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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
Washington, D.C. 20555

0057203

INSPECTION AND ENFORCEMENT MANUAL

TEMPORARY INSTRUCTION 2515/76

EVALUATION OF LICENSEE'S PROGRAM FOR QUALIFICATION OF ELECTRICAL EQUIPMENT LOCATED IN HARSH ENVIRONMENTS

2515/76-01 PURPOSE

To provide guidance (1) for the inspection of licensee environmental qualification programs for electrical equipment important to safety located in harsh environments as required by 10 CFR 50.49 and (2) for determining that licensee commitments for resolution of outstanding issues from NRC equipment qualification (EQ) safety evaluation reports (SERs) are being properly implemented.

2515/76-02 OBJECTIVES

To review licensee's implementation of a program for meeting 10 CFR 50.49 requirements.

To review the licensee's implementation of SER corrective action commitments.

To review the licensee's implementation of a program for maintaining the qualified status of equipment during the life of the plant.

To perform a physical inspection of equipment to determine that the installations agree with SER commitments and qualification requirements.

2515/76-03 BACKGROUND

In response to IE Bulletin 79-01B and NUREG-0588, licensees submitted EQ documentation. This documentation was reviewed by the NRR-EQB staff, and SERs were issued listing the deficiencies in the documentation. Meetings were held with the licensees during 1983 and 1984 to establish commitments for corrective action. 10 CFR 50.49 became effective on February 22, 1983, establishing formal qualification requirements.

NUCLEAR REGULATORY COMMISSION

Docket No. _____ Official Exh. No. 93

In the matter of ALABAMA POWER CO.

Staff _____ IDENTIFIED 3/12/86

Applicant APCO RECEIVED 3/12/86

Intervenor _____ REJECTED _____

Staff's DR's _____

Contractor _____ DATE 3-27-86

Other _____ WITNESS _____

Reporter L Estep

04.01 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," effective February 22, 1983,

04.02 Regulatory Guide 1.89, "Environmental Qualification of Certain Equipment Important to Safety for Nuclear Power Plants," Revision 1, June 1984.

04.03 NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Equipment," (for Comments Version), July 1981.

04.04 "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors," November 1979 (DOR Guidelines).

04.05*+Technical Evaluation Report (TER), "Review of Licensees'Resolution of Outstanding Issues from NRC Equipment Environmental Qualification Safety Evaluation Report." An individual TER for each operating power plant prepared by Franklin Research Center under NRC Contract 03-79-118.

04.06+ NRC Safety Evaluation Reports concerning environmental qualification of safety-related electrical equipment, including the SER that forwarded the TER to each licensee.

04.07*+Licensee's commitments for corrective action including May 1983 SER/TER response, 1984 minutes of meeting with NRC, and subsequent changes.

04.08 Regulatory Guide 1.97, "Instrumentation for Light Water-Cooled Nuclear Reactor Power Plants to Assess Plant and Environmental Conditions During and Following an Accident," Revision 2, December 1980.

04.09 Technical Evaluation Report, "Implementation Guidance for New and Corrective Equipment Environmental Qualification," prepared by Franklin Research Center Under NRC Contract 03-79-118, April 22, 1983.

04.10*+

a. Licensee's list of equipment requiring environmental qualification (Master List, submitted in May 1983).

b. Master List, version in effect at time of inspection.

04.11*+

a. Generic Letter 84-24, D. G. Eisenhut to Licensees and Applicants, dated December 27, 1984, Subject: Certification of Compliance to 10 CFR 50.49.

b. Licensee's Response to Generic Letter 84-24.

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* These documents shall be available for the inspectors' use thoughout the inspection.

\+ These documents shall be obtained for review before the inspection.

04.12* Licensee's current System Component Evaluation Worksheets (SCEW sheets) or equivalent (earlier SCEW sheets may have been included in previous licensee submittals).

04.13*+Licensee's procedures applicable to equipment qualification (EQ program, procurement of qualified equipment, maintenance of qualified equipment and modifications to plant that could affect qualified equipment).

04.14* Licensee qualification documentation and/or files.

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2515/76-05 RESPONSIBILITIES

A team should be assigned to perform this inspection with the following members as a minimum:

MHP a. Team Leader - A regionally based inspector to lead discussion with licensee, to conduct entrance and exit interviews, to coordinate team activities and participate in the inspection effort. (May also perform role b, c, or d below).

CP MS b. Technical Specialist - Knowledgeable about the application and operation of electrical power and control equipment requiring EQ.

c. Quality Assurance Specialist - Knowledgeable of quality assurance requirements for procurement, maintenance, and testing of electrical equipment requiring EQ.

All d. Equipment Qualification Specialist - Knowledgeable of EQ testing and analysis requirements and requirements for documenting qualification results.

2515/76-06 INSPECTION REQUIREMENTS

06.01 Pre-Inspection Tasks

The following tasks should be accomplished prior to the site inspection:

a. Document Review

Inspectors should obtain and review copies of the plant-specific documents marked by a plus (+) in Section 04 of this TI.

b. Sample Selection

The inspection will include evaluation of qualification documentation and visual inspection of 10 to 15 equipment items. Selection of the devices to be evaluated is important since multiple concerns must be addressed by the inspection. Rank the sample list in importance with the most critical devices first. The list of devices should contain as many different equipment types as possible and should be developed with the following concerns in mind:

* These documents shall be available for the inspectors' use throughout the inspection.

+ These documents shall be obtained for review before the inspection.

1. Table 4-1 and the Equipment Item Checksheet Index in Section 4 of Reference 04.05 should be the starting point for development of the sample list. Devices listed in categories I.B, II.A, II.B, II.C, and IV may be chosen as samples. Tables 4-2, 4-3, and 4-4 provide further information concerning deficiencies in the documentation. Reference 04.10 provides the base list of items that the licensee has determined to require qualification in accordance with 10 CFR 50.49.

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may disagree to some of this - should force TU response to the rule.

2. Outstanding IE bulletins and information notices related to qualified equipment should be considered. Generic Letter 84-24 (Reference 04.11.a) lists several such bulletins and notices.

3. Plant-specific EQ-related problems reported under 10 CFR Part 21 or paragraphs 50.72 and 50.73 should be considered.

* 4. Access to the equipment during the walk-through inspection should be considered.

* 5. Equipment which the licensee added to or deleted from the list of devices requiring qualification since issuance of Reference 04.05 should be considered.

* 6. Equipment that has changed from one category to another (e.g., from qualification not established to qualified) since issuance of Reference 04.05 should be considered.

* 7. Special attention should be given to devices listed in Reference 04.05 for which no documentation was submitted for review.

8. Equipment that has been installed as replacement for non-qualified equipment should be included.

* 9. At least one piece of equipment qualified to the DOR Guidelines (Reference 04.04) should be included.

* 10. The list of samples should cover a variety of equipment types including transmitters, valve operators, solenoid operated valves, cables, limit switches, motors, terminal blocks, and containment penetrations when possible.

11. Probabilistic Risk Analysis (PRA) of the sensitivity of hypothetical severe accident damage to component failure should be considered. Appendix A to this TI lists the most significant EQ-related components identified in one study in order of decreasing significance.

* 12. Partial review of certain files should be considered to address more rapidly, the treatment of specific concerns such as those cited in 06.01b.2 and 3 above.

Some modification of the sample list during the inspection may be desirable or necessary.

* Denotes issues we should address

c. Team Member Assignments

The responsibility for the main segments of the inspection (see 06.02) should be divided among the team members before the inspection. The segments may be performed in parallel; however, comparison and correlation of information discovered during the inspection is necessary. For example, maintenance requirements described in qualification documentation should be compared with maintenance procedures, and master list equipment descriptions should be compared with the installed equipment.

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d. Licensee Contact

Approximately _ weeks before the inspection, the following items should be reviewed with the licensee:

1. Detailed inspection scope.

2. Documents to be made available for the inspection - see 04, References.

3. Advance copies of procedures - reference 04.13.

4. Licensee presentation in the entrance meeting covering:

   (a) organization chart with EQ applicability
   (b) overview of EQ program
   (c) overview of EQ documentation file organization

5. Advance arrangements for plant walkdown to avoid unnecessary delays.

6. Other logistics matters as appropriate.

06.02 Inspection Tasks

a. Entrance Meeting

MHP Day 1

During the entrance meeting at the start of the inspection, the team leader will describe the scope of the inspection and identify the list of the samples selected, including identification of walkdown samples. The logistics of the inspection should be discussed. The licensee's presentation to describe its organization, EQ program, and the status of program implementation should be made.

All Day 1

b. Procedural and Programmatic Inspection

1. Review the licensee's procedures to determine that a program has been implemented to generate, maintain, and distribute the list of equipment requiring qualification in accordance with 10 CFR 50.49.

2. Review EQ program documentation to determine that the licensee has implemented procedures for review and approval of EQ documentation and for establishing equipment qualification.

3. Review selected maintenance and/or surveillance procedures to determine that EQ requirements have been incorporated.

4. Determine that the procedures for procurement of replacement and spare equipment address EQ requirements and that they require qualification of the equipment to be established prior to use in the plant. Review selected procurement documents to determine that EQ requirements have been incorporated. In most instances, Paragraph (1) of 10 CFR 50.49 requires that replacement equipment must be qualified to a higher level than the DOR Guidelines. RG 1.89, Revision 1, provides guidance for alternatives to this requirement.

5. Determine that the procedures for control of plant modifications include evaluations of the effect of the modification on qualified equipment (e.g., the modification requires equipment that is qualified or the modification affects the environment of qualified equipment). Review selected modification packages and related documents such as work requests to determine that EQ requirements have been incorporated.

6. Determine by interviewing licensee personnel performing work involving qualified equipment that they are aware of EQ requirements and procedures. Determine that personnel performing review and approval of qualification documentation have appropriate training or experience.

7. Determine that the licensee has established and implemented a mechanism for addressing IE bulletins and information notices relating to equipment requiring qualification.

8. Review licensee QA/QC audit records for evidence of conformance to procedure requirements.

c. Documentation File Inspection

All
Day 1-2

1. Review the completeness of the licensee's list of equipment requiring qualification by determining that the list includes the equipment listed in the licensee's list of emergency procedures equipment and that equipment required by RG 1.97 is included. Compare Reference 4.10a to 4.10b. Review the changes made to the EQ list and determine that they been made in accordance with established procedures.

2. Review the qualification files for the samples selected in 06.01b to determine if they contain the qualification specification for the equipment, adequate documentation of the qualification of the equipment, and a positive statement that the documentation has been reviewed and approved and the equipment determined to be qualified for its application. The review should be general in nature to determine that the important qualification requirements have been addressed. A checklist that can be used as a guide for these reviews is contained in Appendix B. Not every checklist item need be reviewed for each file; the Comments Column can be marked N/A for items not reviewed. In-depth review of one qualification package is addressed in Subsection 06.02c.5 below.

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3. Review the documentation files to determine that the licensee has demonstrated that the qualified devices are the same as, or have been proven to be adequately similar to, the devices requiring qualification (i.e., the installed equipment).

4. For the selected samples, determine if that the commitments for corrective action stated in Reference 04.07 have been fulfilled or appropriate action is being taken.

5. Determine if the licensee's procedures for review and approval of qualification documentation have been implemented through review of the documentation file for a new device qualified to the requirements of 10 CFR 50.49 or for a piece of replacement equipment.

   This evaluation should entail an in-depth review of the adequacy of the qualification documentation in addition to the evaluation of the licensee's review and approval process. The check sheet provided in Appendix A should be completed for the in-depth review of one component file.

6. Obtain the equipment descriptions, model and serial number, and plant ID for use in the physical inspection. Determine any special requirements for device orientation, connections, housing seals, etc. dictated by the EQ documentation. (Appendix C contains checklists for standard pieces of equipment.)

7. For Westinghouse plants, verify that the licensee has satisfactorily addressed IE Information Notice 84-90 concerning main steam line breaks.

d. Physical Inspection

TCP Day 2

1. At the beginning of the inspection, discuss the accessibility of the devices to be inspected with the licensee. Modify the list as appropriate.

2. Through use of the equipment checklists contained in Appendix C, determine if the installed equipment is the same as that described in the licensee's documentation and that the equipment appears to be properly installed and maintained. The team member reviewing the documentation for a component should also perform the physical inspection, if possible. Physical inspection of the equipment by the entire team is desirable.

3. Determine if the equipment surrounding the device being inspected may fail in a manner that could prevent the device from performing its safety function. Any condition that could adversely affect the safety function of equipment being inspected should be noted for discussion with the licensee.

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2515/76-07 REPORTING REQUIREMENTS

The team leader is responsible for the timely assembly and generation of the inspection report. The results of the inspection will be documented in a standard inspection report. A copy of the report shall be forwarded to the Office of Inspection and Enforcement, Vendor Program Branch, and to the Office of Nuclear Reactor Regulation, Environmental Qualification Branch.

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2515/76-08 EXPIRATION DATE

This temporary instruction shall remain in effect for one year from the date of issue.

2515/76-09 IE CONTACT

R. C. Wilson (492-4841)

2515/76-10 STATISTICAL DATA REPORTING

The hours expended in the above activities should be reported under module 25576 on NRC form 766.

END

Appendices

Dag — Exit Meeting

APPENDIX A

MOST SIGNIFICANT EQ-RELATED COMPONENTS

PWR Component Sensitivities, PRA Study

Solenoid Valves for Control Valves	Auxiliary Feedwater
Motor Operators for Valves	Auxiliary Feedwater
Pump Motors	Auxiliary Feedwater
Motor Operators for Valves	High Pressure ECC
Motor Operators for Valves	Service Water
Pump Motors	Service Water
Motor Operators for Valves	Low Pressure ECC
Pump Motors	High Pressure ECC
Pump Motors	Low Pressure ECC

BWR Component Sensitivities, PRA Study

Motor Operators for Valves	Low Pressure ECC
Motor Operators for Valves	Service Water
Pump Motors	Service Water
Motor Operators for Valves	High Pressure ECC
Pump Motors	Low Pressure
Pump Motors	High Pressure ECC

CHECKLIST FOR REVIEW OF LICENSEE EQ DOCUMENTATION FILES

This checklist is provided for use in performing evaluations of the adequacy of a qualification package for a piece of equipment. Such reviews will determine the adequacy of the EQ program for the device and will determine the adequacy of the licensee's review and approval process for the equipment. Perform a complete review for one file. For other files, items not reviewed should be marked "N/A" in Comments Column.

Plant/Docket No.: _____ Reviewer: _____

Component(s): _____

Equipment Documentation File: _____

Criteria: 10 CFR 50.49 ___ or DOR Guidelines ___ or Other ___

EQ Issue		Covered in EQ Documentation Yes	No	Comments
1.	Positive statement by the licensee that the equipment is qualified for its application.	___	___	
2.	Full description of the equipment.	___	___	
3.	If qualification sample is not identical to the instal led devices, a similarity analysis has been provided.	___	___	
4.	Allowed mounting methods and orientations.	___	___	
5.	Interfaces - conduit, housing seal, etc.	___	___	
6.	A qualified life has been established based on accel erated aging-thermal, radiation, cyclic, as appropriate.	___	___	
7.	All type tests performed on the same specimen (N/A DOR Guidelines).	___	___	

Component(s): _____ 0057213

Covered in
EQ Documentation

EQ Issue		Yes	No	Comments
8.	Performance/acceptance criteria (operating time, transmitter accuracy, etc as applicable to component).	—	—	
9.	Test sequence conforms to IEEE 323-74 or justification has been provided (N/A DOR Guidelines).	—	—	
10.	Radiation dose covers accident and normal service (DOR Guidelines permits analysis).	—	—	
11.	DBE exposure simulation meets plant requirements:	—	—	
	Steam Exposure	—	—	
	Temperature	—	—	
	Pressure	—	—	
	Humidity	—	—	
	(DOR Guidelines requires test for steam environment.)			
12.	Chemical or water spray simulation performed when required.	—	—	
13.	Accident environment margins (N/A DOR Guidelines).	—	—	
14.	Submergence test (if required for application).	—	—	
15.	Test anomalies resolved.	—	—	
16.	Applicable INs, etc. resolved.	—	—	
17.	Maintenance/Surveillance Criteria and Life Defined.	—	—	
18.	References clearly identified and attached or retrievable (including I.D. of plant equipment).	—	—	

APPENDIX C

PHYSICAL INSPECTION CHECKLISTS

This appendix contains checklists for use in physical inspection of environmentally qualified equipment. Prior to the physical inspection, checklists should be prepared for each device that is to be inspected. The blank spaces in the "Documented Information" section of the checklist should be completed from the information in the licensee's documentation files relating to the device. Alternately, SCEW sheets, other licensee's current equivalent, may be used in lieu of completing some of the checksheet spaces. During the physical inspection, the installed condition should be compared with the documented condition. Agreement between the "As-installed" and "As-documented" information should be marked in the "Yes" column. A disagreement should be marked with a "No" and a description of the nature of the disagreement placed in the "Comments" column. A space is provided for general comments at the bottom of the checklist.

Checklists are provided for the following equipment:

Pressure Transmitters (also to be used for level and flow transmitters)
Motorized Valve Actuators
Limit Switches
Solenoid Operated Valves
Electric Motors
Cables

A general form is provided for other devices.

TRANSMITTER PHYSICAL INSPECTION CHECKLIST

Component ID No.: _____ Reviewer: _____

Documented Information	Installed Condition Agrees with Documented: Yes	No	Comments
1. Location Bldg. ____ Room ___ Elev ____	___	___	
2. Manufacturer _____	___	___	
3.a. Model No. _____	___	___	
b. Range/Type Code _____	___	___	
c. Serial No. _____	___	___	
4. Mounting Description _____ _____	___	___	
5. Orientation _____ _____	___	___	
6. Process Connection Type _____ _____	___	___	
7. Electrical Connection Type ___ _____	___	___	
8. Housing Seals in Good Condition, Covers in Place	___	___	
9. Does Installed Device Experience a Significant Temperature Rise from Process?	___	___	(If yes, review documentation to determine whether considered)
10. Ambient Normal Expected Temperature Range _____	___	___	(If ambient temperature exceeds normal expected, verify that qualified life evaluation considered)

General Comments on Physical Inspection:

MOTORIZED VALVE ACTUATOR PHYSICAL INSPECTION CHECKLIST

Component ID No.: _____ Reviewer: _____

Documented Information		Installed Condition Agrees with Documented: Yes	No	Comments
1.	Location Bldg. ___ Room ___ Elev ___	___	___	
2.	Manufacturer _____	___	___	
3.a.	Model No. _____	___	___	
b.	Serial No. _____	___	___	
4.	Mounting Description _____	___	___	
5.	Orientation _____	___	___	
6.	Housing Seals in Good Condition, Covers in Place	___	___	
7.	Housing and Motor Drains ___	___	___	
8.	Does Installed Device Have a Brake?	___	___	(If yes, verify qualification status)
9.	Conduit Seals _____	___	___	
10.	Ambient Normal Expected Temperature Range _____	___	___	(If ambient temperature exceeds normal expected conditions, verify that licensee has considered the elevated temperature in the qualified life evaluation)

General Comments on Physical Inspection:

LIMIT SWITCH PHYSICAL INSPECTION CHECKLIST

Component ID No.: _____ Reviewer: _____

Documented Information	Installed Condition Agrees with Documented: Yes	No	Comments
1. Location Bldg. ____ Room ____ Elev ____	___	___	
2. Manufacturer _____	___	___	
3. Model No. _____	___	___	
4. Mounting Description _____ _____	___	___	
5. Orientation _____ _____	___	___	
6. Electrical Connection Type _____	___	___	
7. Housing Seals in Good Condition	___	___	
8. Ambient Normal Expected Temperature Range _____	___	___	(If ambient temperature exceeds normal expected conditions, verify that licensee has considered the elevated temperature in the qualified life evaluation)

General Comments on Physical Inspection:

SOLENOID OPERATED VALVE PHYSICAL INSPECTION CHECKLIST

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Component ID _____ Reviewer: _____

Documented Information	Installed Condition Agrees with Documented: Yes	No	Comments
1. Location Bldg. ___ Room ___ Elev ___	___	___	
2. Manufacturer _____	___	___	
3. a. Model No. _____	___	___	
b. Voltage _____	___	___	
c. Configuration _____	___	___	
4. Mounting Description _____	___	___	
5. Orientation _____	___	___	
6. Process Connection Type _____	___	___	
7. Electrical Connection Type ___	___	___	
8. Housing Seals in Good Condition	___	___	
9. Does Installed Device Experience a Significant Temperature Rise from Process?	___	___	(If yes, documentation must be reviewed to determine if the temperature rise was considered)
10. Ambient Normal Expected Temperature Range _____	___	___	(If ambient temperature exceeds normal expected conditions, verify that licensee has considered the elevated temperature in the qualified life evaluation)

General Comments on Physical Inspection:

ELECTRIC MOTOR PHYSICAL INSPECTION CHECKLIST

Component ID: _____ Reviewer: _____

Documented Information	Installed Condition Agrees with Documented: Yes	No	Comments
1. Location Bldg. ___ Room ___ Elev ___	___	___	
2. Manufacturer _____	___	___	
3.a. Model No. _____	___	___	
b. Serial No. _____	___	___	
c. Voltage _____ Hp ____	___	___	
4. Mounting and Orientation ____ _____	___	___	
5. Accessories _____	___	___	
Coolers _____	___	___	
Lubricant Reservoirs _____	___	___	
Heaters _____	___	___	
6. Housing Seals and Covers ____ in Place and Tight _____	___	___	
7. Area Surrounding Motor is Clean and Dry _____	___	___	
8. Ambient Normal Expected Temperature Range _____	___	___	
9.a. Junction Box Type _____ _____	___	___	
b. Drainage Method _____ _____	___	___	

General Comments on Physical Inspection:

CABLE PHYSICAL INSPECTION CHECKLIST

Documented Information	Installed Condition Agrees with Documented: Yes	No	Comments
1. Location Bldg. ___ Room ___ Elev ___	___	___	
2.a. Manufacturer _____	___	___	
b. Model No. _____	___	___	
c. Batch No. _____	___	___	
3.a. Insulation Type _____	___	___	
b. Jacket Type _____	___	___	
c. Number of Conductors _____	___	___	
d. Conductor Size _____	___	___	
e. Shield Configuration _____ _____	___	___	
4. Voltage Rating _____	___	___	(General Information may not be discernible as installed)
5. Ambient Normal Expected Temperature Range _____	___	___	
6. General Condition of Installed Cable	None	Some	
a. Obvious signs of mistreatment	___	___	
b. Obvious surface flaws	___	___	
c. Obvious flaws on conductor insulation at terminations	___	___	

General Comments on Physical Inspection:

EQUIPMENT DESCRIPTION

Component ID _____ Reviewer: _____

Documented Information	Installed Condition Agrees with Documented: Yes	No	Comments
1. Location Bldg. ____ Room ____ Elev ____	___	___	
2. Manufacturer _____	___	___	
3.a. Model No. _____	___	___	
b. Serial No. _____	___	___	
4. Mounting Description _____	___	___	
5. Orientation _____	___	___	
6. Process Connection Type _____	___	___	
7. Electrical Connection Type _____	___	___	
8. Housing Seals in Good Condition, Covers In Place	___	___	
9. Does Installed Device Experience a Significant Temperature Rise from Process?	___	___	(If yes, documentation must be reviewed to determine if the temperature rise was considered)
10. Ambient Normal Expected Temperature Range _____	___	___	(If ambient temperature exceeds normal expected conditions, verify that licensee has considered the elevated temperature in the qualified life evaluation)

General Comments on Physical Inspection: