READ THIS FIRST

Notice to the Design Engineer, please refer to the Port of Seattle, Facilities and Infrastructure standards for reference before editing this specification.

This Project Spec Document may need additional modifications to suit your project. It is recommended that you proofread each section, paying attention to any “Notes” boxes such as this one--you should remove these “Notes” sections as you go. Also, do a search for all bracket characters “ [ ] “ as they are used to show you areas containing options or project specific details (you can use Microsoft Word’s Find feature {Ctrl-F} to jump to an open bracket “ [ “ character quickly). Again, these bracket characters should be removed.

It is important that every paragraph be numbered to allow for easy referencing. If you use the document’s built in styles and formatting your outline should be fine (turn on the formatting toolbar by going to View > Toolbars > Formatting). Most paragraphs will use the style “Numbered Material” and can be promoted (Shift) or demoted (Shift-Tab).

You should not have to manually enter extra spaces, carriage returns or outline characters such as A, B, C, or 1.01, 1.02; the formatting will do this for you. The entire document is 11 pt. Arial. If you paste items in, you may need to reapply the “Numbered Material” format.

1. GENERAL
   1. SUMMARY OF WORK
      1. The extent and location of “Enclosed Switches and Circuit Breakers” Work is shown in the Contract Documents. This section includes individually mounted enclosed switches and circuit breakers used for the following:

Adjust list below to suit Project.

* + - 1. Service disconnecting means.
      2. Feeder and branch-circuit protection.
      3. Motor and equipment disconnecting means.
    1. Definitions

Retain abbreviations that remain after this section has been edited.

* + - 1. GFCI: Ground-fault circuit interrupter.
      2. RMS: Root mean square.
      3. SPDT: Single pole, double throw.
  1. GOVERNING CODES, STANDARDS AND REFERENCES
     1. NEMA AB 1 (National Electrical Manufacturers Association) - Molded Case Circuit Breakers.
     2. NEMA FU1 (National Electrical Contractors Association) - Low Voltage Cartridge Fuses.
     3. NEMA KS 1 (National Electrical Contractors Association) - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
     4. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
     5. NFPA 70 (National Fire Protection Association) - National Electrical Code.
  2. SUBMITTALS
     1. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.
     2. Submittals shall include the following:
        1. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.
        2. Shop Drawings: For each switch and circuit breaker.
           1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

Enclosure types and details for types other than NEMA 250, Type 1.

Current and voltage ratings.

Short-circuit current rating.

Series ratings are only acceptable when engineering considerations dictate. Delete subparagraph below, if series rating of overcurrent protective devices is not used.

UL listing for series rating of installed devices.

Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

Include time-current coordination curves for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

* + - 1. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Section 26 05 48 - Structural Loading Controls for Electrical and Communication Work:
         1. Basis of Certification: Verify whether withstand certification is based on actual test of assembled components.

The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.”

* + - * 1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
        2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
      1. Field Test Reports: Submit written test reports and include the following:
         1. Test procedures used.
         2. Test results that comply with requirements.
         3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
      2. Manufacturer’s field service report.
      3. Operations and Maintenance Data: Shall comply with requirements specified in Division 1 General Requirements. In addition to requirements specified in Division 1 include the following:
         1. Time-current curves, including selectable ranges for each type of circuit breaker.
  1. QUALITY ASSURANCE
     1. Listing and Labeling: Provide components, devices and accessories that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which they are installed.
        1. Service Entrance: Switches and circuit breakers identified for use as service equipment shall be labeled for this application.
     2. Comply with NEMA AB 1 and NEMA KS 1.
     3. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

Delete below if space is not a problem. Coordinate with Drawings.

* + 1. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
  1. PROJECT CONDITIONS

Specify unusual environmental or service conditions here. For equipment installed outdoors, indicate maximum and minimum ambient temperature and expected humidity range.

* + 1. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
       1. Ambient Temperature: Not less than minus 22°F (minus 30°C) and not exceeding 104°F (40°C).
       2. Altitude: Not exceeding 1000 feet.
  1. COORDINATION

Edit below to delete or add types of construction and encumbrances that affect switch and circuit-breaker installation.

* + 1. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
  1. EXTRA MATERIALS
     1. Spare and extra parts shall be identified for all products, but not provided. Include spare parts information in Operation and Maintenance Manuals.

Include spare parts information in Operation and Maintenance Manuals.

Potential Transformer Fuses: [3] of each type and rating installed.

Control-Power Fuses: [3] of each type and rating installed.

Fuses and Fusible Devices for Fused Circuit Breakers: [3] of each type and rating installed.

Fuses for Fused Switches: [3] of each type and rating installed.

Fuses for Fused Power-Circuit Devices: [3] of each type and rating installed.

Spare Indicating Lights: [2] of each type installed.

1. PRODUCTS

A. If only one product is acceptable (single or sole source product), obtain an approved Competition Waiver and submit to the CPO Construction, Contract Administrator. The language shall read as: “Manufacturer Name, Product # XXXXX, No Equal.” Refer to CPO-6 Competition Waiver Policy for more information.

B. If a Competition Waiver is not approved or more than one product is acceptable, this section must list a minimum of 2 products plus the language “Or Approved Equal,” along with salient characteristics. Refer to CPO Construction’s Salient Characteristics Guidelines for more information.

* 1. MANUFACTURERS
     1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. Cutler-Hammer; Division of Eaton.
        2. General Electric.
        3. Square D.; Schneider Electric.
        4. Siemens.
        5. Or Approved Equal.
  2. COMPLIANCE
     1. Seismic: Refer to Section 26 05 48 – Structural Loading Controls for Electrical and Communication Work.
  3. ENCLOSED SWITCHES
     1. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

Edit below to indicate Project requirement for standard blade disconnect, bolted-pressure contact switch, and high-pressure butt contact switch.

* + 1. Enclosed, Fusible Switch, 800A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handles with two padlocks, and interlocked with cover in closed position.
    2. Service Entrance: For switches identified for use as service equipment, provide solid neutral assembly and equipment ground bus.
  1. ENCLOSED CIRCUIT BREAKERS
     1. Enclosed Circuit Breakers
        1. Ground Fault protection type:
           1. Required for solidly grounded wye service entrance switches over 150 Volts to ground, not exceeding 600 Volts and rated 1000 Amps and above.
        2. Switch Duty (SWD) rated type for switching lighting fixtures. Note that energy code restricts use of circuit breakers as sole means of switching lighting circuits. (See State of Washington Nonresidential Energy Code 1513.2)
        3. Auxiliary contacts: Provide as required by engineering considerations.
     2. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

Edit to match requirements for the project.

* + - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.
      2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
      3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

Edit below to add other adjustable parameters or communications capability as required by engineering considerations.

* + - * 1. Instantaneous trip.
        2. Long- and short-time pickup levels.
        3. Long- and short-time time adjustments.
        4. Ground-fault pickup level, time delay, and I2t response.
      1. Current-Limiting Circuit Breakers: Frame sizes 400A and smaller; let-through ratings less than NEMA FU 1, RK-5.
      2. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

Refer to Electrical System Design Criteria. Select 5mA for personnel protection, or 30mA for equipment protection.

* + - 1. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30] mA trip sensitivity.
      2. Molded-Case Switch: Molded-case circuit breaker without trip units.
    1. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
       1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
       2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
       3. Ground-Fault Protection: [Integrally mounted] [Remote-mounted] relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
       4. Communication Capability: [Circuit-breaker-mounted] [Universal-mounted] [Integral] [Din-rail-mounted] communication module with functions and features compatible with power monitoring and control system.
       5. Shunt Trip: 120V trip coil energized from separate circuit, set to trip at [55] [75] percent of rated voltage.
       6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage [without intentional] [with field-adjustable 0.1- to 0.6-second] time delay.
       7. Auxiliary Switch: [One SPDT switch] [Two SPDT switches] with “a” and “b” contacts; “a” contacts mimic circuit-breaker contacts, “b” contacts operate in reverse of circuit-breaker contacts.
       8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
       9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
    2. Service Entrance: For enclosed circuit breakers identified for use as service equipment, provide solid neutral assembly and equipment ground bus.
  1. ENCLOSURES
     1. NEMA AB 1, NEMA KS 1 and UL 50 to meet environmental conditions of installed location.

Delete nonapplicable subparagraphs below. Edit to suit Project. Coordinate with Drawings.

* + - 1. Indoor Clean Locations: NEMA 250, Type 1.
      2. Indoor Dusty Locations: NEMA 250, Type 12.
      3. Indoor Wet or Damp Locations and Outdoor Dirty/Oily or Washdown Locations: NEMA 250, Type 4.
      4. Outdoor Locations: NEMA 250, Type 3R.
      5. Corrosive Locations: NEMA 250, Type 4X, stainless steel.

Enclosures in hazardous locations must be carefully selected to meet the division and group listing of the environment.

* + - 1. Hazardous Areas Indicated on Drawings: NEMA 250, Type [7] [8] [9].
  1. FACTORY FINISHES
     1. Manufacturer’s standard prime-coat finish ready for field painting.

Edit below to include custom colors. Coordinate custom-color requirements with sample submittal requirements.

* + 1. Finish: Manufacturer’s standard [Insert color] paint applied to factory-assembled and tested enclosures before shipping.

1. EXECUTION
   1. EXAMINATION
      1. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
         1. Proceed with installation only after unsatisfactory conditions have been corrected.
   2. EQUIPMENT INSTALLATION
      1. Comply with NFPA 70 working space requirements and NECA 1.
      2. Standard Mounting Height: Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated. Operating handle typically at 5’-0” above grade or finished floor.
      3. Mount on substantial structure and secure to meet seismic requirements. Comply with mounting and anchoring requirements specified in Section 26 05 48 - Structural Loading Controls for Electrical and Communication Work.
      4. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
      5. Install fuses with rating indications facing outward.
      6. Set adjustable parameters and provide testing and calibration as required by engineering considerations.
   3. IDENTIFICATION
      1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 05 53 - Electrical Identification.
      2. Install enclosure nameplate with switch or circuit breaker designation, power source, source location, voltage, load served and load location.
         1. Identify special conditions for shutting down load served.
      3. Apply label inside door cover identifying NEMA fuse class and size of fuses installed.
      4. Equipment used in emergency systems shall be labeled “Suitable for use on emergency systems” per NEC 700-3.
   4. CONNECTIONS

Coordinate paragraphs below with Drawings.

* + 1. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
    2. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
    3. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.
       1. Mark lugs after torquing with red paint such that paint will be visibly disturbed if lugs are disturbed.
  1. FIELD QUALITY CONTROL
     1. Manufacturer's Field Service: Engage a factory-authorized service representative to initially inspect, test, and adjust components, assemblies, and equipment installations, including connections. Verification will be by third party testing agency.
     2. Prepare for acceptance tests as follows:
        1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
        2. Test continuity of each line- and load-side circuit.
     3. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
        1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
        2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  2. ADJUSTING

Paragraph below assumes that settings are indicated on Drawings or a coordination report is available for Contractor to use.

* + 1. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
    2. Set field-adjustable switches and circuit-breaker trip ranges.
  1. CLEANING
     1. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.
  2. OPERATION AND MAINTENANCE MANUALS
     1. Comply with Section 01 78 23.13 - Operations and Maintenance Data and Part 1 of this specification.

1. MEASUREMENT AND PAYMENT
   1. GENERAL
      1. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items in the [Schedule of Unit Prices] [Lump Sum price bid for the Project].

End of Section

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

04/30/2024 Updated Operations and Maintenance Data

01/12/2025 Updated Equipment Installation seismic requirements