

# NRC INSPECTION MANUAL

EEEE  
RPAC & MEB

---

## INSPECTION PROCEDURE 51080

---

### PART 52, ENVIRONMENTAL QUALIFICATION (EQ) PROGRAM FOR ELECTRICAL AND MECHANICAL EQUIPMENT

PROGRAM APPLICABILITY: 2504

#### 51080-01 INSPECTION OBJECTIVES

01.01 To inspect the licensee's EQ program for electrical and instrumentation and control (I&C) equipment that is important to safety for meeting the requirements of 10 CFR 50.49.

01.02 To inspect the licensee's implementation of the EQ program for maintaining the qualified status of equipment during the life of the plant, as required by 10 CFR 50.49.

01.03 To inspect the EQ documentation files to verify that electric equipment important to safety meets the requirements of 10 CFR 50.49(j).

01.04 To physically inspect equipment within the scope of 10 CFR 50.49, to determine that the installed equipment meets the qualification requirements.

01.05 To inspect the establishment, implementation, and documentation of the EQ program for nonmetallic parts for pumps, valves, and dynamic restraints to verify that this program meets quality assurance requirements of 10 CFR Part 50, Appendix B and the licensing requirements of the facility.

#### 51080-02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Team Members and Responsibilities. A team of regional personnel supplemented by personnel from NRC headquarters, if necessary, performs this onsite inspection. The following defines the required nominal team composition and each team member's responsibilities:

- a. Team Leader - A regional inspector to coordinate team activities, lead discussions with the licensee, conduct entrance and exit interviews, and participate in the inspection.
- b. Technical Specialist - Knowledgeable of the application and operation of electrical, mechanical, and I&C equipment requiring EQ.
- c. Quality Assurance Specialist - Knowledgeable of quality assurance (QA) for procurement, maintenance, and testing of equipment requiring EQ.
- d. Environmental Qualification Specialist - Knowledgeable of the 10 CFR 50.49 requirements of EQ testing and analysis and requirements for documenting qualification results.

- e. Radiation Specialist - Knowledgeable of the requirements of radiation exposure for EQ testing and analysis and requirements for documenting radiation testing qualification results.

02.02 Pre-Inspection Tasks. Prior to the inspection, the team completes the following tasks:

- a. Review those portions of Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment," of NUREG-0800, and Section 3.11, Environmental Qualification of Mechanical and Electrical Equipment, of the NRC Final Safety Evaluation Reports for the relevant licensee and any referenced design certification.
- b. Review the Equipment Qualification Master List (EQML) of equipment requiring EQ for completeness and accuracy.
- c. From the EQML, select a representative sample size of items. The inspection will include evaluation of qualification documentation of these items. The list of selected items should contain as many different types of equipment as possible located in multiple EQ zones. The selection process should consider the safety significance of the equipment items, including an evaluation of the probabilistic risk assessment (PRA) ranking of the equipment by the licensee, generally described in Chapter 19 and Section 17.4 of the Final Safety Analysis Report (FSAR). If the selected equipment is located in multiple EQ zones, consider performing the inspection in the harshest EQ zone.
- d. The team leader divides the responsibility for the main segments of the inspection among the team members before the inspection. Comparison and correlation of information discovered during the inspection by the team members is important.
- e. Approximately three weeks prior to the inspection, review the following items with the licensee:
  - 1. Scope of the EQ inspection.
  - 2. Documents to be made available during the inspection to include the licensee's updated FSAR (specifically Section 3.11), EQ Program, site-specific EQ equipment list, system component evaluation worksheets (SCEW) (which may also be known as environmental qualification data packages (EQDP)), qualification plans, qualification reports, and other pertinent qualification documentation files.
  - 3. Advance copies of the licensee's procedures applicable to EQ, which include the EQ program, procurement of qualified equipment, maintenance of qualified equipment, service life and maintaining qualified status of equipment and nonmetallic parts, and any modifications to the plant that could affect qualified equipment.
  - 4. Advance arrangements for plant walkdown to avoid unnecessary delays.
  - 5. Other logistics, including security.

02.03 Inspection Tasks. The inspection will consist of the following tasks:

- a. Request that the licensee give a presentation to describe its organization, EQ program and the status of program implementation.
- b. The procedural and programmatic inspection tasks will include the following:
  1. Review the licensee's procedures to determine that the licensee has implemented a program to generate, maintain, and distribute the list of electrical and mechanical equipment requiring EQ.
  2. Review the licensee's procedures for the EQ of nonmetallic parts for pumps, valves, and dynamic restraints, following the specific guidance in Appendix C to this inspection procedure.
  3. Review program documentation to determine that the licensee has implemented procedures for review and approval of EQ documentation and for establishing EQ.
  4. Review selected maintenance and surveillance procedures to determine that the licensee has incorporated EQ requirements, including provisions for service life and maintaining qualified status of equipment and nonmetallic parts.
  5. Determine that the procedures for procurement of replacement and spare equipment addresses EQ requirements and that the procedures require qualification of the equipment to be established before use in the plant. Review selected procurement documents to determine that EQ requirements have been met. Determine that the people performing these requirements have the requisite skill and knowledge (e.g., equipment aging due to radiation exposure).
  6. 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 to be re-qualified or the modification changes the environment of qualified equipment, changes the expected service life of the equipment, or changes the design basis event (DBE) environmental conditions).
  7. 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 and experience.
  8. Determine that the licensee has established and implemented a mechanism for addressing NRC generic communications relating to EQ of electrical and mechanical equipment.
  9. Review licensee QA audit records for evidence of conformance to procedure requirements.

10. Review the licensee's process for determining the Total Integrated Dose (TID) to equipment. Confirm that the process utilized includes dose over the duration of the operating license (e.g., including license renewal) and dose from DBEs (e.g., including any power uprates).
  11. Review the licensee's process for including the results of Operating Experience, related to the qualification and performance of electrical and mechanical equipment.
- c. The EQ documentation file inspection will include the following tasks:
1. Review the completeness and accuracy of the EQML by comparing to other approved documents or databases and by actual walkdowns. The EQML should contain electric equipment important to safety as defined in 10 CFR 50.49(b). Note that this includes non-safety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by the safety-related equipment. In addition, confirm by sampling that the EQML includes the equipment listed in the licensee's emergency procedures and equipment required by RG 1.97. The walkdowns should confirm on a sampling basis the completeness and accuracy of the EQML. This could be accomplished by verifying that all 10 CFR 50.49 equipment located in a specific harsh zone is included in the EQML and also verifying the accuracy of information in the EQML such as the location of the equipment.
  2. Review the qualification files for the samples selected 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 determine that all qualification requirements have been addressed in the qualification files. The review should also ascertain that the assumed values for environmental parameters are bounded by the vendor specifications (e.g., humidity, temperature and pressure). Inspectors can use the checklist in Appendix A to this inspection procedure as a guide for the reviews of the qualification files.
  3. Review the documentation files for the EQ of nonmetallic parts for pumps, valves, and dynamic restraints as specified in Appendix C to this inspection procedure.
  4. Review the qualification documentation files to determine that the licensee has demonstrated that the installed devices are the same or similar devices that were qualified (i.e., type tested).
  5. Obtain the equipment descriptions, model and serial number, and plant ID for use in the physical inspection (equipment walkdown). Determine any special requirements for device orientation, connections, housing seals, etc., required by the EQ documentation. Appendix B to this inspection procedure contains checklists for several standard pieces of equipment.

6. Sample check the EQ radiation zone determination calculations to ensure that the licensee used conservative design inputs for establishing the radiation zones. Compare design outputs to the corresponding EQ specifications.
- d. The physical inspection (equipment walkdown) will consist of the following tasks:
1. At the beginning of the inspection, discuss the accessibility of the equipment to be inspected with the licensee. Modify the list as appropriate with proper justification.
  2. Through use of the equipment checklists contained in Appendix B to this inspection procedure, 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. The team member responsible for reviewing the documentation for an equipment item should also perform the physical inspection.
  3. Determine if equipment surrounding the equipment being inspected may fail in a manner that could prevent the inspected equipment 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.
  4. Look for potential sources of localized effects that could worsen the general EQ zone environmental conditions. Determine if the operational environmental conditions (e.g., temperature, humidity, radiation type, and exposure rate) are as described.
  5. Validate the assumptions of the EQ zone calculations on a sampling basis. Note: This should include unsealed doors that serve as barriers to mitigate high energy line breaks, normally open dampers, and unsealed penetrations that could make the environmental conditions harsher than calculated or can potentially cause common mode failure.

#### 51080-03 RESOURCE ESTIMATE

The average time needed to complete the onsite EQ inspection is estimated to be one week. In addition to the team leader, additional technical specialists may be required to assist in the inspection. The resource estimate for this inspection procedure is approximately 200 hours of direct inspection effort.

#### 51080-04 PROCEDURE COMPLETION

The goal of this inspection is to review the representative sample size of electrical and mechanical equipment chosen from the EQML; if fewer samples are available, then generally all available samples should be reviewed. However, if fewer samples than these goals are reviewed, but the inspectors feel that the quality of the samples reviewed is high and there are no significant findings, the intent of this inspection procedure has been met.

This procedure is complete when the programmatic portions of each section of the IP have been inspected and verified to meet the intent of that described in the FSAR and the inspectors can make a determination that the program has been adequately implemented.

51080-05 REFERENCES

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

NRC Information Notice 2014-04, "Potential for Teflon Material Degradation in Containment Penetrations, Mechanical Seals and Other Components," March 2014.

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

NUREG-0800 Standard Review Plan, Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment."

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, "Instrumentation for Light Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," Revision 3, May 1983.

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."

Regulatory Guide 1.100 (Revision 3), "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants."

Information Notice 2014-11, "Recent Issues Related to the Qualification and Commercial Grade Dedication of Safety-Related Components," September 19, 2014.

Information Notice 86-71 "Recent Identified Problems with Limitorque Motor Operators,"

Information Notice 84-68 "Potential Deficiency in Improperly Rated Field Wiring to Solenoid Valves,"

Information Notice 84-90 "Main Steam Line Break Effect on Environmental Qualification of Equipment,"

Information Notice 85-39 "Auditability of Electrical Equipment Qualification Records at Licensees' Facilities,"

NUREG-1465 "Accident Source Terms for Light-Water Nuclear Power Plants,"

Inspection Procedure 65001.E, "Inspection of the ITAAC-Related Qualification Program," June 20, 2014.

ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants."

IEEE Std. 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."

END

List of Appendices:

Appendix A – Checklist for Review of Licensee Electrical EQ Documentation Files

Appendix B – Pressure Transmitter Physical Inspection Checklist

Appendix C – Environmental Qualification (EQ) of Nonmetallic Parts for Pumps, Valves, and Dynamic Restraints

List of Attachments:

Revision History Table

APPENDIX A

Checklist for Review of Licensee **Electrical** 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 inspection team 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 EQ file. For other files, items not reviewed should be marked N/A in the "Comments" column.

Plant/Docket No.: \_\_\_\_\_ Reviewer: \_\_\_\_\_

Component(s): \_\_\_\_\_

Equipment Documentation File: \_\_\_\_\_

Covered in  
EQ Documentation

<u>EQ Issue</u>	<u>Yes</u>	<u>No</u>	<u>Comments</u>
1. Definitive documentation provided by the licensee that the equipment is qualified for its application.	___	___	
2. Technical description of the equipment.	___	___	
3. If qualification sample is not identical to the installed devices, a documented engineering analysis has been provided.	___	___	
4. Required mounting methods and orientations.	___	___	
5. Delineated Interfaces - conduit, housing, seal, etc.	___	___	
6. A documented qualified life has been established based on accelerated aging - thermal, radiation, cyclic, as appropriate.	___	___	
7. <b>Verification of Post Accident monitoring equipment, Per RG 1.97.</b>	___	___	



Component(s): \_\_\_\_\_  
 Covered In  
 EQ Documentation

<u>EQ Issue</u>	<u>Yes</u>	<u>No</u>	<u>Comments</u>
8. All type tests performed on the same test specimen.	___	___	
9. Performance/acceptance criteria (operating time, transmitter accuracy, etc. as applicable to component).	___	___	
10. Documented test sequence conforms to IEEE 323-1974 or justification for non-conformance has been provided.	___	___	
11. Radiation types, levels and exposure times cover accident and normal service. (Levels should include localization effects, if any)	___	___	
12. Other normal accident level exposure simulation meets plant requirements:			
Steam Exposure	___	___	
Temperature	___	___	
Pressure	___	___	
Humidity	___	___	
13. Chemical or water spray testing performed when required.	___	___	
14. Suggested margins according to IEEE Std 323.	___	___	
15. Submergence test (if required).	___	___	
16. Test anomalies properly documented and resolved.	___	___	
17. Applicable Installations, etc. resolved.	___	___	
18. Maintenance/Surveillance Criteria and Qualified Life Defined.	___	___	
19. References clearly identified and attached or retrievable (including I.D. of plant equipment).	___	___	

## APPENDIX B

### Physical Inspection Checklists

This appendix contains checklists for use in physical inspection of environmentally qualified equipment. Prior to the physical inspection, **the inspectors should prepare** checklists for each device that is to be inspected. **Complete the** blank spaces in the “Documented Information” section of the checklist from the information in the licensee’s documentation files relating to the device. Alternatively, **use system component evaluation worksheets (SCEW)** sheets in lieu of completing some of the check sheet spaces. During the inspection, **compare** the “As-Installed Condition” with the “Documented Information.” **Verify** the absence of sources of localized environmental effects such as proximity of equipment to heat and radiation sources (e.g., uninsulated pipes, and the location of equipment in unvented enclosures.) **Mark a**greement between the “As Installed” Condition and “As Documented Information” in the “Yes” column. **Mark a** disagreement with a “No” and **describe** the nature of the disagreement in the “Comments” column. **The bottom of the checklist provides a** space for general comments.

**This appendix provides** checklists for the following equipment on the licensee’s EQML:

- Sensors (e.g., pressure, temperature, level, radiation) transmitters
- Motor Operated Valves
- Limit Switches
- Solenoid Operated Valves
- Electric Motors
- Electrical Cables
- Data cables (e.g., network, fiber optic)

**This appendix provides a** General Form (EQUIPMENT DESCRIPTION) 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
- Electrical Connectors
- Fiber Optic Connectors
- Splices (EQ taped and Raychem splices)
- Terminal Blocks

PRESSURE TRANSMITTER PHYSICAL INSPECTION CHECKLIST

Component ID No.: \_\_\_\_\_ Reviewer: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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 (Verify shipping plugs have been removed and required plugs in place, and that housing seals are flush against body, (i.e., no gaps))	___	___	
9. Does installed device experience a significant temperature rise from process or accident conditions? (If yes, review documentation to determine whether considered)	___	___	
10. Ambient Normal Expected Temperature Range _____ (If ambient temperature exceeds normal expected, verify that licensee has considered the elevated temperature in the qualified life evaluation)	___	___	

General Comments on Physical Inspection:

# MOTORIZED VALVE ACTUATOR PHYSICAL INSPECTION CHECKLIST

Component ID: \_\_\_\_\_

Reviewer: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
1. Location Bldg. ____ Room ____ Elev ____	___	___	
2. <b>Motor and Actuator</b> Manufacturer _____	___	___	
3. a. Model No. _____	___	___	
b. Serial No. _____	___	___	
4. Mounting Description _____ _____	___	___	
5. Orientation _____	___	___	
(Note: <b>MOV should be horizontal with limit switch compartment above the gearbox.</b> )			
6. Housing seals in Good Condition, Covers in Place,	___	___	
7. Housing and Motor Drains _____	___	___	
8. Does Installed Device Have a Brake? (If yes, verify status qualification)	___	___	
9. <b>Electrical Conduit and Seals Condition</b>	___	___	
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)	___	___	
11. <b>Actuator Grease Relief</b>	___	___	
12. <b>Motor and Actuator for Structural Integrity and Bolting Acceptability</b>	___	___	
13. <b>Actuator and Valve Stem Lubricant Condition</b>	___	___	

General Comments on Physical Inspection:

LIMIT SWITCH PHYSICAL INSPECTION CHECKLIST

Component ID: \_\_\_\_\_ Reviewer: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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

Component ID: \_\_\_\_\_

Reviewer: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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 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.)	___	___	

General Comments on Physical Inspection:

**PYROTECHNICALLY OPERATED VALVE PHYSICAL INSPECTION CHECKLIST**

Component ID: \_\_\_\_\_

Reviewer: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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 <b>and Condition</b> _____ _____	___	___	
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 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.)	___	___	
11. Pyrotechnic Material <b>Service Life</b> _____ _____	___	___	
12. <b>Actuator Structural Integrity and Bolting Acceptability</b>	___	___	

General Comments on Physical Inspection:

## ELECTRIC MOTOR PHYSICAL INSPECTION CHECKLIST

Component ID: \_\_\_\_\_

Reviewer: \_\_\_\_\_

<u>Documented information</u>	<u>Installed Condition</u> <u>Agrees with Documented</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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 _____	—	—	
_____	—	—	
10. Motor T-Drain	—	—	

General Comments on Physical Inspection:



## CABLE PHYSICAL INSPECTION CHECKLIST

Component ID: \_\_\_\_\_

Reviewer: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u> <u>Agrees with Documented</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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 _____	___	___	
5. Ambient Normal Expected Temperature Range _____	___	___	
6. General Condition of Installed Cable	<u>None</u>	<u>Some</u>	
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: \_\_\_\_\_

<u>Documented Information</u>	<u>Installed Condition</u> <u>Agrees with Documented</u>		<u>Comments</u>
	<u>Yes</u>	<u>No</u>	
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 (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 the licensee has considered the elevated temperature in the qualified life evaluation.)	—	—	

General Comments on Physical Inspection:

## APPENDIX C

### Environmental Qualification (EQ) of Nonmetallic Parts for Pumps, Valves, and Dynamic Restraints

#### 51080-APPA.01 INSPECTION OBJECTIVE

The objective of this inspection is to evaluate the following for a nuclear power plant licensed under 10 CFR Part 52:

1. Establishment of the EQ program for nonmetallic parts for pumps, valves, and dynamic restraints
2. Implementation of the EQ program for demonstrating and maintaining the capability of non-metallic parts for pumps, valves, and dynamic restraints to continue to perform their intended function
3. Documentation of the EQ of nonmetallic parts for pumps, valves, and dynamic restraints.

Nonmetallic parts include seals, gaskets, lubricant, fluid for hydraulic systems, and diaphragms that are sensitive to environmental effects. Note: The dynamic and functional qualification of pumps, valves, and dynamic restraints is addressed through other programs.

#### 51080-APPA.02 INSPECTION REQUIREMENTS AND GUIDANCE

##### 02.01 Inspection Requirements

The NRC regulations in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," specify requirements for structures, systems, and components (SSCs) important to safety that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public. General Design Criterion (GDC) 1 in Appendix A to 10 CFR Part 50 states that SSCs important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. GDC 1 also states that where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency, and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. GDC 1 also requires that a quality assurance (QA) program be established and implemented in order to provide adequate assurance that these SSCs will satisfactorily perform their safety functions. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 specifies criteria for the QA program to provide reasonable assurance that SSCs will perform their safety-related functions satisfactorily in service.

GDC 4 states, in part, that "[s]tructures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents."

In SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License without Inspections, Tests, Analyses, and Acceptance Criteria," the NRC staff discussed the level of programmatic information needed for approval of a Combined License (COL) without

Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for operational programs. In the Staff Requirements Memorandum (SRM) dated May 14, 2004, the Commission stated that “fully described” for an operational program should be understood to mean that the program is clearly and sufficiently described in terms for scope and level of detail to allow a reasonable assurance finding of acceptability. The Commission noted that required operational programs should always be described at a functional level and an increasing level of detail where implementation choices could materially and negatively affect the program effectiveness and acceptability. The Commission also stated that the staff should continue the practice of inspecting relevant licensee procedures and programs in a similar manner as was done in the past and consistent with applicable inspection programs. The staff should also continue to ensure, consistent with the inspection and enforcement processes, that licensees address pertinent issues prior to fuel loading. To allow the staff to complete the necessary inspections, procedure-level information that has typically not been docketed for staff review should continue to be made available to NRC inspectors with sufficient time to allow the inspectors to complete the necessary inspections and resolve pertinent issues.

In SECY-05-0197, “Review of Operational Programs in a Combined License Application and General Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria,” the NRC staff defines operational programs for new nuclear power plants as programs that are required by regulation, are reviewed by NRC staff for acceptability with the results documented in the safety evaluation report (SER), and will be verified for implementation by NRC inspectors. SECY-05-0197 includes the EQ program as an operational program. SECY-05-0197 discusses the information necessary for the staff to make a reasonable assurance finding on the acceptability of the operational program in the review of a COL application.

#### 02.02 Inspection Guidance

The inspector should review the results of audits of the EQ program for nonmetallic parts for pumps, valves, and dynamic restraints conducted during review of design certification and COL application reviews. The inspector should also review the results of ITAAC inspections and vendor inspections related to the EQ of nonmetallic parts for pumps, valves, and dynamic restraints. The inspector should review the reports of any previous inspections performed using this inspection procedure for inspection findings and follow-up actions.

The results of ITAAC inspections may be used in completing portions of this inspection procedure. Similarly, the results of inspections using this inspection procedure may be used to support completion of NRC review of specific component ITAAC.

#### 02.03 Inspection Guidance for Establishment of the EQ Program

The inspector should confirm that the EQ process specified in the plant program and procedures for nonmetallic parts of pumps, valves, and dynamic restraints is consistent with the provisions in the plant-specific design control document (DCD) and updated final safety analysis report (FSAR), as accepted in the applicable NRC SERs.

Appendix QR-B, “Guide for Qualification of Nonmetallic Parts,” in ASME Standard QME-1-2007, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants,” includes provisions for EQ of nonmetallic parts for mechanical equipment in nuclear power plants. The NRC staff has accepted the use of ASME QME-1-2007 in Revision 3 to Regulatory Guide (RG) 1.100, “Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants,” with specific

conditions. As stated in RG 1.100, “when a licensee commits to use a non-mandatory appendix in ASME QME-1-2007 [such as Appendix QR-B] for its qualification of active mechanical equipment, then the criteria and procedures delineated in [Appendix QR-B] become part of the basis for its qualification program, unless specific deviations are requested and justified.”

For passive plants, the inspector should also verify that the licensee’s program addresses the EQ of nonmetallic parts for pumps and valves within the scope of the regulatory treatment of non-safety systems (RTNSS) consistent with the Commission policy in SECY-95-132, “Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plants.” For example, SECY-95-132 states that the designer should establish graded requirements for SSCs based on the importance to safety of their functional reliability and availability missions. Application of Appendix QR-B of ASME QME-1-2007 as accepted in Revision 3 to RG 1.100 is one acceptable method for demonstrating the EQ of nonmetallic parts for RTNSS pumps, valves, and dynamic restraints.

The NRC inspector may contact NRC headquarters technical staff for assistance in preparing for and conducting the inspection of the EQ program at nuclear power plants being constructed under 10 CFR Part 52. Headquarters staff may provide training for inspectors in preparation for performing inspections using this inspection procedure. Also, headquarters staff may be available to support the performance of inspections using this inspection procedure either directly on site or indirectly by telephone.

#### 02.04 Inspection Guidance for Implementation of the EQ Program

The objective of this inspection is to evaluate the implementation of the EQ program for nonmetallic parts for pumps, valves, and dynamic restraints during construction of a nuclear power plant licensed under 10 CFR Part 52. The inspector should review the licensee’s EQ program for consistency with Appendix QR-B of ASME QME-1-2007 as accepted in RG 1.100 (Revision 3) and the design certification DCD/FSAR and COL FSAR as accepted in the applicable NRC SERs.

When evaluating the EQ of nonmetallic parts for mechanical equipment, the inspector should consider the following items as applicable:

##### a. Qualification Plan

If feasible, the inspector should observe testing to verify that the requirements and assumptions in the Qualification Plan and Appendix QR-B of ASME QME-1-2007 are satisfied. The inspector should review and reference the results of NRO vendor branch inspections related to the EQ of nonmetallic parts for mechanical equipment.

1. Has a Qualification Plan been prepared that satisfies Appendix QR-B of ASME QME-1-2007 as accepted in Revision 3 to RG 1.100?
2. Does the plan identify each nonmetallic part by material type and the following specific characteristics?
  - Commercial name/trade name of the material
  - Manufacturer
  - Generic name/chemical name of the material

- Dimensions of the part(s) composed of the material
- Chemical composition of the material
- Manufacturer's compound identification for the material
- Material's activation energy

When properties for a specific material are not available, the licensee should choose data for materials of the same family and failure mechanism as the materials in question. The licensee shall provide a basis as to why these properties are conservative.

3. Does the plan specify the safety function of the nonmetallic part?
4. Does the plan specify the nonmetallic part location and function in the equipment?
5. Does the plan justify exclusion of any nonmetallic parts, such as by describing the absence of failure modes under the specified environmental and service conditions that would affect the safety function of the mechanical equipment?
6. Does the plan specify the external (environmental) service conditions? The external service conditions should include normal, abnormal, and postulated design basis event (DBE) parameters. Mechanical equipment will experience that same environmental conditions as those defined in 10 CFR Part 50.49(e) for electrical equipment. The parameters may include, but are not limited to, the following:
  - Temperature
  - Pressure
  - Relative humidity
  - Radiation: gamma, beta, neutron (dose and rates, under normal and accident conditions)
  - Cycling/operation/vibration: wear, make/break
  - Duration: normal, DBE, post-DBE
  - Spray: chemical, demineralized water
  - Submergence
  - Seismic OBE/SSE
7. Does the plan specify the internal conditions of the mechanical equipment? These parameters may include but are not limited to the following:
  - Process fluid media type and chemistry
  - Process temperature
  - Process pressure
  - Process relative humidity
  - Process radiation
  - Mechanical stress
8. Does the plan describe qualification test methods as specified in Appendix QR-B of ASME QME-1-2007 as accepted in RG 1.100 (Revision 3) and in the applicable plant-specific DCD and updated FSAR, as accepted in the applicable NRC SERs? Does the plan specify qualification by test or a combination of test and analysis?
9. Does the plan provide justification for the choice of qualification methods

10. Does the plan address applicable prerequisites to qualification testing such as thermal aging, radiation aging and mechanical wear aging?
11. Does the plan consist of a specific sequence of test conditions that meets or exceeds the specified external and internal service conditions?
12. Does the plan specify that qualification of nonmetallic part is accomplished to the same margins as is required by ASME QME-1-2007, Sections QP and QV, as applicable?
13. Does the plan specify the acceptance criteria to be established for performance of the qualification testing?
14. Does the plan specify the component initial setup, limits, maintenance, or adjustments that are acceptable during performance of the qualification testing?
15. Does the plan specify the application of a quality assurance program that satisfies 10 CFR Part 50, Appendix B?
16. Does the plan specify the required qualifications of test personnel?
17. Does the plan specify determination of the qualified life? Based on the qualified life, does the plan recommend a service life?
18. Does the plan specify the preparation of a Qualification Report in accordance with ASME QME-1-2007 sufficient to support close-out of applicable ITAAC for the EQ of nonmetallic parts for mechanical equipment?
19. Does the plan provide justification of commercial grade dedication when implemented as part of the EQ program? See NRC Information Notice 2014-11 dated September 19, 2014 for issues related to the qualification and commercial grade dedication of safety-related components.

b. Qualification Report

1. Does the qualification report satisfy Appendix QR-B of ASME QME-1-2007 as accepted in RG 1.100 (Rev. 3)?
2. Does the qualification report identify nonmetallic parts by manufacturer and material? The following items should be included in the identification of nonmetallic parts:
  - Commercial name/chemical name of the material
  - Manufacturer
  - Generic name/chemical name of the material
  - Dimensions of the part(s) composed of the material
  - Chemical composition of the material
  - Manufacturer's composition identification for the material
  - Materials activation energy

3. Does the qualification report identify the external (environmental) service conditions? The parameters may include, but are not limited to, the following:
  - Temperature
  - Pressure
  - Relative humidity
  - Radiation: gamma, beta, neutron (doses and rates under normal and accident conditions)
  - Cycling/operation/vibration: wear, make/break
  - Duration: normal, DBE, post-DBE
  - Submergence
  - Seismic OBE/SSE
  - DBE (LOCA, High Energy Line Break, etc.)
4. Does the qualification report identify the internal service conditions? The parameters may include, but are not limited to, the following:
  - Process fluid medial type and chemistry
  - Process temperature
  - Process pressure
  - Process relative humidity
  - Process radiation
  - Mechanical stress
5. Is the justification for the choice of qualification methods documented in the qualification report?
6. Does the qualification report describe the qualification methods used for each nonmetallic part?
7. Does the qualification report describe the qualification test sequence? A typical sequence includes thermal aging, radiation exposure, and operation under the qualification conditions of temperature, pressure, humidity, and chemical environment.
8. Does the qualification report describe methods used for thermal aging, radiation aging, and mechanical wear aging?
9. Are the qualified life, replacement schedule, and replacement procedures for the qualified nonmetallic part determined and recorded in the qualification report? Is a service life recommended?
10. Is the shelf life of the nonmetallic part, and any applicable storage limitations, justified and recorded in the qualification report?
11. Does the qualification report provide justification of commercial grade dedication when implemented as part of the EQ program?



c. Documentation

1. Does the documentation include the following?

- The Qualification Report
- Identification of each of the nonmetallic part in the equipment
- Description of its application/function in the mechanical equipment
- The equipment's postulated internal and external service conditions
- The qualified life of each nonmetallic part and recommended service life
- The qualification for replacement nonmetallic parts that were not part of the original qualification
- Schedules and requirements for maintenance/surveillance
- Shelf life preservation requirements

2. For nonmetallic parts having no failure modes under the specified environmental and service conditions that affect the safety function of the mechanical equipment, does the documentation provide an evaluation justifying their exclusion from qualification?

d. Licensee Programs to Maintain the Qualified Status of Nonmetallic Parts of Mechanical Equipment

Maintenance and surveillance programs provide assurance that the qualification status of equipment will be maintained during the operational life of the plant. The inspector should review the licensee's EQ operational program and applicable maintenance and surveillance programs to verify that the programs contain the following aspects specific to the EQ of nonmetallic parts for mechanical equipment:

1. EQ results are used to establish activities to support continued EQ status.
2. Surveillance and preventive maintenance activities are based on EQ results.
3. EQ maintenance recommendations from equipment vendors are considered.
4. Operating experience is considered in developing surveillance and preventive maintenance activities for specific equipment.
5. Plant procedures specify individual equipment identification, appropriate references, installation requirements, surveillance and maintenance requirements, post-maintenance testing requirements, condition monitoring requirements, replacement part identification, and applicable design changes and modifications.
6. Plant procedures specify reviewing equipment performance and EQ operational activities, and for trending the results to incorporate lessons learned through appropriate modifications to the EQ operational program.
7. Plant procedures specify provisions for control and maintenance of EQ records.

Attachment 1 - Revision History for IP 51080

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	ML112620648 11/07/11 CN 11-029	<p>Initial issue to support inspections of construction programs described in IMC 2504, Construction Inspection Program: Inspection of Construction and Operational Programs.</p> <p>Completed 4 year search of historical CNs and found no commitments related to this Inspection Procedure.</p>	None	ML112620655
N/A	ML17003A184 06/26/17 CN 17-013	<p>Revision to reflect refinements in program development, including changing the title and the addition of Appendix C related to EQ of nonmetallic parts for pumps, valves, and dynamic restraints. The revision also makes editorial and formatting changes.</p> <p>Completed 4 year search of historical CNs and found no commitments related to this Inspection Procedure.</p>	None	ML17003A180