

READ THIS FIRST

Notice to the Design Engineer, this document is part of Facilities and Infrastructure standards for Electrical Systems. Designers are advised to NOT use this template (*.doc) document as part of any project contract documents. Designers shall use the Port of Seattle MasterSpec specifications from the following link:

<https://www.portseattle.org/page/guide-specifications>.

Designers shall edit the corresponding Port's MasterSpec specification to meet the F&I Electrical Standard outlined in this specification. Note that Port's MasterSpec specifications contain specifications and languages for both Aviation and Maritime Divisions. F&I Standards are strictly for Aviation Division, and any Maritime related specs or languages should be removed from the project specifications.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY AND NOTES TO DESIGNER

- A. Section Includes:
 - 1. Cartridge fuses rated 600-V ac and less for use in disconnects, panelboards, switchboards, controllers, and Motor Control Centers.
 - 2. Medium voltage fuses up to 15kV class as appropriate for transformers and fused interrupter switches.
 - 3. Spare-fuse cabinets.
- B. Select fuses to provide appropriate levels of short circuit and overcurrent protection for components such as wire and cable, bus structures, and other overcurrent equipment.
- C. Select fuses to coordinate with time-current characteristics of other overcurrent protective elements, such as other fuses, circuit breakers, and protective relays. Design system to ensure that device closest to fault operates first.
- D. The Engineer shall verify that the let-through current of the selected fuse does not exceed the rating of downstream devices or conductors. The Engineer shall calculate the short-circuit capability of downstream cable to verify that it is protected by the fuse time-current characteristic curve.
- E. The Engineer shall selectively coordinate all protective devices so faults are isolated to the most localized level.

1. On low voltage systems this may occasionally indicate the use of a fuse in series with a circuit breaker.
2. On medium voltage systems, particular care should be given to coordination of padmount vacuum fault interrupters with upstream feeder fuses and coordination of fuses in series through a transformer (i.e. a 12.47-4.12kV transformer with primary and secondary fuses).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 3. Current-limitation curves for fuses with current-limiting characteristics.
 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
 5. Charts and tables and related data.
 6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Ambient temperature adjustment information.
 2. Current-limitation curves for fuses with current-limiting characteristics.
 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Standby Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Ferraz Shawmut, Inc.
 - 3. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages for use on low voltage systems.
- B. Fuses for circuits under 600V shall be UL listed, Class J, Class L, Class R or RK.
- C. Fuses for safety switches shall be Class R, intended for use with rejection clips.
- D. Use Class L and Class T fuses to protect loads over 600A such as transformer secondaries, switchboard mains, or large feeders.

- E. Use Class J, Class K and Class R fuses to protect most feeder and branch circuit applications.
- F. Provide fuses from a single manufacturer.

2.3 MEDIUM VOLTAGE FUSES

- A. Fuses for medium voltage motors shall be R rated for use with an overload relay and contactor as part of a medium voltage motor starter package. Typically the starter manufacturer will select the fuse.
- B. Fuses for other medium voltage loads including transformers, feeders and capacitors shall be E-rated general-purpose current limiting fuses.

2.4 POTENTIAL TRANSFORMER FUSES

- A. Medium Voltage: E rated, intended for the purpose.
- B. Low Voltage: As selected by the original equipment manufacturer

2.5 SPARE-FUSE CABINET (MEDIUM VOLTAGE FUSES ONLY)

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch high letters on exterior of door.
 - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - INSTALLATION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

- 1. Main Services and Main Feeders:
 - a. 601A to 6000A circuits: Class L, minimum 4 second time delay at 500% rated current, with an interrupting rating of 200,000 amperes RMS symmetrical.
 - b. 600A and less circuits: Class RK1 dual-element, time delay, non-interchangeable fuses with an interrupting rating of 200,000 amperes, for 600V and 250V applications.
 - 1) 600V RK1 fuses shall have an indicating feature which clearly indicates when fuse is opened (blown).
- 2. Motor Branch Circuits: Class RK1 and Class J dual element time-delay fuses with 10-second minimum time delay at 500% rated current, sized at 125% of full load current of motor.
- 3. Current Limiting Fuses Protecting Molded Case Circuit Breaker Panelboards:
 - a. Molded case circuit breaker panelboards having short circuit ratings less than the available short circuit current at the point where the panelboard is applied shall be protected by Class and maximum fuse ratings listed by the panelboard manufacturer.
 - b. Class G (300V) and Class CC (600V) current limiting, non-interchangeable time delay or non-time delay fuses are used in branch circuit panelboards.
- 4. Light Fixture Protection:
 - a. Luminaire ballasts shall be individually protected on their line.
 - b. In each instance, fuse size and type shall be as recommended by the fixture or ballast manufacturer.

3.3 FUSE INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so that manufacturer, type and rating information are readable without removing fuse.
- B. The Electrical Contractor at the job site shall install all fuses only when equipment is to be energized. Fuses shall not be installed prior to shipment.
- C. Install spare-fuse cabinets as required and approved by F&I.

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

F&I STANDARD