

NRC INSPECTION MANUAL

IRIB

INSPECTION PROCEDURE 71111 ATTACHMENT 21P

COMPONENT DESIGN BASES INSPECTION (PROGRAMS)

INSPECTABLE AREA: Design Bases Inspection (DBI)

CORNERSTONES: Barrier Integrity
Mitigating Systems

EFFECTIVE DATE: XX/XX/2015

INSPECTION BASES: Licensees are required by 10 CFR Part 50 Appendix B to establish a quality assurance program which will provide control over activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to safety. This inspection is intended to assess the effectiveness of one of the many licensee's quality assurance program using the appropriate attachment to this inspection procedure.

LEVEL OF EFFORT: Review of one to two programs. IP Attachment 71111.21T provides direction on conducting a 2-week team inspection.

71111.21P-01 INSPECTION OBJECTIVE

To gain reasonable assurance that risk significant structures, systems, and components (SSCs) can adequately perform their design basis function. This includes reasonable assurance that the components can fulfill their design basis function during or after licensee's activities (e.g., maintenance, surveillance) which can affect component's availability, reliability and capability. Additionally, this includes that reasonable assurance that risk significant issues resulting from the generic communications have been adequately addressed.

This inspection attachment is intended to assess the effectiveness of the licensee's engineering programs by sampling a limited number of components. In the course of evaluating specific components, important attributes of the selected program, processes, and procedures are also examined to provide a reasonable level of assurance that risk-significant components and systems throughout the plant will function as designed during design basis events and that common-mode failures of components are prevented.

71111.21P-02 INSPECTION REQUIREMENTS AND GUIDANCE

See attachment

71111.21P-03 DOCUMENTATION

The results of this inspection report may be documented in either the resident's integrated quarterly inspection report or in a stand-alone inspection report.

71111.21P-04 RESOURCE ESTIMATE

Completion of this attachment to the DBI inspection procedure is expected to take, on the average, 96 hours (plus or minus 15%) of direct inspection effort at the site, regardless of the number of units every three years. This attachment should nominally take three inspectors, one week to complete.

71111.21P-05 COMPLETION STATUS

Inspection in the sample range specified in the attachment for a license program inspected will constitute completion of this procedure in the RPS.

Satisfactory completion of inspection procedures 71111.21P and 71111.21T satisfy the requirement to complete IP 71111.21 every three years.

END

Attachment 1 - Environmental Qualification (EQ) under 10 CFR 50.49
Programs, Processes, and Procedures

Background:

It is essential that safety-related equipment located in harsh environments be qualified to demonstrate that it can perform its safety function during and after a design basis accident: under the environmental service conditions in which it will be required to function; for the length of time its function is required; and that non-safety related equipment be able to withstand environmental stresses under which its failure could prevent the satisfactory function of safety-related equipment.

Formal qualification requirements for electrical equipment located in harsh areas are stated within 10 CFR Part 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants." Furthermore, EQ principles are embodied in General Design Criteria 1, 2, 4, and 23 of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 and in Criterion III, "Design Control," Criterion XI, "Test Control," and Criterion XVII, "Quality Assurance Records," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50.

This inspection is intended to assess the effectiveness of the licensee's EQ program by sampling a limited number of components. In the course of evaluating specific components, important attributes of the EQ program, processes, and procedures are also examined to provide a reasonable level of assurance that risk-significant components and systems throughout the plant will function as designed during design basis events and that common-mode failures of components are prevented. This Attachment is applicable to equipment located in areas with harsh environments (as defined in 10 CFR 50.49) both inside and outside primary containment.

If possible, this attachment should be performed in a different year than the DBI (team) inspection during the applicable Reactor Oversight Process (ROP) triennial period.

Each region should consider the advantages of performing a program inspection in advance of the larger team inspection. Specifically, the program review may be done before the larger team inspection (ideally 6-12 months in advance) to provide an opportunity for deficiencies identified during program reviews to be used to guide component sample selection for the subsequent team inspection. In addition, this approach allows the subsequent team inspection to evaluate engineering corrective actions and their effectiveness.

71111.21P-.01 INSPECTION OBJECTIVES

This inspection procedure will review the licensee's implementation of the electrical equipment qualification program, as required by 10 CFR 50.49, for maintaining the qualified status of equipment during the life of the plant. Additionally, the inspection will perform an inspection of the equipment qualification documentation files to verify that electric equipment important to safety meets the requirements of 10 CFR 50.49(j) and will perform inspection of selected accessible electrical equipment which are within the scope of 10 CFR 50.49.

71111.21P-.02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Select Sample Components to Review Select 6 to 10 components to review and assess regarding the EQ program. The focus should be equipment that is subjected to the effects of pipe breaks, radiation, high temperatures, or other harsh environments and is required to mitigate the consequences of a design basis accident or bring the plant to safe shutdown. At least one of the components shall be located within primary containment.

The components should be in different plant systems and should cover a variety of equipment types (e.g., pressure and flow transmitters, solenoid-operated valves, air operated valves, motor-operated valves, cables, electrical splices, limit switches, motors, terminal blocks, containment penetrations, and post-accident monitoring equipment. The selection process should consider the safety significance of the equipment items based on Probabilistic Risk Assessment (PRA) ranking of the licensee's design.

02.02 Pre-Inspection Tasks Prior to the On-Site Inspection: the following tasks should be completed:

- a. Inspectors should obtain and review those portions of the Final Safety Analysis Report and any Safety Evaluation Reports applicable to 10 CFR 50.49 and the components selected for review.
- b. Inspectors should review the licensee's Equipment Qualification Master List (EQML) requiring environmental qualification for the samples selected for review.

It is intended that the team leader bagman trip will occur in advance of the inspector's preparation week so that for the samples selected, the following materials are available for the preparation phase of the inspection. For the 6 to 10 components selected, the following items should be obtained from the licensee for use during the preparation week:

1. Scope of the equipment qualification program
2. Licensee's site-specific EQ equipment list, system component evaluation worksheets (SCEW), also known as environmental qualification data packages (EQDP), and other pertinent qualification documentation files.

Note that full qualification reports can be several hundred pages long and include mostly data tables and laboratory documentation. Inspectors may choose to initially ask for summary reports which will contain much of the review material needed for each component.

3. Copies of the licensee's procedures applicable to equipment qualification which include the EQ program, procurement of qualified equipment, maintenance of qualified equipment, and any modifications to the plant that could affect qualified equipment under such activities as the equivalency or commercial grade dedication programs.

4. Near the beginning of the on-site inspection, make advance arrangements for a briefing by licensee staff knowledgeable of high energy line break (HELB) analyses and assumptions. The intent is for inspectors to gain an understanding of HELB analyses so that during the inspection they are aware of calculations which may lack adequate documentation; plant areas which may be missing a HELB analysis; and components which may be located in harsh environmental areas for which they are not rated.
5. Advance arrangements for plant walkdowns and interviews to avoid unnecessary delays. Discuss the accessibility of the devices to be inspected with the licensee modifying the list of selected components, if necessary.

Note that it is not expected that inspectors would perform a primary containment entry at power to perform a component walkdown. However, the inspector should perform a walkdown of a component inside primary containment if a refueling, maintenance, or forced outage provides access to the component while the inspector is on site.

6. List of corrective action program condition reports related to the EQ program or environmental qualification of components over the last 3 years.

02.03 Inspection Requirements:

The onsite inspection will consist of the following tasks:

a. EQ Program

1. Review the site HELB analysis and assumptions to verify that there have been no changes to the HELB areas for the components selected.
2. Determine that the licensee has implemented corrective actions for addressing operating experience relating to equipment requiring qualification under 10 CFR 50.49.
3. Verify that the licensee accounts for warehouse storage time and environmental conditions, where applicable, in the service life of components approved as EQ replacement parts in plant systems.

b. EQ Procedures

1. Review selected maintenance and/or surveillance procedures to determine that EQ requirements have been incorporated.
2. Review selected procurement documents to determine that EQ requirements have been met.
3. Review modification packages and related documents such as work orders to verify that EQ requirements have been incorporated.

c. EQ Documentation Files

1. Review the qualification files for the samples selected to evaluate whether 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 is qualified for the application.

The review should be general in nature and should verify that the important qualification requirements have been addressed in the qualification files. A checklist that can be used as a guide for the reviews of the qualification files is contained in Appendix A. Note that Appendix A should be used as a sample list of attributes to consider, recognizing that there may be other attributes that are applicable to the specific component selected.

In addition, for the components selected:

- a) Sample any changes made to specific components and verify that the EQML has been appropriately updated.
- b) Review the qualification documentation files to determine if the licensee has demonstrated that the installed devices are the same, or similar devices that were qualified (i.e., type tested).
- c) Obtain the equipment descriptions, model and serial number, and plant ID for use during equipment walkdown portion of this inspection. Determine any special requirements for device orientation, connections, housing seals, junction box drain holes etc. required by the EQ documentation. (Appendix B contains checklists for several standard pieces of equipment).

d. Equipment Walkdown

1. Through use of the equipment checklists contained in Appendix B, determine if the installed equipment is the same as that described in the licensee's documentation and that the equipment is properly installed and maintained.
2. Determine if the equipment surrounding the component 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.
3. Verify that a sample of replacement parts in the warehouse, approved for installation in plant systems, is that described in the licensee's documentation and EQML.

- e. Problem Identification and Resolution Inspection activities under this attachment include independent verification that the licensee is identifying problems related to EQ and entering them in the corrective action program. For a sample of selected problems documented in the corrective action program, verify that the corrective actions and

resolutions are appropriate and adequate. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance. Where applicable, the inspectors should include a review of internal and external operating experience to ensure the licensee has included HELB and EQ issues into their corrective action program.

71111.21P-.03 REFERENCES

10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants"

NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Equipment", Revision 1, July 1981

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

Regulatory Guide 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants", Revision 4, June 2006

SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria", dated 10/28/2005

Temporary Instruction 2515/76, "Evaluation of Licensee's Program for Qualification of Electrical Equipment Located in Harsh Environments", issued 03/27/1986
IEEE Std. 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"

Licensee's EQ Master List (EQML) of Equipment Requiring Qualification to 10 CFR 50.49.
Licensee's System Component Evaluation Worksheets (SCEW) for EQ

Licensee's Procedures for EQ Program, Procurement of Qualified Equipment, Maintenance of Qualified Equipment, and Maintenance to Plant that could affect qualified equipment

Licensee's Qualification Documentation and/or Files (e.g., EQDP)

Appendix A – Checklist for Review of Licensee EQ Documentation Files

Appendix B – Physical Inspection Checklists

END

APPENDIX A

CHECKLIST FOR REVIEW OF LICENSEE EQ DOCUMENTATION FILES

This checklist is provided for use in performing evaluations of the adequacy of a qualification documentation package for a piece of equipment qualified to the requirements of 10 CFR 50.49(j).

Such reviews by the inspector(s) 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. For other files, items not reviewed should be marked "N/A" in the "Comments Column".

Plant/Docket No.: _____ Reviewer: _____

Component(s): _____

Equipment Documentation File: _____

A general list of attributes to consider in reviewing EQ documentation include:

- Definitive documentation provided by the licensee that the equipment is qualified for its application
- Technical description of the equipment
- If qualification sample is not identical to the installed devices, a documented engineering analysis has been provided
- Required mounting methods and orientations
- Delineated Interfaces – conduit, housing, seal(s), etc.
- A documented qualified life has been established based on accelerated aging – thermal, radiation, cyclic, as appropriate
- All type tests performed on the same test specimen
- Performance/acceptance criteria (operating time, transmitter accuracy, etc., as applicable to component)
- Documented test sequence conforms to IEEE 323-1974, or justification for non-conformance has been provided
- Radiation levels and exposure times, cover accident, and normal service
- DBE exposure simulation meets plant requirements:
 - Steam Exposure
 - Temperature
 - Pressure Humidity
- Chemical or water spray testing performed, when required
- Suggested margins according to IEEE Std. 323
- Submergence test (If required)
- Test anomalies properly documented and resolved
- Applicable installations, etc., resolved
- Maintenance/surveillance criteria and qualified life defined
- Required maintenance activities have been performed and are current
- References clearly identified and attached or retrievable (including the component name and designator of the plant equipment)

APPENDIX B

PHYSICAL INSPECTION CHECKLISTS

This Appendix contains checklists for use in physical inspections 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. Alternatively, SCEW sheets may be used in lieu of completing some of the check sheet spaces. During the physical inspection, the as “Installed Condition” should be compared with the “Documented Information.” Agreement between the “As Installed” Condition 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 should be placed in the “Comments” column.

Checklists are provided for the following equipment on the licensee’s EQML:

- Pressure transmitters (also to be used for level and flow transmitters)
- Motor Operated Valves
- Limit Switches
- Solenoid Operated Valves
- Electric Motors
- Cables including consideration of submerged cables in buried and below grade cable vaults

A general form (EQUIPMENT DESCRIPTION) is provided for other devices such as:

- Switchgear
- Motor Control Centers
- Logic Equipment
- Diesel Generator Control Equipment
- Sensors (pressure, pressure differential, temperature, and neutron)
- Limit Switches
- Heaters
- Fans
- Control Boards
- Instrument Racks and Panels
- Electrical Penetrations
- Connectors
- Splices
- Terminal Blocks
- EQ taped and Raychem splices

PRESSURE TRANSMITTER PHYSICAL INSPECTION CHECKLIST

Component ID No. _____ Review: _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. <u>Location</u> Bldg. _____ Room _____ Elevation _____			
2. Manufacturer Model No. _____ Serial No. _____ Range/Type/Code _____			
3. Mounting Description			
4. Orientation			
5. Process Connection Type			
6. Electrical Connection Type			
7. Housing seal(s) in good condition, covers, in-place			
8. Does the installed device, experience a significant temperature rise from process or accident conditions? (If yes, review documentation to determine whether considered)			
9. Ambient normal expected temperature range: _____ (If ambient temperature exceeds normal expected range, verify that licensee has considered the elevated temperature in the qualified life evaluation)			

MOTORIZED VALVE ACTUATOR PHYSICAL INSPECTION CHECKLIST

Component ID: _____ Reviewer _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. <u>Location</u> Bldg. _____ Room _____ Elevation _____			
2. Manufacturer Model No. _____ Serial No. _____ Range/Type/Code _____			
3. Mounting Description			
4. Orientation			
5. Housing seal(s) in good condition, covers, in-place			
6. Housing and motor drains			
7. Does the installed device have a brake? (If yes, verify status qualification)			
8. Conduit seal(s)			
9. Ambient normal expected temperature range _____ (If ambient temperature exceeds normal expected conditions, verify, that the licensee has considered the elevated temperature in the qualified life evaluation)			

LIMIT SWITCH PHYSICAL INSPECTION CHECKLIST

Component ID: _____ Reviewer: _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
1. Location	Yes	No	Comments
Bldg _____ Room _____ Elevation _____			
2. Manufacturer _____ Model No. _____ Serial No. _____			
3. Mounting Description			
4. Orientation			
5. Electrical Connection Type			
6. Housing seal(s) in good condition			
7. Ambient Normal Expected Temperature Range (If ambient temperature exceeds normal expected conditions, verify, that the licensee has considered the elevated temperature in the qualified life evaluation)			

Issue Date:

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SOLENOID OPERATED VALVE PHYSICAL INSPECTION CHECKLIST

Component ID: _____ Reviewer: _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. Location Bldg: _____ Room _____ Elevation _____			
2. Manufacturer 3. Model No. _____ Serial No. _____ Voltage _____ Configuration _____			
4. Mounting Description			
5. Orientation			
6. Process Connection Type			
7. Electrical Connection Type			
8. Housing seal(s) 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 was considered.)			
10. Ambient normal expected temperature range (If ambient temperature exceeds normal expected conditions, verify that the licensee has considered the elevated temperature in the qualified life evaluation.)			

ELECTRIC MOTOR PHYSICAL INSPECTON CHECKLIST

Component ID No. _____ Reviewer: _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. Location Bldg. _____ Room _____ Elevation _____			
2. Manufacturer _____ Model No. _____ Serial No. _____ Batch No. _____			
3. Insulation Type _____ Jacket Type _____ No. of Conductors _____ Conductor Size _____ Shield Configuration _____			
4. Voltage Rating			
5. Ambient Normal Expected Temperature Range			
6. General Condition of Installed Cable			

CABLE PHYSICAL INSPECTION CHECKLIST

Component ID: _____

Reviewer: _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. <u>Location</u> Bldg. _____ Room _____ Elevation _____			
2. Manufacturer Model No. _____ Serial No. _____ Batch No. _____			
3. Insulation Type			
4. Jacket Type			
5. No. of Conductors			
6. Conductor Size			
7. Shield Configuration			
8. Voltage Rating			
9. Ambient Normal Expected Temperature Range			
10. General Condition of Installed Cable			

Issue Date:

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EQUIPMENT DESCRIPTION

Component ID: _____ Reviewer: _____

<u>Documented Information</u>	<u>Installed Condition Agrees with Documented Information</u>		
	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. Location Bldg. _____ Room _____ Elevation _____			
2. Manufacturer Model No. _____ Serial No. _____			
3. Mounting Description			
4. Orientation			
5. Process Connection Type			
6. Electrical Connection Type			
7. Housing seal(s) in good condition, Covers in-place			
8. Does the installed device experience a significant temperature rise _____? (If yes, documentation must be reviewed to determine if the temperature rise was considered)			
9. Ambient normal expected temperature range (If ambient temperature exceeds normal expected conditions, verify that the licensee has considered the elevated temperature in the qualified life evaluation)			
10. Does the licensee account for warehouse storage time, where applicable, in the service life of components approved as replacement parts in plant systems (e.g. elastomer compounds such as O-rings, air-operated valve diaphragms, etc.)			

Attachment 2
Revision History for IP 71111.21P

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment and Feedback Resolution Accession Number
N/A	ML15176A433 XX/XX/15 CN 15-XXX	Initial Issuance of the inspection procedure. Researched commitments for four years and found none.	No	N/A