage).

The licensee reported that each unit had approximately 150 splices that had to be repaired. The purpose of this report was to review the repairs and the environmental qualification status of the materials employed in the repair.

#### a. Documents Reviewed

- (1) Procedure No. QMP 100-00, "Scotch Brand Tapes EQ Installation Instructions," Revision 1.
- (2) Work Request No. 53811 - Splice Repair.
- (3) Environmental Qualification Report No. CQD-029164, "3M Electrical Cable Splice Assemblies.
- (4) Temporary Procedure Change No. 4399.

- (5) Engineering Evaluation No. 157, "Scotch Brand 130c Tape."
- (6) Engineering Evaluation No. 158, "Scotch Brand 33+ Tape."
- (7) Safety-related Dedication No. 86-072, "Scotch Brand 130c Insulating Tape."
- (8) Safety-related Dedication No. 86-073, "Scotch Brand 33+ Jacketing Tape."

b. Inspection Results

- (1) The repair Procedure, No. QMP 100-60, was properly reviewed and approved, including Temporary Change No. 4399, which clarified the procedure and added a cut-away drawing of the completed splice. The procedure was technically acceptable.
- (2) The repair procedure stipulated Scotch Brand 130c insulating tape and 33+ jacketing tape for the repair. The plant did not have any safety-related environmentally qualified 130c or 33+ tape; however, they did have a supply of both types of tape classified non safety-related. An engineering evaluation was performed and the materials were upgraded to safety-related commercial grade. This made the tape acceptable for use in EQ installations since the CECO QA Manual dictates that only safety-related material be used for EQ systems.
- (3) The package for Work Request No. 53811 identified all the affected penetrations and their associated splices. These were 1X-100B, 1X-100G, 1X-104F, 1X-105A, and 1X-105B.
- (4) Scotch Brand 130c and 33+ tape have been evaluated for use in the plant and documented in EQ Binder No. 29164. Further, Wyle Labs tested splices with similar configurations as those in Procedure No. QMP 100-60. The test report (Wyle Preliminary Test Report dated November 7, 1986) documents that the splices met IEEE 323-1974 and that they can be used for inside drywell applications and for repair of nylon splices used on GE penetrations.

Based on the above, the Staff found the splice repairs acceptable.

3. Exit Interview

The NRC inspector met with licensee representatives on December 9, 1986, and summarized the purpose, scope, and findings of the inspection. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection.

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/87011(DRS); 50-265/87011(DRS)

Docket Nos. 50-254; 50-265

Licenses No. DPR-29; DPR-30

Licensee: Commonwealth Edison Company  
Post Office Box 767  
Chicago, IL 60690

Facility Name: Quad Cities Nuclear Power Station, Units 1 and 2

Inspection At: Quad Cities Site, Cordova, Illinois;  
NRC RIII Office, Glen Ellyn, Illinois

Inspection Conducted: June 8 through July 28, 1987

Inspector: A. S. Gautam *A. S. Gautam*  
Reactor Inspector, Region III

8/26/87  
Date

Also participating in the inspection and contributing to the report were:

- M. Kopp, RIII
- R. Moist, NRR
- J. Stoffel, INEL
- H. Stromberg, INEL
- M. Jacobus, SANDIA

Approved By: *R. N. Gardner*  
R. N. Gardner, Chief  
Plant Systems Section

8/31/87  
Date

Inspection Summary

Inspection on June 8 through July 28, 1987 (Report Nos. 50-254/87011(DRS); 50-265/87011(DRS))

Areas Inspected: Special announced safety inspection of the environmental qualification (EQ) of electric equipment within the scope of 10 CFR 50.49. The inspection included licensee action on SER/TER commitments; EQ program compliance to 10 CFR 50.49; adequacy of EQ documentation; and a plant physical inspection of EQ equipment (Modules No. 30703 and No. 25576).

Results: The licensee has implemented a program to meet the requirements of 10 CFR 50.49. Deficiencies in the areas inspected are summarized below:

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## VIOLATIONS

<u>Item No.</u>	<u>Description</u>	<u>Report Section</u>
50-254/87011-07(DRS) 50-265/87011-07(DRS)	Inadequate documentation to qualify AVCO solenoid valves	5e
50-254/87011-08(DRS) 50-265/87011-08(DRS)	BIW and OKONITE cable EQ files not auditable to permit verification of the environmental qualification of cables	5f

## POTENTIALLY ENFORCEABLE/UNRESOLVED ITEMS

<u>Item No.</u>	<u>Description</u>	<u>Report Section</u>
50-254/87011-01(DRS) 50-265/87011-01(DRS)	Unqualified Nylon AMP Butt splices	2
50-254/87011-03(DRS) 50-265/87011-03(DRS)	Unqualified SIMPLEX butyl rubber insulated cables	5a
50-254/87011-04(DRS) 50-265/87011-04(DRS)	Unqualified SIMPLEX polyethylene insulated cable	5b
50-254/87011-06(DRS) 50-265/87011-06(DRS)	Unqualified GE butyl rubber insulated cable	5d

## OPEN ITEMS

<u>Item No.</u>	<u>Description</u>	<u>Report Section</u>
50-254/87011-02(DRS) 50-265/87011-02(DRS)	Lack of a formal EQ training program; lack of EQ training for subcontractor personnel	4e
50-254/87011-05(DRS) 50-265/87011-05(DRS)	Replacement of GE butyl rubber insulated cable in Units 1 and 2	5c
50-254/87011-09(DRS) 50-265/87011-09(DRS)	Replacement of Nylon AMP butt splices in EQ applications in Units 1 and 2	6a

## DETAILS

### 1. Persons Contacted

#### a. Commonwealth Edison Company (CECo)

- \*R. L. Bax, Station Manager, Quad Cities Plant
- \*D. A. Gibson, QA Superintendent
- \*R. Robey, Services Superintendent
- L. Petrie, Assistant Superintendent Maintenance
- G. C. Tietz, Assistant Superintendent Operations
- +S. Hunsader, Nuclear Licensing Administrator
- \*M. Kooi, Regulatory Assurance Supervisor
- \*J. J. Kopacz, Tech Staff Supervisor
- \*C. Smith, QC Supervisor
- \*M. Siwert, EQ Site Coordinator
- \*Z. J. Boxer, EQ Engineer, SNED
- \*G. D. Young, Electrical Engineer
- M. Reed, Engineer
- \*M. Brown, QA Inspector
- C. Sack, QC Inspector
- \*J. Ford, QC Inspector
- \*D. Craddick, Master Electrician
- \*D. Rajcerich, Master IM
- B. Viehl, Engineer
- J. E. Housman, Project Engineer
- J. S. Abel, SNED Manager
- \*I. M. Johnson, Nuclear Licensing

#### b. Consultants to CECo

- \*C. J. Crane, WESTEC
- \*J. R. Wahl, Independent
- \*M. J. Wylie, Bechtel Power
- ... Behera, S&L
- J. Sinnoppan, S&L
- C. T. Nieh, General Electric

#### c. Nuclear Regulatory Commission (NRC)

- \*R. Higgins, Senior Resident Inspector
- A. Morrongiello, Resident Inspector
- \*T. M. Ross, Project Manager, NRR

\*Denotes those attending the interim site exit meeting on June 12, 1987.

+Denotes those attending the exit interview conducted on the telephone on July 28, 1987 at the conclusion of the inspection.

2. Response to NRC Bulletins

- a. (Closed) IE Bulletin (50-254/79001-1B; 50-265/79001-1B): This item addressed requirements of Bulletin 79-01A dated June 6, 1979, and required the licensee to review qualification and preventative maintenance of ASCO solenoid valves installed in their plant.

During this inspection, the licensee confirmed that they had qualified ASCO solenoid valves in EQ applications. These valves were considered acceptable in regard to problems identified in the bulletin. No concerns were identified.

- b. (Closed) IE Bulletin (50-254/79001-2B; 50-265/79001-2B): This item addressed requirements of IE Bulletin 79-01B dated January 14, 1980, regarding the environmental qualification of class IE electrical equipment required to function during and following postulated accident conditions. Licensee action was required in the following areas:

- (1) A master list was required to be provided for all Engineered Safety Feature (ESF) Systems required to function under postulated accident conditions, including identification of class IE electrical equipment items within these systems required to function under accident conditions. Appropriate submittals were made by the licensee and found adequate by the NRC.
- (2) For each item of class IE electrical equipment identified on the master list, written evidence was required to be provided to support the capability of the item to function under postulated accident conditions.

During this inspection, the inspectors reviewed the licensee's submittals to the NRC which included written evidence of the qualification of items on the master list. Qualification deficiencies had been previously identified by the NRC in the Franklin Research Center (FRC) Technical Evaluation Report (TER). The licensee's approach to resolve outstanding deficiencies was accepted by the NRC in their final July 19, 1984 SER on EQ equipment.

- (3) Service condition profiles (i.e., temperature, pressure, humidity, radiation as a function of time) were required to be provided for EQ equipment. The NRC reviewed plant service condition profiles provided by the licensee. No concerns were identified.

- (4) 79-01B required evaluation of the qualification of EQ equipment against the guidelines provided in Enclosure 4 and 5 of the bulletin, and required an equipment qualification plan including schedules for completing the qualification of outstanding items.

The licensee's submittals and subsequent NRC TER/SERs identified the licensee's evaluation required by 79-01B, and its acceptance by the NRC. The licensee submitted and met their equipment qualification plan as approved by the NRC.

- (5) Maximum expected flood levels resulting from postulated accidents were required to be identified inside the containment. The inspectors found appropriate information on flood levels for the equipment reviewed.
- (6) Licensee Event Reports (LERs) were required to be submitted for equipment not capable of meeting environmental qualification requirements for the intended services. No concerns were identified in this area.

### 3. Review of Unqualified AMP Nylon Butt Splices

IE Information Notice No. 86-104 alerted licensees regarding unqualified butt splice connectors supplied by General Electric in conjunction with qualified FO1 series penetration enclosures. This discrepancy was identified by the NRC during an EQ inspection at Dresden Nuclear Power Station on May 19-23, 1986. Subsequently CECO tested eight sample splices (Q13-Q20) removed from Quad Cities Nuclear Station at Wyle Laboratory to verify their qualification. During the testing performed at Wyle Laboratory on Test Report 17859-02B dated March 11, 1987, all samples failed during the LOCA exposure in 132 VAC and 528 VAC circuits. Failures were due to severe insulation degradation and excessive leakage current. Consequently CECO declared the splices unqualified and shut down its Quad Cities Unit 1 to rework the splices by taping them with qualified tape.

During the current inspection the NRC reviewed the licensee's EQ documentation to determine if the AMP splices were unqualified, and if the licensee clearly should have known that these AMP splices were unqualified prior to the 10 CFR 50.49 EQ deadline of November 30, 1985. The inspectors reviewed the following reports:

- a. Qualification Test for FO1 Electrical Penetration assembly by R. M. Schuster, April 30, 1971.

- b. Qualification Test Summary, 100 Series Electrical Penetrations, Document No. 994-75-011, April 23, 1975.
- c. Bechtel Power Corporation Evaluation of the EQ of Nylon Butt Splices used in GE penetrations, Chron No. 11558, August 20, 1986.
- d. CECo - Documentation for Tested and Installed Splices (AMP, T&B, and Hollingsworth)
- e. CECo - Review of EQ documentation for Penetration Splices; Meeting Notes from December 30, 1986.
- f. CECo - Similarity Evaluation for Nylon Butt Splices used in GE Penetrations.
- g. Qualification Test Program on Raychem Nuclear Cable Splices, Okonite tape Kerite Tape Splices, Scotch Tape Splices and AMP Butt splices Test Report No. 17859-02B, Volumes I and II, March 11, 1987

Based on their review of EQ testing, analysis, evaluations and discussions with the licensee, the inspectors concluded that the AMP nylon butt splices were unqualified for use in HELB/LOCA environments at Quad Cities Station.

The NRC is continuing to evaluate if the licensee clearly should have known that the AMP splices were unqualified past the EQ deadline of November 30, 1985. Enforcement action is also being considered in accordance with the NRC EQ guidance outlined in Generic Letter 86-15. Pending further NRC review this is a Potentially Enforceable/Unresolved Item. (50-254/87011-01(DRS); 50-265/87011-01(DRS))

#### 4. Licensee Action on SER/TER Commitments

The NRC inspection team evaluated the implementation of the licensee's EQ corrective action commitments made as a result of EQ deficiencies identified by the NRC in their July 23, 1982 Franklin Research Center (FRC) Technical Evaluation Report (TER), the January 18, 1983 Safety Evaluation Report (SER), and the July 19, 1984, final EQ SER.

The majority of the deficiencies identified in the SERs addressed documentation, similarity, aging, qualified life, and replacement schedules. All open items identified in the SERs were discussed with the NRC staff, and the licensee's proposed resolutions to these items were found acceptable by the NRC, as stated in their July 19, 1984, SER. The primary objective of the Region III EQ Audit in this area was to verify that appropriate analyses and necessary documentation to support the licensee's proposed and accepted resolutions to NRR were contained in the licensee's EQ files, and that appropriate modifications or replacements of equipment had been implemented.

During this review, the NRC inspection team selectively reviewed EQ documentation and examined equipment in the plant relevant to prior discrepancies identified in the SERs. For example, the inspectors selectively reviewed the licensee's commitment to complete the qualification of various EQ items identified on the JCO list in the July 19, 1984 NRC SER. The inspectors noted that the licensee had qualified or removed items (with technical justification) on this list relative to their 10 CFR 50.49 program. No concerns were identified.

5. EQ Program Compliance to 10 CFR 50.49

The inspectors reviewed selected areas of the licensee's EQ Program to verify compliance to 10 CFR 50.49. The licensee's EQ program was found to identify methods of equipment qualification; provide for evaluation and maintenance of EQ documentation in an auditable form including maintenance records; provide for upgrading of replacement equipment; and control of plant modifications. Based on their review, the inspectors determined that the licensee had established an adequate EQ program in compliance with the requirements of 10 CFR 50.49. The licensee's methods for establishing and maintaining the environmental qualification of electrical equipment were reviewed in the following areas:

a. EQ Program Procedures

The inspectors examined the adequacy of the licensee's policies and procedures for establishing and maintaining the environmental qualification of equipment within the scope of 10 CFR 50.49. The licensee's EQ program was reviewed for procurement of qualified equipment; maintenance of qualified equipment; modifications to the plant that could affect qualified equipment; updating of the EQ master list; and review and approval of EQ documentation. Procedures reviewed included the following documents:

-SNED Procedure Q.6, "Environmental Qualification Design Review," Revision 15

-SNED/PE Procedure Q.42, "Environmental Qualification Documentation Preparation, Control and Acceptance," Revision 4, dated May 23, 1986.

-QAP 500-13, "Environmental Qualification Program," Revision 4, dated November 1986.

-QAP 500-14, "Environmentally Qualified Equipment Maintenance and Surveillance," Revision 3, dated November 1986.

-QAP 500-16, "Environmental Qualification (E.Q.) Maintenance History File and Trending Program," Revision 2, dated November 1986.

- QAP 500-17, "E.Q. Surveillance Scheduling," Revision 1, dated August 1986.
- QAP 600-1, "Request for Purchase, Requisition Card and Purchase Requisition," Revision 23, dated May 1987.
- QAP 600-4, "Technical Evaluation of Replacement Parts," Revision 4, November 1986.
- QAP 1200-1, "Deviation Report Procedure," Revision 14, dated November 1986.
- QAP 1500-2, "Work Request Procedure for Station Maintenance," Revision 27, dated February 1987.
- QAP 1500-4, "Work Request Procedure for Station Construction, Substation Construction and O.A.D.," Revision 3, dated February 1987.
- QAP 1800-9, "Control of Vendor Equipment Technical Information," Revision 3, dated November 1986.
- QTP 050-1, "Equipment Qualification Guidelines for the Need to Upgrade Qualified Components," Revision 2, dated November 1986.
- QTP 050-2, "Environmental Qualification Binder Review," Revision 2, dated November 1986.

Specific areas reviewed in these procedures included definitions of harsh and mild environments, equipment qualified life, service conditions, periodic testing, maintenance and surveillance, and upgrading of replacement equipment purchased after February 22, 1983.

No violations of NRC requirements were identified.

b. 10 CFR 50.49 Master Equipment List (MEL) of EQ Equipment

IE Bulletin No. 79-01B required licensees of all power reactor facilities with an operating license to provide a MEL that identified each Class IE electrical equipment item relied upon to perform a safety function during a design basis event. 10 CFR 50.49, Paragraph (d), requires licensees to prepare a list of electric equipment important to safety and within the scope of the rule. The NRC inspectors reviewed the licensee's MEL for compliance to 10 CFR 50.49. Areas reviewed included adequacy of the MEL, technical justifications for removal of items from the MEL, and licensee reviews of the MEL for changes due to field modifications.

The inspectors verified the completeness/adequacy of the list in terms of equipment needed during accident conditions through selective reviews of piping and instrumentation drawings (P&IDs), emergency procedures, technical specifications, and FSARs.

No violations of NRC requirements were identified.

c. EQ Maintenance and Surveillance Program

The inspector reviewed specific maintenance, replacement, surveillance tests, and inspections necessary to preserve the environmental qualification of EQ equipment identified on the MEL. The NRC inspectors compared the EQ requirements in the licensee's maintenance procedures and EQ binders against maintenance records of selected equipment to verify performance of maintenance and surveillance activities at prescribed intervals. Activities reviewed included gasket inspections, lubrication, torquing of housing covers and installation of replacement parts. Maintenance and surveillance records were reviewed for General Electric 4KV ECCS pump motors, Westinghouse 460V RC fan motor, Limitorque actuators, Rosemount pressure transmitters, ASCO solenoid valves, and Conax thermocouples. The following exceptions were identified:

- (1) The inspectors noted that the replacement schedule for solenoids, coils and viton elastomers in ASCO solenoid valves varied from 3 years to 37 years. This schedule was not consistent with the licensee's EQ qualification report which identified the average qualified life of the ASCO valves to be four years. The licensee provided documentation to evidence that the actual qualification life of these valves did vary from 3 to 37 years, and the licensee agreed to clarify their files. No further concerns were identified.
- (2) During review of EQ maintenance activities for ASCO solenoid valves the inspector noted that the maintenance schedule allowed the exceeding of scheduled maintenance dates by 25%. The licensee agreed that this was not consistent with their EQ requirements and revised EQ surveillance scheduling procedure QAP 500-17 to require maintenance and surveillance prior to qualified intervals. No further concerns were identified.
- (3) The inspectors noted that the ASCO Vendor Bulletin recommended monthly cycling of the valves. The ASCO EQ files, however, called for yearly cycling of these valves. The licensee reviewed these requirements with ASCO and reported that monthly cycling intervals did not affect the environmental qualification of these valves. ASCO also confirmed to the licensee that yearly cycling was acceptable. No further concerns were identified.

No violations of NRC requirements were identified.

d. Plant Procurement and Upgrading of Replacement Equipment

Licensee procedures were found to adequately address upgrading of replacement equipment purchased after February 22, 1983. Procurement procedures and documents were found to adequately address appropriate quality and regulatory requirements regarding the environmental qualification of equipment within the scope of 10 CFR 50.49. Checklists were observed to have been used to provide evidence of reviews and approvals. For example, the procurement package for the replacement of Limitorque MO 2-202-5A was found to properly address upgrading to the requirements of IEEE 323-1974.

No violations of NRC requirements were identified.

e. Quality Assurance (QA) and Training Program

During this review the inspectors determined that the licensee had implemented a program to monitor the quality of EQ activities through surveillance, audits, and reviews of the records and files for plant modifications and procurement of equipment. NRC inspectors reviewed the licensee's QA audits, including QA Audit No. QAS-4-86-174 conducted on July 8-9, 1986, and found the methodology, results and followup corrective action relative to the audits acceptable.

The NRC inspectors also reviewed the licensee's staff training program and associated records relative to the performance of EQ activities. The training records indicated that the licensee had implemented a training program for key personnel, including management, operations and maintenance personnel responsible for EQ activities.

During this review the inspectors noted that the licensee did not have a procedure to control the onsite training program. Based on the inspectors review, key personnel had received EQ training, however, there were no specific requirements in place to control such training. The licensee stated that a controlled training program was planned to be implemented, however, there was no planned schedule for its implementation. The inspectors also noted that subcontractor personnel were not being given any EQ training.

At the inspection exit the licensee committed to incorporating a controlled procedure for EQ training at the plant, and to ensure that all appropriate sub-contractor personnel were trained for EQ activities. Pending further review of the licensee's training program this is an Open Item (50-254/87011-02(DRS); 50-265/87011-02(DRS)).

## 6. Detailed Review of Qualification Files

The licensee qualified their EQ equipment to the requirements of the DOR Guidelines (10 CFR 50.49, Paragraph K). The inspectors reviewed over 32 equipment qualification files for evidence of the environmental qualification of equipment within the scope of 10 CFR 50.49 and evidence of equipment qualification to NUREG 0588 Cat I. Files were found to include a description of the equipment; similarity analysis of tested equipment to that installed in the plant; allowed mounting methods and orientation; qualification of interfaces (conduit housing, seal, etc.); evaluation of aging effects on equipment; description of test sequence and methodology; environmental conditions for the equipment during an accident; qualification for submergence of applicable equipment; resolution of test anomalies; and maintenance/surveillance criteria for the preservation of the qualified status of equipment.

The inspectors selectively reviewed the above areas, as applicable, including special reviews for the required duration of operability of EQ equipment; licensee evaluation of tested materials and configurations relative to actual plant installations; adequacy of EQ test conditions; aging calculations for qualified life and replacement intervals; effects of decreases in insulation resistance on equipment performance; adequacy of demonstrated accuracy of equipment and interfaces during an accident; and licensee evaluations of discrepancies identified in IE Notices and Bulletins.

EQ files were reviewed for electrical cables, cable splices, terminations, terminal blocks, electric motors, solenoid valves, electrical penetrations, seals, lubricants, transmitters, temperature elements, radiation monitors, control and position switches, switch gear, control panels and miscellaneous electrical devices. The inspectors identified minor deficiencies such as incorrect model numbers and location elevations on the SCEW sheets. These were corrected by the licensee. The inspectors also found that in certain cases the files did not allow verification of equipment qualification to a specified performance for accident conditions. Details are noted below:

### a. SIMPLEX Butyl Rubber Insulated Cables (File No. 29, CQD-014973)

The above file was reviewed for the qualification of SIMPLEX butyl rubber insulated/PVC jacketed cable to the requirements of NUREG 0588 Cat. I. This cable was identified by the licensee to be used in 5KV power applications. Subsequent to the site inspection the licensee identified the SIMPLEX butyl rubber cables to be also used in 480VAC, 208VAC, 120VAC, and 125VDC low power and control applications in HELB and radiation harsh environments outside the drywell. The licensee stated that the environmental qualification of all the SIMPLEX cables was based on Wyle Lab Report No. 45917-40-4 which documented the testing

of eight 5KV SIMPLEX butyl rubber cable specimens. The inspectors noted that no insulation resistance was measured during the HELB exposure of this test and that the test configuration was such that conductor to conductor shorts may have gone undetected. The licensee stated that the post accident dielectric withstand test performed by Wyle for submerged cable at 5000 VAC, and the radiation harsh only location of the 5KV cables in the plant was evidence of the qualification of the SIMPLEX 5KV and 600V rated cables, however, the inspectors concluded that the Wyle report was not adequate to qualify the SIMPLEX butyl rubber cable for applications of less than 4160 volts.

Subsequent to this finding, on June 30, 1987 the licensee provided an enhanced EQ package which included additional justification for the qualified life of the butyl rubber insulated cables (CQD No. 014973) relative to the DOR Guidelines (DOR is applicable to Quad Cities). This EQ package was also transmitted by the licensee to NRR. Based on the regional review of the above package, Region III had the following concerns:

- (1) Based on testing in the industry, butyl rubber is known to be a very degradable material susceptible to significant radiation damage. For example, the IEEE Transactions Paper by R. B. Blodgett and R. G. Fisher, July 12, 1986, states that during testing conducted on Butyl-Neoprene (ozone resisting butyl based insulation) having a polychloroprene based jacket, the butyl was degraded to a tar like liquid between  $5 \times 10^6$  and  $10^7$  Rads. The DOR Guidelines, Paragraph 5.2.3, states that for such degradable materials the radiation doses should be applied prior to or concurrent with exposure to elevated temperature and pressure steam/air environment. The Wyle test presented by CECO did not meet these DOR Guideline requirements, in that the Wyle test (Report No. 45917-40-4) did not expose the same butyl rubber specimens to appropriate doses of radiation and elevated temperatures.
- (2) The referenced Wyle test was performed on a 5KV rated 3/c, 500 MCM, butyl rubber insulated, PVC jacketed cable. The insulation had a thickness of 171.875 mils and the jacket had a thickness of 125 mils. The low voltage power and control cables at Quad Cities, however, have an insulation thickness of 46.875 mils with a 62.5 mils overall jacket. The inspectors were concerned that the Wyle test done on the 5KV cable did not account for the postulated aging due to oxidation and subsequent surface cracking of the thinner cables.

During a conference call on July 9, 1987, the licensee was informed that based on NRC concerns relative to the documentation provided, the licensee was required to submit an operability analysis to justify continued operation. The licensee was also requested to address the qualification of any EQ application of butyl rubber cable at the Dresden Plant Units 2 and 3.

On July 17, 1987 the licensee provided additional documentation to enhance their qualification documentation for the butyl rubber insulated cables at both Quad Cities and Dresden. In this package the licensee stated that the cables were qualified to the DOR Guidelines, and that actual environmental parameters during an accident were less harsh than previously addressed. This package is being currently reviewed by the NRC. Pending further review of this package by the NRC, this is a Potentially Enforceable/Unresolved Item (50-254/87011-03(DRS); (50-265/87011-03(DRS))).

b. Simplex Polyethylene Insulated Cable (File No. 29, CQD 014973)

The inspectors reviewed the EQ file for SIMPLEX polyethylene insulated/PVC jacketed instrument cable for qualification to NUREG-0588, Category I. The cable was tested by Wyle Labs, Report No. 45917-04-1, and the HELB test was monitored by means of an indicating lamp which was connected in series with the cables being tested and powered by approximately 135 mA current. The test configuration was such that any decreased insulation resistance (including shorts) would apparently not be detected as no IR measurements were taken during the test. The licensee stated that these cables were used outside the drywell. The SCEW sheet in the EQ file indicated a severely harsh environment of 304°F, 20 psia, 100% RH, and  $3.9 \times 10^7$  Rads for these cables during an accident. The inspectors concluded that these cables were unqualified in the absence of IR data to evidence the performance of these cables during accident conditions at Quad Cities.

Subsequent to the finding the licensee stated that after further evaluation they had determined that the SIMPLEX polyethylene instrument cables would be exposed to a low "radiation harsh only" environment, and that the cables were not required to function in HELB areas. The licensee submitted revised SCEW sheets to evidence the less severe environment. Pending further review of the revised qualification files of these cables, this is a Potentially Enforceable Unresolved Item (50-254/87011-04(DRS); 50-265/87011-04(DRS)).

c. General Electric 5KV Butyl Rubber Insulated Cables (File No. 25-1, CQD-015110)

The inspectors reviewed the above file for the qualification of GE 5KV butyl rubber insulated cable to the requirements of NUREG 0588 Cat. 1. The licensee stated that this cable was used outside the drywell, and that it would not be required to function in an environment where maximum temperature/steam and high radiation levels occur simultaneously.

Some of this cable is used within the steam tunnel where the ambient temperature is 150°F. The testing attempted to attain a qualified life of 40 years at 150°F, however, the specimen aged to the equivalent of 40 years at 150°F failed the qualification test. Other 5KV power cable specimens including one aged to the equivalent of 13.2 years at 150°F did pass the test. Based on the installed life, the 5KV EQ cable located in the steam tunnel is scheduled for replacement at the next plant outage.

The inspectors noted that no insulation resistance was measured during the test, and that the test configuration was such that conductor-to-conductor shorts may have gone undetected. The LOCA test was conducted on a plant specific naturally aged cable with a radiation exposure followed by thermal aging. The inspectors concluded that certain conservatisms in the test including a subsequent successful post-accident withstand test justified use of this cable for 4160 VAC power cable applications. Pending review of the licensee's replacement of this cable during the next plant outage, this is considered an Open Item (50-254/87011-05(DRS); 50-265/87011-05(DRS)).

d. General Electric Low Power and Control Butyl Rubber Insulated Cable

Subsequent to the site inspection and after being questioned by the NRC, the licensee revealed that GE butyl rubber insulated cables (discussed in Section 5c) were also used in 480V, 208V, 120VAC and 125VDC circuits outside the drywell. The licensee was informed that based on inadequate documentation in the EQ files, this cable was unqualified for accident conditions in low voltage power and control applications at Quad Cities. The licensee stated they could provide additional responses to justify the qualification of the cable. Pending further review of the licensee's responses in regard to the qualification of these cables, this is a Potentially Enforceable/Unresolved Item (50-254/87011-06(DRS); 50-265/87011-06(DRS)).

e. AVCO Solenoid Valves, (FILE No. CQD 015004)

AVCO solenoid valves were reviewed for qualification to the DOR Guidelines. The inspectors observed that during the testing of the AVCO valve, excessive air leakage was recorded. The file

did not contain a technical justification for the acceptability of this air leakage. The inspectors also observed that during the LOCA testing a Parker O-Lube lubricant was used in the solenoid valve. The EQ file maintenance documents, however, indicated that another lubricant, Super Parker O-Lube was being used in the installed AVCO valves at Quad Cities. Since the EQ file did not address the qualification of the Super Parker O-Lube lubricant, the licensee was informed that the AVCO solenoid valves in Units 1 and 2 were unqualified based on inadequate documentation, and that a prompt operability analysis was required. The licensee stated that the AVCO valve was part of the Automatic Depressurization System (ADS) and that based on their technical specifications the plant could operate for seven days if one ADS valve was declared inoperable. The licensee also stated that additional documentation existed to qualify these valves. Subsequent to the finding the licensee procured new qualification tests and performed an additional evaluation to demonstrate that the rate of air leakage noted during the EQ test did not compromise the function of the valve, and that the Super Parker O-Lube lubricant was qualified. The licensee was informed that their failure to qualify the AVCO solenoid valve by test or analysis prior to the EQ deadline of November 30, 1985 was a violation of 10 CFR 50.49, Paragraph (f) and (g), Severity Level IV, Supplement 1D. (50-254/87011-07(DRS); 50-265/87011-07(DRS)).

f. File Auditability

10 CFR 50.49, Paragraph (j) and NUREG 0588 Category I, Paragraph 5 require records of qualification to be maintained in an auditable form for the entire period during which an EQ item is installed in the plant to permit verification that the item is qualified for its application and meets specified requirements. During this review the inspectors identified the following exceptions.

(1) BIW Cable (File No. 24, CQD No. 015821)

The inspectors reviewed the file for low voltage BIW multiconductor signal cable for qualification to NUREG 0588, Category I. The inspectors noted that the file did not contain sufficient documentation (such as test data to support results, and evidence of the test profile being maintained as stated in the report) to meet NUREG 0588 Category I EQ requirements. Subsequent to this finding the licensee submitted additional documentation from BIW Cable Systems Inc., and additional technical justifications to establish the qualification of the BIW wire and cable for normal and accident conditions at the Quad Cities Station.

(2) Okonite Cables (File No. 26, CQD-015880)

The inspectors reviewed the EQ package for Okonite EPK insulated cable to the requirements of NUREG-0588, Category I. The inspectors noted that the level of documentation included in the test report (Engineering Report No. 266-R.1) was insufficient to support Category I qualification. The licensee stated that the Okonite Company had a new test report available and that they planned to add this report to their file to meet Category I requirements.

The licensee was informed that their failure to maintain a record of qualification of BIW and Okonite cables (Sections 6f(1) and (2)) in an auditable form to permit verification that the cables were qualified was considered a violation of 10 CFR 50.49, Paragraph (j), Severity Level V, Supplement ID. (50-254/87011-08(DRS); 50-265/87011-08(DRS))

g. Marathon 1500 Terminal Blocks (File No. 19, CQD-014893)

The inspectors reviewed the EQ package for Marathon 1500 Series terminal blocks, for qualification to NUREG 0588, Category I. A test of Marathon blocks was done by Wyle (Report No. 45603-1), which indicated to the inspectors that the terminal blocks were not qualified for 480V service. During this test a 12A fuse did not fail in the 132V circuit, however, there was no measurement taken for IRs or leakage current. The lack of failure of this fuse was not considered adequate to determine the qualification of the blocks in 120V circuits at Quad Cities. A subsequent test (included in the EQ file) of the same terminal blocks (Wyle Report No. 17657) measured a leakage current of 50mA for terminal blocks in junction boxes with top entry conduits. Since Quad Cities has demineralized water spray and the test used chemical spray, this leakage current is considered conservative. In order to justify the 50mA leakage current recorded in the report, the licensee had initiated field modifications to ensure that all applicable terminal blocks were not mounted directly below conduit openings. This effort included re-routing of installed conduits for bottom conduit entry. During the current EQ inspection the inspectors noted that there was no evidence in the EQ files that this effort had been completed, however, the licensee reviewed their records and confirmed that all modifications had been completed for terminal blocks in LOCA/HELB areas inside and outside the drywell. No further concerns were identified.

7. Plant Physical Inspection

The NRC inspectors selected over 40 items on the MEL for examination in the plant. The EQ file of each item had been reviewed, and information regarding the location, manufacturer, model/serial number, mounting,

orientation, environment, and interfaces had been noted. The inspectors examined the selected items in the field, as accessible, and verified that the method of installation of each item was not in conflict with its environmental qualification. Specific areas reviewed included traceability of installed items of EQ files, ambient environmental conditions, qualification of interfaces (connectors, wires, seals, insulation, lubricants, etc.), evidence of significant temperature rise from process, drainage, mounting methods, physical conditions and housekeeping. In almost all cases, items examined in the field during this walkdown were found to meet their appropriate EQ requirements with the following exceptions:

a. AMP Splices

During review of cables in the Reactor Building the inspectors identified a nylon AMP butt splice in Unit 1 Motor Control Center 19-4, Cubicle A-2. This was noted as a discrepancy because the licensee had stated that they did not have AMP splices in any application except the General Electric FO1 penetrations. Further review of maintenance documents indicated various nylon AMP splices had been identified during EQ reviews in Unit 1, however, the licensee stated that these splices were all taped or covered with heat shrink tubing when identified. The inspectors were concerned that nylon AMP splices may have been used in EQ applications, other than the GE FO1 penetration, inside the Unit 2 drywell. The licensee stated that there were no unqualified nylon Amp splices in any EQ applications in Units 1 and 2. The licensee further stated that they planned to perform an additional EQ review of Unit 2 during their upcoming outage to replace the remaining nylon AMP splices in appropriate EQ applications. Pending review of the licensee's actions, this is an Open Item (50-254/87011-09(DRS); 50-265/87011-09(DRS)).

b. Marathon Terminal Blocks

During the examination of terminal blocks the inspectors observed that the end of a Marathon block was stamped "Screw torque 25 inch pounds." The licensee had not addressed this requirement in their EQ files or installation criterion. After further review with the manufacturer the licensee stated that this was the maximum torque value for the terminals to prevent terminal damage. The licensee committed to include this requirement into the appropriate documents. No further concerns were identified.

c. Comsip Delphi Hydrogen Monitor HM-1-2402A

The above panel was examined and found to have an incorrect identification. Similar deficiencies were found on other panels. The licensee took corrective action and applied the correct identification labels. No further concerns were identified.

8. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee or both. Open Items disclosed during this inspection are discussed in Paragraphs 4e, 5c, and 6a.

9. Potentially Enforceable/Unresolved Item

An Unresolved Item is a matter about which more information is required in order to ascertain whether it is an acceptable item, an open item, a deviation, or a violation. Potentially Enforceable/Unresolved Items are unresolved items, which if ascertained to be a violation may be followed up with enforcement action in accordance with NRC enforcement guidance on 10 CFR 50.49. Potentially Enforceable/Unresolved Items are discussed in Paragraphs 2, 5a, 5b, and 5d.

10. Exit Interview

The Region III inspectors met with the licensee's representatives (denoted under Paragraph 1) during an interim exit on June 12, 1987, and discussed their findings by phone at the conclusion of the inspection on July 28, 1987. The inspectors summarized the purpose and findings of the inspection and the licensee acknowledged this information. The licensee did not identify any documents/processes reviewed during the inspection as proprietary.