UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-348/87-30 and 50-364/87-30

Licensee: Alabama Power Company
600 North 18th Street
Birmingham, AL 35291-0400

Docket Nos.: 50-348 and 50-364 License Nos.: NPF-2 and NPF-8

Facility Name: Farley Nuclear Plant, Units 1 and 2

Inspection Conducted: November 2-6, 1987, and November 16-20, 1987

Inspector: N. Merriweather 1-28-88
N. Merriweather, Team Leader Date Signed

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

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SUMMARY

Scope: This special, announced inspection was in the area of Environmental Qualification (EQ) of Electrical Equipment and included a review of Alabama Power Company's (APCO) implementation of the requirements of 10 CFR 50.49; plant walkdown inspections of electrical equipment within the scope of 10 CFR 50.49; a review of the licensee's corrective actions for previously identified EQ deficiencies; and a review of their evaluations of these findings on how they effect restart of Unit 2 and continued operation of Unit 1.

Results: Eleven violations were identified and are discussed in paragraphs 2 and 3.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*T. M. Broad, Design Engineer
*C. L. Buck, Discipline Engineer
*L. W. Enfinger, Manager Plant Administration
*J. E. Garlington, Manager Engineering and Licensing
*W. G. Hairston, III, Vice President Nuclear Support
*D. H. Jones, Supervisor, Design Support
*R. P. McDonald, Senior Vice President
*J. W. McGowan, Manager Safety Audit and Engineering Review
*B. L. Moore, Training Representative
*D. N. Morey, Assistant General Manager - Operations
C. D. Nesbitt, Technical Manager
*J. K. Osterholtz, Supervisor - Safety Audit and Engineering Review
*W. B. Shipman, Assistant Plant Manager
*R. W. Stewart, Project Engineer
*L. M. Stinson, Plant Modification and Maintenance Support Manager
*W. G. Ware, QC Engineer
*L. S. Williams, Training Manager
*J. D. Woodard, General Manager, Nuclear Plant
*L. A. Word, Maintenance Manager

Other licensee employees contacted included craftsmen, engineers, technicians, operators, security force members, and office personnel.

Other Organizations

*P. A. D. Benedetto, EQ Consultant, DBA, Inc.
*J. Love, Project Engineer, Bechtel Engineering

NRC Resident Inspector

*W. H. Bradford, Senior Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on November 20, 1987, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection findings listed below. The licensee subsequently presented their position on each of the findings. In most cases, the licensee did not agree with the position taken by NRC. Subsequent to the inspection, one new violation was identified because the wide range and narrow range containment sump level

transmitters were found not to be installed in accordance with the tested configuration (Item No. 50-348, 364/87-30-06), one previously identified unresolved item has been determined to be a violation (Item No. 50-348, 364/87-30-07) for lack of T-drains on limitorque motor operated valves, and one new unresolved item was identified as Item No. 50-348, 364/87-30-12, for lack of cable entrance seals on certain solenoid valves. In addition, six previously identified unresolved items have been upgraded to violations and are discussed in Paragraph 3 below.

The following is a list of new items identified during this inspection.

Item Number	Description/Reference Paragraph
50-348, 364/87-30-11	Violation, Licensee EQ files did not support qualification for use of States (type NT/ZWM) and G.E. (type CR151B) terminal blocks in instrumentation circuits, paragraph 6.i.(15)
50-348, 364/87-30-08	Violation, Unqualified limit switch installed in a limitorque valve inside Unit 1 containment, paragraph 6.i.(3)
50-348, 364/87-30-15	Violation, Raychem/Chico A Seal (Package 29G) - NUREG 0588 Category II qualification not demonstrated because bonding of the Raychem material to the metal pipe nipple under LOCA conditions (including chemical spray) has not been addressed, paragraph 6.i.(32)
50-348, 364/87-30-14	Violation, Qualification not demonstrated for Raychem seal installed on Target Rock Solenoid valve cable entrance seal, paragraph 6.i.(31)
*50-348, 364/87-30-01	Violation, Use of unqualified commercially procured equipment in EQ applications, paragraph 6.e.(1)
*50-348, 364/87-30-02	Violation, Failure to procure replacement equipment in conformance with 10 CFR 50.49(L), paragraph 6.e.(2)
50-348, 364/87-30-04	Unresolved Item, Failure to train personnel involved in EQ activities in the requirements of the EQ program, paragraph 6.h

*Listed for record purposes only and not included in the total of 11 violations identifed in the summary section.

50-348, 364/87-30-03	Violation, Failure to take prompt and timely corrective action for EQ programmatic deficiency identified by SAER staff in 1983, paragraph 6.f
50-348, 364/87-30-09	Unresolved Item, EQ file did not include qualification for terminal blocks used in motor operated valves in that various terminal blocks were identified during walkdowns of limitorque operators, paragraph 6.i.(3)
50-348, 364/87-30-07	Violation, Some Limitorque Motor Operated Valves (MOVs) inside Unit 1 containment do not have T-drains installed. This condition is not in accordance with the tested configuration documented in the files, paragraph 6.i.(3)
50-348, 364/87-30-12	Unresolved Item, Certain SOVs may not be qualified due to a lack of cable entrance seals. This is contrary to the qualification basis, paragraph 6.i.(29)(a), (b) and (c)
50-348, 364/87-30-06	Violation, The licensee found wide range and narrow range containment sump level transmitters on both units, in a configuration that was not considered qualified by existing test data, paragraph 6.i.(1)
50-348, 364/87-30-13	Unresolved Item, Automatic Switch Company Solenoid Valves installed in Unit 1 Containment exceeded their qualified life, paragraph 6.i.(29)(d)
50-348, 364/87-30-10	Unresolved Item, Raychem Stilon cable test data does not support qualification for the use of this cable in instrument circuits, paragraph 6.i.(14)
50-348, 364/87-30-05	Unresolved Item, Thermal and radiation effects not evaluated for lead wire insulation, terminal blocks and resistors for the GEMs level transmitter, paragraph 6.i.(1)

Although proprietary material was reviewed during the inspection, proprietary information is not contained in this report.

3. Licensee Action on Previous Enforcement Matters

a. (Closed) Unresolved Items 50-348, 364/87-25-01: Unqualified Splice on Hydrogen Recombiners.

This item is being upgraded to violation 50-348, 364/87-30-16. The licensee operated Units 1 and 2 of the Farley Plant at various power levels for some unknown period of time after November 30, 1985 without adequate documentation in their EQ files to demonstrate that the in-line 5-to-1 field to pigtail tape splice configuration used on the Hydrogen Recombiners would perform its intended function during a design basis accident.

b. (Closed) Unresolved Items 50-348, 364/87-25-02.A: Procurement of Commercial Grade Components for EQ Applications.

This item is being upgraded to a violation and is discussed in Paragraph 6.e. in this report.

c. (Closed) Unresolved Items 50-348, 364/87-25-02.B: Inadequate Upgrade Program for EQ Components.

This item is being upgraded to a violation and is discussed in paragraph 6.e. in this report.

d. (Open) Unresolved Items 50-348, 364/87-25-03: Inadequate Peer Review Program.

Peer inspections of splice configurations on the containment Post-Loca mixing fan motors were inadequate and did not reflect drawing requirements. Recent walkdown inspections of the fan motors showed only the use of T95 tape in V-configuration which are not in accordance with design. Maintenance Work Requests used to determinate and reterminate splices during the previous outages on each unit indicated that the splices were documented as being in accordance with design by an inspection performed by the foreman.

Specifically, MWR 147889, completed November 13, 1986, on Unit 1 documented that the splices on containment Post-Loca Mixing Fan Motors 1B and 1C were in accordance with design. However, during the recent walkdowns on Unit 1, it was found that these fan motor splices only had T95 tape in a V-configuration which is not in accordance with design (reference MWRs 159078 and 159079), indicating an inadequate peer review. This item is still considered unresolved.

e. (Closed) Unresolved Items 50-348, 364/87-25-04: Use of Unqualified Grease On Motor Operated Valves.

The Limitorque Motor Operated Valves (MOVs) used by FNP inside containment were supplied by the vendor with Exxon Nebula EP0 or EP1 grease in the main gear boxes. The potential of having incompatible greases inside the main gear box exists as a result of maintenance performed with Texaco MARFAK AP grease, which is a lithium soap base

versus Nebula which is a calcium soap base. The lubrication checks as specified by the FNP Lubrication Manual (P12) are performed every 548 days and MARFAK AP is added as necessary to ensure sufficient grease level. Limitorque specifically states that greases of different soap bases should not be mixed. In addition, this problem was detailed further in INPO SOER 7-84. The team noted that the plant response to this SOER was to be included in that of IEB 85-03 which is not yet completed.

Another item of concern to the team was the fact that no documentation was presented to the team on September 18, 1987, to establish the environmental qualification of the MARFAK AP grease for inside containment applications or SUN 50EP grease for outside containment applications. The licensee stated that they had information addressing MARFAK AP but it was still under review and was not yet approved. Subsequent to the inspection, the licensee provided the team a copy of a JCO for mixed grease used in MOVs. This item is being upgraded to Violation 50-248, 364/87-30-17.

f. (Closed) Unresolved Items 50-348, 364/87-25-05: Unqualified Lubricants.

No documentation was presented to the inspection team on September 18, 1987, which supported the use of Premium RB grease on fan motors inside containment and room coolers outside containment. The root cause is that lubricants were not included on the EQ Master list of EQ equipment and components. Subsequent to the inspection, the licensee documented a JCO to allow continued operation with this deficiency.

This item is being upgraded to violation 50-348, 364/87-30-18.

g. (Closed) Unresolved Items 50-348, 364/87-17-01, 02 and 03: Use of Unqualified V-type Electrical Tape Splices on SOVs, MOVs and Inside Containment Fans.

These items are being upgraded to violation 50-348, 364/87-30-19. These items are discussed in detail in inspection report 50-348, 364/87-25.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. Five unresolved items identified during this inspection are discussed in paragraph 6.

5. Background

On January 11, 1984, the NRC held a meeting with APCO to discuss proposed methods to resolve the deficiencies identified in the Equipment

Qualification Safety Evaluation Report dated January 31, 1983, and in the Franklin Research Center (FRC) Technical Evaluation Reports dated January 14 and 17, 1983 for Units 1 and 2, respectively. Discussions also included general methodology for compliance with 10 CFR 50.49 and justification for continued operation (JCO) for those equipment items for which environmental qualification was not completed. The minutes of the meeting and proposed method of resolution for each of the EQ deficiencies were documented in a submittal dated February 29, 1984. The final SER was transmitted to APCO in a letter dated December 13, 1984. In the licensee's submittal dated February 29, 1984, the licensee stated that "all equipment required to achieve a safe shutdown condition at FNP is environmentally qualified and Justifications for Continued Operation (JCO) are not necessary."

Prior to this inspection, there was a reactive inspection conducted by Region II during the period of September 14-18, 1987, to followup on licensee identified deficiencies regarding unqualified tape splices on ASCO solenoid valves, limitorque motor operated valves and containment fan motors. The results of this inspection were documented in inspection report 50-348, 364/87-25.

On September 24, 1987 at the NRC offices in Bethesda, Maryland, a meeting was held with APCO to discuss the deviation from design of certain cable splices used at Farley Nuclear Plant on environmentally qualified equipment and the potential safety significance associated with the use of these splices. The results of this meeting were summarized in a letter dated September 30, 1987 from APCO and in a meeting summary documented by NRC dated November 5, 1987. In this meeting, the licensee made certain commitments to the NRC relative to v-splices which were later documented in a Confirmation of Action letter (CAL) from NRC to APCO dated October 6, 1987.

This inspection reviewed the licensee's implementation of a program to meet the requirements of 10 CFR 50.49 and corrective actions on previously identified EQ issues.

6. Findings

The NRC inspectors examined the licensee's program for establishing the environmental qualification of electric equipment within the scope of 10 CFR 50.49. The program was evaluated by physical inspection of EQ equipment, examination of the EQ files, interviews of personnel involved in EQ activities, review of procedures for controlling the EQ Master List, and examination of the licensee's maintenance program for maintaining the qualified status of the covered electrical equipment. The procedures and documents reviewed are discussed in other sections of this report. This inspection took place over a two week period of time due to the licensee's planned outage tasks.

During the entrance meeting on November 16, 1987, APCO provided an overview of the Farley EQ Program, organization, procedures, and EQ

documentation. The licensee indicated that changes had been made in the EQ program to be more consistent with NRC positions. The licensee also discussed their commitments which were documented in their letter to NRC dated September 30, 1987 and the Confirmation of Action letter from NRC to APCO dated October 6, 1987. A copy of the licensee's handout is included in this report as Attachment A. The inspection team noted that significant improvements had been made in the licensee's EQ Program compared to previous inspections. Specifically, the licensee has made improvements in the EQ central files making them auditable or in some cases more auditable. In addition, the licensee has corrected significant omissions from the EQ master list and has revised the EQ program to require upgrading of replacement parts in accordance with 10 CFR 50.49(1). A number of significant deficiencies were identified, and the inspection team concluded that the licensee implemented a very marginal program in an attempt to meet the requirements of 10 CFR 50.49.

A more detail review of maintenance; IE Notices and Bulletins; procurement; EQ master list; EQ files; and walkdown results are discussed in the paragraphs that follow.

a. EQ Maintenance Program

The licensee has undertaken a thorough review of the EQ Maintenance Program at Farley due to deficiencies identified by a NRC inspection team and other problems identified in the industry relating to EQ. The licensee reviewed plant maintenance records and procedures, and performed walkdowns of EQ equipment to determine if the maintenance program at Farley was adequate to maintain the qualified status of EQ equipment. The results of these reviews identified that several deficiencies existed in the implementation of the EQ maintenance program at the Farley Plant and that not all required EQ maintenance had been performed.

For example, the review of plant records (i.e., maintenance work requests (MWRs) and purchase orders) identified approximately 10,000 items (7,000 for Unit 1 and 3,000 for Unit 2) for which EQ qualification may not have been maintained. At the time of the inspection, approximately 60% of the items had been reviewed and 22 discrepancies had been noted. Most of the discrepancies that have been identified involved the purchase and use of commercial grade (Code C) components in EQ applications (for more discussion on the use of Code C items in EQ applications see paragraph 6.e.).

Also found during the review was that lubrication requirements were not being met for all equipment and an evaluation had not been performed to allow a different lubrication schedule than that which was specified by the vendor. Subsequently, the licensee performed an evaluation to show that qualification was not jeopardized by the deficiency. To prevent recurrence, the licensee has included preventive maintenance on EQ equipment into the Technical Specifications Surveillance Program. Procedures have been written, but

all have not been approved and issued. These changes will require future Preventative Maintenance (PM) on EQ equipment to be scheduled and performed as required by their surveillance test program.

Some of the deficiencies identified during walkdowns which were also considered caused by inadequate maintenance are: (1) use of unqualified V-type tape splices on numerous EQ components; (2) Raychem splices not installed per vendor instructions; (3) use of unqualified jumper wires; (4) use of unqualified lubricants; (5) use of unqualified limit switch on limitorque; (6) exceeding replacement schedules for ASCO solenoid valves; (7) failure to install T-drains on certain limitorque motor operated valves; and (8) failure to install ASCO solenoid valves in accordance with vendor recommendations.

The licensee is currently taking steps to correct all maintenance concerns prior to restart of Unit 2 in accordance with commitments made to NRC.

b. Inspection and Enforcement Notices (IENs) and Bulletins (IEBs)

The NRC inspectors reviewed and evaluated the licensee's activities concerning the review of EQ related IENs and IEBs. The inspectors review included examination of procedures and EQ documentation packages relative to Information Notices and Bulletins. The inspectors concluded that the licensee does have a system for distributing, reviewing, and evaluating IENS and IEBs relative to equipment within the scope of 10 CFR 50.49. A weakness observed in the licensee's program is that the IENs and IEBs are not addressed in the component EQ files.

The specific IENs and IEBs examined are IENs: 84-47, 86-53, 86-03, 84-90, 84-68, 84-78, 83-72, 80-08, 82-03, 84-57, and 85-47.

c. Environmental Qualification Master Equipment List

The licensee is required to maintain an up-to-date list of equipment that must be qualified under 10 CFR 50.49. The list for FNP was prepared as described in their SER dated December 13, 1984. The list was based on a review of the design and as-built documentation, the Final Safety Analysis Report (FSAR), Technical Specifications, Emergency Operating Procedures and flow/electrical diagrams to determine the systems and components required to perform the functions of reactor trip, containment isolation or accident mitigation and exposed to harsh environmental conditions. Other equipment evaluated included nonsafety-related electrical equipment whose failure under postulated harsh environmental conditions could prevent satisfactory accomplishment of safety functions. This list is a controlled document at FNP and is updated in accordance with FNP-0-AP-8.

To assess the completeness of the Master List, a spot check of several systems and components was performed. Specifically, flow diagrams D-175039, D-175038 and D-175041 for the Low Head Safety Injection and High Head Safety Injection System were reviewed to determine the system components, such as Motor Operated Valves (MOVs), Solenoid Valves (SOVs), motors, and instrumentation that are required to bring the plant to a safe shutdown condition. In addition, required auxiliary support system components such as HVAC and CCW were reviewed to verify necessary components were included on the Master List. No deficiencies were noted during this review. One item of concern to the team during the course of the review, however, involved the accumulator discharge valves, MOVs E21MOV8808A, B, and C. The team noted that these valves were located below the submergence level and had brakes installed on the motor operators. The team was concerned that the MOVs were not qualified to operate under these conditions. The licensee reported, however, that although the valves were included on the Master List - the valves were not required to operate under all postulated accident conditions and in fact were locked open with power removed during normal plant operation.

d. Cable Identification

During the plant walkdown inspection the inspectors identified cable ID numbers to the licensee so that traceability could be established to the cables identified in the EQ Master List. In all but one case the cable was able to be traced back from the installation records to the material receiving reports. The one case where traceability could not be traced back to the receiving report was due to lack of reel number identification on the pull card. The licensee could, however, establish how the cable was procured by reviewing the receiving records for all of that type of cable. No further questions were asked in this area.

e. EQ Equipment Replacement and Spare Parts Procurement

Procedure FNP-0-M-060, "Environmental Qualification Program Description," describes the environmental qualification program for safety related electrical equipment installed in potentially harsh environments, and establishes requirements for procurement of equipment and components within the scope of 10 CFR 50.49. Implementation of the procurement requirements for EQ assemblies and components is delineated in procedure FNP-0-ETP-4108, "FNP Environmental Qualification Program Implementation." Paragraph 7.0 of this procedure delineates procurement controls necessary to assure that applicable regulatory requirements are included in procurement documents. Requirements for up-grading EQ equipment in accordance with 10 CFR 50.49(1) have been delineated in writing. Additionally, commercial grade parts and materials procured for EQ applications will be dedicated for safety-related use in accordance with the requirements of 10 CFR 21.3(c-1).

Administrative process for the procurement of EQ equipment, and control of the associated procurements, is described in procedure FNP-0-AP-9, "Procurement and Procurement Document Control." The procurement process ensures that the EQ requirements of procured equipment are included as part of the QA Program requirements. As such, QA documentation is required to include either a certificate of compliance to the specified test report from the vendor or a reference to the appropriate documents which indicate that the Manager of Nuclear Engineering and Licensing approves the use of another qualification method for the component. In addition, the test report number and revision date are required to be stated on the certificate of conformance.

QA Review Codes are assigned to all procured equipment. These codes are based on the importance to nuclear safety or system operation of the equipment; the complexity of design or manufacture; cost, reliability, or design; or availability as a stock or special purpose item. QA Review Codes are documented on the Purchase Order. Definition of the QA Review Codes i Code A (Safety-Related); Code A (Non-safety-Related); code non-safety-Related); Code D (Nonsafety- Related); and Code E (Non-safety Related). Responsibilities for assigning QA Review Codes have been delegated to the Supervisor of the group requisitioning the material, with review and concurrence by the Manager, Performance and Planning, or his designee.

Pursuant to the review of the QA Review Codes it was determined that the application of these codes for the procurement of 10 CFR 50.49 categories (b)(1),(b)(2) and (b)(3) equipment was not addressed. Discussions with licensee management revealed that all EQ equipment are procured as Code A (Safety-Related). Spare parts for EQ assemblies may be procured as Code A (Safety-Related) or Code E (Non-safety-Related). The procurement of spare parts as Code E (Non-safety-Related) is a commercial grade procurement with the potential for degradation of the EQ status of equipment in the absence of a commercial grade dedication process. The inspectors were informed that procedure FNP-0-AP-9 will be revised to more clearly define the application of QA Review Codes for the procurement of EQ equipment.

The following purchase orders (P.O.s) were reviewed to verify inclusion of EQ requirements in the procurement documents: P.O. No. QP-1481 dated February 26, 1987, P.O. No. QP-1132 dated September 8, 1986, P.O. No. QP-2106 dated November 3, 1987, P.O. No. QP-1576 dated April 7, 1987, P.O. No. QP-1544 dated March 26, 1987, P.O. No. QP-1393 dated January 15, 1987, and P.O. No. QP-1164 dated September 18, 1986. Deficiencies identified in the procurement documents reviewed and root cause of the identified deficiencies are discussed below.

(1) Procurement of Commercial Grade Components for EQ Applications

The licensee's accepted QA program FNP-FSAR-17, Section 17.2.3, states that design changes and/or modifications during plant operations will be handled in a manner which will comply with the requirements of ANSI N45.2.11-1974. Additionally, Section 17.2.4 states that procurement documents will delineate the quality program requirements to be met by the contractor and will provide for the control of procured items in compliance with the requirements of ANSI N45.2.13-1974.

Review of the quality implementing procedure FNP-O-AP-9, Revision 12, revealed that measures had not been established to assure that applicable regulatory requirements are met, and design bases are preserved during the procurement and use of QA Review Code C (Non-safety-Related) and QA Review Code D (Non-safety-Related) items in EQ applications. Equipment and spare parts classified as QA Review Code C are commercial grade items that require dedication prior to use in EQ application, pursuant to 10 CFR 21.3 (C-1). Additionally, this application is a design change which is required to be controlled in accordance with the requirements of ANSI N45.2.11-1974. This standard requires that design changes shall be subjected to design control measures commensurate with those applied to the original design, and be approved by the organization that performed the original design, unless the licensee designate another responsible organization.

ANSI N45.2.13-1974 delineate requirements for control of procured items. Paragraph 10.2.1, requires the procurement document to specify the method of acceptance of an item; and where a Certificate of Conformance is used the certificate should identify the specific procurement requirements met, such as codes and standards. Paragraph 9.2.1.5 of procedure FNP-O-AP-9, Revision 12, establishes requirements for imposing 10 CFR 21.3 (C-1) on safety-related procurements. Measures had not in fact been established to impose the requirements of 10 CFR 21.3 (C-1) on material procured as QA Review Code D (Non-safety-Related). Materials procured to this QA Code level are therefore commercial grade and require dedication prior to use in EQ applications.

A dedication process involving the performance of an up-front engineering evaluation of the items critical attributes; its ability to function in the intended safety-related application; and a determination of the acceptance parameters required for verification of those critical attributes had not been established by the licensee. Procedure FNP-O-AP-9, Revision 12 was subsequently revised to establish requirements for a Dedication Program. However, the root cause of the deficiencies identified with the following POs is programmatic and they are examples of the deficiencies that existed in the EQ procurement program. Failure to assure that applicable regulatory

requirements, design bases, and other requirements necessary to assure adequate quality are correctly translated into specifications, drawings, and instructions is identified as a violation (50-348, 364/87-30-01). This is considered to be another example of a previously identified violation (50-348, 364/87-11-03).

P.O. No. QP-1481 (QA Review Code D) was issued for the procurement of States type ZWM terminal blocks. The controlling procedure for this procurement was FNP-0-AP-9, revision 12 (Issue Date September 2, 1986). This procedure defined Code D as a non-safety-related procurement of an item where current license requirements are applicable to the part, or special vendor documentation and verification of vendor's QA program is deemed necessary. The requirements of 10 CFR 21 were not imposed on this purchase order. Acceptance of the items by the licensee was by receipt inspection with a Certificate of Conformance that noted the terminal blocks had been manufactured using vendor's standard QA/QC procedures for Class 1E terminal blocks. However, specific supplemental documentation, such as material certificates or reports of tests, was not requested in the purchase order nor were they provided by the vendor.

The reactive inspection the week of September 14-18, 1987, for followup of licensee identified unqualified taped splices revealed the use of commercially procured tapes for EQ applications. Purchase Order No. B4541 (QA Review Code C) was issued on September 30, 1986 for procurement of miscellaneous electrical supplies including Okonite T-95 insulating tape and No. 35 overlay tape. An engineering determination of the items critical attributes, ability to function in the intended safety-related application, and the acceptance parameters for verification of those critical attributes were never performed by the licensee. An assessment of the impact on EQ status pursuant to receipt of Okonite's letter to Mr. Robert Culp, dated November 11, 1986, was never performed. This letter gave a qualified shelf life for T-95 tape as 18 months, and for No. 35 tape as 24 months. The controlling procedure for this procurement FNP-0-AP-9, revision 12, did not establish requirements for dedication of commercially procured items prior to use in EQ applications.

Licensee management has created a task force that is presently reviewing old maintenance work orders to assess the impact of past maintenance activities on equipment EQ status. The following are examples of licensee identified deficiencies discovered during this ongoing effort.

> Installation of unqualified limit switch and torque switches in motor operated valves discovered during walkdown in response to IEN 86-03. (Procured Code C)

Installation of Raychem Breakout kits in NAMCO Limit Switches for Chico Seal (Procured Code D without supporting documentation).

Installation of G.E. O rings in penetrations (Procured Code C, not upgraded for EQ applicable).

Installation of metal O rings in Conax Penetration (Procured Code C).

The above deficiencies are symptomatic of a programmatic breakdown of procurement activities in addition to weaknesses in the maintenance area. Other maintenance activities are addressed in paragraph 6.a. of the report.

(2) Failure to Upgrade Equipment During Procurement Activity

An example of failure to upgrade during procurement is the purchase of Snap-Lock limit switches. P.O. No. QP-1164 (QA Review Code A) was issued for the procurement of environmentally qualified Snap-Lock limit switches on September 8, 1986. The switches were procured as safety-related equipment, and the provisions of 10 CFR 21 were imposed on the purchase order. However, the P.O. specified that the Certificate of Compliance should certify compliance with ACME-Cleveland Development Report No. QTR/105 Revision 4, dated January 8, 1984. This report establishes environmental qualification (EQ) to NUREG 0588 Category II. Contrary to the requirements of 10 CFR 50.49(1) the equipment was not upgraded to 10 CFR 50.49 and reasons to the contrary for not doing so were never documented. The controlling procedure for procurement activities, FNP-O-AP-9, revision 12, did not establish requirements for procurement of upgraded items. This failure of the licensee procurement program to establish measures that ensure upgrade of equipment in accordance with requirements of 10 CFR 50.49(1) is identified as a violation (50-348, 364/87-30-02). This is considered to be another example of a previously identified violation (50-348, 364/87-11-03).

f. QA/QC Interface

The supervisor, Safety Audit and Engineering (SAER), and his staff conducts an audit program of safety-related activities for Farley to verify that such activities are in compliance with the Operational Quality Assurance Program (OQAP). The objectives of the audits are to determine that the OQAP has been developed in accordance with applicable requirements; to verify by evaluation that the program has been implemented; to assess the effectiveness of the OQAP; to identify program noncompliances; and to verify resolution of deficiencies and noncompliance.

The SAER group onsite has conducted audits of various performance areas of the EQ program. Review of five audit reports covering a time span from August 8, 1986 to July 7, 1987, revealed the following deficiencies:

- Inadequate specification of EQ requirements on purchase orders.
- Inadequate delineation of EQ requirements in preventive maintenance procedures.
- Improper maintenance activities performed on EQ equipment.
- Failure to perform vendor recommended maintenance for EQ equipment in storage.

The scope of the deficiencies related to maintenance practices were documented as being generic to the electrical and mechanical, and the Instrumentation and Control (I&C) shops. Corrective action has not been completed for some deficiencies. However, developed corrective action plans for the other identified deficiencies appeared to be adequate.

The SAER staff conducted an audit of the Farley EQ program during October 20 - November 15, 1983 and identified three non-compliances. The audit findings are documented in the report dated November 15, 1983. The first non-compliance described on Corrective Action Report (CAR) No. 829, identified a deficiency in the EQ Program documentation as required by 10 CFR 50.49(f) and (j). The CAR dated December 22, 1983, for this identified deficiency stated that all required documentation, i.e. those required to make auditable files, will be on site by January 1984. Objective evidence for completion of this corrective action by January 1984 was not presented. The third non-compliance described on CAR-831, identified a deficiency concerning containment cooler fan motors and whether or not they were approved models based on the Acceptable Test Report List. The developed corrective action plan for this deficiency appeared to have been adequate.

Nonconformance FNP-NC-48-83/19(8)-CAR-830, identified a deficiency that involved failure of the design change program to identify vendor technical manuals and vendor drawings as requiring update upon implementation of a plant modification. The licensee's Preventative Maintenance (PM) program for EQ equipment requires that appropriate vendor service manuals be referenced for the performance of PM activities. Failure of the design program to identify vendor technical manuals and shop drawings that should have been updated resulted in the PM program referencing incorrect vendor documents. The scope of the problem was defined as generic to all Production Change Notice (PCN) work involving both EQ and Non-EQ components.

Estimated completion of corrective action for this deficiency was documented on the Corrective Action Report (CAR) form as April 1, 1984. Further evaluation of the problem by licensee management

resulted in CAR-830 being revised on July 7, 1984, and an estimated completion date of January 5, 1985 was given for CAR 830, Revision 1. Administrative controls were also implemented to assure that environmentally qualified components would not be degraded by PM activities. These controls are delineated in administrative procedure FNP-0-AP-52. The effectiveness of these controls are in doubt, however, because the SAER staff in audit report dated October 10, 1986, identified a deficiency wherein the controls delineated in this procedure were not being followed. CAR 1222 was prepared to address this deficiency.

Pursuant to further evaluation of the problem by licensee management, CAR 830, Revision 1 was revised on August 27, 1984, and an estimated completion date of July 1, 1985 was given for CAR-830, Revision 2.

The inspector determined that CAR-830, Revision 2, with an initial estimated completion date of July 1, 1985, was subsequently given approved estimated completion dates of January 1, 1986; July 1, 1986; December 15, 1986; and January 1, 1987. A more recently requested estimated completion date of March 3, 1988 was approved on October 10, 1987 by the Plant Manager.

The apparent lack of timeliness in correcting a significant deficiency identified in 1983 and its potential for degrading EQ equipment because of incorrect guidance contained in the PM program was discussed with licensee management. In response, licensee management referred to generic letter 83-28, and their actions taken to meet the requirements delineated in this letter. Previous correspondence from the licensee was reviewed regarding generic letter 83-28, Item 2.2, Equipment Classification and Vendor Interface (Programs for all Safety-Related Components), and the Safety Evaluation Report (SER) transmitted to Mr. R. P. McDonald, Senior Vice President, in NRC letter dated December 12, 1986, from Edward A. Reeves, Project Manager. The SER stated for generic letter 83-28, Item 2.2.2, that the lack of a formal vendor interface with each vendor of safety-related equipment, or a program to periodically contact vendors of safety-related equipment, does not relieve the licensee of his responsibility to obtain appropriate vendor instructions and information where necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service, and to ensure adequate QA in accordance with 10 CFR 50 Appendix B.

Another example of untimely corrective action and failure of the SAER staff to effectively implement the QA program is provided by CAR 1251. This CAR describes a deficiency found in November 1986, where the preventive maintenance of EQ motor operated valves was found to be inadequate. The root cause was determined to be lack of detail in procedure FNP-0-MP-28.137. The corrective action, which involves revising the procedure, has been given an estimated completion date of March 31, 1988.

The licensee's accepted QA Program requires that conditions adverse to quality be promptly identified and corrected. In the case of significant conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. Examples of non-compliances identified by SAER and addressed in this section of the report have not been corrected in a timely manner. Specifically, failure to promptly correct the deficiency identified in November 1983, wherein vendor technical information and shop drawings were not upgraded for implemented PCNs, and which created conditions adverse to quality such that the PM program contained incorrect guidance for maintenance of EQ equipment, is identified as violation 50-348, 364/87-30-03.

g. EQ Modification Program

Procedure FNP-0-ETP-4108, "FNP Environmental Qualification Program," establishes requirements for design changes that add, delete, or alter environmentally qualified equipment. Responsibilities have been assigned to off-site engineering organizations to ensure that Production Change Notices (PCNs) impacting EQ equipment address Farley specific environmental conditions, maintenance, installation configuration, submergence level, and interfaces with other components. PCNs prepared for design changes to EQ equipment are required to be completed in accordance with the requirements of ANSI N45.2.11-1974, "QA Requirements for the Design of Nuclear Power Plants."

The controlling procedures for design changes are FNP-0-AP-8, "Design Modification Control," revision 12, and GO-NG-11, "Design Change and Design Control," revision 5. These procedures were reviewed to assess the adequacy of licensee control of EQ requirements in the modification program. The documents indicate that the General Office Nuclear Support Group is responsible for administration of the offsite design development program and for processing production change requests (PCRs) in accordance with applicable portions of procedure GO-NG-11. This procedure establishes requirements that ensure EQ program considerations are included in the design effort from initial identification of a station problem that resulted in the preparation of a PCR. Additionally, responsibilities have been assigned to ensure that completed design change packages have incorporated EQ program requirements. The Production Change Notice (PCN) Review Checklist is used to verify the adequacy with which EQ requirements have been included in the design process.

Procedure FNP-0-AP-8, paragraph 9.1 and 9.2, assigns engineering evaluation and review responsibilities to the Plant Modification Manager and his staff. It was determined, however, that training in the requirements of the Farley EQ program had not been given to members of this group. This deficiency is addressed in paragraph 6.h. of this report where it is identified as a violation.

Production Change Packages No. B84-2-2624, and B84-2-2618 which involved the change-out and installation of EQ electronic differential pressure transmitters to meet the requirements of Regulatory Guide 1.97 were reviewed. Associated engineering requisition for procurement of the instruments and completed maintenance work request for their installation was also reviewed. No EQ related deficiencies were identified.

h. EQ Personnel Training

Procedure No. FNP-0-M-060, Environmental Qualification Program Description, Revision 0, assigns responsibility to the Farley Nuclear Plant Training Center for providing EQ and special training to craft and maintenance personnel working on EQ equipment or components. Discussions with the Training Manager and review of procedure FNP-0-M-015, "FNP Master Training Plan," revealed that EQ training was not specifically addressed within the training program. The inspector was informed that EQ training is an integral part of the overall training provided to plant personnel. Pursuant to an INPO audit in June 1986 which identified deficiencies in the EQ training of craft personnel, licensee management has enhanced the EQ training provided to this group. INPO accreditation of the Electrical and Instrumentation and Control (IEC) training programs was received by Farley in late 1986.

The inspector reviewed Attendance Sheets, Lesson Plans, and Examination Grade Sheets of four persons in both the Electrical and I&C groups to verify incorporation of environmental qualification requirements within the training program. No deficiencies were identified in the licensee's program to provide EQ training to Electrical and I&C craft personnel.

Responsibilities for implementation of various activities associated with the EQ program has been assigned to the QC Engineer. Paragraphs 3.2.3 and 9.0 of procedure FNP-0-ETP-4108 delineate these responsibilities. Discussions with the QC Engineer and other members of this group revealed that training in the requirements of the EQ program had not been provided. Additionally, review of objective evidence in the form of training attendance sheets corroborated this finding. Licensee management's response to this identified deficiency was that the Technical Staff and Management Training Program will be revised to include requirements of the Farley EQ program.

Subsequent discussions with the on-site Plant Modification group identified similar deficiencies in EQ program training.

Licensee accepted QA program, FNP-FSAR-17, Section 17.2.2, states that the objective of the Operational QA Program is to provide adequate assurance of quality during operation of FNP by complying with the provisions described in the OQAPM and procedures listed in the OQAPIL which satisfy the criteria of 10 CFR 50 Appendix B.

Criterion II of 10 CFR 50 Appendix B states that the QA program shall provide control over activities affecting quality to an extent consistent with their importance to safety. The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained. However, at the time of the inspection licensee management had not provided training in the requirements of the EQ Program to the QC Engineer and his staff, nor to members of the plant modification group. This failure to provide indoctrination and training of personnel assigned responsibilities for implementation of various activities of the EQ Program is identified as an unresolved item 50-348, 364/87-30-04.

i. EQ Documentation Files and Walkdown Items

The required qualification level for the Farley 1 and 2 original 10 CFR 50.49 scope equipment is the DOR Guidelines or NUREG 0588, Category II. Replacement equipment purchased after February 23, 1983 is required to meet the requirements of 10 CFR 50.49. The EQ Documentation at Farley is composed of Master Equipment List, Environmental Profiles and the Central File. The Central File contains the EQ Test Reports, EQ Evaluation checklists, system component evaluation worksheet (SCEW) and support documentation.

The licensee's generic EQ files were reviewed in detail against the requirements to determine if qualification had adequately been established and that records were maintained in an auditable fashion. As discussed previously the licensee had revamped their EQ files to make them auditable and in some cases more auditable.

The NRC inspectors examined files for approximately 32 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 items were selected in advance by the inspection team and identified to the licensee during the entrance meeting.

The files were examined to verify the qualified status of equipment within the scope of 10 CFR 50.49. In addition to comparing plant service conditions with qualification test conditions and verifying the bases for these conditions, the inspectors 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 (e.g., insulation class, materials of components of the equipment, test configuration compared to installed configuration, and documentation of both), (3) evaluation of adequacy of test conditions, (4) aging calculations for qualified life and replacement interval determination, (5) effects of decreases in insulation resistance on equipment performance, (6) adequacy of demonstrated

accuracy, (7) evaluation of test anomalies, and (8) applicability of EQ problems reported in IEBs/IENs and their resolution.

The aging calculations were not reviewed because they were not available at the site and the team was told that they would have to be reviewed at Bechtel, Gaithersburg, Maryland. In addition, the performance characteristics or accuracies were not specified in the files. The files would reference a Westinghouse WCAP-11658 dated November 13, 1987, which was the basis for instrument accuracy calculations. To evaluate the Westinghouse WCAP on instrument accuracy the licensee had to have representatives from Westinghouse come to the site on November 18, 1987.

This meeting resolved all concerns the team had regarding the calculations performed to develop Emergency Procedures and Instrument Setpoints. It identified another concern about the values provided to Westinghouse for terminal block (10 E7 ohms) error contributions in the loop accuracy calculations. Review of the files for GE Penetrations, and States Terminal Blocks did not identify IR values which were measured during the LOCA test. These concerns are discussed further under the file reviews for Penetrations and Terminal Blocks.

Excluding the fact that no aging calculations were reviewed and performance data was not included on the SCEW sheets, the files were auditable and documented qualification of the equipment, except as described in the findings below. These comments on both EQ records and walkdown items are considered the most significant findings.

(1) GEMS Delavel Level Transmitters

During the review of the GEMS level transmitters qualification file, model XM-36495, it was noted that thermal and radiation aging effects were not evaluated for all susceptible materials. Specifically, the lead wires, terminal block and resistors were not evaluated for these transmitters. The file stated that it was not necessary to evaluate the effects for those materials since the materials were immersed in silicone oil which would protect them from age related affects. It was noted during the walkdown of the wide range sump level transmitters in Unit 2 that there was no silicone oil in the junction box as required. The assumption that the materials won't experience these affects is invalid based on our physical inspection. This item was left as unresolved and is listed as Unresolved Item 50-348, 364/87-30-05, Inadequate Materials Evaluation for GEMs Level Transmitters.

The licensee found wide range and narrow range containment sump level transmitters, on both units, in a configuration that was not considered qualified by existing test data. Specifically, one or more of the GEMS type level transmitters did not contain

the required silicone oil in the housing, the conduit opening was not sealed and/or wires were terminated using an unqualified V-type tape splice configuration. This is considered a violation of 10 CFR 50.49 and it is identified as Violation 50-348, 364/87-30-06.

(2) Joy Manufacturing Containment Fan Motors

During the walkdown of Unit 2 equipment inside containment the team noted that plastic shipping caps were still installed in the unused conduit port of the auxiliary conduit box for the Post-Loca Mixing fans and the Hydrogen Dilution fans. There was a concern that the plastic caps would melt during the temperature extremes experienced during a Design Basis Accident and allow a direct path for moisture to enter the motor. However, during the course of the inspection the licensee was able to produce additional information from the vendor that verified that the fan motors would perform their function during the Design Basis Accident due to the specific FNP configuration and location.

(3) Limitorque Motor Operators

During the course of the inspection PCN 86-1-3760 was reviewed. This PCN was generated to resolve concerns detailed in IEN 86-03, specifically the use of unqualified internal jumper wires in limitorque motor operated valves (MOVs). Coincident with the internal wiring inspection/replacement required by the PCN other items of MOVs were checked per an approved check sheet. Some items of concern noted by the team during the review of the completed walkdown sheets which were performed for Unit 1 during October 1986 include the following:

- T-drains not installed at low point for 15 MOVs
- Presence of one MOV inside containment with limit switch frame housing constructed of aluminum
- Use of unidentified terminal blocks for power leads in Limitorque MOVs

The absence of T-drains was also noted during the walkdown inspection conducted the week of November 2, 1987. Specifically, MOVs 3046, 3660, 3441A, 3441B and 3872A were configured for T-drains but did not have them installed. In addition the MOV was installed with the limit switch compartment on the same horizontal plane as the motor with top entry conduit into the switch compartment for both the power and control cables. During the course of the inspection the team was presented with additional information by the licensee to justify their installed configuration. The team was satisfied with the

information presented for these MOVs which had a short term operating requirement. However, for those MOVs which have a long term operating requirement, be it valve position indication or valve repositioning the team was not satisfied. The team was concerned that the long term affects of moisture intrusion were not adequately addressed as the tested versus installed configuration with respect to orientation and conduit system differed and the referenced test without T-drains had a total test duration of seven days. This item is considered to be a Violation of 10 CFR (50.49) and is identified as Violation 50-348, 364/87-30-07, Lack of T-Drains in Limitorque Motor Operated Valves.

The walkdown check sheet for MOV Q1E11MOV8811A dated October 9, 1986, indicated that the limit switch frame housing was constructed of aluminum. Aluminum is not qualified for applications where it can be subjected to a caustic spray environment as evidenced in Limitorque report 600198 where a limit switch frame housing constructed of aluminum corroded and caused the limit switch to fail less than 24 hours into the test. The licensee pointed out to the team that they became aware of this problem during a recent review of the walkdown data and had initiated MWR 167476, dated November 3, 1987, to replace the switch during the upcoming refueling outage. In addition, an administrative LCO was written for this valve on November 19, 1987, to ensure that the valve remained in its required safety position. This unqualified component is in violation of 10 CFR 50.49 and is listed as Violation 50-348, 364/87-30-08, Use of Unqualified Limit Switch in Motor Operated Valve.

The walkdown check sheets also indicated the use of terminal blocks for some of the power leads. Some were identified by just the manufacturer's name, i.e. Buchanan, with no model number or by just the color, i.e., black. The equipment qualification file for the Limitorque MOV's file numbers 23A, 23B and 23C did not specify which terminal blocks were acceptable for use in Limitorque MOVs. During the inspection the licensee stated that terminal blocks qualified by report B0119 were acceptable for use. However, there was no evidence that the licensee had reviewed this report to determine its acceptability nor had they verified that the terminal blocks installed in their MOVs were one of the models tested in the B0119 report. This item is identified as Unresolved Item 50-348, 364/87-30-09, Use of Unidentified and/or Unqualified Terminal Blocks in Limitorque Motor Operated Valves.

(4) File Number 30A, B - Rosemount RTD, Model 176K and F.

This item is required to be qualified to a temperature of 378°F for accident conditions at Farley. However, the test report

demonstrated qualification to only 365°F. The file referenced a Bechtel mechanical calculation no. 23.4. This calculation is suppose to show that there will be a thermal lag, and therefore this item will not reach 378°F. This calculation was not available at the site for review. The licensee was also requested to provide accuracy requirements for this item. The licensee provided the accuracy requirements of the test plan and the test results, and stated that the performance data is contained in the Westinghouse W-CAP and is used in the calculation of loop accuracy.

The file adequately demonstrated qualification for all other requirements.

(5) File Number 10A - Conax Containment Air Temperature Sensors, Model 7D-37-10000-01.

This file contained information that showed this item to be qualified for its application at Farley (i.e., qualified by similarity to a Conax RTD).

(6) File - Westinghouse Hydrogen Recombiner Type A.

No deficiencies were found in this file.

(7) File Number 14C - Foxboro Junction Box

This junction box was qualified in conjunction with a Foxboro transmitter. However, this file indicates that it is being used with a Barton transmitter, therefore the licensee was requested to show that the amount of leakage current measured during the qualification test was sufficiently low as not to affect the accuracy of the Barton transmitter. The licensee provided information that showed that the terminal block, as tested, displayed a leakage current of 1.9 x 10-6 amps and agreed to add this information to the file.

(8) Okonite Okozel Instrument Cable, File 27

The qualification basis was 10 CFR 50.49. Qualification was based upon Okonite Report #NQRN-4A, Revision 1, dated March 31, 1987, "Qualification of Okozel Insulation for Nuclear Plant Service." Test conditions adequately enveloped the required plant profile, with margin, though credit was taken for an analysis per Bechtel Mechanical Calculation No. 23.4 which provided a basis of 317°F peak cable surface temperature. Similarity was not addressed in the file. The licensee was able to show that the samples tested were identical to plant installed cables, though this discussion was not included in the file. The reviewer suggested that a summary explanation be provided. Supplement #1 to the EQREC provided a summary of a

licensee trip report which included verification of raw data which was not available from Okonite. This fact, and the results, were not clearly addressed and cross-referenced in the file. The licensee stated that the files were currently being upgraded in a generic fashion to more completely document similarity. A number of questions regarding incomplete or missing file documentation were posed and resolved. Beta radiation was not specifically addressed; however, there was more than adequate gamma dose margin to negate this issue. No findings were identified.

(9) Okonite Low Voltage FMR Power and Control Cable, File 26B.

As with the instrument cable, test parameters enveloped the plant conditions with the provision for using 317°F peak cable temperature. Qualification was based upon Okonite Report No. NQRN-2, Revision 6, dated February 27, 1987, "Qualification of Okonite-FMR Insulated cables for Nuclear Plant Service." As with File #27, the raw data was not available in the file and is apparently proprietary. The licensee physically inspected (audited) and verified the data which is summarized in the test report. Similarity was not clearly addressed and the licensee provided a response to trace the cable identification and to show that the samples tested were identical to plant cables. Insulation resistance readings taken during the LOCA were only marginally acceptable. However, all stated test acceptance criteria were met. These low IRs were used in Bechtel Calculation No. E-87 for instrument loop accuracy calculations and for input to a Westinghouse Setpoint Analyses (WCAP-11658). No findings were identified.

(10) ITT Supernate type SIS 600 Volt Wire.

The qualification basis was 10 CFR 50.49. This cable is exposed to a relatively mild environment (104°F, 14.7 psia, 6.7 Mrad gamma) in the auxiliary building. The Isomedix Report No. 1179-01 more than adequately exposed identical cable with good results and no anomalies. No findings were identified.

(11) Raychem Flamtrol-Insulated 1000 Volt Control Cable - File 28A.

The qualification basis is NUREG 0588, Cat. II. Qualification was based on "Raychem Flamtrol Qualification to IEEE Std. 383," dated March 15, 1976, and Appendix XI to that report: Franklin Report F-C4033-1, January 1975. Time did not allow a complete review of this package, though the documentation and technical basis appeared complete. No findings were identified.

(12) Brand Rex SIS Switchboard Wire, Ultrol #T-61057, File 7C

The qualification basis is 10 CFR 50.49. The plant environmental conditions were adequately enveloped by the stated test conditions. The file referenced Franklin Test Reports F-C5120-1, -3, and -4. Report #F-C5120-1 was missing from the package. The licensee reported that the master EQ file includes it and a copy was provided for review. Performance (insulation resistance) was monitored during all phases of testing and found acceptable. A Bechtel letter was referenced to support the similarity analysis but was not in the EQ file. Insulation (XLPE) and jacketing (hypalon) for both tested and installed cable is identical but part numbers were different and thicknesses not clearly addressed. The Bechtel letters were provided for review and they adequately addressed that installed (30 mil XLPE) and tested (20 and 30 mil XLPE) had similar thickness insulation. Aging was based on a derived value for activation energy of 2.21 eV. When questioned, information was provided which gave a good discussion of the methods used and understanding of the use of this relatively high value. No findings were identified.

(13) Brand Rex 300 Volt Instrument Cable, File 7B.

The qualification basis was 10 CFR 50.49. The plant profile was enveloped and acceptable performance during testing was verified. Qualification was based upon Franklin Report No. F-C5120-4. As in File 7C, an activation energy of 2.22 ev was used. The response discussed the highly conservative service temperature of 90°C and that acceptable qualified life could be shown for activation energies as low as 0.996 eV. The licensee committed to revising the file to include this discussion. Beta radiation was not discussed and a reference to Bechtel drawing No. A-506150, Rev. 0, "Beta Radiation Reduction Methodology" was missing. A copy was provided and briefly reviewed, but not discussed in detail with the licensee. Qualification was based on sample 5B of the test report, which was #16 AWG, 7 strand, 20 mil XLPE insulated cable. The referenced codes Y35 and Y36 cables given on the SCEW sheet were questioned as to similarity. A response was provided which documented the traceability and certification of the cables (per APCO P.O. #QP-0417). No findings were identified.

(14) Raychem Stilan Cable, File 28A.

The qualification basis was the DOR Guidelines. The test profile easily enveloped the plant conditions, but a significant number of insulation resistances were reported only as "less than" some value (apparently the low end of the instrument range). These anomalies were discussed in the test report, but no additional "good" data was included in the file. The utility was questioned about Stilan cable usage and they responded that it is used in instrument circuits. Sufficient time was not

available to discuss the issue further so it was left as an unresolved item at that time. At the follow-up meeting on November 25, 1987 in the Region II office, the licensee stated that they have replaced or will replace this cable. This item is still unresolved and will be tracked as Unresolved Item 50-348, 364/87-30-10.

(15) States and General Electric Terminal Blocks, File 34 and No File.

The inspectors reviewed the file for States terminal blocks used inside containment in instrumentation and control circuits. The qualification basis was NUREG-0588, Category II. Plant personnel indicated that the General Electric terminal blocks were included in the General Electric penetration file, but the reviewer could not find any evidence that terminal blocks were included in the steam testing of the penetrations, and the licensee later agreed with this position. The only reference to General Electric terminal blocks was in the licensee's response to E.Q. Action Items 018 and 067 pertaining to terminal blocks and loop accuracy requirements associated with IEN 84-47. The action items were identified by the licensee on October 27, 1987, and resolved to the licensee's satisfaction on November 15, 1987. The licensee had performed a type test of the installed States blocks to qualify them for use in control circuits, but no insulation resistance (IR) information was obtained in the test.

To qualify the blocks for instrumentation circuits (relative to E.Q. Action Items 018 and 067), the licensee chose to cite a Conax test report on Connectron NSS3 terminal blocks and qualify both the States and General Electric blocks by similarity. The similarity analysis was based on center-to-center spacing of terminal block poles, whether a barrier existed between poles, the height of the block with the barrier, and the width of the block with the barrier. The analysis stated that "all of the installed instrument loop terminal blocks have superior significant characteristics to the NSS3." A minimum IR of 3 x 107 ohms (L) was quoted from the Conax test as a basis for providing a value of 1 x 107L to Westinghouse for use in instrument loop accuracy calculations. The inspectors did not agree that the similarity analysis was sufficient and felt that the quoted IRs were totally unrealistic. Consequently, the NRC requested that the licensee provide a Justification for Continued Operation (JCO) for the operating unit. On November 25, 1987, a meeting was held at the NRC offices in Atlanta to discuss Farley EQ issues. The meeting summary is included in a letter to the license dated January 22, 1988. The inspectors reviewed the Conax report and found that the single data point for insulation resistance above 150°F (taken at 300°F) was very clearly stated in the test report as being

invalid due to instrumentation difficulties and the value was not plotted on the data plots provided by Conax. However, the licensee considered this to be acceptable test data to establish similarity.

In addition, the licensee provided the inspection team a copy of a GE test report dated November 27, 1983 which indicated that the IR values demonstrated by States and GE terminal blocks during design basis testing were not acceptable for use in instrumentation circuits.

Section 2.2(2) of NUREG-0588, Category II states in part that "test results should demonstrate that the equipment can perform its required function..." Information Notice 84-47 clearly stated the terminal block issues and suggested actions by licensees and further stated that consideration of leakage currents was already part of the EQ final rule, 10 CFR 50.49.

Contrary to the above, the licensee did not have data to demonstrate that both States and General Electric terminal blocks would maintain acceptable instrument accuracy during design basis accidents. The cited test data for Connectron terminal blocks was considered invalid by the testing organization and similarity between the Connectron and States terminal block was not established. It should also be noted that the only evidence of licensee response to IEN 84-47 was dated November 15, 1987. This is considered as Violation 34S, 364/87-30-11.

(16) File No. 1.0, Amphenol Coax Connector, Models "N" Plug 34500-1000 and Jack 18250-1000.

The connectors qualified using this file are located inside and outside containment. Only the inside containment application of these connectors was considered during the file review. These connectors are used to connect the plant's Victoreen Radiation Monitor to power and signal cables.

The licensee considers these connectors qualified to the requirements of NUREG-0588, Category 1. Qualification is supported by the following test documents:

- Westinghouse Test Report, PEN-TR-84-08, dated June 1, 1984
- Similarity Analysis performed by Bechtel (attachment 4 to EQREC No. 1, Rev. 1)

The Licensee has issued a maintenance work request to seal the 1 1/2-inch opening in penetration 8009-A, to provide additional protection from the effects of chemical spray.

The inspectors concluded these Amphenol Coax Connectors are qualified to the 10 CFR 50.49(k), NUREG-0588, Category I, requirements for the conditions specified at the Farley Nuclear Plant.

(17) File No. 9A, Conax Medium Voltage Power Electrical Penetrations, Model 7K69-10000.

The penetrations qualified using this file are located in the containment wall. They are used to supply power to the Reactor Coolant Pumps (Non-EQ Circuits). However, qualification is required to maintain the containment boundary.

The licensee considers these penetrations qualified to the requirements of NUREG-0588, Category II. Qualification is supported by the following documents:

- Conax Test Report No. IPS-1286 Rev. A
- Conax Test Report No. IPS-585.1 Rev. C
- Conax Test Report No. IPS-325 Rev. E

The inspectors concluded these Conax Penetration Assemblies are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

(18) File 9C, Conax Instrumentation Electric Penetration Assembly, Models 7D20-10001-01 and 02.

The penetrations qualified using this file are located in the containment wall. They are for instrumentation circuits in the Inadequate Core Cooling System.

The Licensee considers these penetrations qualified to the requirements of NUREG-0588, Category II. Qualification is supported by the following test documents:

- Conax Test Report No. IPS-1117 Rev. A
- Conax Test Report No. IPS-1054 Rev. 0
- Conax Test Report No. IPS-325 Rev. E.

The inspectors concluded these Conax Penetration Assemblies are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

(19) File 9D, Conax Electrical Penetration FTAs for ECT and POSA, Models 7H59-10000-01 and 7H59-10001-01.

The penetrations qualified using this file are located in the containment wall. They are used in Non EQ instrument circuits.

However, qualification is required to maintain the Containment boundary.

The Licensee considers these penetrations qualified to the requirements of NUREG-0588, Category II. Qualification is supported by the following test documents.

- Conax Test Report No. IPS-1242 Rev. C
- Conax Test Report No. IPS-585.2 Rev. C
- Conax Test Report No. IPS-325 Rev. E
- Conax Test Report No. IPS-1054 Rev. 0

The inspectors concluded these Conax Penetration Assemblies are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

(20) EQP No. 9E, Conax Feedthrough/Adapter Module Assemblies for GE Penetrations, Models 7179-10000-01 and 02, 7F30-10000-01 through 06 and 08 through 17.

The penetrations qualified using this file are located in the containment wall. They are used for EQ instrumentation and low voltage power circuits inside containment.

The Licensee considers these penetrations qualified to the requirements of NUREG-0588, Category II. Qualification is supported by the following test documents:

- Conax Test Report No. IPS-723 Rev. D
- Conax Test Report No. IPS-325 Rev. E

The failure, in Farley Unit 1 of the originally installed General Electric Series 100 penetration modules, is discussed in Farley Licensee Event Report 016, dated October 9, 1985. These failures necessitated the installation of the Conax Modules into the General Electric Penetrations.

The inspectors concluded these Conax Penetration Assemblies are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

(21) File Number 18, General Electric Electrical Penetrations (Low Voltage) 100 Series, Models Y7156-1-15 and Y7156-455.

The penetrations qualified using this file are located in the containment wall. They are used for EQ instrumentation and low voltage power circuits inside containment.

The walkdown of containment electrical penetration assemblies identified terminal blocks that were not on the master list of qualified equipment. The GE penetrations were in the process of having the GE penetration modules replaced with Conax modules due to the unavailability of the GE modules. It was noted that many of the penetration junction boxes had top entry, unsealed conduits, and that at least one box had a hole with no conduit. Many of the boxes had holes in the bottom, some with cable passing through and some empty.

The Licensee considers these penetrations qualified to the requirements of NUREG-0588, Category II. Qualification is supported by the following test documents.

- GE Test Reports U-406155 Unit 2, U-400755 Unit 1, dated January 29, 1974 and Addendum No. 1, dated March 1974.
- GE Test Report 941-V7110-3 Rev. 0, dated May 16, 1973, U-406158 Unit 2.
- GE Test Report 941-V7110-5 Rev. 0, dated May 16, 1973, U-406160 Unit 2.
- GE Test Report 941-SY008-1 Rev. 0, dated May 31, 1973, U-406157 Unit 2.
- GE Test Report 941-SY008-2 Rev. 0, dated May 31, 1973, U-400721 Unit 1.
- GE Test Report 941-SY008-5 Rev. 0, dated May 31, 1973, U-400723 Unit 1.
- GE Test Report 941-SY008-9 Rev. 0, dated May 31, 1973, U-400724 Unit 1.
- GE Test Report 941-SY008-13 Rev. 0, dated May 31, 1973, U-406159 Unit 2.

The licensee stated this file contained qualification data for the GE CR151B terminal blocks used inside containment. During the course of the detailed file review it was noted that qualification of these terminal blocks was only addressed in a seismic qualification test. The licensee stated that they were attempting to obtain data to establish LOCA and post-LOCA qualification of the GE CR151B terminal blocks for use on instrument circuits inside containment.

The licensee stated IR values of 1.0 x 10E7 ohms were used as input to the loop accuracy calculations in Westinghouse WCAP-11658. Attachment 3 to EQREC 18, Rev. 1 stated that IR values of -1.0 x 10E7 ohms shall be factored into the final setpoint calculation. This discrepancy was discussed with the Licensee and determined to be a typographical error. Additional test references supplied by the Licensee provided data to support a calculation input of 1.0 x 10E7 ohms.

The inspectors concluded these General Electric Penetration Assemblies (excluding the GE CR151B terminal blocks) are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

The lack of qualification documentation for the GE terminal blocks is considered a part of violation 50-348,364/87-30-11 and is discussed further in paragraph 6.i.(15).

(22) File Number 38, Veritrak (Westinghouse) Differential Pressure Transmitter, Model 59 Series.

The Differential Pressure Transmitters qualified using this file are located outside containment. They are used to provide Service Water to Containment Cooler flow indication.

The licensee considers these Differential Pressure Transmitters qualified to the requirements of NUREG-0588, Category II. Qualification is supported by the following test document:

- Franklin Institute Report F-C3715, dated October 1973

The inspectors concluded these Veritrak (Westinghouse) Differential Pressure Transmitters are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

(23) File Number 42, Westinghouse Low Voltage Control and Instrumentation Electrical Penetrations, Models 328, 261 and 246.

The penetrations qualified using this file are located in the containment wall. They are used for EQ instrumentation and low voltage power circuits inside containment.

The licensee considers these penetrations qualified to the requirements of NUREG-0588 Category II. Qualification is supported by the following test document:

- PEN-TR-77-59, July 18, 1977 (Part of PEN-TR-79-07, January 25, 1979) "Qualification of Modular Type Electric Penetrations following the requirements of IEEE Std.

317-1976 and IEEE Std. 323-1974 for use in PWR and BWR" (U-217092).

The inspectors concluded these Westinghouse penetration assemblies are qualified to the 10 CFR 50.49(k), NUREG-0588, Category II, requirements for the conditions specified at the Farley Nuclear Plant.

(24) File Number 4 - ITT Barton Remote Sensor, Models 352 and 353.

Barton sensors are located both inside and outside containment and are used with different transmitters to provide level, pressure, and flow measurements. The Licensee considers these sensors qualified to the requirements of NUREG-0588, Category I. Qualification is supported by the following test document:

- ITT Barton Test Report No. R3-764-20, dated July, 19-84.

The inspectors concluded that the Barton Models 352 and 353 sensors are qualified to 10 CFR 50.49(k), NUREG-0588, Category I, requirements for the conditions specified at the Farley Nuclear Plant.

(25) File Number 3A - ITT Barton Pressure Transmitter, Model 763.

Barton Model 763 transmitters are located both inside and outside containment above the 115 ft. flood level. The licensee considers this transmitter to be qualified to the requirements of NUREG-0588, Category I. Qualification is supported by the following test documents:

- ITT Barton Test Report No. R3-764-20, dated July 19, 1984.
- Addendum to Report No. R3-763-6, dated December 9, 1983.

The Barton Remote Sensors and the Model 763 (764) transmitters are considered an integral unit and Test Report R3-764-20 supports qualification of such a unit. The licensee specified environment for both the remote sensors and the transmitters (i.e., both 763 and 764) are enveloped by all the individual test reports.

The required accuracies for the 763 (764) transmitters were not provided (i.e., the accuracies for both accident and post-accident conditions). The licensee acknowledged that the ±0.5% accuracy specified SCEW sheet for the 763 transmitter was an error. This number should have been ±5.0, as was provided for the 764 transmitter. This accuracy issue is more generic in nature, however. The Licensee took the position that accuracy requirements need not be specified for individual instruments because the real issue was overall loop accuracy (i.e., the

overall accuracy when considering the accuracies and/or IR values for the individual components in the instrument loop). The licensee stated that instrument loop accuracies had been determined by Westinghouse and are provided in a report (WCAP-11685, dated November 13, 1987). The licensee did acknowledge that he failed to provide a reference to this report in some EQP files, however. (Note: Of the Barton, Foxboro, and Rosemount files, only the Foxboro file referenced the WCAP report.) The overall issue of instrument accuracies is discussed further in paragraph 6.j.

Demonstrated accuracies are provided in the test reports for the transmitters. These demonstrated accuracies can thus be compared to the accuracy values inputed into the Westinghouse calculations. Specified accuracies in the Barton test reports are ±5 and ±10 for DBE-First 5 Minutes and DBE-Post accident monitoring, respectively.

A review of maintenance requirements for 763 (764) transmitters resulted in a concern that O-rings might be being reused when the transmitter covers were removed. The licensee verified, by providing a copy of the specific maintenance procedure, that O-rings were not being reused.

The licensee's response to IE Notice 83-72, as it related to Barton instruments, was reviewed and found to be adequate.

The inspectors concluded that the Barton Model 763 transmitters are qualified to 10 CFR 50.49(k), NUREG-0588, Category I requirements for the conditions specified at the Farley Nuclear Plant.

(26) EQP No. 3B - ITT Barton Differential Pressure Transmitter, Model 764.

Barton Model 764 differential pressure transmitters are located both inside and outside containment above the 115 ft. flood level. The Licensee considers this transmitter to be qualified to the requirements of NUREG-0588, Category I. Qualification is supported by the following test reports:

- ITT Barton Test Report No. R3-764-9, dated October 5, 1982
- Addendum to IIT Barton Test Report N. R3-764-9.

The tests performed by Barton on the 763 and 764 transmitters were identical in terms of environmental and other conditions imposed on instruments. The discussions above involving accuracies, maintenance requirements, and IEN 83-72 are applicable to the Model 764 transmitters as well as the Model 763.

The inspectors concluded that the Barton Model 764 transmitters are qualified to 10 CFR 50.49(k), NUREG-0588, Category I requirements for the conditions specified at the Farley Nuclear Plant.

(27) File Number 14A - Foxboro Transmitter, Model N-E11GM.

Foxboro transmitters of this model are located inside containment above the flood level and are used in the pressurizer and accumulator tank pressure instrument circuits. The licensee considers this transmitter to be qualified to the requirements of NUREG-0588, Category I. Qualification is supported by the following test report:

- Wyle Test Report No. 45592-4, dated May 18, 1983.

Actual test was performed on a Model No-E10 transmitter; the Model N-E11GM was qualified by similarity with supporting analysis to the Model N-E10.

The loss-of-coolant (LOCA) temperature used in the test was 350°F, which is less than the composite LOCA/high energy line break (HELB) temperature of 378°F specified in the Farley FSAR. However, Bechtel calculations were performed and indicated that the peak surface temperature for the transmitters would be only 318°F.

Instrument accuracy was not specified (see discussion under K); however, the Westinghouse WCAP report was referenced in the file.

A review of maintenance requirements verified that the Licensee's procedures called for replacement of the instrument and the cover O-ring at intervals that would be conservative with respect to the qualified life of the transmitter.

The inspectors concluded that the Foxboro Model N-E11GM Transmitters are qualified to 10 CFR 50.49(k), NUREG-0588, Category I requirements for the conditions specified at the Farley Nuclear Plant.

(28) File Number 31A/B, Rosemount Pressure Transmitters, Models 1153D Code R and 1154.

Rosemount pressure transmitters are used both inside and outside containment in pressure and flow measurement applications. The transmitters are located above the flood level and those inside containment are required to have a Rosemount Model 353C conduit

seal. The Licensee considers these transmitters to be qualified to the requirements of NUREG-0588, Category I. Qualification is supported by the following documents:

- Rosemount Type Test Report No. D8300131, Rev. A, dated December 13, 1983
- Rosemount Type Test Report No. D8300040, Rev. C, dated May 1, 1986,
- Rosemount Report No. D8400102, Rev. B, dated June 14, 1984.

Note: Model 11530 Code R and 1154 transmitters are structurally identical. The only difference between the two models is the value (not the physical dimensions) of certain sub-components (e.g., resistors).

The test configuration for the transmitters utilized a 1/4-inch weep hole in the low point of the conduit run. This weep hole was not utilized in the as built configuration. When questioned about this concern, licensee stated that the conduit system inside containment is not air tight and will thus equalize pressure quickly. The concern of moisture intrusion is further diminished by the fact the Rosemount 353C seals are used inside containment and the conduit entry points were configured such that water would not stand on the end of the seal. This latter fact was determined through discussions with those Region II inspectors that had previously walked down this equipment.

The tested LOCA temperature for the Model 11530 Code R transmitter (350°F) did not envelope the composite LOCA/HELB temperature as specified in the Farley FSAR (378°F). Bechtel calculations showed peak surface temperatures during LOCA to be 313°F (271°F for MSLB); therefore, the 350°F LOCA test temperature does envelope the component's "as-seen" temperature.

A review of maintenance documentation demonstrated that procedures were in place to replace these transmitters prior to the end of their qualified life.

A review of the Licensee's response to IE Information Notice 85-100, concerning a zero point shift, indicated that the Licensee had revised six different calibration procedures and informed appropriate licensed personnel of the problem via a Training Change Notice, dated March 11, 1987.

While inspecting pressure transmitter Q2B21PT402, it was noted that a V-type tape spice existed in the condulet adjacent to the instrument. Closer inspection revealed that the insulation had been cut all the way through on both instrument leads. This was confirmed when the licensee electrician removed the splices from

the condulet and the wire arched across to the condulet. Even though this splice was identified to be replaced during the licensee's walkdowns as per CAL October 6, 1987, the cut insulation was not identified and is another example of poor peer review. See Unresolved Item 50-348, 364/87-25-03, Paragraph 3.d.

(29) ASCO Solenoid Valves Package 2A for NUREG 0588 Cat. II and Package 2B for 10 CFR 50.49, both SCEW sheets dated November 16, 1987.

A major qualification concern related to the absence of cable entrance seals for the harsh environment solenoid valves (SOVs) as determined in the previous plant walkdown inspection. The inspector reviewed and discussed in detail the licensee's "EQ Action Item Response No. B-001" which addressed this concern by dividing the SOVs into groups and justifying the absence of cable entrance seals for each group.

(a) Seventeen pilot SOVs (per unit) are located in the Main Steam Valve Room (MSVR). The licensee provided FSAR Figures E-1A and E-2 which show that the MSVR environment remains above 210°F for only 1.3 seconds, and the inspector agreed that a cable entrance seal would not be required for that environment. However, a new WCAP report dated November 13, 1987 provided results of new calculations reflecting the steam generator tube superheat concerns of Information Notice 84-90; the newly calculated environment remains above 300°F for 5 minutes. The licensee was advised that if his continued evaluation of IN84-90 supported the newly calculated values apply to these SOVs, then cable entrance seals would be required. Simple conformance to ASCO installation guideline permitting open conduit entrances with low point drain holes would not be acceptable because ASCO type testing did not demonstrate qualification for such a configuration. This item is unresolved pending completion of the licensee's action concerning IN 84-90 and is identified as part 1 of unresolved item 50-348, 364/87-30-12.

(b) Four Pressurizer Power Operated Relief Valve (PORV) pilot SOVs (per unit) are located inside containment. The licensee demonstrated that the PORVs need not be actuated to provide any safety function; the pilot SOVs are shown on the EQ Master List only because the PORVs are required by NUREG 0737. Just before the exit meeting the licensee advised that a ten second required operating time would be shown in the EQ documentation for these SOVs, and the inspector agreed that in that case no cable entrance seal is required. This item remains unresolved pending verification that the ten second operating time is

documented. This item is considered as part 2 of unresolved item 50-348, 364/87-30-12.

(c) One pilot SOV (per unit), P17SV3184-B, is located inside containment. The associated isolation valve is normally open to provide component cooling water for the reactor coolant pump seals, a non-safety function. A Phase B containment isolation signal energizes the SOV to close the isolation valve; however the Phase B signal also isolates instrument air to containment, which will close the isolation valve through loss of air pressure due to bleeding. Thus the SOV need not be qualified and a cable entrance seal is not required, provided that it is either removed from the EQ Master List or it can be demonstrated by test data or analysis that the valve will operate within design requirements and still meet the single failure criteria. This item is considered as part 3 of unresolved item 50-348, 364/87-30-12.

(d) The licensee stated that all other steam-environment SOVs on the Master List perform their function very early in the accident, are de-energized to perform their safety functions, and after actuation the current paths to the solenoid coils are interrupted by control equipment located in a mild environment. Questioning by the inspector further revealed that each coil is individually protected by a 3 amp fuse. It is concluded that these SOVs can perform their safety functions without cable entrance seals and after functioning there is no failure made that can adversely affect safety.

Another SOV qualification concern involves the failure of the licensee's original qualified life calculations to reflect higher normal operating temperature for normally-energized SOVs. This inspector determined that three Unit 1 SOVs and several Unit 2 SOVs had in fact operated beyond their qualified lives as determined by new licensee calculations. Unit 1 data are as follows:

Tag No.	Date Installed	Qual. Life	End of Qual Life	Date Replace
3376	4/80	5.8 years	2/86	11/10/87
3443	4/80	5.8 years	2/86	11/10/87
8047	11/79	5.8 years	9/85	10/12/86

The licensee advised, near the end of the inspection, that the new qualified life calculations did not take credit for outages and that preliminary revised calculations show discrepancies of only about one month for SOVs 3376 and 3443. Another valve, 7126, was also reported as having a discrepancy of about three

months. Subsequent to the inspection, the licensee stated that for those valves that appeared to have exceeded their qualified life, additional calculations were performed to take into account actual temperature and actual time energized in order to extend the qualified life time. The licensee further stated in a management meeting held November 25, 1987, in Region II that the calculations extended the life to approximately eleven years. The licensee, however, has not provided NRC these calculations for review. This is considered Unresolved Item 50-348/87-30-13, ASCO Solenoid Valves Exceeding Qualified Life.

(30) Namco Limit Switches.

Package 25A for NUREG 0588 Cat. II and 25C for 10 CFR 50.49 Namco limit switches. No concerns were noted except that numerous limit switches covered by package 25A are dependent on the Chico seals which are covered separately. (Package 25C limit switches use the Namco connector to seal the cable entrance.

(31) Cable Entrance Seal for Target Rock Solenoid Valves.

This design was not addressed in a qualification package. The reactor coolant system (RCS) head vent SOV are covered in package 35 documenting qualification to 10 CFR 50.49. To describe the design the licensee provided a drawing A-177541 (no sheet number) which shows a one inch conduit nipple and a Y-fitting connected to the SOV cable entrance hub. Each of the two ports of the Y-fitting contains an unspecified length of one inch conduit nipple, and a Raychem CB-4 cable breakout kit is installed over each of these two nipples and the lead wires entering the SOV. The drawing calls for Greenfield adjustable type compression fittings and 1-1/4 inch couplings to be installed over the Raychem boot, connected to 1-1/4 inch Greenfield type flex conduit. During the inspection the licensee did not provide a rationale for qualification of this cable entrance design. The inspector noted the following basic qualification deficiencies:

(a) Raychem cable breakout kits are LOCA-qualified only over cable jackets, not metal pipe nipples, and never with metal conduit compression fittings over the plastic breakout.

(b) This general design of device entry seal was tested by both Raychem and Alabama Power Company, and both experienced catastrophic failures during LOCA testing because there is a void inside the Raychem boot adjacent to the end of the pipe nipple. The combination of external LOCA pressure and temperature-induced shrinkage of the heat-shrink boot material led to ruptures of the boot wall. Possible softening of the Raychem adhesive could also aggravate seal

failure. Thus, the Farley design has been demonstrated by test to fail under LOCA conditions.

(c) No documentation was provided by the licensee to address these and other concerns, or to otherwise demonstrate qualification.

Subsequent to the inspection the licensee indicated that the cable entrance design would be modified by introducing Chico cement. This modification has two unacceptable aspects.

(1) The licensee has not demonstrated qualification for his Chico cable entrance, and

(2) Even if the Chico cable entrance were shown to be qualified for NUREG 0588 Category II, the qualification basis including test reports is inadequate for the 10 CFR 50.49 qualification level of the Target Rock SOVs. The deficiencies are addressed in the Chico cable entrance discussion.

The Target Rock cable entrance design constitutes a violation of 10 CFR 50.49 and is identified as Violation 50-348, 364/87-30-14.

(32) Chico Seals Package 29G for NUREG 0588 Cat. II.

The licensee stated that his cable entrance design is used only for Namco limit switches qualified to NUREG 0588 Cat. II. The design is similar to the cable entrance described above for the Target Rock RCS head vent valves, in that a Raychem cable breakout seal kit is applied over a one inch pipe nipple and under 1-1/4 inch flex conduit fittings. Although not shown in the drawings, the licensee's contractor explained that a Raychem sleeve was installed over the breakout boot (and under the compression fitting) and the sleeve is clamped to the metal nipple. None of the drawings provided during the inspection clearly show this configuration; in fact, the inspector drew the design on a whiteboard to ensure understanding. In addition, Chico A inorganic cement mix is injected into the boot from the limit switch side to fill and seal internal voids. The design was developed by Bechtel for Farley, and is not a Raychem design. No statements from Raychem concerning qualification of this design were provided to the inspectors.

The file contained three qualification type test reports. Wyle Report 58442-2 dated April 3, 1981 covers LOCA type-testing of a Raychem 403A112-52 cable breakout seal; it covers a cable breakout application (sealing individual insulated conductors emerging from a translated cable jacket) but does not address a device entry application involving metal pipe nipples and

conduit fittings. A second report covers a 1981 test of the Farley Chico seal design performed for the licensee; it is further described below. A third test report describes testing of the Chico A material by Southwest Research Institute (Project No. 03-4974-001) for Grand Gulf Nuclear Station. Although the Grand Gulf design is very different from Farley's, the report does confirm that the Chico A materials are not damaged by the Farley total radiation dose. Finally, although not included in the package provided to the inspector for review, upon questioning, the licensee did provide a four-page 1981 Bechtel qualification report, drawings, and other documentation. The Chico seal qualification was also discussed in some detail. Additional information provided during a November 25 meeting at NRC Region II offices did not contribute any additional basis for qualification beyond the documentation and discussion at the plant site during the inspection.

The 1981 Bechtel qualification report states that "since the breakout had been qualified previously, the Farley configuration needed only to be tested for pressure and temperature with time dependent variations approximating the postulated Farley LOCA profile." The test actually performed exposed one sample of the Farley seal design to compressed air in an electrically heated chamber whose dimensions are not stated. Seal leakage was monitored by a pressure gage connected to the inside of the pipe nipple by an unspecified length of piping or tubing. In response to questioning, the licensee stated that "any increasing building of pressure indicative of a pressure boundary breach would have been unacceptable;" however, an initial increase of uncalculated magnitude was expected due to expansion of trapped air in the leakoff volume". Since the sequence specified in the test procedure had resulted in catastrophic failure of specimens without Chico cement, the Chico test specimen was instead subjected to the following test sequence: The open chamber was electrically heated to 310°F. The chamber cover, with test specimen attached, was installed and within about one minute, compressed air was admitted to bring the chamber to 60 psig. After seven minutes, the pressure was ramped down at about 0.5 psig per minute, and the temperature at roughly 1.0°F per minute. After 1½ hours, the pressure was held at 15 psig and the temperature at 200°F for about 3 hours, then both were further reduced. The test was terminated after 24 hours, the last 15½ hours of which were generally at or below 5 psig and 130°F. At no time was moisture or chemical spray introduced into the test chamber. Furthermore, no electrical performance measurements of any type were made.

The gauge monitoring seal internal pressure initially read 0.4 psig on a 0 to 30 psig scale. It's reading steadily increased to 1.0 psig 51 minutes after installing the test

sample, at which time the chamber pressure had decreased to 33 psig and the temperature to 254°F. The leakage pressure then steadily dropped to 0.2 psig over the next two hours, read from 0.4 to 0.6 psig for the next 4-3/4 hours (chamber down to 5 psig and 140 F), then generally read 0.2 psig thereafter.

The test described above must bear the full burden of LOCA qualification for the Farley Chico seal design (other than for radiation). Raychem's qualification testing the sealing ability of its cable breakout kit is irrelevant because of the major differences in application of the Raychem seal, particularly the intimate involvement of Raychems plastic with metal in the Farley design. In fact, the metal compression adapter bearing down on a Raychem sleeve surrounding a metal pipe nipple at elevated temperature must be regarded as a negative design feature until proven otherwise.

The inspectors conclude that the type test of the Farley Chico seal design does not adequately simulate Farley LOCA conditions for the following reasons:

(a) No steam or moisture of any sort was present even though moisture leakage is a frequent cause of electrical equipment LOCA test failures.

(b) No chemical spray was used, even though the effect of these chemicals on bonding of the Raychem seal to the metal pipe nipple is of considerable concern. The licensee addressed this concern only by stating that Raychem's type test showed that the spray does not react with the adhesive; however, the Raychem test does not address the bond between the adhesive and the metal pipe nipple, and the licensee further cautions that the spray may react with the nipple's zinc coating to form a gray powder that could further challenge the adhesive bonds. The inspectors note in this regard that the Raychem NEIS conduit seal kit has been successfully qualification tested for high energy line breaks outside containment (no chemicals), but LOCA qualification is not claimed and a stainless steel pipe nipple is used.

(c) The slow initial temperature increase failure to simulate the initial thermal shock of the LOCA transient as it would affect rapid differential thermal expansion of the metal, plastic, and cement portions of the seal. Additionally, the nature of the test appears to avoid simultaneous application of peak pressure and temperature as is true of the plant LOCA profile, so that the most severe combination is not simulated. The test in fact in nonconservative because softening of the Raychem plastic by temperature will occur after the pressure peak.

(d) Although not mandatory for qualification to Category II of NUREG 0588, Category I qualification (as for the Target Rock solenoid valves) could not be based on this test because of failure to age the test specimen, failure to perform the complete test sequence on a single specimen and numerous QA/QC-related deficiencies.

The inspectors also concluded that the data taken during the test did not support qualification of the Farley Chico seal design for the following reasons:

(1) The dry chamber atmosphere and lack of electrical performance measurements of any type constitute a failure to monitor the performance of the seal design in its major function - keeping electrical circuits dry.

(2) The 0 to 30 psig leakage gauge appears to be of dubious value for detection of small, short-term leaks (and the absence of moisture and chemicals greatly reduces the probability of small, long-term leaks). In fact, the increase in measured pressure for the first 51 minutes of the test, while the chamber pressure and temperature decreased significantly, suggests that the seal did leak. The subsequent increase in measured pressure, maintained over an additional 4 3/4 hours, also suggests a leak. A conclusion that no leakage occurred appears to be unfounded.

The inspectors also concluded that the licensee's procedures for installing the Chico seal did not adequately control the uniformity of the seals, for reasons including the following:

(1) Drawing A-177541 sheet 23S-1, Rev. 0 does not control the minimum quantity of Chico mixture. It specifies injecting 1½ ounces into the pipe nipple, and cautions against using more than 1½ ounces to ensure against forcing the mixture into the limit switch housing. Since the Chico mixture is injected through the side of the limit switch into the assembled Raychem boot and conduit, using a hypodermic syringe and tubing, the technician cannot easily see when the seal cavity is filled.

(2) Procedures provided to inspectors did not cover details known to be important in Raychem-designed applications of their seals, such as surface preparation, detailed use of a heat gun, and selection of properly dimensioned kits.

(3) Similarity of the test specimen to plant equipment was also not established. The test procedure references drawing A-177541 sheets 23K, 23L, and 23P all Rev. 0, whereas the inspectors were given sheets 23K Rev. 2, 23M Rev. 1, and

23U Rev. 1. The inspectors noted that the quantity and type of Chico cement are included in "clouds" on two of the drawings, and the Raychem cable breakout kit number on one. No explanation of differences was provided.

(4) Information provided by the licensee concerning the metal compression adapter applied over the Raychem sleeve contains conflicts. The 1981 test procedure material list calls out a "Greenfield compression fitting or equivalent." Drawings provided during the inspection show a "Greenfield adjustable type compression fitting" for both the Chico seal and the Target Rock SOV. At the Region II meeting, the drawing provided calls out an "adjustable type compression fitting," and the test provided refers to an "appleton compression adapter." In no case is a model number specified.

In summary, the Chico seal package provided for review fails to document qualification, and review of additional material provided during and after the inspection also fails to establish qualification. Chico seals constitute failure to adequately demonstrate qualification for violation 50-348, 364/87-30-15.

j. Instrument Accuracy.

The inspectors had difficulty determining how the overall subject of instrument accuracy was addressed for Farley. Relevant equipment files do not contain plant performance requirements. These files cover transmitters, cable, terminal blocks, and containment penetrations. The category "Accuracy" had been deleted from System Component Evaluation Worksheet immediately before the inspection. File deficiencies further complicated the review; for example there was no file for GE terminal blocks because the licensee erroneously assumed that they were covered in the GE containment penetration package.

A proprietary Westinghouse report, WCAP-11658 dated November 13, 1987 covered much but not all of the accuracy evaluation. For example, it included loop-by-loop cable leakage current valves transmitted to Westinghouse by an Alabama Power Company letter dated November 11, 1987, but the Bechtel calculations were not available for inspection; they were subsequently explained to the inspectors' satisfaction using sample pages faxed from Bechtel's Gaithersburg office. Acceptance criteria values for transmitter loops were not provided in the WCAP, nor were the values of errors calculated for each loop; concerns in this area were resolved by Westinghouse personnel in a meeting the evening before the exit meeting. The WCAP included as Appendix A.4 a short Bechtel letter dated November 5, 1987 stating that a value of 1E7 ohms should be used for each terminal block, but providing no basis for that number.

Farley is vulnerable to instrument accuracy concerns because of the widespread use of terminal blocks in in-containment instrument circuits. The inspectors felt that the problem is aggravated by the arrangement of relevant documentation, described in the following paragraphs.

Transmitter files, although lacking plant acceptance criteria, do identify errors determined during LOCA testing, and those errors were provided to Westinghouse. Unfortunately, the licensee had to address all test anomalies without knowledge of required performance. All anomalies were found acceptable by the licensee.

The States terminal block file used the acceptance criteria that the block should not experience completely open or short circuits during the LOCA test. No data pertaining to instrument circuit performance were present, and substantial physical distortion apparently caused by heat softening was considered acceptable. There was no package for GE terminal blocks. On the second afternoon of the inspection, a four page typed response to inspector questions stated that a value of 1E7 ohms was supported by a test of Connectron terminal blocks and the licensee proposed to use that test as a basis for qualifying states and GE terminal blocks.

Instrument cable packages documented the leakage currents measured during LOCA listing. The Bechtel calculation cited above then determined, for the cable type and length in each instrument loop, the minimum LOCA leakage current. As for transmitters and terminal blocks, the acceptability of these valves was determined by Westinghouse.

The Westinghouse methodology for combining instrument loop errors was described in IEEE Transactions on Nuclear Science vol. NS-33 number 1, February 1986, pages 684-7, and was generically reviewed by the NRC as reported in Supplement 4 to NUREG 0717, the Summer Nuclear Station SER, dated August 1982. Subsequently, plant-specific WCAPs have been reviewed in the NTOL licensing process by ICSB. For Farley, WCAP-11658 specifically addresses the "Evaluation of the Impact of Cable and Terminal Block Leakage on RPS/ESFAS and ERP Setpoints." It is Westinghouse Proprietary Class II. WCAP-11658 does not include calculations or quantitative comparisons of calculated loop errors with setpoint values. Although most inputs defining EQ errors for loop components are included, Barton and Rosemount transmitter errors are not specified. Accordingly, there was not sufficient information at hand to permit verifying the overall consistency of the instrument accuracy calculations. For example, if the 1E7 ohm terminal block resistance could not be supported, available information did not permit estimating the impact on accuracy. The licensee offered to bring

Westinghouse personnel to the site for a meeting, and the inspectors agreed.

Westinghouse confirmed that EQ errors were combined for Farley in a conservative manner. Although specific EOP setpoint values were in general not discussed, Westinghouse's approach to establishing setpoint values that do not infringe on normal operation was explained. The "Engineering Evaluation" basis for acceptability in WCAP-11658 was explained as including (1) an error in a conservative direction, (2) a change considered insignificant with respect to imposing operator response, and (3) a change that was considered to have no impact on the events scenario. Westinghouse confirmed that two terminal blocks per loop were assumed inside containment, one each at the transmitter and containment penetration. Westinghouse also stated that the loop error contributed by terminal blocks is about 0.05% at 1E7 ohms, increasing by one decade for each decade decrease in resistance; these values are consistent with the inspectors' expectations. All questions relating to WCAP-11658 were resolved.

The inspectors concluded that, even though a separate violation may not be warranted at this time, the licensee's documentation related to instrument accuracy should be placed in a controlled, auditable format to meet the intent of 10 CFR 50.49.

Attachment:
Environmental Qualification
Program Presentation

ATTACHMENT

ALABAMA POWER COMPANY

FARLEY NUCLEAR PLANT

ENVIRONMENTAL QUALIFICATION PROGRAM

PRESENTATION

NRC EQ AUDIT

NOVEMBER 16 - 20, 1987

FARLEY NUCLEAR PLANT

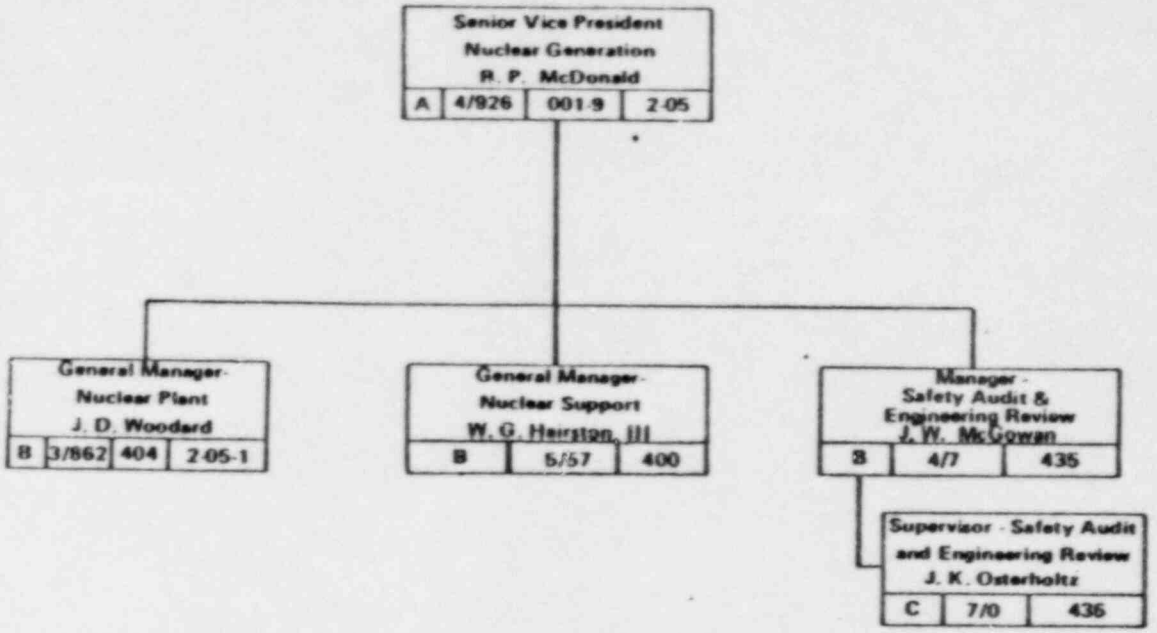
NRC EQ AUDIT

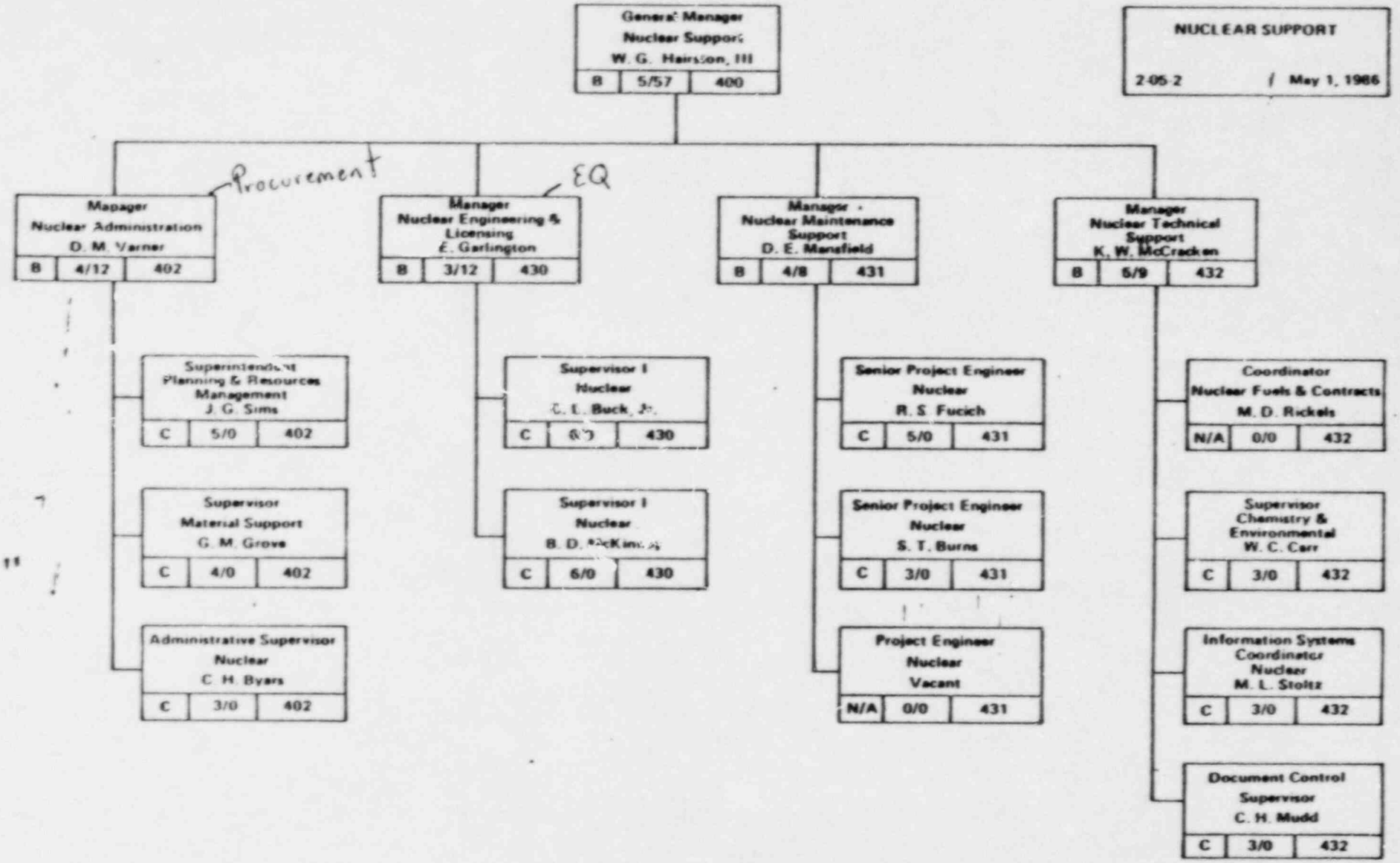
AGENDA

INTRODUCTION	J. D. Woodard General Manager-Nuclear Plant
HISTORY	David Jones
ORGANIZATION	W. B. Shipman Assistant General Manager - Plant Support
EQ DOCUMENTATION	W. G. Ware
MAINTENANCE AND SURVEILLANCE	R. G. Berryhill Manager-Performance & Planning- Nuclear

ATTACHMENT

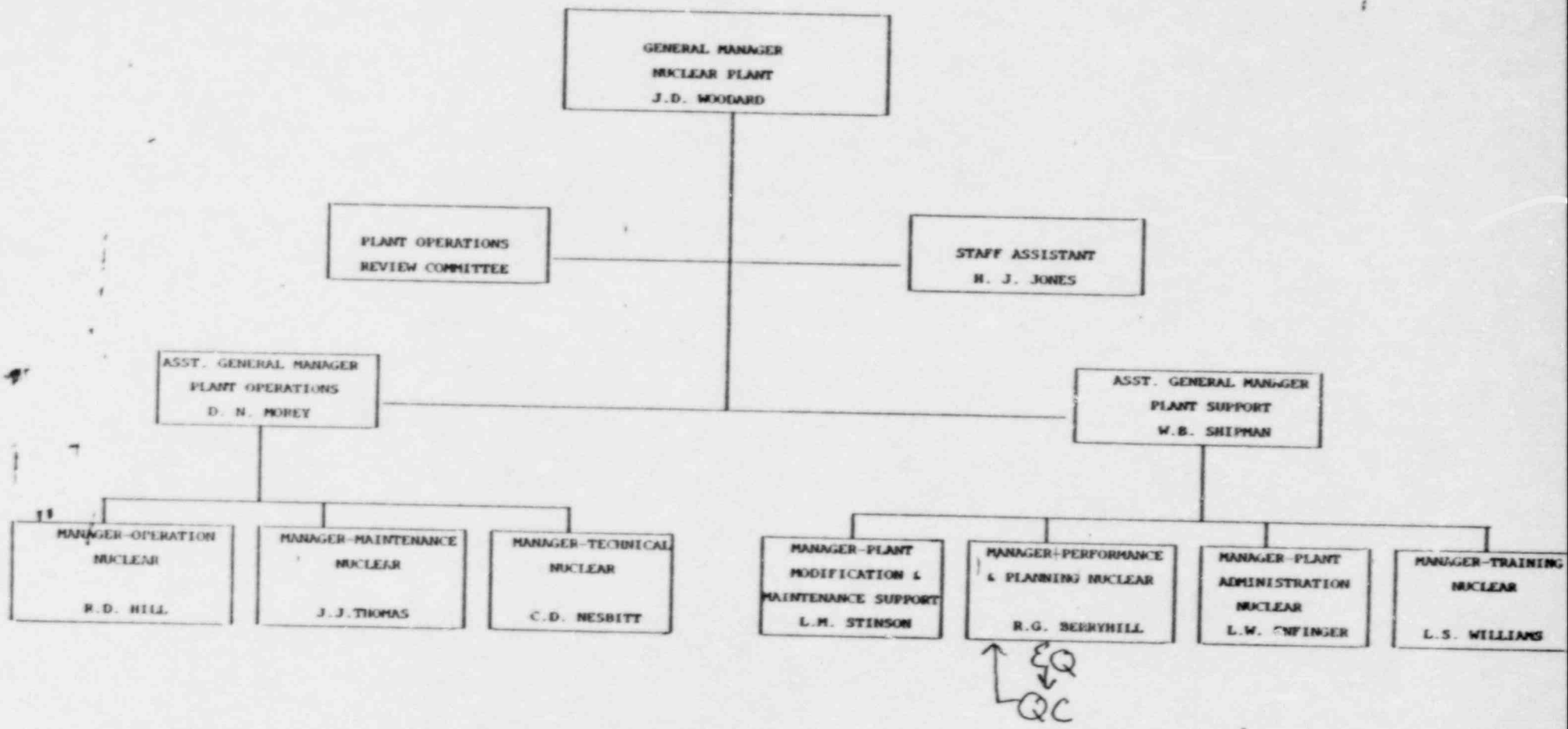
ATTACHMENT

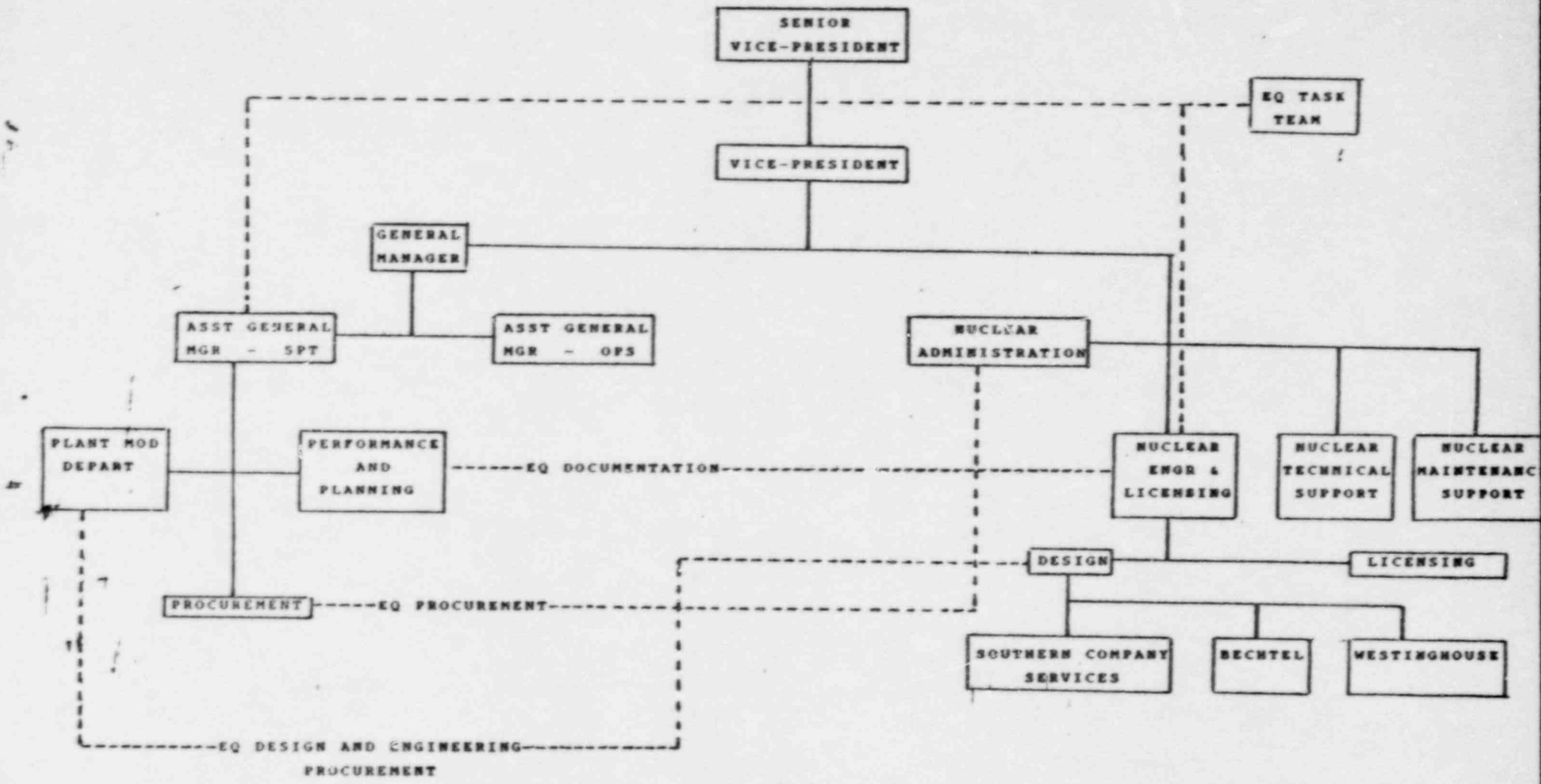

Senior Vice President
Nuclear Generation
R. P. McDonald
A | 4/926 | 001-9 | 2-05
General Manager-
Nuclear Plant
J. D. Woodard
B | 3/862 | 404 | 2-05-1
General Manager-
Nuclear Support
W. G. Hairston, III
B | 5/57 | 400
Manager -
Safety Audit &
Engineering Review
J. W. McGowan
B | 4/7 | 435
Supervisor - Safety Audit
and Engineering Review
J. K. Osterholtz
C | 7/0 | 436


General Manager
Nuclear Support
W. G. Hairston, III
B | 5/57 | 400
NUCLEAR SUPPORT
2-05-2 / May 1, 1986
Procurement
EQ
Manager
Nuclear Administration
D. M. Varner
B | 4/12 | 402
Manager
Nuclear Engineering & Licensing
E. Garlington
B | 3/12 | 430
Manager
Nuclear Maintenance Support
D. E. Mansfield
B | 4/8 | 431
Manager
Nuclear Technical Support
K. W. McCracken
B | 5/9 | 432
Superintendent
Planning & Resources Management
J. G. Sims
C | 5/0 | 402
Supervisor
Material Support
G. M. Grove
C | 4/0 | 402
Administrative Supervisor
Nuclear
C. H. Byars
C | 3/0 | 402
Supervisor I
Nuclear
C. L. Buck, Jr.
C | 6/0 | 430
Supervisor I
Nuclear
B. D. McKinney
C | 6/0 | 430
Senior Project Engineer
Nuclear
R. S. Fucich
C | 5/0 | 431
Senior Project Engineer
Nuclear
S. T. Burns
C | 3/0 | 431
Project Engineer
Nuclear
Vacant
N/A | 0/0 | 431
Coordinator
Nuclear Fuels & Contracts
M. D. Rickels
N/A | 0/0 | 432
Supervisor
Chemistry & Environmental
W. C. Carr
C | 3/0 | 432
Information Systems Coordinator
Nuclear
M. L. Stoltz
C | 3/0 | 432
Document Control
Supervisor
C. H. Mudd
C | 3/0 | 432

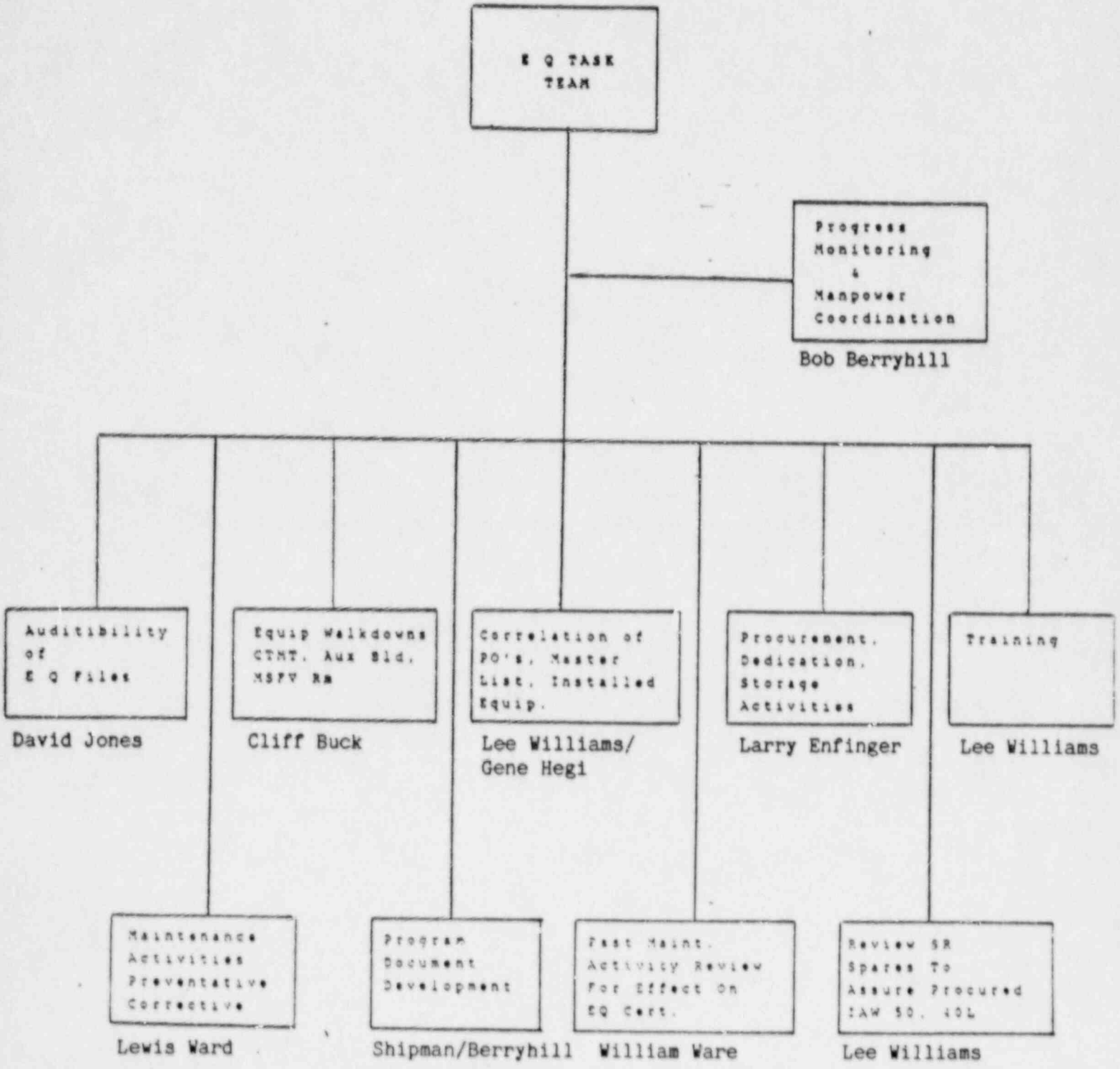
FARLEY NUCLEAR PLANT

ORGANIZATION CHART




SENIOR VICE-PRESIDENT
EQ TASK TEAM
VICE-PRESIDENT
GENERAL MANAGER
ASST GENERAL MGR - SPT
ASST GENERAL MGR - OPS
NUCLEAR ADMINISTRATION
PLANT MOD DEPART
PERFORMANCE AND PLANNING
EQ DOCUMENTATION
NUCLEAR ENGR & LICENSING
NUCLEAR TECHNICAL SUPPORT
NUCLEAR MAINTENANC SUPPORT
DESIGN
LICENSING
PROCUREMENT
EQ PROCUREMENT
SOUTHERN COMPANY SERVICES
BECHTEL
WESTINGHOUSE
EQ DESIGN AND ENGINEERING PROCUREMENT

FARLEY NUCLEAR PLANT
ENVIRONMENTAL QUALIFICATION PROGRAM ORGANIZATION



E. Q. Question Number_____

E. Q. INSPECTION TRACKING SHEET
FARLEY NUCLEAR PLANT

NRC INSPECTOR: DATE:

EQ COMPONENT:

EQ FILE NUMBER:

NRC QUESTION:

RESPONSE ASSIGNED TO: DATE:

APCO RESPONSE: DATE:

E.Q. DOCUMENTATION

- MASTER EQUIPMENT LIST
- ENVIRONMENTAL PROFILES
- CENTRAL FILE
  - Environmental Qualification Test Reports
  - Environmental Qualification Report Evaluation Checklist
  - System Component Evaluation Worksheet
  - Supporting Documentation

MASTER EQUIPMENT LIST

- Provided for each unit
- Defines/identifies components relied on to function (or not fail) when exposed to a potentially harsh environment resulting from a postolated Design Basis event
- Component identified by system, plant identification number, generic name, manufacturer, model number, building location, and elevation
- Controlled by FNP-0-AP-8

SAMPLE OF MASTER LIST ENTRY (TYPICAL OF BOTH UNITS)

MASTER LIST

JOSEPH M. FARLEY NUCLEAR PLANT UNIT 1

(Class 1E Electrical Equipment Required to Function Under Postulated Accident Conditions)

SYSTEM: Feedwater Control System C-22

COMPONENTS					
				LOCATION	
PLANT ID NO.	GENERIC NAME	MANUFACTURER	MODEL	BLDG	ELEV
Q1C22ZS0478 (FCV478)	Limit Switch	NAMCO	EA-180 [5]	Mn Stm Room	≥ 131'
Q1C22SV0478A (FCV478)	Solenoid Valve	ASCO	HV-206-381-2U	Mn Stm Room	≥ 131'
Q1C22SV0478B (FCV478)	Solenoid Valve	ASCO	HV-206-381-2U	Mn Stm Room	≥ 131'
Q1C22ZS0488 (FCV488)	Limit Switch	NAMCO	EA-180 [5]	Mn Stm Room	≥ 131'
Q1C22SV0488A (FCV488)	Solenoid Valve	ASCO	HV-206-381-2U	Mn Stm Room	≥ 131'
Q1C22SV0488B (FCV488)	Solenoid Valve	ASCO	HV-206-381-2U	Mn Stm Room	≥ 131'
Q1C22ZS0498 (FCV498)	Limit Switch	NAMCO	EA-180 [5]	Mn Stm Room	≥ 131'
Q1C22SV0498A (FCV498)	Solenoid Valve	ASCO	HV-206-381-2U	Mn Stm Room	≥ 131'
Q1C22SV0498B (FCV498)	Solenoid Valve	ASCO	HV-206-381-2U	Mn Stm Room	≥ 131'
Q1C22ZS0479 (FCV479)	Limit Switch	NAMCO	EA-180 [4]	Mn Stm Room	130'
Q1C22SV0479A (FCV479)	Solenoid Valve	ASCO	HV-206-381-4U	Mn Stm Room	130'
Q1C22SV0479B (FCV479)	Solenoid Valve	ASCO	HV-206-381-4U	Mn Stm Room	130'
Q1C22ZS0489 (FCV489)	Limit Switch	NAMCO	EA-180 [5]	Mn Stm Room	≥ 131'
Q1C22SV0489A (FCV489)	Solenoid Valve	ASCO	HV-206-381-4U	Mn Stm Room	≥ 131'
Q1C22SV0489B (FCV489)	Solenoid Valve	ASCO	HV-206-381-4U	Mn Stm Room	≥ 131'
Q1C22ZS0499 (FCV499)	Limit Switch	NAMCO	EA-180 [5]	Mn Stm Room	≥ 131'
Q1C22SV0499A (FCV499)	Solenoid Valve	ASCO	HV-206-381-4U	Mn Stm Room	≥ 131'
Q1C22SV0499B (FCV499)	Solenoid Valve	ASCO	HV-206-381-4U	Mn Stm Room	≥ 131'
N1C22SV0478A-A/JB	Terminal Block	States Company	Type ZWM [3]	Mn Stm Room	≥ 131'
N1C22SV0488A-A/JB	Terminal Block	States Company	Type ZWM [3]	Mn Stm Room	≥ 131'
N1C22SV0498A-A/JB	Terminal Block	States Company	Type ZWM [3]	Mn Stm Room	≥ 131'
1VAL5060B	Control Cable			Mn Stm Room	≥ 131'

ENVIRONMENTAL QUALIFICATION PROFILES

- Composite temperature and pressure curves created that envelop the FNP environmental qualification requirements

FIGURE 3.0-1

This curve is based on FSAR Curves Figures 6.2-11, 6.2-13, and 6.2-40.

COMPOSITE LOCA/MSLB

CONTAINMENT VAPOR TEMPERATURE ENVELOPE

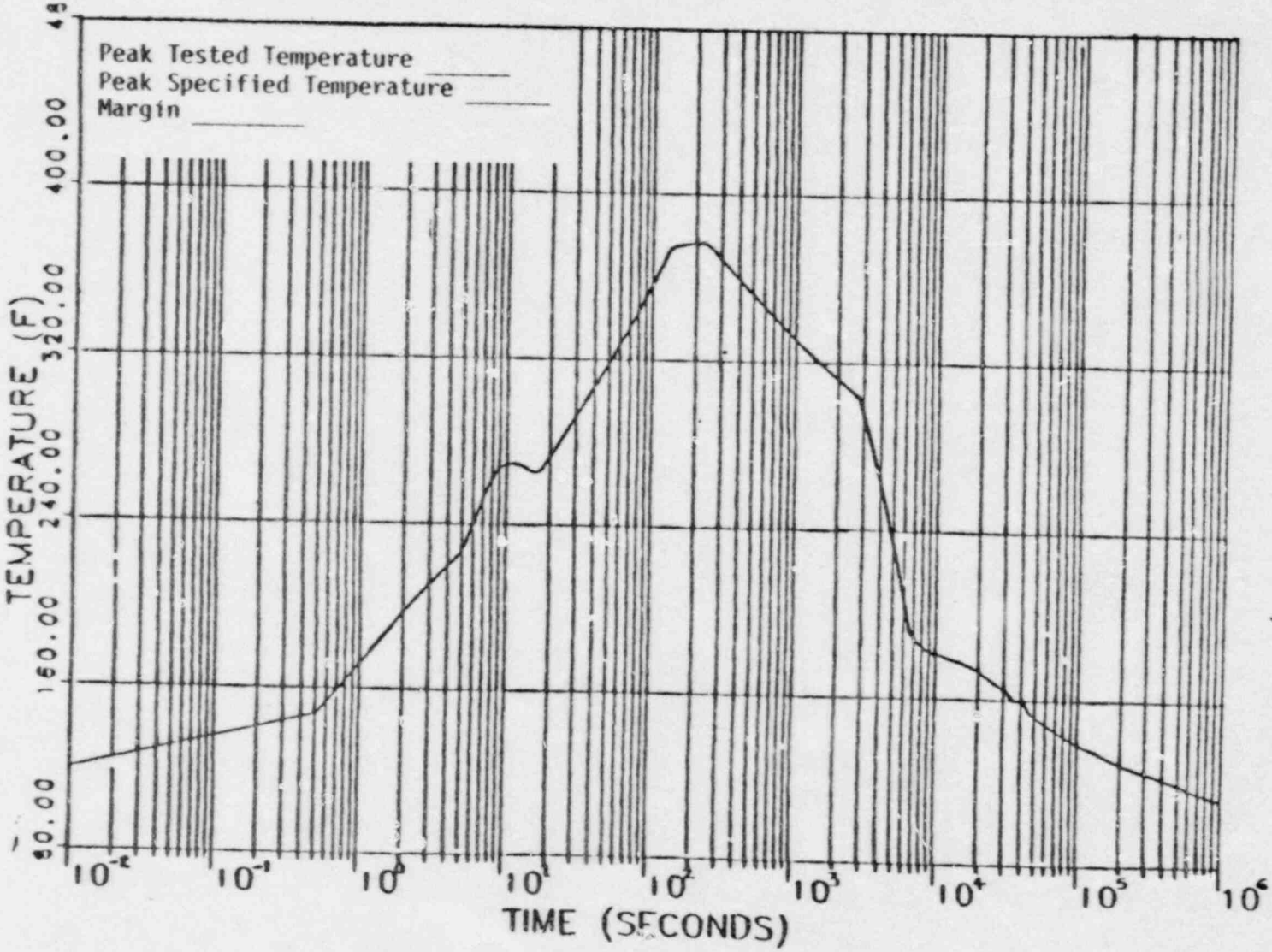
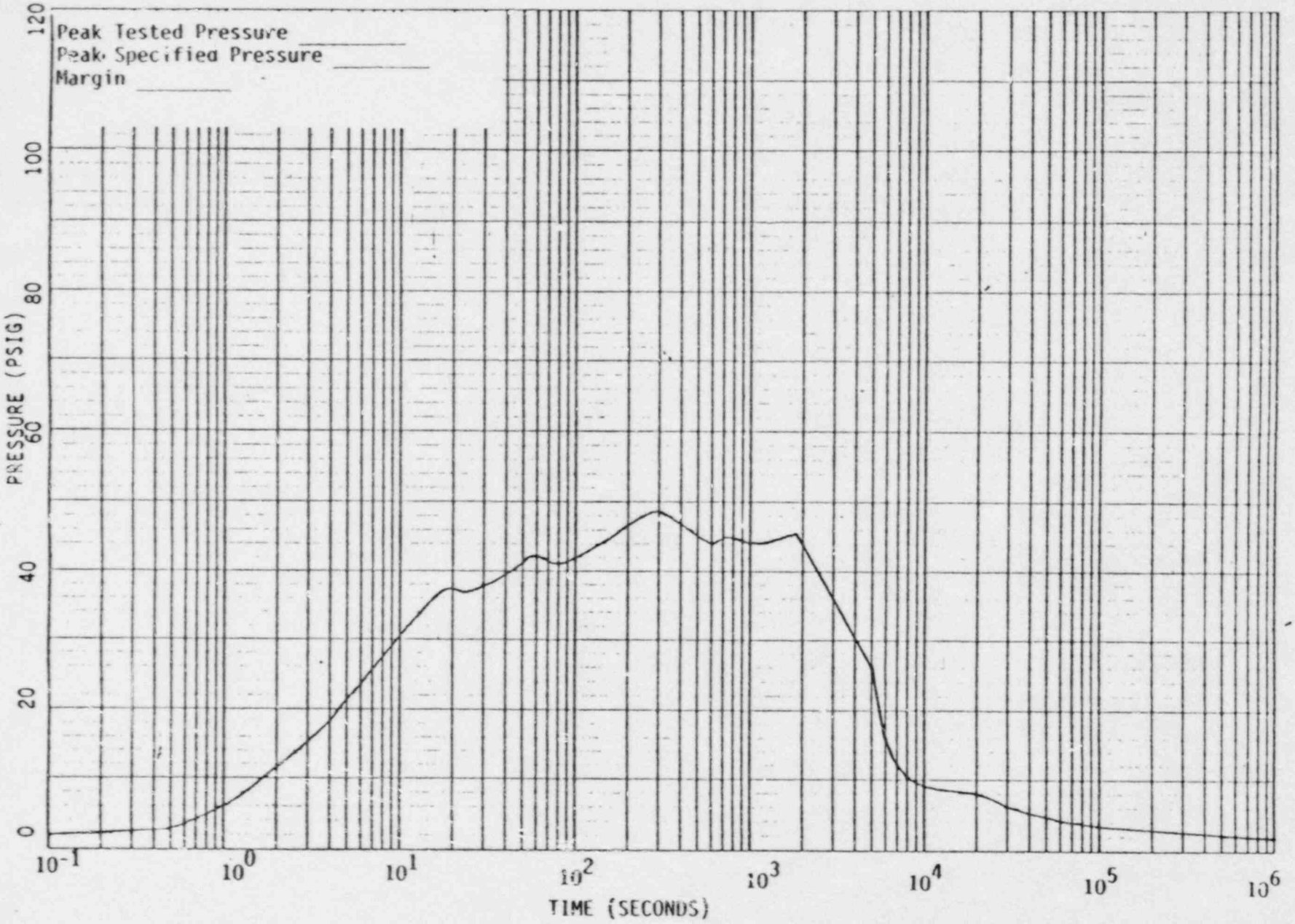


FIGURE 3.0-2

The specified curve is based on FSAR curves, Figures 6.2-36 and 6.2-39

COMPOSITE LOCA/MSLB
CONTAINMENT PRESSURE ENVELOPE



CENTRAL FILE

- EQREC
- SCEW
- List of Test Reports
- Typical information provided/referenced supporting qualification

FIGURE 7.0-2

SYSTEM COMPONENT EVALUATION WORK SHEET

Joseph M. Farley Nuclear Plant Unit _____ Sheet _____ of _____

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF.*		QUAL. METHOD	OUTSTANDING ITEMS
	PARAMETER	SPEC.	QUAL.	SPEC.	QUAL.		
SYSTEM:	OPERATING TIME						
COMPONENT:	TEMP. (°F)						
MANUFACTURER:	PRESSURE (PSIA)						
MODEL NUMBER:	RELATIVE HUMIDITY (%)						
FUNCTION:	CHEMICAL SPRAY						
ACCURACY: SPEC: DEMON:	RADIATION						
SERVICE: LOCATION:	AGING						
FLOOD LEVEL ELEV: ABOVE FLOOD LEVEL:	SUBMER-GENCE						

GPC-1375 1/80

*DOCUMENTATION REFERENCES:

NOTES:

FARLEY NUCLEAR PLANT

ENVIRONMENTAL QUALIFICATION REPORT EVALUATION CHECKLIST

Equipment Description _____

Manufacturer _____ Model/Serial No. _____

Qualifier (Test Lab) _____ Report No. _____

Plant Area Evaluated for Equipment Installation _____

Prepared by _____ Title _____ Date _____

Requirement 10 CFR 50.49 Rule	Rule Section	Compliance Yes	Compliance No	Test Report Section or Page	Remarks
1.0 Temperature and Pressure Does the test profile acceptably envelop the temperature and pressure conditions resulting from the most severe design basis accident during or following which the equipment is required to remain functional?	(e)(1)				
2.0 Humidity Was humidity considered in the qualification program?	(e)(2)				
3.0 Chemical Effects Was the chemical spray used in qualification testing the same or more severe than testing resulting from the most limiting mode of plant operation?	(e)(3)				
4.0 Radiation Was the radiation in the qualification test based on: 1) the type of radiation expected, 2) the total dose expected during normal operation over the installed life of the equipment plus the most severe DBA during or following which the equipment is required to remain functional, and 3) radiation resulting from	(e)(4)				

Requirement 10 CFR 50.49 Rule	Rule Section	Compliance Yes	Compliance No	Test Report Section or Page	Remarks
5.0 Aging Was equipment preconditioned to its end of installed life condition?	(e)(5)				
6.0 Submergence Was equipment subjected to submergence?	(e)(6)				
7.0 Synergistic Effects Were any known synergistic effects considered?	(e)(7)				
8.0 Margins Were margins applied to account for unquantified uncertainty?	(e)(8)				
.0 Qualification Methods Was equipment qualified according to the guidance set forth in NUREG 0588 for Category I plants by test or test combined with analysis?	(f)				
10.0 Qualification Documentation Does the qualification documentation verify that the equipment is qualified for its application and meets its specified performance requirements?	(j)				

MAINTENANCE REQUIREMENTS

EVALUATION SUMMARY

Reviewed by: _____ Date _____
Title: _____
Organization: _____
Checked by: _____ Date _____
Title: _____

TABLE 7.0-1
LIST OF VENDORS

1. Amphenol Coax Connectors
2. Automatic Switch Company Solenoid Valves - NP, 206 and NP-1 Series
3. Barton Transmitters - Models 763 and 764
4. Barton Transmitter Sensors - Models 352 and 353
5. Boston Insulated Wire and Cable
6. Brand-Rex Cable
7. Brown-Boveri - Gould 5600 Series MCC (Supplier Telemecanique)
8. Bussmann Fuses and Fuseholders
9. Champlain Cable Corporation 600 V Grade Wires and Cables
10. Chico A Sealing Compound
11. Combustion Engineering Inadequate Core Cooling System
12. Conax Electrical Penetrations and Thermocouples and Cable
13. Conax Penetration Modules
14. Electroswitch Lockout Relays
15. ERD Whittaker MI Cable System with Connectors (Supplier: Combustion)
16. Fisher E/P Converter for RHR Hx Control Valves
17. Foxboro Transmitter - Models E11GM (MCA), E13DM, N-E11GM, N-E11GH, N-E13DM, N-E13DH
18. Gamma-Metrics Neutron Flux Monitor - RCS Series
19. GEMS Delaval Level Transmitter - Model XM-36495; Level Transmitter - Model LS-36497; Level Switch - Model XM-54852A; Level Sensor - Model XM-54854; Receiver - Model RE-36562A
20. General Electric 600 VAC Motors
21. General Electric Penetrations - 100 Series
22. General Electric Fuse Blocks - Model 8452-3
23. G & H Technologies (Supplier: Combustion)
24. ITT Gould (See Brown Boveri)
25. ITT Imperial (See Brown Boveri)
26. ITT Suprenant 600 V SIS Wire
27. Joy Manufacturing Containment Fan Motors
28. Limitorque Motor Operators

Table 7.0-1 (continued)

LIST OF VENDORS, continued

29. Limitorque Brakes for Limitorque Actuators (Dings Company)
30. NAMCO Limit Switches - Model EA-180 and EA-170XX302
31. Okonite Control and Power Cable
32. Okonite Instrument Cable (Okuzel Insulated)
33. Raychem Cable - Stilan, Flamtrol and Splice
34. Rosemount RTD - Models 176KF and 176KS
35. Rosemount Pressure Transmitters - Models 1153D and 1154
36. Rosemont Remote Seals - Model 1159
37. Rosemount Conduit Seal Model 353C
38. States Terminal Block - Type ZWM and NT
39. Target Rock Solenoid Valve - Model 79AB-001
40. Telemecanique Qualification of Motor Control Centers (MCC) 1U, 1V, 2U and 2V and their components. (See also Brown Boveri)
41. Texaco Grease
42. Veritrak Differential Transmitters - Model 59 Series
43. Victoreen Radiation Monitor - Model 877-1
44. Weidmuller Terminations Inc. Terminal Blocks
45. Westinghouse Disconnect Switches
46. Westinghouse Electric Hydrogen Recombiner - Type A
47. Westinghouse Penetration
48. Westinghouse Pump Motors

EQ PROGRAM PROCEDURES AND DOCUMENTS

FNP-0-M-060	Environmental Qualification Program Description
FNP-0-ETP-4108	FNP Environmental Qualification Program Implementation
FNP-0-ETP-4248	Guidelines to Maintain Environmentally Qualified Equipment

MAINTENANCE PROCEDURES FOR EQ TERMINATIONS/SPLICES

FNP-0-MP-91.0	Termination of Environmental Qualified Motors Using Raychem Motor Inspection Kits
FNP-0-MP-91.1	Termination of Environmental Qualified Limitorque Motors Using Raychem Motor Connection Kits (Electrical Maintenance)
FNP-0-MP-91.2	In-Line Environmental Qualified Terminations Using Raychem Heat Shrink (Electrical Maintenance)

EQ INSPECTION PROCEDURES

FNP-0-ETP-4250	Inspection Procedure for Raychem Heat Shrink In-Line Splices or Repairs
FNP-0-ETP-4251	Inspection Procedure for Raychem Heat Shrink Connections
FNP-0-ETP-4263	EQ Instrumentation Splice/Termination Inspection
FNP-0-ETP-4264	EQ Inspection of Electrical Penetrations Inside Containment
FNP-0-ETP-4265	EQ Inspection of Electrical Penetrations Outside Containment
FNP-0-ETP-4268	EQ Inspection of Instrument Loops
FNP-0-ETP-4269	EQ Inspection of Electrical Penetrations
FNP-0-ETP-4270	EQ Inspection of Solenoid Valves
FNP-0-ETP-4271	EQ Inspection of Limitorque Operators

FNP-0-ETP-4272		EQ Program Evaluations and Review
FNP-0-ETP-4273		Environmental Qualification Inspection of Miscellaneous Environmentally Qualified Equipment

ADMINISTRATIVE PROCEDURES APPLICABLE TO EQ

FNP-0-AP-1		Development, Review, and Approval of Plant Procedures
FNP-0-AP-3		Plant Organization and Responsibility
FNP-0-AP-4		Control of Plant Documents and Records
FNP-0-AP-5		Surveillance Program Administrative Control
FNP-0-AP-8	*	Design Modification Control
FNP-0-AP-9	*	Procurement and Procurement Document Control
FNP-0-AP-15		Maintenance Conduct of Operations
FNP-0-AP-18		Conduct of Operations - Technical Group / Bulletins and Notices
FNP-0-AP-20		Receipt Inspections
FNP-0-AP-21	*	Identification and Control of Materials, Parts and Components
FNP-0-AP-22		Nonconformance Control / Deficiency Reporting
FNP-0-AP-23		Handling, Storage, and Shipping of Materials, Components, and Equipment
FNP-0-AP-25		Equipment Identification
FNP-0-AP-27		Conduct of Operations - Training Group
FNP-0-AP-28		Plant Lubrication Program
FNP-0-AP-31		Quality Control Measures
FNP-0-AP-32		Review of Operating Data
FNP-0-AP-35		General Plant Housekeeping and Cleanliness Control
FNP-0-AP-44		Cleanliness of Fluid Systems and Associated Components

FNP-0-AP-45		Farley Nuclear Plant Training Plan
FNP-0-AP-51		Instrumentation and Control Group Conduct of Operation
FNP-0-AP-52	*	Equipment Status Control and Maintenance Authorization
FNP-0-AP-53	*	Preventive Maintenance Program
FNP-0-AP-62		Evaluations of Defects and Noncompliances Potentially Reportable Under 10CFR21
FNP-0-AP-63		Conduct of Operations - Systems Performance Group
FNP-0-AP-65		FNP Operating Experience Evaluation Program
FNP-0-AP-70		Conduct of Operations - Plant Modifications and Maintenance Support

LIST OF OTHER PROCEDURES APPLICABLE TO EQ COMPONENTS

FNP-0-MP-79.0
FNP-0-MP-83.0
FNP-0-MP-28.137
FNP-0-MP-28.184
FNP-0-MP-28.212
FNP-0-MP-45.1
FNP-0-MP-45.3
FNP-0-MP-82.0
FNP-0-MP-84.0
FNP-0-MP-28.163
FNP-0-MP-28.172
FNP-0-MP-45.0
FNP-0-MP-45.2

FNP Master List of Surveillance Requirements

GENERAL MAINTENANCE PROCEDURES APPLICABLE TO EQ:

FNP-0-GMP-1
FNP-0-GMP-7
FNP-0-GMP-12.0
FNP-0-GMP-13.0
FNP-0-GMP-17.0
FNP-0-GMP-28.0
FNP-0-GMP-32.0
FNP-0-GMP-32.1
FNP-0-GMP-55

INSTRUMENT MAINTENANCE PROCEDURES APPLICABLE TO EQ:

FNP-0-IMP-0.11
FNP-0-IMP-416.1
FNP-0-IMP-427.1
FNP-0-IMP-428.1
FNP-0-IMP-430.15
FNP-0-IMP-430.16
FNP-0-IMP-430.16
FNP-0-IMP-430.17
FNP-0-IMP-432.1
FNP-0-IMP-443.1
FNP-1-IMP-201.3
FNP-1-IMP-201.35
FNP-1-IMP-201.4
FNP-1-IMP-201.5
FNP-1-IMP-202.11
FNP-1-IMP-202.12
FNP-1-IMP-202.4
FNP-1-IMP-202.9
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FNP-1-IMP-205.4
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FNP-1-IMP-206.8
FNP-1-IMP-206.8
FNP-1-IMP-208.1
FNP-1-IMP-208.2
FNP-1-IMP-210.10
FNP-1-IMP-210.3
FNP-1-IMP-210.5
FNP-1-IMP-210.8
FNP-1-IMP-210.9
FNP-1-IMP-212.10
FNP-1-IMP-212.11
FNP-1-IMP-212.13
FNP-1-IMP-212.14
FNP-1-IMP-212.3
FNP-1-IMP-212.4
FNP-1-IMP-212.8
FNP-1-IMP-212.9
FNP-1-IMP-220.12

FNP-2-IMP-201.2
FNP-2-IMP-201.34
FNP-2-IMP-201.35

FNP-2-IMP-201.4
FNP-2-IMP-201.5
FNP-2-IMP-202.11
FNP-2-IMP-202.12
FNP-2-IMP-202.4
FNP-2-IMP-205.4
FNP-2-IMP-205.6
FNP-2-IMP-205.8
FNP-2-IMP-206.11
FNP-2-IMP-206.3
FNP-2-IMP-206.4
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FNP-2-IMP-210.10
FNP-2-IMP-210.8
FNP-2-IMP-210.9
FNP-2-IMP-212.10
FNP-2-IMP-212.11
FNP-2-IMP-212.13
FNP-2-IMP-212.14
FNP-2-IMP-212.3
FNP-2-IMP-212.4
FNP-2-IMP-212.8
FNP-2-IMP-212.9
FNP-2-IMP-228.12

SURVEILLANCE TEST PROCEDURES APPLICABLE TO EQ:

FNP-1-STP-11.1
FNP-1-STP-11.10
FNP-1-STP-11.2
FNP-1-STP-11.3
FNP-1-STP-11.4
FNP-1-STP-11.9
FNP-1-STP-19.0
FNP-1-STP-201.1
FNP-1-STP-201.18
FNP-1-STP-201.19
FNP-1-STP-201.2
FNP-1-STP-201.20
FNP-1-STP-201.22
FNP-1-STP-201.23
FNP-1-STP-201.24
FNP-1-STP-201.25
FNP-1-STP-201.26
FNP-1-STP-201.27
FNP-1-STP-201.3

NP-1-STP-201.4
NP-1-STP-201.5
NP-1-STP-201.6
NP-1-STP-206.1
NP-1-STP-206.2
NP-1-STP-209.1
NP-1-STP-213.1
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NP-1-STP-213.17
NP-1-STP-213.19
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NP-1-STP-213.5
NP-1-STP-213.6
NP-1-STP-213.7
NP-1-STP-213.8
NP-1-STP-213.9
NP-1-STP-215.7
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NP-1-STP-223.1
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NP-1-STP-224.3
NP-1-STP-227.18
NP-1-STP-227.19
NP-1-STP-256.8
NP-1-STP-30.0
NP-1-STP-300.0
NP-1-STP-309.1
NP-1-STP-45.2
NP-1-STP-500.0
NP-1-STP-513

NP-2-STP-11.1
NP-2-STP-11.10
NP-2-STP-11.2
NP-2-STP-11.3
NP-2-STP-11.4

FNP-2-STP-11.9
FNP-2-STP-19.0
FNP-2-STP-201.1
FNP-2-STP-201.13
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FNP-2-STP-201.26
FNP-2-STP-201.27
FNP-2-STP-201.3
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FNP-2-STP-227.19

FNP-2-STP-256.2
FNP-2-STP-256.4
FNP-2-STP-256.6
FNP-2-STP-256.8
FNP-2-STP-30.0
FNP-2-STP-45.2
FNP-2-STP-600.0
FNP-2-STP-630.0
FNP-2-STP-813

OTHER FNP MANUALS APPLICABLE TO EQ:

FNP-0-M-015	FNP Master Training Plan
FNP-0-M-028	SEE-IN Procedures Manual
FNP-1-M-014	FNP Lubrication Manual - Unit 1
FNP-2-M-012	FNP Lubrication Manual - Unit 2