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DRAFT - TEMPORARY INSTRUCTION 2515/XX

Evaluation of Licensee's Program for Qualification of
Electrical Equipment Located in Harsh Environments

FRC Report No. 5896-05-1

NRC Contract 05-83-215
NRC Project No. TA-EL-205
FRC Project 5896-005

FRC Task Leader: G. J. Toman
NRC Task Leader: G. Hubbard

Prepared for

Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

April 4, 1985

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ALABAMA REGULATORY COMMISSION

Docket No. _____
 In the matter of ALABAMA POWER Co. Official Exp. No. 57
 Staff ☒ IDENTIFIED 2/2/92
 Applicant _____ RECEIVED 2/14/92
 Intervenor _____ REJECTED _____
 Cont'g Diff. _____
 Contractor _____
 Other _____ DATE 4-4-85
 Reporter L. Estep V. Iness _____

(NRC Header)

Inspection and Enforcement Manual

TEMPORARY INSTRUCTION 2515/XX

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

2515/XX-01 PURPOSE

To provide guidance (EQ) for the inspection of licensee environmental qualification programs for ^{electric} equipment important to safety located in harsh environments as required by 10CFR50.49. This temporary instruction (TI) also provides guidance for determining that licensee commitments for resolution of outstanding issues from NRC ~~equipment~~ EQ safety evaluation reports (SERs) are being properly implemented.

2515/XX-02 OBJECTIVES

Verification that the licensee has established a program for the implementation of 10CFR50.49 requirements.

Verification that SER corrective action commitments are being properly implemented.

Verification that the qualified status of equipment is maintained during the life of the plant.

Performance of a physical inspection of equipment to verify that the installations agree with SER commitments and qualification requirements.

2515/XX-03 BACKGROUND

In response to IE Bulletin 79-01B and NUREG-0588, licensees submitted EQ documentation which was reviewed by the NRC-EQS staff and their consultant. 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. 10CFR50.49 became effective on February 22, 1983, further establishing formal qualification requirements. This TI verifies that the licensee has taken the required corrective actions and has implemented a program as required by 50.49 and that the qualification documentation ~~responds to~~ the installed equipment.

COVERS

2515/XX-04

REFERENCES

- 04.01 10CFR50.49, "Environmental Qualification of Electrical 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
- 04.03 NUREG-0588, Rev. 1 (for Comments Version), "Interim Staff Position on Environmental Qualification of Safety-Related Equipment," July 1981
- 04.04 "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 (DOR Guidelines)
- 04.05* Technical Evaluation Report (TER), "Review of Licensee's 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 Report (SER) concerning Environmental Qualification of Safety-Related Electrical Equipment, which forwarded the TER to licensees Also used
last SER
- 04.07* Licensee's response to SER including commitments for corrective action (issued during 1984)
- 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
- 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* Licensee's Response to Generic Letter 84-24

04.12* Licensee's ^{current} System Component Evaluation Worksheets (SCEW sheets) or equivalent (earlier SCEW sheets may be 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* EQ Files

*Prior to the inspection, the licensee shall be requested to have those documents marked by an asterisk available for inspectors' use at the start of the inspection. Key procedures from 04.13 should be obtained and reviewed by the inspector in advance.

2515/XX-05

GENERAL INFORMATION

05.01

Composition of Inspection Team

It is recommended that a team be assigned to perform this inspection. The following is a suggested minimum team:

- a. Team Leader - Leads discussion with licensee at entrance and exit interview. Should be a region-based inspector. Also participates in the inspection effort. (May also perform role b, c, or d below).
- b. Technical Specialist - Knowledgeable of and familiar with 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.
- d. Equipment Qualification Specialist - Knowledgeable of EQ testing and analysis requirements and requirements for documenting qualification results.

2515/XX-06

INSPECTION REQUIREMENTS

06.01

Pre-Inspection Tasks

Prior to the site inspection, a site-specific inspection plan must be prepared.

a. Document Review

In preparation for the inspection, the inspectors should obtain copies of the plant-specific items marked by an asterisk in Section 04, "References." These documents will be used to prepare for the inspection (except for documents 04.10b, 04.12, and 04.13, which will be reviewed during the inspection).

b. Sample Selection

The inspection will entail 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. The sample list should include 10 devices that definitely will be evaluated and 5 that will be evaluated if time permits. The last 5 should be ranked in importance with the most critical first. The list of devices to be evaluated should be developed with the following concerns in mind and should contain as many different equipment types as possible.

and the previously "checksheet index" in section 4.

1. Table 4-1 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 documentational deficiencies. Reference 04.10 provides the base list of items that the licensee has determined to require qualification in accordance with 10CFR50.49. This list is the initial submittal in response to 10CFR50.49 and will be useful for comparison with the present list for evaluation of control and maintenance of the list.
2. Outstanding IE Bulletin and Information Notices related to qualified equipment should be considered. *Generic Letter 94-24 (see reference 04.11) lists several.*
3. Access to the equipment during the walk-through inspection should be considered.
4. Equipment which the licensee added to or deleted from the list of devices requiring qualification since issuance of Reference 04.05 should be considered.
5. *Equipment that has changed category since issuance of reference 04.05.*

motors, terminal boxes, etc.
 9x. The list should cover a variety of equipment including transmitters, valves, valves, cables, limit switches, etc. penetration assemblies which

- 6x. Special attention should be given to devices listed in Reference 04.05 for which no documentation was submitted for review.
- 7x. Equipment that has been installed as replacement for non-qualified equipment should be included.
- 8x. At least one piece of equipment qualified to the DOR Guidelines should be included.

Some modification to the sample list must be expected during the inspection.

c. Team Member Assignments

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

- d. Approximately 2 weeks prior to the start of the inspection, the licensee should be instructed to have the documents marked by an asterisk in the Reference section of this TI available for inspector use during the inspection. *except as noted in 06.01a.*

06.02

INSPECTION TASKS

a. Procedural and Programmatic Inspection

1. Verify that the licensee has implemented a program to generate, maintain, and distribute the list of equipment requiring qualification in accordance with 10CFR50.49.
2. Verify that the licensee has implemented procedures for review and approval of EQ documentation.
3. Verify ^{that} requirements for preservation of the qualified status of equipment ~~is~~ incorporated into plant maintenance and surveillance ~~program~~ procedures. ~~(e.g., that replacement schedules have been established for components once their service life is reached)~~

Note that paragraph (d) of 10 CFR 50.49 generally requires that replacement equipment must be qualified to a higher level than DOR Guide lines.

OK
No

~~equipment and that devices are restored to proper condition after repairs.~~ Review selected maintenance and/or surveillance task procedures to verify that EQ requirements have been incorporated.

4. Verify 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 verify that EQ requirements have been incorporated.
5. Verify 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).
6. Verify that licensee personnel performing work involving qualified equipment are aware of EQ requirements and procedures. Verify that personnel performing review and approval of qualification documentation have appropriate training or experience.
7. Verify that the licensee has established and implemented a mechanism for addressing IE Bulletin and Information Notices relating to equipment requiring qualification.

b. Documentation File Inspection

1. Check the completeness of the licensee's list of equipment requiring qualification by verifying that the list includes the equipment listed in the licensee's list of emergency procedures equipment and that equipment required by Reg. Guide 1.97 is included. Compare Reference 4.10 ~~equipment list~~ *a and b.* Verify that changes made to the EQ list have been performed in accordance with established procedures.
2. Verify that the qualification files for the samples selected in 06.01b 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 the equipment has been determined to be qualified for its application.

The team member reviewing the documentation for a component should also perform the physical inspection where possible. Team inspection by the team is a group is desirable.

No

3. Verify that the licensee has determined 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, verify that the commitments for corrective action stated in Reference 04.07 have been fulfilled or appropriate action is being taken.
 5. Verify that the licensee's procedures for review and approval of qualification documentation have been implemented through review of the documentation file for a new device or for a piece of replacement equipment.
 6. Obtain the equipment descriptions, model and serial number, and plant ID for use in the physical inspection. Determine any special requirements for orientation, connections, housing seals, etc. dictated by the EQ documentation. (The Appendix contains check sheets for standard pieces of equipment.)
- d. Physical Inspection
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 the Appendix, verify that the installed equipment is that which is described in the licensee's documentation and that the equipment appears to be properly installed and maintained.
 3. Verify that equipment surrounding the device being inspected will not 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.

2515/XX-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, Division of Quality Assurance, Safeguards and Inspection Programs, and to the Office of Nuclear Reactor Regulation, Environmental Qualification Branch.

2515/XX-08 EXPIRATION DATE

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

2515/XX-09 IE CONTACT

R. C. Wilson, 492-4841

2515/XX-10 STATISTICAL DATA REPORTING

(To be added by NRC)

Temporary Instruction 2525/XX
Evaluation of Licenser's Program for Qualification of
Electrical Equipment Located in Harsh Environments

APPENDIX

PHYSICAL INSPECTION CHECKLIST

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. 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.

Alternately, SCEW sheets or the licensee's current equivalent can be used in lieu of filling out some of the checklist spaces.

PHYSICAL INSPECTION CHECKLIST

Pressure Transmitter

Plant ID No. _____

Documented Information	Installed Condition		Comments
	Agrees with Documented		
	Yes	No	
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, documentation must be reviewed to deter- mine if the temperature rise was considered)
10. Ambient Normal Expected Tempera- ture 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:

PHYSICAL INSPECTION CHECKLIST

Motorized Valve Actuator

Plant ID No. _____

<u>Documented Information</u>	<u>Installed Condition</u>		<u>Comments</u>
	<u>Agrees with Documented</u>	<u>Agrees with Documented</u>	
	<u>Yes</u>	<u>No</u>	
1. Location Bldg _____ Room _____ Elev _____	_____	_____	
2. Manufacture _____	_____	_____	
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:

PHYSICAL INSPECTION CHECKLIST

Limit Switch

Plant ID No. _____

Documented Information			Installed Condition		Comments
			Agrees with Documented		
			Yes	No	
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:

PHYSICAL INSPECTION CHECKLIST

solenoid Operated Valve

Plant ID No. _____

Documented Information	Installer Condition		Comments
	Agrees with Documented	Agrees with Documented	
	Yes	No	
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:

PHYSICAL INSPECTION CHECKLIST

Electric Motor (large, continuous duty)

Plant ID No. _____

Documented Information	Installed Condition		Comments
	Agrees with Documented		
	Yes	No	
1. Location Bldg. _____ Room _____ Elev _____			
2. Manufactured _____			
3. a. Model No. _____			
b. Serial No. _____			
c. Voltage _____ Hp _____			
4. Mounting and Orientation _____			
5. Accessories _____			
Coolers _____			
Lubricant Reservoirs _____			
Heaters _____			
6. H using 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:

PHYSICAL INSPECTION CHECKLIST

Equipment Description

Plant ID No. _____

Documented Information	Installed Condition		Comments
	Agrees with Documented		
	Yes	No	
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 deter- mine if the temperature rise was considered)
10. Ambient Normal Expected Tempera- ture 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:

PHYSICAL INSPECTION CHECKLIST

Cable

Plant ID No. _____

Documented Information	Installed Condition		Comments
	Agrees with Documented		
	Yes	No	
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: