

UNITED STATES NUCLEAR REGULATORY COMMISSION **REGION II** 101 MARIETTA STREET, N.W., SUITE 2900 ATLANTA, GEORGIA 30323

50-400/88-27 Report No.: Carolina Power and Light Company Licensee: P. O. Box 1551 Raleigh, NC 27602

Docket No.: 50-400

License No.: NPF-63

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Facility Name: Shearon Harris

Inspection Conducted: August 15-19, 1988 Inspectors: iweather, Team Leader

Team Members: M. Jacobus, Consultant Engineer, Sandia National Laboratories C. Kido, Consultant Engineer, Idaho National Engineering Laboratory

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Approved by:

T. E. Conlon, Chief Plant Systems Section Engineering Branch Division of Reactor Safety

SUMMARY

- This routine, announced inspection was conducted in the area of Scope: Environmental Qualification (EQ) of Electrical Equipment which included: a review of Carolina Power and Light Company's implementatation of a program to meet the requirements of 10 CFR 50.49; walkdown inspections of equipment inside containment; preventative and corrective EQ maintenance; EQ procurement; and followup on previous inspection issues and commitments.
- In the areas inspected, one violation and one unresolved item were Results: identified.

The violation involves the failure to maintain the qualified status for certain EQ equipment. The root cause for the violation may be the result of inadequate training and/or procedures. The unresolved item involves the licensee's commitment to do additional testing to extend the qualified life of the coils in Target Rock Solenoid valves that are both continously energized, and on hot process piping.

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This inspection was considered to be Phase II of the previous EO inspection which was conducted in March 1988. The previous inspection concentrated on EQ equipment located in the Steam Tunnel and the Reactor Auxiliary Building due to the fact that the plant was operating preventing containment walkdowns. The team concluded during the inspection that the licensee had implemented a program which meets the requirements of 10 CFR 50.49. The team also concluded that the licensee's training programs on EQ were weak. During this inspection, the team concluded that the licensee continues to have an adequate EQ program. The program is considered to be average and is not outstanding at this point. However, there are certain initiatives that are currently ongoing which will greatly enhance their EQ program. These initiatives include changes in the EO organization and responsibilities to better interface with other departments and organizations on EQ matters (such as design, maintenance, procurement and scheduling) performing walkdowns of EQ equipment, and conducting engineering surveys of EQ equipment's ambient temperatures during power operation for age related effects on EO equipment, and followup on NRC issues.

The weaknesses identified in the licensee's EQ program related specifically to EQ maintenance and training. The licensee performed maintenance on EQ equipment which failed to maintain the qualified status of the equipment. The training provided the craft was considered marginal and procedures may also have been inadequate. Staffing for EQ has been increased with a proposed new position in the newly described organization. All these actions may enhance the licensee's EQ program over the years to come.



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REPORT DETAILS

1. Persons Contacted

Licensee Employees

*P. Brady, Senior Engineer, Harris Plant Modification Unit *C. Crawford, Representative, On-Site Nuclear Station (ONS) *R. Cuthbertson, Senior Specialist, Technical Support *E. Evans, Project Engineer, Nuclear Engineering Department (NED) *C. Gibson, Director, Program and Procedures *C. Hinnant, Plant General Manager *M. A. Kite, Senior Specialist, Technical Support *J. Lewis, Senior Engineer, NED *C. McKenzie, Principal QA Engineer *T. Nelson, Senior Specialist, NED *F. Nowak, Senior Engineer, NED *L.Oakley, Senior Engineer, Technical Support *L. Olsen, Project Specialist, Technical Support *A. Roberts, Senior Specialist, Technical Support *W. Russell, Project Engineer, ONS *P. Salas, Senior Engineer, Licensing *J. Sipp, Manager *C. Sweely, Project Engineer, NED *D. Tibbitts, Director, Regulatory Compliance *R. Van Metre, Manager, Technical Support *M. Wallace, Senior Specialist, Regulatory Compliance *R. Watson, Vice President, Harris Nuclear Project *L. Woods, Engineering Supervisor, Technical Support *P. Yandow, Senior Engineering, NED *R. Zula, Project Engineer, Technical Support

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, security force members, technicians, and administrative personnel.

Other Organizations

*D. Rhyne, Patel Engineers

NRC

*P. Fredrickson, Chief, Project Section 1A, Division of Reactor Project
*C. Hehl, Deputy Director, Division of Reactor Projects
*E. Merschoff, Deputy Director, Division of Reactor Safety
*M. Shannon, Resident Inspector

*Attended exit interview

2. Evaluation Of Licensee's Program For Qualification Of Electrical Equipment Located In Harsh Environments (TI2515/76)

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A special team inspection was performed during the week of March 7-11, 1988, to assess the licensee's implementation of a program to meet the requirements of 10 CFR 50.49. During that inspection, files for 23 equipment items were reviewed and found acceptable with some minor discrepancies. A walkdown was performed of equipment located in the steam tunnel and auxiliary building with some maintenance concerns being identified. Due to the operational status of the plant walkdowns of equipment, inside containment could not be accomplished; however, the licensee's EO program appeared to be adequate. This inspection was considered a continuation of the first inspection concentrating on those inside containment components which were not examined during the first round EQ inspection. Similar to the first inspection, the NRC inspectors examined files as the basis for qualification for EQ equipment inside containment; performed walkdown inspections of equipment (inside containment only); continued the review of the EQ maintenance program; examined the licensee's procurement program for EQ components and spare parts; reviewed EQ training; and examined what actions had been taken on previous inspection concerns. The results of the inspection and the conclusions reached are discussed below:

a. Maintenance

During this inspection, work requests that had been closed out (either by completion or cancellation) and those that had been issued since March 1988, were reviewed. At first there appeared to be many problems in the area of EQ. This was because many of the work requests identified "unqualified" components, "unknown" components, and missing components.

The "unqualified" and "unknown" components were associated with Limitorque motor operators. The number of these items was alarming since the licensee stated that a 100% walkdown of environmentally qualified Limitorque operators had been performed in 1986. Upon questioning by the inspector, the licensee was able to show for the 1986 data that the questionable item was not "unknown" or "unqualified."

These items were identified by the licensee during the performance of EPT-072, Limitorque Valve Actuator Inspection Guidelines. The procedure requires the performer to annotate what is found. When something was found that was questionable, the technician would indicate the item was "unknown" or "unidentified". The procedure does not provide any acceptance criteria to determine what would be acceptable or to identify any discrepancies. The procedure requires the EQ Coordinator or Designee to resolve any discrepancies, yet there is no acceptance criteria or reference list of acceptable items for this person to use in meeting this signoff requirement.

Several factors are involved in this issue. The individuals that are performing the procedure are not adequately trained in EQ, the procedure does not provide any acceptance criteria for determining what is acceptable, and management appears to have only a handful of people knowledgeable in EQ. Unless the technicians and electricians understand EQ and the requirements for maintaining equipment qualified, qualification issues will arise. In this instance, there was no hardware problem, but there was a problem with the training of personnel responsible for performing EQ related activities.

During the review of the work requests, a problem with motor operators missing T-drains was identified. The following scenario indicates that although corrective actions were taken, they were considered inadequate to prevent similar problems from recurring.

In 1986, WR&A 86-BMBS1 was written to correct a cable termination problem in the limit switch for Valve No. 1RH-63. The work request did not specify what was required to maintain the limit switch in a qualified configuration; WR&A 87-AMPE1 was issued April 24, 1987, to re-establish the environmental qualification of the limit switch by replacing the front cover gasket. The work was completed on August 6, 1987.

On August 7, 1987, NCR 87-098 was issued and it identified the problem with WR&A 86-BMBS1 as not meeting the requirements of MMM-012 which states "if the work request is on a[n] Environmentally Qualified component...the planner will determine if the environmental boundary will be degraded by the maintenance action and provide planning instructions as necessary to restore the EQ boundary." The root-cause was identified as "[i]ncorrect planning of WR 86-BMBS1 did not include EQ requirements". The corrective actions were to issue WR87-AMPE1 and to provide training.

On August 21, 1987, Planners were trained on EQ requirements and the processing of work requests involving EQ. Classes to indoctrinate I&C and Electrical personnel were scheduled to begin in September 1987.

On, or about, September 17, 1987, the motor operated valve 1MS-70, the Main Steam supply to the Turbine Driven Auxiliary Feedwater (TDAFW) pump from the "B" main steam line, was replaced in accordance with WR 87-BCLY1.

On February 29, 1988, WR 88-AEKE1 was initiated to replace the motor operator for valve 1AF-143, the AFW isolation valve to the "B" S/G⁻ from the TDAFW pump. The work request did not require the electricians to remove the T-drains from the old motor and install them on the new motor, however, they did. This is another example of the work request not being completed with the necessary information to ensure electrical equipment maintains environmental qualification. On March 2, 1988, WR 88-AEQM1 was written to install the T-drains on the operator motor for valve 1MS-70 which were not installed in September 1987.

On April 15, 1988, it was "discovered" by the licensee that the missing T-drains was a "qualification problem: and SOOR 88-068 was initiated. WR 88-AEQM1 was performed on April 15, 1988, and T-drains were installed in the limit switch housing, not the motor as instructed by the WR.

On April 21, 1988, WR 88-AIXH1 was initiated based on a review of WR 88-AEKE1. The review identified that no T-drains were removed from supply and it was assumed that none were, therefore, installed on 1AF-143. Workmen were dispatched to perform the work request but found the T-drains already installed and cancelled the work request.

On June 23, 1988, WR 88-APQS1 and SOOR 88-114 were initiated due to the T-drains being installed in the limit switch housing on 1MS-70. The T drains were correctly installed in the motor on June 23, 1988.

The above scenario shows that the licensee identified a problem with the maintenance of EQ equipment. Although corrective actions were taken, the scenario shows that those actions were inadequate since there continues to be problems with EQ maintenance. Specifically, technicians and/or electricians not adequately trained to ensure that environmental qualification is maintained after performing work, and work planners not providing adequate instructions for maintaining environmental qualification. This is identified as Violation 88-27-01, Failure to Take Adequate Corrective Actions for EQ Problems.

The maintenance of the licensee's EQ program is not as strong as it should be. Improvements must be made in training, procedural compliance, and procedures in order to avoid problems in the future. This will require more management support and involvement than is present at this time.

b. EQ Personnel Training

The EQ inspection conducted March 7-11, 1988, identified deficiencies in the EQ training of licensee personnel. At the time of the inspection, licensee management was in the process of reviewing lesson plans QA6084G, and QA6085G in preparation for development of a formalized EQ training program. A commitment date of May 15, 1988, was also given as the starting date for implementation of the training program. Based on review of objective evidence and discussions with licensee training staff the inspector verified that a formalized EQ training program had been developed and implemented for non-craft personnel in accordance with licensee commitments.



Requirements for providing training, continuing training, and on-the-job training for maintenance personnel is specified in procedure TI-113. Pursuant to review of this procedure during the first round EQ inspection, the inspector determined that a formalized training program had not been established for indoctrination and training of Electrical and Instrumentation and Control (I&C) personnel in the requirements of Harris EQ program. This deficiency was previously recognized by the Electrical Craft and Technical Steering committee in late 1987. They recommended that Qualification Checkout Cards (QCCs) that define specific tasks related to the implementation of the EQ program be developed and used for craft EQ training.

The inspector determined that the above recommendation has not been acted upon by licensee management. Additionally, the Electrical and I&C maintenance personnel have not been indoctrinated and trained in the requirements of the EQ program to an extent similar to that provided non-craft personnel. Licensee management has identified deficiencies in the implementation of the EQ maintenance program. А prime contributor to these deficiencies was identified as lack of EQ Corrective actions completed included training of the craft. development and presentation of a one hour course (No. CT1010H), to maintenance personnel. Licensee management further indicated that long term corrective action in the form of continuing training on the requirements of the EQ program was presently being established. This would involve expansion of course CT101H in lieu of the use of QCCS and would be given periodically every two years. The licensee indicated that training will begin on or around February 1989.

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EQ Equipment Replacement and Spare Parts Procurement

A review of the implementation of the procurement program was performed to verify conformance with applicable industry codes and standards and regulatory requirements. The following environmentally qualified equipment, selected for physical inspection during the plant walkdown, was chosen for this review.

Equipment Description	<u>SFD. Tag No.</u>
ASCO Solenoid Valve	CP-5:005
Pressurizer Safety Valve Position Indicators (CR0534)	ZS-R530SAB
NAMCO limit Switch (CV Purge Valve)	1CP-5:004
Target Rock Valves	1RC-901



Equipment	Description
(cont'd)	

Barton Transmitter (Model 764)

Barton Transmitter (Model 763)

Barton Transmitter (Model 752)

FT-414

LT-474

PT-455

SFD. Tag No.

Purchase Orders (PO) for the above equipment were retrieved by the Licensee Engineering Technical Support group via on-line Supply Inventory System computer network. The inspector reviewed the purchase orders and verified that applicable technical and quality requirements required for environmentally qualified equipment had been specified. Additionally, the review was performed to ensure that reference to an EQ Test Report, and the requirement of 10 CFR 21 had been included. No deficiencies were identified during this effort.

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Procedure number TMM-104, paragraph 5.4.4. defines "Off-the-Shelf" item as commercial grade and provides criteria for commercial grade items that are similar to 10 CFR 21.3(4)(a-1). Paragraph 5.4 of this procedure further specifies the method for determining the technical, quality, and regulatory requirements for procurement documents and delineate the applicable Quality Classes on which these requirements are to be imposed. Guidance for the determination of Quality Class of replacement parts, equipment and material is shown on Attachment E. This attachment permits the procurement of commercial grade replacement parts for end use in basic components.

Interviews were conducted with licensee personnel to determine the technical adequacy of the Dedication process for commercial grade items prior to their use in basic components. The inspector determined that CP&L Corporate Quality Assurance Manual, Section 5.5.a requires that an engineering evaluation be performed prior to the use of an "Off the Shelf" item. The procurement evaluation process specified in Section 4.3.4 of the manual is intended to meet this engineering evaluation requirement and allows for the preparation of purchase requisitions in accordance with approved procedures, or alternatively, by performance of a specific Section 4.3.4 of the Corporate Quality engineering evaluation. Assurance Manual also states that once an item has been evaluated to be acceptable for off-the-shelf use the original specification does not remain as the governing purchasing criteria, and vendors supplying off-the-shelf items are not required to be on the approved Suppliers List.



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Direct replacement parts are procured by part number via the preparation of purchase requisitions in accordance with procedure Guidance for performing the required engineering TMM-104. evaluations are delineated in Attachments A, B, and C of this procedure. Pursuant to review of these attachments and discussions with licensee personnel the inspector determined that adequate procurement controls have not been developed and implemented to verify the critical characteristic data of commercial grade replacement parts intended for use in EQ applications. The existing procurement controls for replacement parts do not ensure identification of select critical characteristics. Licensee management stated that ordering replacement parts by part number guarantees receipt of like-in-kind replacements. However, because the replacement parts are procured commercial grade no documentation are required to be provided by the vendor to assure that the replacement parts are identical to the original parts.

The inspector made a random selection of commercial grade replacement parts used by the licensee in EQ applications to verify conformance with technical and regulatory requirements. The parts selected were primarily non-electrical replacement parts, gaskets, and lubrication oil. The inspector determined that the licensee has established a chemical and consumable control program for replacement parts identified as consumables. Applicable requirements of this program are imposed during the procurement of bulk commercial grade items such as gaskets, O-rings, and lubricants. The requirements provide for identification of chemical characteristics of the material and/or special, or limited use associated with the material because of plant specific requirements. No EQ deficiencies were identified during this review.

The inspector selected a broader sample consisting of electrical replacement parts. Documentation associated with the part numbers selected were transmitted to the Regional Office by the licensee after completion of the inspection. The following purchase orders and supporting documents were reviewed.

PO No.	Part No.	Material Description
44109700	727-653-73	Silicone Caulk
198507BT	725-619-12	Groove Pin
191108BF	725-631-82	Limit Switch Rotor
468131BT	726-048-87	Terminal Block
425388AR	726-039-96	Silicone Gasket

The licensee uses various methods to ensure receipt of like-in-kind replacement parts. The replacement parts were procured by part number from the original equipment manufacturer who in some instances provided compliance. The Certificate of Compliance certified that the materials met all the requirements of the PO and specification. Additional controls, demonstrated for PO No. 191108BF, the procurement of only nuclear grade replacement parts which are then used in both standard and nuclear applications. The limited engineering evaluations, performed for determination of replacement parts critical characteristics, do not appear to adversely affect the procurement of like-for-like parts. The purchase order imposes instructions that there shall be no change in part numbers or item description unless approved by the purchaser. Design changes initiated by the vendor needs to be reported and should state whether the new part number services the same fit, form and function as the old part number. Additionally, the receipt inspection process provides for verification of easily identified physical characteristics, part number; and when necessary. verification of performance characteristics by performance of special tests. Based on the sample reviewed, the inspector concluded that technical and quality requirements for like-in-kind replacement parts are maintained during implementation of the procurement program. No EQ deficiencies were identified during this review.

d. QA/QC Interface

Nonconformance Report No. 87-098, was written on August 7, 1987; to document a significant deficiency in the implementation of the EQ maintenance program. The problem involved degradation of the environmental qualification boundaries of equipment caused by maintenance activities. The root cause was determined to be inadequate training of both the maintenance planners and maintenance craft personnel in requirements of Harris EQ program. Corrective actions taken to resolve this deficiency are described in paragraph "b" above.

Additional corrective action, implemented the week of August 8, 1988, to correct the above deficiency included restructuring the EQ Technical Support organization. An additional staff positions have been added with responsibilities for administrative control of the EQ maintenance program. The objective of the reorganization is to provide centralized control for implementation of the EQ maintenance program. Functional responsibilities, levels of authority, and lines of internal and external interface communications will also be specified to better coordinate and assess the effectiveness of the EQ program.

Pursuant to discussions with licensee management the inspector was informed that procedure PLP-108, "Environmental Qualification Program," will be revised to reflect the above organizational change. A commitment date of October 1, 1988, was given for completion of this revision. The inspector also reviewed section 4.4.2 of procedure PLP-108, and verified that inadequacies in the program description identified during the first round EQ inspection had been corrected. The corrective action was completed in accordance with the licensee prior commitment.

Within this area, no violations or deviations were identified.

EQ Documentation Files and Walkdown Items

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The NRC inspectors examined files for 28 equipment items, where an item is defined as a specific type of electrical equipment, designated by manufacturer and model, which is representative of all identical equipment in a plant area, exposed to the same environmental service conditions. The inspector selectively reviewed areas such as (1) required post-accident operating time compared to the duration of time the equipment has been demonstrated to be qualified, (2) similarity of tested equipment to that installed in the plant, (3) adequacy of test conditions enveloping calculated accident profile conditions, (4) aging calculations for qualified life determination, (5) temperature related effects on instrument accuracy due to decreases in insulation resistance, (6) evaluation of test anomalies, and (7) applicability of EQ problems reported in IEBs/IENs and their resolution. The results of the file reviews and walkdown items will be discussed in detail in the paragraphs that follow; however, in general, the files were considered adequate.

(1) General Electric Vulkene Supreme Wire (EQDP 6.10)

The inspector reviewed the file for General Electric Vulkene Supreme SIS wire used outside containment for control applications. The qualification basis was NUREG-0588, Category I. The worse case steam environment is in the steam tunnel where the peak temperature reaches 437°F for about ten minutes, followed by a fairly rapid return to much lower temperatures. A thermal lag analysis (File No. 2202.006, not reviewed) yielded a peak temperature of 328°F. The radiation dose is 43 Mrad normal and 1 Mrad accident. The cable was qualified to nominal IEEE 323-1974 conditions and is reported tin FRC report F-C4497-2. All plant parameters were enveloped. The tested cable was identical to the cable purchased for the plant. Good IR performance was indicated by the steam test. No findings were identified.

(2) Rockbestos Coaxial Cable (EQDP 6.7)

The inspector reviewed the file for Rockbestos coaxial cable used for instrumentation circuits, including the General Atomics radiation monitor inside containment. Cables used include RSS-6-104/LD, RSS-6-105/LD, and RSS-6-108/LD. The qualification basis was NUREG-0588, Category I. The plant parameters were enveloped by the test and the LD/LE similarity analysis was included in the file. Performance (IR) of the cable is addressed elsewhere (in General Atomics radiation monitor file, not reviewed). No findings were identified.

(3) Instrument Loop Accuracy Calculations (EQDP 90.1)



The inspector briefly reviewed the instrument loop accuracy calculations of EQDP 90.1. This file contains the basis and justification for data supplied to Westinghouse for input to loop accuracy calculations. The reviewed calculation does not include any degraded IR calculations. Cable lengths and IRs used for cables, connectors, penetrations, and splices are determined in the package and justified based on peak expected containment temperature. No findings were identified.

(4) Rockbestos Instrumentation and Control Wire (EQDP 6.8)

The inspector reviewed the file for Rockbestos chemically XLPE (Type XXL-760D) insulated 600V control and thermocouple cable. The control cable is used in Limitorques and the thermocouple cable is used in Westinghouse penetrations. The qualification basis was NUREG-0588, Category I. The plant parameters were enveloped by the test conditions. Insulation resistance performance was satisfactory during the test. No findings were identified.

(5) Rockbestos Instrument and Control Wire (EQDP 6.9)

The inspector reviewed the file for Rockbestos radiation XLPE insulated cable. All information for this cable is the same as for the chemically XLPE cable in $4 \cdot above$. No findings were identified.

(6) Okonite Okozel Cable (EQDP 6.13)

The inspector reviewed the file for okonite cable insulated with Okozel, an ETFE flouropolymer (Tefzel). The qualification basis was NUREG-0588, Category I. The cable is used for internal jumpers and for field cable terminators for Target Rock Solenoid valves. This cable was purchased and installed as a result of IEN 84-68. The cable is rated at 150°C in dry locations with a qualified life of ten years. The cable type designation are Z and ZW. The only area questioned was that of documentation required to support Category I qualification. Prior to the end of the inspection, additional documentation was obtained and will be added to the file. The new documentation was considered adequate for Category I qualification. No findings were identified.

(7) Anaconda Control Cable (EQDP 6.11)

The inspector reviewed the package for Anaconda NSIS switchboard and control wire. The qualification basis was NUREG-0588/ Category I. The cable has FR-EP insulation and a CPE jacket. The test parameters enveloped the plant parameters with a qualified life of 40 years at 71°C. The two test specimens identical to the cable used in the plant both carried rated



voltage and current with IRs in excess of 107L. The test results are reported in FRC report F-C4969-1. No findings were identified.

(8) Anaconda Power Cable (EQDP 6.6)

The inspector briefly reviewed the file for Anaconda medium voltage (15 kV) power cable. The cable is specifically excluded from safety-related use in the containment or main steam tunnel, resulting in a peak accident temperature of only 133°F and less than 1 Mrad radiation. No findings were identified.

(9) Anaconda Instrumentation Cable (EQDP 6.2)

The inspector reviewed the file for Anaconda instrument and thermocouple extension cable. The qualification basis was NUREG-0588/Category I. The test conditions enveloped the plant parameters with a qualified life of 40 years at 71°C. Submergence testing was included. The cable uses FR-EP insulation and a CPE jacket. The tested cables are similar to those used in the plant with the only significant difference being conductor materials in some of the plant cables (thermocouple extension wire). IR performance during the 30 day LOCA was better than 106L. The test results are reported in FRC reports F-C4969-1 and F-C4836-2. No findings were identified.

(10) Eaton Thermocouple Extension Wire (EQDP 6.3)

The inspector reviewed the file for Eaton (Samuel Moore) thermocouple extension wire using an FR-EPDM insulation. The qualification basis was NUREG-0588/Category I. Qualification was based on tested specimens with the same insulation material. IR performance during the test remained better than 1 ML. Submergence testing was included and all plant parameters were enveloped. No findings were identified.

(11) Bishop Electrical Tape (EQDP 16.2)

The inspector briefly reviewed the file for Bishop semiconducting electrical tape used for 600 V and 15 kV terminations. The qualification basis was NUREG-0588/ Category II. The tape is not used for safety applications in the containment and main steam tunnel, giving a peak accident tempertaure of 167°F. The only significant qualification parameter is 43 Mrad of aging which is enveloped by a 200 Mrad radiation test. No findings were identified.

(12) Scotch Electrical Tape (EQDP 16.4)

The inspector briefly reviewed the file for Scotch semiconducting electrical tapes. The qualification basis was

NUREG-0588/Category II. The cable is not used in safety applications in the containment and main steam tunnel, making the maximum accident temperature 167°F. A Radiation aging dose of 43 Mrad was enveloped by test. No findings were identified.

(13) Okonite Electrical Tape (EQDP 16.3)

The inspector reviewed the file for Okonite T-95 and No. 35 electrical tapes used for splices and terminations outside of the containment and main steam tunnel. The worst case accident temperature is 167°F. The qualification basis was NUREG-0588/ Category I. The normal aging dose of 43 Mrad was easily enveloped by test. No findings were identified.

(14) AIW Cable (EQDP 6.5)

The inspector reviewed the file for AIW cable used for instrumentation and control applications outside containment. The qualification basis was NUREG-0588/Category I. Both the tested and installed cables are single conductor with 30 mil of EPDM insulation. The test profile enveloped the plant requirements. IRs measured during the steam exposure all exceeded 108L. No findings were identified.

(15) RdF Temperature Elements (EQDP 39.8)

The inspector reviewed the file for RdF model 21205 RTDs used to monitor RCS hot and cold leg temperatures. The qualification basis was NUREG-0588/Category I. The test units were identical to those used in the plant. Qualification was based on supplement 2-EO6A of WCAP-8687. Aging was performed for 2 Aging was performed for 264 hours at 400°F giving a qualified life of 23 years at 100°C (50°C ambient + 50°C heat rise due to process fluid). Performance was monitored by measuring the detector outputs and monitoring insulation resistance to ground periodically (specification of 1 ML minimum). Because of testing problems, the cable to the detector was installed in sealed conduit to get the unit to pass. The plant requires the installation of a . Conax T8 sealed termination head with a Conax ECSA to address the sealing requirement. The qualified life determination is still pending verification of service temperature. No findings were identified.

(16) BIW Triaxial Cable (EQDP 6.1)

The inspector reviewed the package for BIW triaxial cable with Tefzel insulation. The qualification basis was NUREG-0588/ Category I. Testing to envelope the plant conditions was performed but the documentation in the file was considered inadequate to support Category I qualification. Specifically, the items of Section 8.3 of IEEE 323-1974 were not fully addressed. However, this item was previously accepted by NRR in NUREG-1038, Supplement 4, Section 3.11.4.

(17) Target Rock Solenoid Valves (EQDP 3.1)

The inspector reviewed the file for Target Rock 790 series The qualification basis was NUREG-0588/ solenoid valves. Category I. The valves are primarily sampling system containment isolation valves. Some of the valves are continuously energized and/or subject to process heat rise during normal operation. Typically, the valves all closed at the beginning of an accident, but there still may be process heat rise. The licensee performed calculations which showed very short qualified lives for some of the valves (on the order of one month), based on the artificial aging performed. An analysis, based on testing done on a valve removed from Sequoyah after five years of continuously energized service, was used to extend the minimum qualified life to one cycle. Two questions were posed to the licensee. First, the valve removed from Sequoyah did not appear to be one which would be subject to process heat rise, resulting in a question of the applicability of the Sequoyah valve. Second, it was not clear what process fluid temperature was used in the Target Rock test, resulting in a question of whether the plant valves could be exposed to temperatures above their qualification when accident conditions are combined with process heat rise. The licensee is addressing the first question through on-going evaluation and a test program using naturally-aged valves being removed from the plant during the current outage. The second question was adequately addressed by considering the accidents where the valves would be needed, their required state during these accidents, and the actual accident profile. The question of qualified life and the results of additional testing will be reviewed at a future Therefore, this item is considered unresolved inspection. pending the results of the testing to be performed on the coils removed during this outage and documentation of the results by NED in the EQDP (Unresolved Item (URI) 50-400/88-27-02).

(18) Limitorque Actuators (Dual Voltage), Equipment Tag Nos. 1CC-249 and 1CS-470 (Inspection Plan TI 2500/17)

The Phase 1 EQ inspection held March 7-11, 1988, identified URI 50-400/88-04-01, Nylon type Crimp Connectors on Dual Voltage Limitorque Actuators. At the close of that inspection, the licensee committed to obtain qualification documentation for the nylon crimp connectors or remove the connectors and replace them with qualified splices. The purpose of the Phase 2 equipment walkdown was to physically inspect the dual voltage limitorque actuators inside containment, determine if the nylon connectors were being used, and evaluate the licensee's basis for qualification of these connectors.

There are two dual voltage Limitorque actuators (1CC-249 and 1CS-470) inside containment. The walkdown of these valves verified that the mounting configuration was consistent with the tested configuration. The T-drains and grease reliefs were found to be properly installed. The equipment was identified by the manufacturer's nameplate as a dual voltage model. The licensee stated that the nylon connectors for both were replaced with Raychem splices.

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The inspection of 1CS-470 verified that Raychem splices were installed on the motor lead connections. When questioned, the licensee could not identify the type of connectors since the connectors were not saved. The licensee stated that there was documentation available from Limitorque which indicated that only Thomas and Betts connectors were supplied in the actuators. Aging qualification could be demonstrated by a separate test report on the motor. Although, these documents were not reviewed, it appeared that the connectors were qualifiable. This finding was identified as a potential violation, on the basis that at the time of the inspection the EQ file was deficient in showing the qualification of the nylon connectors, however, it is not clear that the licensee should have been aware of this problem considering the location of these connectors. Therefore, a violation will not be cited.

Component 1CC-249 was not inspected internally since the licensee stated that the same Raychem splices were installed to replace the nylon connectors.

(19) Limitorque Actuators Equipment Tag Nos. 1RH-40, 1RH-2, 1ED-94, and 1SI-246 (TI 2500/17)

The above Limitorque actuators were inspected for mounting configuration, T-drains, grease reliefs, nameplate information, and internal wiring. The installed configuration was found to be consistent with the tested configuration. All walkdown concerns were addressed prior to the close of the inspection.

The inspection of 1RH-40 discovered a small leak of red grease inside the housing for the limit switches. The licensee identified the grease as Mobil 28 and stated that orientation of the actuator prevented the grease from reaching the switch contacts. Work ticket WR&A 88AUJSI was issued to clean the housing.

Valves 1RH-2 and 1CS-470 were found to have terminal boards wired at adjacent points, while 1SI-246 was wired at alternate points. When questioned, the licensee explained that either wiring configuration was acceptable, since Limitorque report B0119 supported the use the GE, marathon, and Buchanon terminal blocks in their worst case wiring configuration (adjacent points). There were several Raychem splices where the shim protruded from the sleeve and other cases where the sleeve overlapped the shim. When questioned the licensee stated that the Raychem installation Guide was used as the basis for the plant procedures WP-210 and EMP-3. The installation guide indicates that an accident location requires a 2-inch seal length. In a single shim installation the shim may be overlapped or protrude from the insulation sleeve. The seal lengths of several splices were measured and found acceptable.

. (20) Barton Transmitter Models 763 and 765, Equipment Nos. LT-474, LT-477, 1RC-455, and 1RC-456

The above transmitters were inspected for mounting configuration and wiring and found acceptable. Raychem splices were used for all connections. Single shims were used and appeared to be properly installed. There were no concerns identified during the walkdown.

(21) Minco RVLIS RTD, Equipment Tag Nos. TE-1313 and TE-1314

The above RTDs were inspected for mounting configuration and wiring and found acceptable. Raychem splices were used for all connections. Single shims were used and appeared to be properly installed. The locations of all Minco RTDs were identified and found to be above flood level. There were no concerns identified during the walkdown.

(22) Reliance Motors, Equipment Tag Nos. 1CV-E002:004 and 1CV-E002:005

As a result of the Phase 1 EQ inspection, the licensee committed to inspect the Reliance motors and remove the grease lines to the sealed bearings. However, subsequent to that commitment the licensee determined that the motor had double shielded bearings for which the use of grease lines was specified. The licensee surveyed knowledgeable personnel at Shearon Harris and other plants for advice on lubrication of the motor bearings, but the results were inconclusive. The licensee took the conservative approach and committed to install the grease lines on the motors during the outage. The work tickets were identified and found acceptable. The licensee will void the original work tickets to remove the grease lines. This explanation was acceptable. The motors were not inspected during the walkdowns due to limited time.

(23) Hydrogen Recombiner Equipment Tag No. 1SP-E003

The equipment was inspected for mounting configuration and wiring and found acceptable. The 5 and 1 Raychem splice

configuration appeared to be properly installed. There were no concerns identified during the walkdown.

(24) Electrical Penetration Assembly, Equipment Tag Nos. 1AB-S1206 and 1AB-1225

These penetration assemblies were inspected for mounting configuration and wiring and found acceptable. Penetration IAB-S1206 (and other EPAs in the vicinity) could not be identified from the back panel, which required someone to crawl around the penetration assemblies in order to locate the equipment tags. There was a concern that personnel exposure would be increased anytime someone needed to identify a specific penetration assembly. The licensee issued WR&A 88-AUNG1 and committed to lable the penetrations on the back side of each enclosure. This was acceptable.

The inspection of Penetration 1AB-1255 discovered several black wires with the bare conductor showing where the insulation was stripped back. When questioned, the licensee explained that the Raychem splices associated with these cables were supplied by Westinghouse as part of the electrical penetration assembly. Installation was done in accordance with the Raychem guidelines. The shield on all cables spliced by Westinghouse are covered for isolation purposes only. This explanation was acceptable.

(25) GEMS Transmitter, Equipment Tag Nos. LE-01CT-7160ASA and LE-01CT-7160ASB

The equipment was inspected for mounting configuration and wiring and found acceptable. Raychem splices were used and appeared to be properly installed. The junction box was filled with silicon oil as required to seal the terminations for the sensors. No concerns were identified during the walkdown.

(26) EQ Cable Identification

During the walkdown portion of the inspection, the inspector obtained cable identification numbers from the cable connected to selected EQ equipment. The licensee was then asked to show that the installed cable was qualified by their existing qualification documentation. With the cable identification number, the licensee referenced the applicable pull card which showed the cable routing, reel number and termination points along with a receipt inspection report which shows the bill of materials number for the installed cable. The bill of materials number was shown on the EQ Master List which identified the EQ file which established the qualification for that cable. With this sampling, the inspector determined that adequate traceability existed for the cables requiring environmental qualification.

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- (27) Samples of Target Rock Solenoid Valves, ASCO Solenoid Valves and Namco Limit Switch installations were examined in various locations inside containment for manufacturer and model number, orientation, installation, and interfaces (i.e., cable splice` and entrance seals). No concerns were identified during the Since the inspection the licensee has reported walkdown. several concerns regarding the qualified status of their installed Target Rock valves as a result of cracked insulation on Reed Switch lead wires, cracked terminal blocks and lack of similarity between tested configuration versus vendor supplied components (i.e., terminal blocks and wiring). All these Licensee plans to components are internal to the device. replace all questionable parts prior to restart.
- f. Followup of Licensee's Commitments Resulting From the Phase 1 EQ

At the conclusion of the Phase 1 EQ inspection, there were numerous action items which the licensee committed to perform. During the Phase 2 EQ inspection the INEL inspectors examined the EQ files, PCR change requests, and work requests to verify that the licensee fulfilled its commitment to resolve these items. These documents were reviewed and discussed with the licensee to verify that the EQ concerns were adequately addressed.

The Phase 2 inspection verified that the basis for corrective action, qualification analyses, safety analyses, revisions to the EQ files, and internal reviews were performed and accepted by the licensee before the Phase 1 action items were considered closed. Discussion with the licensee and a brief walkdown of the central files determined that the document control was acceptable. All work requests resulting from the initial inspection were found to be completed or scheduled for completion during the outage. Other NRC Inspectors verified the licensee's commitments for EQ training and replacement equipment.

The following documents were reviewed with respect to updating the EQ files and found acceptable:

EQDP 3.3 Limitorque Actuators EQDP 8.2 GA High Range Monitor EQDP 8.3 GEMS Transmitter EQDP 8.11 Barton Transmitter 763 and 764 EQDP 15.1 Westinghouse Electrical penetration PCRs 2959, 2960, 3036, 3037, 3038, 3039, 3040, 3041, 3042, 3078 and 3414

With the exception of the Limitorque crimp connectors, all action items resulting from the previous inspection were reviewed and found to be closed or awaiting closure during the outage.

3. Action On Previous Inspection Findings (92701)(92702)

a. (Closed) URI 50-400/88-04-01, Nylon Type Crimp Connectors On Dual Voltage Limitorque Actuators (TI 2515/75)

During the first round EQ inspection, the possible use of nylon type crimp connectors in dual voltage Limitorque operators was identified. The licensee identified four valves (two inside and two outside containment) with dual voltage operators and possible crimped connectors. The information that was available to the licensee was not adequate to establish qualification of the crimp connectors. The licensee, therefore, committed to either obtaining the necessary documentation or to remove all the nylon type crimped connectors and replace them with qualified splices.

The licensee issued Work Requests 88-ATS41 and 88-ATS21 for 1CS-470 and 1CC-249, respectively, to remove the nylon type crimp connectors. The work requests were completed a few days prior to this inspection. Even though the licensee was aware of the qualification issue and its importance, the nylon type crimp connectors that were removed from the motors had been thrown away. However, recent information obtained during an inspection of Limitorque (NRC Report No. 99900100/88-01) seems to indicate that only T&B joints were used.

The test report the licensee referenced during the first inspection (Limitorque Test Report B0003) could only be used to establish qualification of the connectors for six to twelve months had the connectors been Thomas and Betts RB-4 or 6 models for use outside containment. Without the removed connectors, the licensee could not clearly establish qualification of the affected motor operators to any test report. The licensee's failure to have qualification documentation in a file for the T&B connectors is an apparent violation of the EQ rule; however, as stated earlier in the paragraph 2.e.18., no violation will be cited because it is not clear the licensee should have been aware of this problem.

While the connectors were being replaced on 1CS-470, the licensee identified that the T-drains were missing on the motor. Work request 88-ATSX1 was performed on August 13, 1988, to install the T-drains on the motor. The licensee was asked to provide a scenario of when the T-drain issues had occurred. For 1CS-470, it was found that WR86-BFPV1 had been performed to install T-drains on the motor. Even though the work request had been signed off as being completed, 1CS-470 did not have T-Drains installed when it was being worked on in August 1988.

Although this T-drain issue was identified by the licensee, it is considered as another example of Violation 88-27-01. This is due to the fact that the licensee had been notified that NRC would look at this particular valve during this inspection.



b. (Closed) Inspector Followup Item 86-88-03, Continue Review of Cable Splicing Program and TI2500/17, Inspection Guidance for Heat Shrinkable Tubing

Documentation to qualify the Raychem heat shrinkable tubing was reviewed and documented in NRC Inspection Report No. 50-400/88-04 as being acceptable. A walkdown of a sample of splices was performed by the inspectors as well as a review of the licensee's activities regarding Raychem heat shrinkable splices.

The walkdown did not identify any splices in an unqualified configuration. The licensee had identified some splices prior to this inspection that did not meet the bend radius specified in procedure EMP-3 for installing the heat shrink tubing. Although the procedure was not followed, the splices were qualified by the qualification package. The licensee has taken corrective actions to require QC inspection hold points during this installation of the Raychem splices.

It should be noted that had this been identified by NRC, it would have resulted in the citing of a violation for failure to follow procedures. However, since this was identified by the licensee, it fits in the Severity Level IV or V category, it did not require reporting, corrective actions have been taken, and it was not a repeat violation. No violation will be cited in this case.

Based on the results of the walkdowns and the previous document reviews, these items are considered closed.

4. Exit Interview

The inspection scope and results were summarized on August 19, 1988, with those persons indicated in Paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. Proprietary information is not contained in this report and dissenting comments were not received from the licensee.

The following new items were identified during this inspection:

Violation 50-400/88-27-01, The licensee failed to take adequate corrective action to ensure that maintenance did not violate the EQ boundaries of EQ equipment, paragraph 2.a.

Unresolved Item 50-400/88-27-02, EQDP 3.1 is the qualification file for Target Rock 790 Series Solenoid Valves. The licensee performed aging calculations which showed very short qualified lives for the continuously energized valves (on the order of one month), based on the artificial aging of tested samples. The licensee extended the qualified life to a cycle based on a TVA report. The NRC questioned the use of the TVA report because the licensee failed to show the similarity between their installation (i.e., continuously energized on hot process pipe) and TVA's installation at Sequoyah. The licensee committed to do additional testing on naturally-aged valves being removed from the plant during the current outage, paragraph 2.e.17.