

**Activity: Fuse Control**

- 1.0 Purpose: This guideline provides a method to evaluate plant practices for the selection, installation, and substitution of electrical fuses in operating nuclear power plants.
- 2.0 Scope: This guideline has been developed for use in the review and evaluation of low-voltage (600 volt or less) power and control fuses, and midsize and small dimension instrumentation fuses for AC and DC voltage applications. It does not apply to non-Class 1E fuses used in electronic instruments such as digital voltmeters, vendor-engineered and -packaged equipment, or for systems not shown on drawings.
- 3.0 References:
- 3.1 NRC Information Notice No. 83-06, "Non-identical Replacement Parts"
  - 3.2 NRC Information Notice No. 84-57, "Operating Experience Related to Moisture Intrusion in Safety-Related Equipment at Commercial Power Plants"
  - 3.3 NRC Information Notice No. 84-80, "Plant Transients Induced by Failure of Non-Nuclear Instrumentation Power"
  - 3.4 NRC Information Notice No. 85-39, "Auditability of Electrical Qualification Records at Licensees' Facilities"
  - 3.5 NRC Information Notice No. 87-24, "Operational Experience Involving Losses of Electrical Inverters"

- 3.6 NRC Information Notice No. 87-62, "Mechanical Failure of Indicating- Type Fuses"
- 3.7 NRC Regulatory Guide 1.97
- 3.8 IEEE/ANSI Standard 334-1974, 1980
- 3.9 IEEE 323-1974, 1980
- 3.10 NRC Inspection Procedure 62705

#### 4.0 Guidelines:

##### 4.1 In preparation for and during the conduct of this surveillance:

- E Obtain and review implementing procedures, instructions and drawings governing this activity.
- E Prepare a guide or checklist using the selected items from this guideline.
- E Review past surveys, audits, surveillances and other evaluations/assessments.
- E Ensure that checklists include, where applicable, actual observations of performance; general plant conditions, radiological work practices, housekeeping, work document controls and use, and safety practices.

**NOTE:** Refer to Guideline A.1, "General Quality Surveillance Guidance," for specific details on the attributes listed above.

- ##### 4.2 Assemble and review the implementing instructions involving fuse control activities as a group to ensure that, if properly implemented, they would satisfy the applicable upper tier requirements. Document the review results including the criteria against which the review was performed.

**NOTE:** This review should be performed for the initial surveillance and after each revision of the respective documents unless it can be verified that Quality Engineering has performed a review per the implementing procedure(s).

4.3 Fuses that will be installed in safety class 1E electrical enclosures according to the electrical fuse tabulation drawings should be evaluated. Coordination of the evaluations with the plant electrical maintenance section and other site-designated responsible persons will be necessary to witness actual fuse replacement since the activity is not a routine preplanned maintenance activity.

4.4 Observe fuse selection activities. Confirm that actions are being taken to confirm fuse manufacturer and fuse type through Engineering approved electrical fuse tabulation drawings. Electrical schematics and connection diagrams can be used for determining the proper location of fuse installations.

A. All fuses contained in Class 1E electrical enclosures are considered as Class 1E fuses. These may be further identified by Environmental Qualification engineers as Class 1E harsh environment fuse or Class 1E mild environment fuse. By interview and purchase document review, determine that identification and traceability to purchase documentation is considered in the selection of fuses for harsh environments.

B. Instrumentation fuses (0.25 inch diameter) located within instrumentation packages such as recorders and amplifiers, some fuses mounted in balance of plant (BOP) instrument racks, and fuses for communication circuits can be exempted from these

identification and listing requirements unless they perform penetration cable protection. For these exempted cases, determine if fuse type and markings are according to vendor manuals.

- C. If a modification work plan is associated with the fuse replacement, determine that electrical fuse drawings have been revised or a field change request has been issued. Conformity should be established between revised fuse listing and tag documents and actual fuse set tagging if this method of fuse identification is used.
- D. Confirm that actions are taken to prevent use of fuses with renewable links which may have changed internal configurations that do not match current rating indicated on the label.

4.5 Observe fuse installation activities and confirm that the installer is verifying that the catalog number on the fuse label matches the catalog number identified for the location based on the engineering approved electrical fuse tabulations or drawings.

**NOTE:** The training and qualification for personnel who install fusing will be developed by each plant. The evaluator should determine that the personnel responsible for removing and replacing fuses have been formally given this authority.

- A. Observe installation activities and confirm that the individual removing or replacing a Class 1E fuse verifies that the fuse is correct, as determined by engineering approved drawing, fuse listing, or engineering approved work document which specifies the exact replacement(s).
- B. Exact replacement fuses must be utilized for all installation purposes. In those cases

when exceptions are taken, determine if engineering approval has been received.

- C. If the fuse location is within a harsh environment or has special test requirements, determine that proper replacements are utilized and specific site traceability requirements are met. Special resistance testing, visual examinations, and documenting of results may be required in certain cases.
- D. Review plant records to determine if authorized operations personnel are reporting for engineering evaluation those cases of fuse substitutions taken to avert or alleviate emergency conditions.

4.6 Observe fuse installation activities and verify that fuse substitutions are according to engineering approved electrical design standards. Also observe disposition of old fuses to safeguard against inadvertent use or installation. Personnel who determine acceptable substitute fuses should be identified and qualified through appropriate training.

- A. When utilizing substitutions specific attention to the voltage application is necessary. Indiscriminate substitution of AC and DC fuses is not permitted and close adherence to established tables is mandatory. In those cases where catalog fuse data does not specifically state DC rating, the data can only be assumed to apply to the more common manufacturer's practice of publishing data for AC applications.
- B. Verify at the installation that the physical size and shape of the fuse substitution is compatible to the designated fuse clips or holders.
- C. Determine that substitution tables for fuses are not being used in reverse order. The

substitute tables may only be based on defined one-way interchangeability.

- 4.7 Review plant fuse replacement records to assure that particular fuse replacement is not a repetitive problem.

5.0 Other Guidelines for Consideration:

5.1 A.1, "General Quality Surveillance Guidance"

5.2 M.6, "Nonconformances"