

APPENDIX B

UNITED STATES NUCLEAR REGULATORY COMMISSION
OFFICE OF ASSOCIATE DIRECTOR FOR SPECIAL PROJECTS
COMANCHE PEAK PROJECT DIVISION

Report Nos.: 50-445/8960 and 50-446/8960

Docket Nos: 50-445 and 50-446

Permits: CPPR-126 and CPPR-127

Applicant: Texas Utilities Electric Company
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Facility Name: Comanche Peak Steam Electric Station (CPSES),
Units 1 and 2

Inspection At: Comanche Peak Site, Glen Rose, Texas

Inspection Conducted: August 7-11, 1989 (Follow-up visits October 19 and 25, 1989)

Inspectors:

<u>G. T. Hubbard</u>	<u>11/16/89</u>
G. T. Hubbard, Inspection Team Leader	Date
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C. Paulk, Reactor/Inspector	Date
<u>P. Wagner</u>	<u>11/16/89</u>
P. Wagner, Reactor/Inspector	Date
<u>R. Moist</u>	<u>11/16/89</u>
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Consultants:

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M. Jacobus, SNL (October 19, 1989 only)
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Approved:

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Comanche Peak Technical Programs

11/22/89
Date

INSPECTION SUMMARY

Inspection Conducted: August 7-11, 1989 (Follow-up visits October 19 and 25, 1989)
(Report 50-445, 446/8960)

Areas Inspected: This inspection reviewed the Comanche Peak Steam Electric Station's (CPSES) implementation of a program for establishing and maintaining the environmental qualification (EQ) of safety-related electrical equipment located in mild and harsh (10 CFR 50.49) environments and safety-related mechanical equipment located in harsh environments. The inspection also included a review of the implementation of the environmental portions of the CPSES Equipment Qualification Corrective Action Program.

Results: The inspection determined that CPSES has implemented a program to establish the environmental qualification of safety-related electrical and mechanical equipment in accordance with NRC requirements and CPSES licensing commitments, except for certain findings listed below.

Inspection Findings:

<u>Items</u>	<u>Status</u>	<u>Description</u>
50-445,446/8960-0-01	Open	Open Item - Vendor EQ Maintenance Requirements Commitment Para. 4.1.1
50-445/8960-V-02	Open	Violation - Failure to Follow Procedures Para. 7.1
50-446/8926-0-01	Closed	Open Item - Component Replacement Para. 10.0
FSAR Update	Open	Update FSAR prior to fuel load: "exact replacement" definition and latest EQML Para. 4.1.3 and Para. 8.0
Certification	Open	Certify the completion of the following items. SDAR 87-132 Para. 4.2.2 DMARC 89-1-075 Para. 4.2.2 SDAR 87-133 Para 4.2.3 STIR-CPRT-E-003 Para. 4.2.4 "T" drain NCR's Para 7.2 NCR 89-8906 Para. 7.3 PIR 89-219, WR's 62209 & 62210 Para. 7.4

REPORT DETAILS

1. 0. Persons Contacted

1.1 TU Electric

- *W. J. Cahill, Jr. Executive Vice President
- *H. D. Bruner, Senior Vice President
- *O. W. Lowe, Director of Engineering
- *C. B. Hogg, Chief Engineer
- *J. W. Moffett, Manager of Engineering
- *W. G. Guldmond, Manager, Site Licensing
- *R. D. Walker, Manager, Nuclear Licensing
- *T. A. Hope, Site Licensing
- *D. R. Woodlan, Docket Licensing Manager
- *V. Cornell, Licensing Engineer
- *C. G. Creamer, EQ Program Manager
- *C. S. Weary, EQ Task Leader
- *D. M. Reynersen, Director of Construction
- *J. R. Fitzgeralds, Consultant
- *L. V. Karten, EQ Specialist
- *J. F. Streeter, Director, Quality Assurance (QA)
- *D. L. Davis, Manager, Technical Support
- *W. Lieneck, Task Manager
- *B. Dockrey, Technical Program Supervisor
- *D. Carlsen, Senior Engineer
- *D. Bhatia, EQ Specialist
- *T. E. Redicon, Manager, Material Maintenance Organization (MMO)
- *D. M. McAfee, Manager, QA
- *S. G. McBee, Licensing Interface
- *T. Engel, Senior Engineer
- *J. LaMarca, Electrical Engineering Manager
- *P. N. Passalugo, Supervisor, Seismic Equipment Qualification
- *F. W. Madden, Mechanical Engineering Manager
- *C. L. Terry, Project Manager
- *A. Naderi, Engineer
- *S. Palmer, Stipulation Manager
- *A. Marvray, Licensing
 - M. N. Fitzgerald, Industry Operating Experience Coordinator
 - M. Quinn, Performance Assessment Engineer
 - C. Feist, Principal Engineer
 - C. B. Corbin, Licensing Engineer
 - P. B. Stevens, Manager, Operation Support Engineering
 - S. Swain, Training Supervisor
 - R. Kooi, Engineer
 - G. J. Laughlin, Instrumentation and Controls (I&C) Engineer
 - J. McMahon, Manager, Nuclear Training
 - C. C. Blackwell, Senior Training Specialist
 - E. Karaan, Senior EQ Engineer
 - D. Noss, Licensing Engineer

1.2 Citizens Association For Sound Energy (CASE)

- *E. Ottney, Project Manager
- *O. L. Thero, Consultant
- *M. Thero, Training

1.3 Contractors

- *W. J. Parker, Consolidated Engineering Contractor Organization (CECO),
Project Engineer
- *P. Raysircan, CECO, Deputy Director
- *D. P. Barry, CECO, Director
- *J. Famiglietti, Impell, President
- *W. Gallo, Impell, Vice President
- *E. Kavaan, Impell, Supervisor
- *A. Huber, Impell, QA Manager
- *R. Burg, Tenera, CETG
- *H. M. Carmichael, Stone & Webster Engineering Corporation (SWEC)/CECO,
Senior Project QA Manager
- *M. Baker, Impell, EQ Supervisor
- *G. Kast, Impell, EQ Supervisor
- *D. Burrell, Tennessee Valley Authority (TVA), EQ Manager (Observer)
- *A. Seiken, Impell, Manager - SED
- *J. Wawzeniak, Impell, Project Director
- *S. Lehman, Auditor, QA Audit
 - B. J. Metro, Westinghouse, Engineer
 - D. M. Enat, Bentham, Consultant
 - T. L. Baumgartner, CECO, QA Program Manager

1.4 NRC

- R. F. Warnick, Assistant Director for Inspection Programs
- H. Livermore, Senior Lead Inspector
- J. Wiebe, Senior Project Manager

2.0 Purpose

The purpose of this inspection was to review the Comanche Peak Steam Electric Station's (CPSES) implementation of a program for establishing and maintaining the environmental qualification (EQ) of safety-related electrical equipment located in mild and harsh (10 CFR 50.49) environments and safety-related mechanical equipment located in harsh environments. The inspection also included a review of the implementation of the environmental portions of the CPSES Equipment Qualification Corrective Action Program.

3.0 Background

The Comanche Peak Safety Evaluation Report (SER) (NUREG-0797) and SER supplements (SSERs) 1, 6, 12 provided the results of staff review of the applicant's programs for environmental qualification of safety-related electrical equipment located in mild and harsh (10 CFR 50.49) environments and safety-related mechanical equipment located in harsh environments.

In October 1984, the applicant formed the Comanche Peak Response Team (CPRT) in response to early findings by NRC's Technical Review Team (TRT). In April 1987, as the investigative phase of the CPSES Design Adequacy Program (DAP) (Appendix A to the CPRT Program Plan) neared completion, the applicant became aware of the numerous and broad-scope findings of the CPRT self-initiated design reviews. Subsequently, the applicant decided to initiate a comprehensive Correction Action Program (CAP) involving a complete design validation of 11 design workscopes to be performed by 3 major design organizations. Included as one of the 11 design workscopes was equipment qualification, which included both environmental and seismic qualification issues.

In January 1988, the applicant submitted to the NRC the CAP Project Status Report for Equipment Qualification. In November 1988, the NRC issued SSER 19 which documented the staff's evaluation of the applicant's CAP for Equipment Qualification. SSER 19 documented the acceptance of the applicant's program, with program implementation to be verified by the staff prior to fuel loading. This inspection reviewed and evaluated the implementation of the environmental portions of the applicant's Equipment Qualification CAP, as well as evaluated the applicant's compliance with NRC and licensing commitments for environmental qualification.

4.0 Harsh Electrical (10 CFR 50.49) Environmental Qualification (2515/76)

The NRC inspectors examined the applicant's program for establishing the qualification of electrical equipment within the scope of 10 CFR 50.49. The program was evaluated by examination of the applicant's qualification documentation summary packages, review of procedures for controlling the applicant's EQ efforts, verification of the adequacy and accuracy of the applicant's 10 CFR 50.49 equipment list (included in the equipment qualification master list), and examination of the licensee's program for maintaining the qualified status of the covered electrical equipment.

4.1. Program Procedures

In order to determine the adequacy of the applicant's procedures for establishing and maintaining the qualification of electrical equipment within the scope of 10 CFR 50.49, the inspectors reviewed the procedures listed below.

NEO 2.25	Equipment Qualification Program
NEO 3.03	Plant Design Modification
NEO 6.02	Preparation and Review of Procurement Documents
NEO 6.10	Use of Commercial Grade Items in Safety Related Applications
ECE 2.25	Equipment Qualification Program
ECE 2.25-01	Equipment Qualification Program Impact Log
ECE 5.01-03	Design Change Notices
ECE 5.04	Master Equipment List

- ECE 5.09 Design Verification
- ECE 5.09-01 Design Verification and Interdiscipline Review
- ECE 6.02 Preparation and Review of Procurement Documents
- ECE 6.02-02 Engineering Review of Procurements
- ECE 6.02-03 Engineering Review of Procurement Documents or Services
- ECE 6.08-03 Initiating and Review of Item Substitutions for Quality Related Equipment
- ECE 6.10 Evaluation and Justification for Acceptance of Items/Services for Use as Basic Components
- EEE 2.25-01 Environmental Qualification of Electrical Equipment Located in a Potentially Harsh Environment
- EEE 2.25-03 Preparation of Environmental Qualification Summary Packages
- EEE 2.25-05 Equipment Qualification Maintenance Manual
- MMO 6.02 Preparation and Review of Procurement Documents
- MMO 6.02-02 Engineering Review of Procurement Documents and Commercial Item Dedication
- STA 677 Preventative Maintenance Program
- STA 708 Seismic and Environmental Qualification
- NQA 3.09-11.03 Receiving Inspection

The inspectors' review of the above procedures determined that the procedures provided acceptable methods and controls for ensuring that equipment within the scope of 10 CFR 50.49 was identified for qualification; qualification documentation in the form of summary packages was established for the identified equipment; the equipment was installed in the plant in its qualified configuration; and the equipment is maintained qualified throughout its plant life. Details of specific areas of interest are discussed in the following paragraphs.

4.1.1. Maintenance

The inspectors reviewed the CPSES procedures to determine if EQ maintenance requirements identified during the qualification process are factored into the plant maintenance program. The inspectors determined that the applicant identified EQ maintenance requirements in the qualification summary packages. The maintenance information from the individual summary packages was gathered

together and documented in the Equipment Qualification Maintenance Manual (EQMM). This manual was then utilized by CPSES operations personnel to incorporate the requirements in the plant maintenance program and procedures.

During the maintenance review and the review of individual summary packages (see paragraphs 4.2.1, 5.1, and 6.0), the inspectors determined that the applicant did not always include all EQ maintenance requirements into the EQMM. The applicant stated that this was due to the interpretation of required versus recommended maintenance. During discussions, the applicant pointed out that in some cases the vendor would make "recommendations" in the test report to perform certain tasks to maintain the equipment qualified. The inspectors discussed the NRC position that if information on qualification maintenance was provided in vendor qualification test reports, whether it is described as "recommended" or "required", it should be considered "required" and included in the qualification maintenance program. The inspectors discussed that if the applicant did not want to perform all the maintenance, then an evaluation should be performed and documented as to why the qualification maintenance was not applicable.

Based on the discussions, the applicant committed to the following:

1. That EQ program personnel would review all vendor recommendations with respect to EQ related equipment.
2. That during the review, all vendor recommendations would be evaluated to identify the important attributes for preserving the qualified status of equipment.
3. That the vendor recommendation (or an EQ-approved alternative method of achieving the above important attributes) would be implemented in the CPSES preventive maintenance program via the EQMM.
4. That the above activities would be completed prior to the end of the first refueling outage at CPSES.

The above commitment is acceptable to the staff and will be tracked as Inspection Open Item 50-445,446/8960-0-01.

4.1.2. Design Modifications

The inspectors reviewed the CPSES procedures to determine if adequate control of modifications to the plant, systems and/or components had been established to ensure that they are reviewed for their impact on EQ. The inspectors determined that procedures establish specific criteria to be used to evaluate design change notices, design change authorizations, stand-alone design change nonconformance reports, and specifications to determine when they should be submitted to the EQ Supervisor for environmental qualification review. When reviews are performed, they are documented on the change verification checklist which is attached to the design change package. The inspectors found the CPSES controls to be acceptable in ensuring that design changes receive reviews for their impact on environmentally qualified equipment.

4.1.3. Procurement

The inspectors reviewed the CPSES procedures to determine if procurement activities for EQ replacement and spare parts were adequate to ensure that environmentally qualified equipment or components remained qualified throughout their installed plant life. The inspectors determined that the procedures described specific requirements for the preparation and review of procurement documents (PDs). The procedures provided for the review of the PDs by the material management organization (MMO), as well as reviews by procurement engineers to determine technical and quality assurance requirements.

The procurement engineer is responsible for identifying the procurement of items on the equipment qualification master list and sending the PDs to the responsible EQ engineer for review and input. The procurement engineer uses a procurement document review summary (PDRS) sheet to document engineering reviews. Once PDs are approved by the procurement engineer and a supervising engineer, the PD and PDRS sheets for a procurement are forwarded to QA for review and approval. Following QA approval, the PD and PDRS sheets are sent to purchasing to initiate a purchase order (PO).

In addition to reviewing the procedures, the inspectors reviewed procurement document review packages for POs 665-71926, and 665-71990, dated July 10 and 11, 1989, respectively. Additionally the inspectors inspected the receiving, inspection, and storage areas of warehouse "A" at CPSES.

During the procurement discussions with the applicant's personnel, the inspectors questioned the FSAR definition of "exact replacement". Appendix 3A to Section 3 of the FSAR stated, "An exact replacement shall be considered to be a component with the same part number as the original." The inspectors recommended that the applicant change this FSAR definition prior to fuel load load to be consistent with his current practices and procedures and industry standards. The applicant agreed to change the FSAR to reflect their current practices (see paragraph 8.0 concerning another FSAR change).

The inspectors determined that the applicant's procurement procedures for procuring EQ spare and replacement parts were acceptable and were being implemented in accordance with the applicant's current procedures.

4.2. Qualification Summary Packages

The NRC inspectors examined 28 of 87 environmental equipment qualification summary packages (EEQSPs) (see Table 1, attached) for CPSES to determine the qualification status of equipment within the scope of 10 CFR 50.49. During the examination, the inspectors compared plant service conditions with qualification test data and verified the basis for the conditions. The inspectors also reviewed areas such as required post-accident operating time compared to the duration of time the equipment had been demonstrated to be qualified; similarity of tested equipment to that installed in the plant (e.g., insulation class, materials of components of the equipment, and test configuration compared to installed configuration); evaluation of adequacy of test conditions; aging calculations for qualified life and replacement interval determination; effects of decreases in insulation resistance on equipment performances; adequacy of demonstrated accuracy; evaluation of test anomalies; and applicability of EQ problems reported in NRC Information Notices (INs)/Bulletins and their resolution.

Based on the examination of the 28 EEQSPs, the inspectors determined that the packages were auditable and documented qualification of the equipment covered in the packages. While the packages were found to be acceptable, the following findings and recommendations are provided.

4.2.1. EEQSPs and Maintenance

As discussed in paragraph 4.1.1., the inspectors determined that the applicant did not always include all EQ maintenance requirements into the EQMM. One example of findings from the package reviews relative to maintenance is:

EEQSP-MS-622-01, Conax/Resistance Temperature Devices (RTDs): The inspectors determined that the vendor recommended maintenance, contained in the EQ test report under the "Qualified Life" section, had not been incorporated into the EQMM in accordance with Procedure PEE 2.25-05, "Equipment Qualification Maintenance Manual." The applicant had evaluated extending the frequency of the vendor's recommendations to check the electrical wire terminal connections and head cover tightness every 12 months, to a projected refueling cycle interval of 18 months. However, the applicant had not addressed the vendor's recommendation to perform a calibration every 48 months at the ice point. The tightness check recommendations were not included in the EQMM. Applicant personnel stated that they did not judge the vendor's recommendations to be requirements for maintaining the environmental qualification of the RTDs but rather advice to ensure good performance. However, the applicant was unable to provide a documented evaluation to support their position.

Other EEQSPs which were reviewed and were determined to have problems with qualification maintenance requirements are:

EEQSP-ES-12-01, Bunker Ramo/Header Plate
EEQSP-ES-100-02, Weidmuller-Phenolic Terminal Blocks
EEQSP-ES-13D-02, BIW Tefzel Triax Cable
EEQSP-ESE-22-01, Westinghouse Power Range Neutron Flux Monitor
EEQSP-ESE-27-01, Westinghouse N-16 Gamma Detector WL-24076
EEQSP-MS-20B-1-02, Limitorque/Class RH Valve Operator

The inspectors determined that the maintenance activities to which the applicant committed (see Inspection Open Item 50-445,446/89-60-01, paragraph 4.1.1) and the ongoing updating of maintenance requirements from the EEQSPs to the EQMM and plant maintenance program will resolve the inspectors' concerns on qualification maintenance.

4.2.2. Limitorque Motor Operated Valve Actuators/SDAR 87-132

The inspectors reviewed this summary package, EEQSP-MS-20B-1-02, Limitorque Class RH Valve Operator, in conjunction with significant deficiency analysis report SDAR 87-132 SN-367, dated December 18, 1987. As a result of this SDAR, the applicant issued 61 nonconformance reports (NCRs) to correct deficiencies in the qualification of Limitorque operators. At the time of the inspection, 44 of the NCRs were closed, work had been completed on 7 of the NCRs but they had not been closed, and 10 NCRs were open with work in progress. The

inspectors reviewed the corrective action taken by the applicant to correct the identified deficiencies and determined that the actions taken or in process were adequate to close the NCRs and close the SDAR once all the NCRs are closed. Technically, SDAR 87-132 is closed; however, it will remain open until all the related NCRs are closed. The applicant is required to certify to the NRC when the NCRs and associated SDAR is closed.

During the review of this package, the inspectors determined that valve operator 1-HV-2491A-MO, model SMB-0-25, would be submerged in the event of a high energy line break (HELB). Three other valves were also identified by the applicant as being subject to submergence during a HELB. The applicant classified these valve operators as NUREG 0588, Category 2C devices for HELB flood conditions. The applicant stated, "That they do not have to function during accidents which cause the flooding; therefore, they do not have to be qualified for submergence. The applicant had issued design modification request construction phase (DMRC) 89-1-075, Revision 0, dated August 2, 1989, to address the failure of power supplies to safety related monitor light boxes due to flooding cause by a HELB. The applicant also stated that a statement would be incorporated in the CPSES Emergency Response Guidelines and Emergency Operating Procedures to instruct the plant operators of the situation and what actions to take. The inspectors found this to be an acceptable approach; however, the applicant is required to certify to the NRC that this work is complete.

4.2.3. SDAR 87-133 HELB Calculations

The inspectors reviewed this SDAR as it related to the CPSES EQ Program. As a result of this SDAR, which involved several issues related to HELBs, the applicant revised some of the computer codes at CPSES. As a result of these revised codes, the environmental parameters in some areas of the plant were changed. These changes are documented in Amendment 76 to the CPSES FSAR Section 3.6.B.1.2.3. and will be evaluated as part of the NRC staff review of Amendment 76.

The applicant discussed with the inspectors how the changed environmental parameters were reflected in the environmental summary packages. The inspectors determined that a change to Environmental Data Drawing, DWG No. MI-3000, was issued to reflect the new parameters resulting from the revised codes. These changes, which affected plant specific areas, were then incorporated in the affected summary packages. At the time of the inspection, the applicant had completed the changes for inside containment locations and was in the process of making the changes for outside containment areas. Based on the discussions and the inspectors review of sample changes to verify that the changes were being reflected in the summary packages, the inspectors determined that the activities performed and in process relative to the environmental aspects of this SDAR are acceptable. Technically, this SDAR is closed; however, it will remain open until the work is complete. The applicant is required to certify to the NRC when SDAR 87-133 is closed.

4.2.4. Raychem (2500/17)

The inspector reviewed EEQSP-TNES-055-01 for Raychem heat shrinkable tubing: Types WCSF-N, WCSF-050-N, NPKV, NPKP, NPKS, NPKX, and molded sleeves. The applicant uses the Raychem tubing and nuclear connection kits on Class 1E

electrical power and control systems at various locations both inside and outside containment. The applicant issued report STIR-CPRT-E-003, "Heat Shrinkable Sleeve Installations," Revision 0, dated June 22, 1987. The inspectors determined that this report was to document the program and required changes to assure that all heat shrinkable insulation sleeves and splices located in Class 1E system at CPSES are installed correctly with documented QA inspections. The report also documented the concerns of NRC IN No. 86-53 on Raychem installations. At the time of the inspection, the applicant was in the process of implementing the provisions of this report. In addition to reviewing the summary package and the report, the inspectors reviewed the QA and installation documentation for one Raychem splice inspected during the plant walkdown. This documentation was found to be complete.

Based on the documentation review and the Raychem splices examined during the plant walkdown, the inspectors determined that the applicant's program for ensuring all Raychem splices at CPSES are qualified is acceptable and only requires completion. The applicant is required to certify to the NRC when STIR-CPRT-E-003 is completed.

The above described activities and the plant walkdown inspections (see paragraphs 7.0 and 7.1) of Raychem splices completes NRC Temporary Instruction (TI) 2500/17, "Inspection Guidance for Heat Shrinkable Tubing."

4.2.5 EEQSP-ES-13D-01, BIW Silicone Cable

During the review of this package, the inspectors discussed the performance requirements for cable insulation resistance (IR). During the discussion, the inspectors determined that even though the system component evaluation worksheets (SCEW) in the package indicated the cable was used in instrument circuits inside containment, the cables were not used for instrument circuits inside containment. The packages also made specific statements regarding the use of the lowest conservative IR values from the EQ package for loop accuracy. The applicant stated that any future design changes that call for BIW cable for instrument circuits inside containment would include supplemental calculations to demonstrate loop accuracy. The inspectors also determined that current SWEC calculations for outside containment applications are based on IR values from BIW test report B915, Revision 1, which is not considered an acceptable test report.

Following the inspection, the applicant determined that incorrect information had been provided to the NRC during the inspection relative to the use of BIW silicon cable inside containment. The NRC was notified of this and a site visit was made to CPSES by the NRC inspection team leader and a consultant from Sandia Laboratories on October 19, 1989 to review the new information. During the visit, the team leader and the consultant determined that the silicon rubber cable was used inside containment; however, it was not connected in any instrumentation circuits requiring loop accuracy calculations. It was included in the EQ program because it was connected to power supplies used in the Power Range Detectors which are qualified per 10 CFR 50.49. Since the cable has no function during a design basis accident, the applicant qualified the cable to demonstrate that a cable failure would not cause failure of the common power supplies. The team leader and the consultant further determined that the cable was not presently used outside containment in instrumentation circuits requiring loop accuracy calculations. Additionally, it was determined that the applicant had adequate documentation to qualify future use of the cable in instrumentation

circuits within the inside and outside containment limits documented in the qualification summary package. The applicant had also established requirements to ensure that future loop accuracy calculations for this cable would reflect IR data from the qualification report which qualifies the cable and not BIW report B915. The team leader and the consultant found the summary package to be acceptable. This issue is considered resolved.

4.2.6 Summary Package Recommendation

During the review of the summary packages for the electrical harsh equipment, the inspectors made a recommendation for the clarification of package, EEQSP-ES-100-02, Weidmuller Phenolic Terminal Blocks. The inspectors' review of this package determined that the applicant had taken appropriate action relative to NRC IN 84-47 concerning leakage currents and terminal blocks. The applicant had removed all terminal blocks from inside containment applications and all instrumentation circuit applications in harsh environments outside containment. Even though the applicant had taken the correct action relative to IN 84-47, the IN was not addressed in the summary package. The inspectors recommended that a written response be added in the package to address the IN and the applicant agreed.

The above recommendation is considered to be either a clarification or an enhancement to the package; therefore, no follow-up will be performed by the NRC on it.

5.0 Mild Electrical Environmental Qualification

During the inspection, the inspectors reviewed NRC concerns relative to the applicant's definition of a mild environment in Appendix 3A, "Environmental Qualification Report," to Section 3 of the FSAR. The staff was concerned that the applicant's definition of a mild environment as being less than 1×10^4 rads total integrated dose (TID) was not consistent with NRC positions.

In a letter from C. I. Grimes, NRC, to W. G. Council, TU Electric, dated November 16, 1988, the staff stated that it generally defines a mild environment as less than or equal to 1×10^3 rads TID. The staff further stated that it was unclear that the applicant's FSAR position was consistent with the NRC position. The staff's concern pertained to the fact that components made of n-channel metal-oxide semiconductors (n-MOSs) and complementary metal-oxide semiconductors (c-MOSs) could be susceptible to radiation damage between 1×10^3 and 1×10^4 rads TID. In support of the applicant's position, the applicant submitted supporting documentation in letters TXX-89011 and TXX-89339 from W. G. Cahill, Jr., dated February 17, and June 16, 1989, respectively.

The staff reviewed the submitted documentation prior to this inspection. During the inspection, the staff reviewed the applicant's position and reviewed seven mild environment qualification summary packages. The staff determined that the applicant uses a two-step method for qualification in radiation environments between 1×10^3 and 1×10^4 rads TID. The two steps are:

- a. A point-specific radiation calculation is made for the exact location of the equipment in question and if the result is less than 1×10^3 rads TID, no further evaluation is required.

- b. If the result of the calculation remains between 1×10^3 and 1×10^4 rads TID, the equipment is qualified by test or by test and analysis.

The staff also determined that components made of n-MOSs are not qualified for environments greater than 1×10^3 rads TID at CPSES.

Based on staff review of the submitted documentation and the seven mild environment summary packages, as well as discussions with the applicant's personnel during the inspection, the staff concluded that the applicant's position relative to a radiation mild environment was acceptable.

5.1 Mild Electric Environmental Qualification Summary Packages

The NRC inspectors reviewed 7 EEQSPs (see Table 2, attached) for Class 1E electrical equipment located in a mild environment. These packages were reviewed to determine if an evaluation had been made to ensure that the equipment was designed to function under its postulated environmental conditions and was included as part of the plant's maintenance program to ensure the item's capability to perform during its installed plant life. The inspectors found these packages to be comprehensive and determined that they documented the item's qualification for operation in mild environmental conditions. Class 1E mild environment equipment was included in the equipment qualification maintenance program. The inspectors consider the Inspection Open Item of paragraph 4.1.1. to be applicable to the mild environment electrical equipment also. Considering the applicant's commitment in the area of EQ maintenance, the applicant's program in electrical equipment located in mild environments is acceptable.

6.0 Harsh Mechanical Environmental Qualification Summary Packages

The NRC inspectors reviewed 5 mechanical equipment qualification summary packages (MEQSPs) (see Table 3, attached) for mechanical equipment located in a postulated environment. The inspectors reviewed the packages to ensure that nonmetallic age-sensitive components of the equipment would withstand the conditions associated with design basis accidents and were included in the plant's maintenance program. The inspectors determined that the packages adequately addressed nonmetallic age sensitive devices and their ability to withstand the environmental conditions to which they would be exposed.

The inspectors determined that the mechanical equipment is included in the equipment qualification maintenance program and by that fact the Inspection Open Item of paragraph 4.1.1. is applicable to this equipment also. In one specific package MEQSP-82-01, CVI Air Filtration Units, the inspectors identified that the filter was the most limiting subcomponent of the units. The CPSES Managed Maintenance System required this filter be visually inspected periodically and replaced every 5 years; however, the package and the EQMM did not specifically address this requirement. With the completion of the Inspection Open Item and the ongoing updating of maintenance requirements in the MEQSPs, the EQMM, and the plant maintenance program, the inspectors determined that this concern will be adequately resolved.

7.0 Plant Physical Inspection

The NRC inspectors physically inspected more than 50 items (18 summary packages represented) of equipment during the plant walkdowns. The items inspected included safety-related electrical equipment located in mild and harsh (10 CFR 50.49) environments and safety-related mechanical equipment located in harsh environments. A listing of equipment inspected is provided in Table 4. The items inspected were chosen based on the inspector's review of the summary packages, knowledge of potential problems with the equipment installation based on previous experience, and equipment located in the most severe environments (emphasis was placed on inside containment equipment). The items inspected were located in Unit 1.

During the physical inspection the inspectors examined characteristics such as mounting configuration, orientation, interfaces, model number, ambient environment, and physical condition. Several observations were identified during the walkdowns and are discussed in the following paragraphs.

7.1 Electrical Splices

During the plant walkdowns, the inspectors inspected both Raychem heat shrinkable electrical splices and Okonite tape splices. While the Raychem splices were determined to be acceptable (see paragraph 4.2.4) problems with Okonite tape splices were observed on the oil pump motor for a chiller unit located in a mild environment and in Limitorque motor operators inside containment. The splices on the oil pump motor were selected to be an example of how tape splices were performed in the field. The tape splices in the Limitorque motor operators were not included on the walkdown list, but were inspected with the motor operators.

The licensee qualified the tape splice configuration by similarity to a tested 8kv in-line splice. The licensee's configuration was an in-line splice for 600 V cable, and the procedure used to install tape splices addressed how to make the splices in a configuration similar to a V-type splice. The procedure, 2323-ES-100, Revision 6, "Electrical Erection Specification," described how to continuously wrap the V-type splice so that the crotch area was sealed, effectively creating an in-line splice that was bent. If a splice were installed in accordance with this procedure, it would be qualified.

The procedure did not contain any caution or warning prohibiting the use of tape splice on instrumentation circuits in harsh environments. The applicant issued an advance interdiscipline review (AIDR) for a generic change to 2323-ES-100, Revision 6, during the inspection to address the issue of not using tape splices on instrumentation circuits in harsh environments.

The splices on the oil pump were noted to be multi-wire splices. These splices were V-type splices with an open crotch area and were not installed in accordance with the specification. These splices, however, were in a mild environment and did not affect the qualification of the equipment. This is an example of failing to follow the procedure for installing tape splices and is identified as Violation (VIO) 50-445/8960-V-02, Failure to Follow Procedures for Installing Tape Splices.

The splices in the Limitorque motor operators for 1-8808A and 1-8808C were found in a configuration that did not appear to be in accordance with the procedure. The applicant, at the request of the inspectors, took one of the splices apart in 1-8808C-MO in order to ascertain if the splice had been made in accordance with the procedure. The outer wrapping was removed and found to be wrapped around both wires together, not in a continuous wrap as described in the procedure.

The electricians who assisted in the inspection stated that they had not seen splices like that before and that this splice was not in accordance with the procedure. The QA representative stated that he thought that special instructions had been provided for this splice. A review of Work Request Number WRO0013184 for Work Order Number C890006367 did not indicate any waiver of the instructions in 2323-ES-100. In fact, the procedure allowed for either the use of Raychem heat shrink or a tape splice in accordance with the specification.

The remaining splices in 1-8808C-MO and 1-8808A-MO were similar in appearance to the one taken apart and did not resemble a splice made in accordance with the procedure. These are additional examples of VIO 50-445/8960-02, Failure to Follow Procedures for Installing Tape Splices. The licensee stated during the inspection that documentation would be researched to determine where the tape splices are located, to inspect all tape splices, and to repair as necessary those not in accordance with the procedure. At the exit meeting, the licensee indicated that this task would be accomplished prior to fuel loading.

On October 25, 1989, one of the NRC inspection team members visited the CPSES site to review documentation which the applicant felt environmentally qualified the Okonite tape splices installed in the above-discussed splice configurations. The inspector reviewed the presented documentation and determined that it provided sufficient information to qualify the tape splices for radiation only harsh environments. The inspector determined that the documentation did not support qualification for tape splices subject to HELBs, loss-of-cooling accidents (LOCAs), or main steamline breaks (MSLBs).

Following the inspector's determination, the inspector held discussions with the applicant concerning his findings. At the end of the discussions, the applicant stated that Okonite tape splices which were not installed in accordance with procedures and were subject to HELBs, LOCAs, or MSLBs would be reworked. The applicant indicated that approximately 12 equipment number items would be affected in Unit 1. The applicant stated that rework would be done by replacing the splices with Raychem splices, replacing only the jacketing tape of the splices in accordance with procedures and the qualified configuration, or replacing the entire tape splice (insulation and jacketing tape) in accordance with procedures and the qualified configuration. This rework is to be accomplished prior to fuel load. The inspector determined the applicant's approach to be acceptable.

7.2 "T" Drains in Limitorque Motor Valve Operators

During the walkdown of Limitorque motor operators 1-8808A and 1-8808C, Model Number 5BD-3-150, located inside containment in Room 155A, the inspectors observed that those operators only had one "T" drain each installed when, in fact, they were supposed to have two "T" drains each. The applicant

provided documentation to the inspectors to show that outstanding non-conformance report (NCR) 89-04197, Revision 0, had been issued to install the additional "T" drains. The inspectors also learned that other NCRs (NCR 89-04214, 89-04213, 89-04200, 89-04198) had also been issued to install "T" drains in other Limitorque operators in accordance with qualification documentation. The applicant is required to certify to the NRC when the required "T" drains are installed.

7.3 Motor Leads in Limitorque Motor Valve Operator

During the plant walkdown of Limitorque operator 1 HV-2491A and 1-8878A located outside containment in Room 100A-2 of the safeguards building, the inspectors observed that the bend radius on the motor leads coming off the terminal block was approximately 90 degrees. The applicant issued NCR 89-8906 to document the above condition. The applicant is required to certify to the NRC when this observation is corrected.

7.4 ASCO Solenoid Valves

During the plant walkdown of ASCO solenoid valves Nos. 1-8875A and 1-8878A, located inside containment, the inspectors identified that both solenoid coil housings were loose. The applicant issued work request Nos. WR 62209 and WR 62210 to repair the valves in question. Additionally, the applicant issued Plant Incident Report (PIR) 89-219 to determine whether the loose housings are a generic problem with ASCO solenoid valves at CPSES. The applicant is required to certify to the NRC when the WRs and PIR are closed.

8.0 Equipment Qualification Master List (EQML)

The inspectors reviewed the EQML for form and content. The information included in the EQML was found to be acceptable and accurately depicted the components that were required to be included in the program.

In order to evaluate the accuracy of the EQML, the FSAR was compared to the EQML. However, the inspectors found that this comparison was not beneficial to the verification process since Table 4.1 of Section 3 of the FSAR had not been updated since January 1988. The applicant stated that this was due to the EQ program being in a state of change during this time period. The applicant is required to update the FSAR to reflect the valid EQML prior to fuel load.

Next, the EQML was compared to the list of equipment required to be used in an accident and post-accident scenario by the operators. These items were included in the CPSES emergency operating procedures and verified to be included in the EQML. Additionally, drawings and utilization of information obtained during previous NRC inspections of similar plants were used to aid the evaluation of the EQML.

No discrepancies were noted in the EQML during the review.

9.0 Corrective Action Program (CAP) Implementation

In November 1988, the NRC issued SSER 19 which documented the staff's evaluation of the applicant's CAP for Equipment Qualification. In the SER, the staff stated that implementation of the CAP would be evaluated during future NRC inspections. During this inspection, the NRC inspectors evaluated the applicant's implementation of the environmental portions of the Equipment Qualification CAP through reviews of procedures, environmental qualification summary packages, the EQML, and other documentation associated with environmental qualification at CPSES and plant walkdown inspections. The inspectors determined that the environmental portions of the Equipment Qualification CAP were being adequately implemented.

10.0 Previous Inspection Findings

10.1 (Closed) Open Item (50-446/8626-0-01)

NRC Inspection Report 50-445/8632 and 50-446/8626 documented Open Item 50-446/8626-0-01 questioning how CPSES would maintain components that were qualified for less than 40 years. While the open item applied only to CPSES Unit 2, the NRC inspectors determined that it had generic applicability to Unit 1. Based on the inspectors' evaluations of the applicant's program to identify when components needing replacement through the environmental qualification summary packages, the qualification maintenance program and the procurement program (see paragraphs 4.2, 4.1 and 4.1.3), the inspectors determined that the applicant has acceptable programs to address this open item. This open item is closed.

11.0 Exit Meeting Summary

An exit meeting was conducted August 11, 1989, with the applicant's representatives and CASE representatives identified in paragraph 1 of this report. No written material was provided to the applicant by the inspectors during this reporting period. The applicant did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection. During this meeting, the NRC inspectors summarized the scope and findings of the inspection.

<u>Items</u>	<u>Status</u>	<u>Description and Reference</u>
50-445,446/8960-0-01	Open	Open Item - Vendor EQ Maintenance Requirements Commitment - Para. 4.1.1
50-445/8960-V-02	Open	Violation - Failure to Follow Procedures - Para 7.1
50-446/8926-0-01	Closed	Open Item - Component Replacement - Para. 10.0

In addition to the above items, the applicant is required to update the FSAR prior to fuel load to address procurement "exact replacement" definition (Para. 4.1.3) and the latest EQML (Para. 8.0).

When the applicant certifies the completion of the Equipment Qualification Program as required by SSER 19, the applicant is required to also certify to the completion of the following items.

- SDAR 87-132 Para. 4.2.2
- DMRC 89-1-075 Para. 4.2.2
- SDAR 87-133 Para. 4.2.3
- STIR-CFRT-E-003 Para. 4.2.4
- NCRs associated with "T" drains Para. 7.2
- NCR 89-8906 Para. 7.3
- PIR 89-219, WRs 62209 and 62210 Para. 7.4

Table 1

Harsh Electrical Environmental
Equipment Qualification Summary
Packages Reviewed

1. EEQSP-ES-12-01, Bunker-Ramo/Header Plate
2. EEQSP-ES-12A-01, Conax/Penetrations Low Voltage
3. EEQSP-ES-12A-01, Conax/Penetrations Medium Voltage
4. EEQSP-MS-622-01, Conax/RTDs
5. EEQSP-TNES-005-01, TEC/Main Steam Safety VPI Instrumentation
6. EEQSP-MS-611A-02, Rosemount/1153D Transmitters
7. EEQSP-ES-100-06, Amp/Lug and Butt Splices
8. EEQSP-ES-13D-05, Litton-Veem/Connectors
9. EEQSP-ES-29-04, Namco/Limit Switch Model EA-740
10. EEQSP-MS-611A-03, Rosemount/353C1 Conduit Seals
11. EEQSP-AE-002-01, Westinghouse/Large Motors
12. EEQSP-MS-160A-1A, Exosensor/Containment Hydrogen Monitoring
13. EEQSP-ES-100-03, Okonite Tape
14. EEQSP-MS-603-02, Valcor/Solenoid Valves
15. EEQSP-ES-100-02, Weidmuller, Phenolic Terminal Blocks
16. EEQSP-ES-13B1-01, Rockbestos/600V Control Cable
17. EEQSP-ES-13B1-02, Rockbestos/600V SISF Control Cable
18. EEQSP-ES-13D-01, BIW/Silicone Insulated Cable
19. EEQSP-ES-13D-02, BIW/Tefzel Coax and Triax Cable
20. EEQSP-ESE-22-01, Westinghouse/Power Range Neutron Detector
21. EEQSP-ESE-27-02, Westinghouse/N-16 Detectors Distribution Box
22. EEQSP-ESE-43A-01, CKB Industries/Type Incore Thermocouple
23. EEQSP-ES-16A-02, General Atomic/Digital Radiation Monitoring
Combined Review
24. EEQSP-TNES-055-01, Paychem/WCSF, WCSF-050-N, NPK, NPKV, Molded Sleeves
25. EEQSP-MS-632-01, ASCO/Solenoid Valves
26. EEQSP-MS-20B1-02, Limitorque/Class RH Valve Operator
27. EEQSP-HE-7-01, Crosby/PIDS
28. EEQSP-ESE-3A-01, Barton/764 Pressure Transmitters

Table 2

Mild Electrical Environmental
Equipment Qualification Summary
Packages Reviewed

1. EEQSP-ESE-27-01, Westinghouse/N-16 Detectors
2. EEQSP-ESE-16A-01, General Atomic/Digital Radiation Monitoring
3. EEQSP-ESE-47B-01, Westinghouse/Low Noise Source Range Pre-amplifier
4. EEQSP-MS-611B-01, Westinghouse/Analog Control System
5. EEQSP-CPF-1233-S-01, CE/HJTC Cabinet and Electronics
6. EEQSP-CPF-585S-1, Quadrex/Balidyne Remote Multiplexor
7. EEQSP-MS-78-01, Fisher/PORV Transducer and Positioner

Table 3

Harsh Mechanical Environmental
Equipment Qualification Summary
Packages Reviewed

1. MEQSP-MS-12-01, Bingham-Willamette/Containment Spray Pumps
2. MEQSP-MS-20B1-1, Borg Warner/Air-Hydraulic Operated Valves -
Larger than 2.5 inches
3. MEQSP-MS-82-01, CVI/Air Filtration Units
4. MEQSP-MS-604-01, ITT-Grinell/Air Operated Diaphragm Valves
5. MEQSP-WEC-01, Westinghouse/NSS Active Mechanical Equipment -
Pumps and Valves (Paul Munroe Hydraulic Snubbers
1000 KIP only)

Table 4

Plant Physical Inspection Items

<u>Quantity</u>	<u>Description</u>
2	ASCO Solenoid Valves - 1-8875A and 1-8878A
3	Crosby Position Indicating Devices - 1-8010A, 1-8010B, and 1-8010C
4	Limitorque Motor Valve Operators - 1-8808A, 1-8808C, 1-HV-2491A and 1-HV-4758
2	ITT Barton Model 764 Differential Pressure Transmitters - 1-LT-501 and 1-LT-502
1	Conax Electric Penetration - E1-18
1	Weidmuller Terminal Block - Inside Junction Box JBIA (Associated with Valve 1 FCV-111A)
2	Litton Veam Electrical Connectors for Wire Numbers EQ127365Z and EQ129363Z
2	Rosemount Pressure Transmitters - 1-PT-960 and 1-PT-2325
2	Rosemount Conduit Seals for Rosemount Pressure Transmitters 1-PT-960 and 1-PT-2325
3	Namco Limit Switches - 1-8875A, 1-HV-4171 and 1-HV-4172
3	Conax Conduit Seals for Namco Limit Switches 1-8875A, 1-HV-4171 and 1-HV-4172
7	Amp Terminal Lugs located in Hot Shutdown Panel
1	TEC Main Steam Safety Valve Indicator - 1-ZE-2444A
	Raychem Heat Shrink Splices - 4-6 splices associated with Conax Electrical Penetration E1-18 were inspected.
	Okonite Tape Splices - Approximately 12 splices located on the oil pump motor CP1-CHCICE-05 and Limitorque Motor Valve Operators 1-8808A and 1-8808C
1	ITT Grinnell Diaphragm Operated Valve - 1-HV-5157
1	Borg-Warner Hydraulic Valve Actuator - 1-HV-2134
2	Fisher PORV Transducer and Positioner - 1-HV-2459 and 1-HV-2460