

**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: Lighting control panels using mechanically held relays for switching.
- B. Section Includes: Networked lighting control panels using control-voltage relays for switching and that are interoperable with BAS. The airport does not typically control or monitor lighting via the BAS. Coordinate with F&I if BAS monitoring and control are necessary.
- C. There are numerous stand-alone relay-based lighting control systems in the airport. Before specifying new system, check if relay panel with spare capacity already exists in the vicinity of the project.

**1.3 DEFINITIONS**

- A. BAS: Building automation system.
- B. IP: Internet protocol.
- C. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.
- D. PC: Personal computer; sometimes plural as "PCs."

- E. RS-485: A serial network protocol, similar to RS-232, complying with TIA-485-A.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, relays, manual switches and plates, and conductors and cables.
  2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each relay panel and related equipment.
1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  3. Detail wiring partition configuration, current, and voltage ratings.
  4. Short-circuit current rating of relays.
  5. Include diagrams for power, signal, and control wiring.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.
1. Show interconnecting signal and control wiring, and interface devices that prove compatibility of inputs and outputs.
  2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices comply with interoperability requirements of the network protocol.
- B. Qualification Data: For testing agency.
- C. Field quality-control reports.
- D. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.
- E. Sample Warranty: For manufacturer's special warranty.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.
- B. Software and Firmware Operational Documentation, if applicable:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish standby materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Lighting Control Relays: Equal to 10% percent of amount installed, but no fewer than 2.

**1.8 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Handle and prepare panels for installation according to NECA 407.

**PART 2 - PRODUCTS**

**2.1 SYSTEM DESCRIPTION**

- A. Input signal from field-mounted manual switches, or digital signal sources, shall open or close one or more lighting control relays in the lighting control panels. Any combination of inputs shall be programmable to any number of control relays.
- 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 47 CFR, Subparts A and B, for Class A digital devices.
- D. Comply with UL 916.

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## **2.2 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Lighting control panels shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

## **2.3 LIGHTING CONTROL RELAY PANELS**

- A. Products: Subject to compliance with requirements, provide one of the following:
1. Acuity Brands, Inc., Lighting Control & Design, Inc.
  2. General Electric Company, GE Consumer & Industrial - Electrical Distribution;
  3. Leviton Mfg. Company Inc.; Z-Max Plus.
  4. WattStopper, a Legrand Group brand;
- B. Description: Standalone lighting control panel using mechanically latched relays to control lighting and appliances.
- C. Lighting Control Panel:
1. A single enclosure with incoming lighting branch circuits, control circuits, switching relays, and on-board timing and control unit.
  2. A vertical barrier separating branch circuits from control wiring.
- D. Control Unit: Contain the power supply and electronic control for operating and monitoring individual relays.
1. Timing Unit:
    - a. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.
    - b. Clock configurable for 12-hour (A.M./P.M.) or 24-hour format.
    - c. Eight independent schedules, capable of seven day repeating and calendar date event-based format. Schedule periods settable to the minute.
    - d. Day-of-week, day-of-month, day-of-year with one-time or repeating capability.
    - e. 10 special date periods.
  2. Sequencing Control with Override:
    - a. Automatic sequenced on and off switching of selected relays at times set at the timing unit, allowing timed overrides from external switches.
    - b. Sequencing control shall operate relays one at a time, completing the operation of all connected relays in not more than 10 seconds.
    - c. Override control shall allow any relay connected to it to be switched on or off by a field-deployed manual switch or by an automatic switch, such as an occupancy sensor.
    - d. Override control "blink warning" shall warn occupants approximately five minutes before actuating the off sequence.

3. Nonvolatile memory shall retain all setup configurations. After a power failure, the controller shall automatically reboot and return to normal system operation, including accurate time of day and date.
- E. Relays: Electrically operated, mechanically held single-pole switch, rated at 20 A at 120-V tungsten, 30 A at 277-V ballast, 1.5 hp at 120 V, and 3 hp at 277 V. Short-circuit current rating shall be not less than 14 kA. Control shall be three-wire, 24-V ac. Provide not less than 10% additional spare relays for future use.
  1. IEC contactors are not allowed.
- F. Power Supply: NFPA 70, Class 2, sized for connected equipment, plus 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, low-voltage inputs, field-installed occupancy sensors, and photo sensors.
- G. Operator Interface:
  1. Integral alphanumeric keypad and digital display, and intuitive drop-down menus to assist in programming.
  2. Log and display relay on-time.
  3. Connect relays to one or more time and sequencing schemes.

## **2.4 NETWORKED LIGHTING CONTROL PANELS**

- A. Description: Lighting control panels as described in section 2.3. The panels shall be capable of being interconnected with digital communications to appear to the operator as a single lighting control system.
- B. Main Control Unit: Installed in the main lighting control panel only; powered from the branch circuit of the standard control unit.
  1. Ethernet Communications: Comply with MS Windows TCP/IP protocol. The main control unit shall provide for programming of all control functions of the main and all networked slave lighting control panels including timing, sequencing, and overriding.
  2. Compliance with ASHRAE 135: Controllers shall support serial MS/TP and Ethernet IP communications, and shall be able to communicate directly via BAS RS-485 serial networks and Ethernet 10Base-T networks as a native device.
- C. Panels shall have same functionality as described in 2.3, but all panels shall be connected into a network for coordinated control.
- D. Standard Control Unit, Installed in All Lighting Control Panels: Contain electronic controls for programming the operation of the relays in the control panel, contain the status of relays, and contain communications link to enable the digital functions of the main control unit. Comply with UL 916.

1. Electronic control for operating and monitoring individual relays, and display relay on-time.
  2. Nonvolatile memory shall retain all setup configurations. After a power failure, the controller shall automatically reboot and return to normal system operation.
  3. Integral keypad and digital-display front panel for local setup, including the following:
    - a. Blink notice, time adjustable from software.
    - b. Ability to log and display relay on-time.
    - c. Capability for accepting downloadable firmware so that the latest production features may be added in the future without replacing the module.
- E. Operator Interface: At the main control unit, provide interface for a tethered connection for configuring all networked lighting control panels using setup software designed for the specified operating system. Include one portable device for initial programming of the system and training of Owner's personnel. That device shall remain the property of Owner.
- F. Software:
1. Menu-driven data entry.
  2. Online and offline programming and editing.
  3. Provide for entry of the room or space designation for the load side of each relay.
  4. Monitor and control all relays, showing actual relay state and the name of the automatic actuating control, if any.
  5. Size the software appropriate to the system.

## **2.5 MANUAL SWITCHES AND PLATES**

- A. Push-Button Switches: Modular, momentary contact, three wire, for operating one or more relays and to override automatic controls.
1. Match color and style specified in Section 262726 "Wiring Devices."
- B. Wall Plates: Single and multigang plates as specified in Section 262726 "Wiring Devices."
- C. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

## **2.6 FIELD-MOUNTED SIGNAL SOURCES**

- A. Daylight Harvesting Switching Controls: Comply with Section 260923 "Lighting Control Devices." Control power may be taken from the lighting control panel, and signal shall be compatible with the relays.

- B. Indoor Occupancy Sensors: Comply with Section 260923 "Lighting Control Devices." Control power may be taken from the lighting control panel, and signal shall be compatible with the relays.

## **2.7 CONDUCTORS AND CABLES**

- A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Control cabling per manufacturer's recommendations, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## **PART 3 - INSTALLATION**

### **3.1 EXAMINATION**

- A. Receive, inspect, handle, and store panels according to NECA 407.
- B. Examine panels before installation. Reject panels that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panels for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 WIRING INSTALLATION**

- A. Comply with NECA 1.
- B. Comply with Part 3 of Section 260519 – Low Voltage Electrical Power Conductors and Cables and Section 260523 Control Voltage Electrical Power Cables,

### **3.3 PANEL INSTALLATION**

- A. Comply with NECA 1.
- B. Install panels and accessories according to NECA 407.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Mount top of trim 90 inches above finished floor unless otherwise indicated.

- E. Mount panel cabinet plumb and rigid without distortion of box.
- F. Install filler plates in unused spaces.

### **3.4 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- C. Create a directory to indicate loads served by each relay; incorporate Owner's final room designations. Obtain approval before installing. Use a PC or typewriter to create directory; handwritten directories are unacceptable. Submit directory in excel format to F&I upon project completion. Directory must accurately reflect as-built conditions. See F&I standard "260943A – LCP TEMPLATE" for sample directory template.
- D. Lighting Control Panel Nameplates: Label each panel with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

### **3.5 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. 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.
- B. Acceptance Testing Preparation:
  - 1. Test continuity of each circuit.
- C. Lighting control panel will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies lighting control panels and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

### **3.6 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.



1. Complete installation and startup checks according to manufacturer's written instructions.
2. Confirm correct communications wiring, initiate communications between panels, and program the lighting control system according to approved configuration schedules, time-of-day schedules, and input override assignments.

### **3.7 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

### **3.8 SOFTWARE SERVICE AGREEMENT**

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
  1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

### **3.9 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the control unit and operator interface.

### **3.10 COMMISSIONING**

- A. Provide controls commissioning according to Washington State Energy Code requirements.

END OF SECTION 260943.23