

**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. Wall-box multi-scene dimming controls.
  - 2. Multipreset modular dimming controls.
- B. Modular dimming control systems can be used in large conference rooms and in some public spaces where daylight dimming and occupancy based dimming and switching are desired. Dimming and switching of fixtures in public spaces with F&I approval.
  - 1. Consider using digital dimming systems in areas where it may be desirable to reconfigure control zones in the future.
- C. Coordinate compatibility of dimming system and controls with LED drivers used on project.

**1.3 DEFINITIONS**

- A. Fade Rate: The time it takes each zone to arrive at the next scene, dependent on the degree of change in lighting level.
- B. Low Voltage: As defined in NFPA 70, the term for circuits and equipment operating at less than 50 V or for remote-control, signaling, and power-limited circuits.

- C. Scene: The lighting effect created by adjusting several zones of lighting to the desired intensity.
- D. SCR: Silicon-controlled rectifier.
- E. Zone: A fixture or group of fixtures controlled simultaneously as a single entity. Also known as a "channel."

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. For modular dimming controls; include elevation, dimensions, features, characteristics, ratings, and labels.
  - 2. Device plates and plate color and material.
  - 3. LED drivers compatible with dimmers.
- B. Shop Drawings; include:
  - 1. Diagrams for power, signal, and control wiring.
  - 2. Load schedule indicating actual connected load, load type and voltage per circuit and control zones.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.
- B. Commissioning plan with test procedures.

#### **1.6 WARRANTY**

- A. Manufacturer's Warranty: Two-year warranty.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Mfg. Company Inc.
  - 2. Lutron Electronics
  - 3. Crestron
  - 4. Acuity

---

**2.2 GENERAL DIMMING DEVICE REQUIREMENTS**

- A. Compatibility:
  - 1. Dimming control components shall be compatible with lighting fixtures, LED drivers, and transformers.
  - 2. Dimming control devices shall be compatible with lighting control system components specified in Section 260943.13 "Addressable-Fixture Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls," and in Section 260923 "Lighting Control Devices."
- B. Dimmers and Dimmer Modules: Comply with UL 508.
  - 1. Audible Noise and Radio-Frequency Interference Suppression: Solid-state dimmers shall operate smoothly over their operating ranges without audible lamp or dimmer noise or radio-frequency interference. Modules shall include integral or external filters to suppress audible noise and radio-frequency interference.
  - 2. Dimmer or Dimmer-Module Rating: Not less than 125 percent of connected load unless otherwise indicated.
- C. Surge Protection: Withstand supply power surges without impairment to performance.
  - 1. Panels: 6000 V, 3000 A, complying with IEEE C62.41.1 and IEEE C62.41.2.
  - 2. Other System Devices: 6000 V, 3000 A, complying with IEEE C62.41.1 and IEEE C62.41.2.
- D. Off Control Position: User-selected off position of any control point shall disconnect the load from line supply.

**2.3 SYSTEM DESCRIPTION**

- A. 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.
- B. Comply with NFPA 70.

**2.4 WALL-BOX MULTISCENE DIMMING CONTROLS**

- A. Description: Factory-fabricated equipment consisting of a wall-box-mounted master programmable controller and indicated number of wall-box zone stations. Controls and dimmers shall be integrated for mounting in multigang wall box under a single wall plate. Each zone shall be adjustable to indicated number of scenes, which shall reside in the memory of zone controller.
- B. Each zone shall be configurable to control the following loads:
  - 1. LED with 0-10V dimming driver.

2. Non-dim, on-off switching only.
- C. Dimmers: Regulate voltages to maintain a constant light level, with no visible flicker, when the source voltage varies plus or minus 2 percent rms.
- D. Memory:
  1. Retain preset scenes and fade rates through momentary (up to 3-second) power interruptions.
  2. Retain preset scenes through power failures for at least seven days.
- E. Device Plates: Style, material, and color shall comply with Section 262726 "Wiring Devices." Master-control cover plate shall be one piece.
- F. Master controller shall include the following:
  1. Cover-mounted switches, including master off, all bright, and selectors for each scene.
  2. Cover-mounted LED indicator lights, one associated with each scene switch, and one for the master off switch.
  3. Concealed switches and indicators for specified function.
  4. A raise/lower switch for each zone for temporary adjustments of the zone, without altering scene values stored in memory.
  5. Fade time indicated by digital display for current scene while fading.
  6. Cover-mounted infrared receiver.
- G. Infrared Transmitters: Wireless remote control for recalling each of the presets. Operate up to 50 feet within line of sight of the master controller.

## **2.5 MULTIPRESET MODULAR DIMMING CONTROLS**

- A. Description: Factory-fabricated equipment providing manual dimming consisting of. the following:
  1. Master controller.
  2. Dimmer panels and indicated number of zone stations.
  3. Controls and dimmers shall be integrated for mounting in a multigang wall box under a single wall plate.
  4. Each zone shall be adjustable to indicated number of scenes, which shall reside in the memory of zone controller.
- B. Each zone shall be configurable to control the following loads:
  1. Non-dim, on-off switching only.
  2. Neon and cold-cathode lighting.
  3. LED with 0-10V dimming driver.
- C. Dimmers: Regulate voltages to maintain a constant light level, with no visible flicker, when the source voltage varies plus or minus 2 percent rms.

- D. Memory: Retain preset scenes and fade settings through power failures by retaining physical settings of controls.
- E. Device Plates: Style, material, and color shall comply with Section 262726 "Wiring Devices." Master-control cover plate shall be one piece.
- F. Master controller shall include the following:
  - 1. Wall-box style, single cover plate supplied by manufacturer.
  - 2. Cover-mounted switches, including master off, all bright, and selectors for each scene.
  - 3. Cover-mounted LED indicator lights, one associated with each scene switch, and one for the master off switch.
  - 4. Concealed switches and indicators for specified function.
  - 5. A raise/lower switch for each zone for temporary adjustments of the zone, without altering scene values stored in memory.
  - 6. Fade time indicated by digital display for current scene while fading.
  - 7. Cover-mounted infrared receiver.
- G. Remote-Control Stations:
  - 1. Numbered push buttons to select scenes.
  - 2. Off switch to turn all zones off.
  - 3. Raise/lower to temporarily adjust all zones of light simultaneously in current scene.
  - 4. Control Wiring: NFPA 70, Class 2.
  - 5. Mounting: Single flush wall box with manufacturer's standard faceplate, color per Section 262726 "Wiring Devices".
- H. Dimmer Panels: Modular, plug-in type, complying with UL 508.
  - 1. Integrated Short-Circuit Rating: Rated for available fault current.
  - 2. Dimmers:
    - a. Dimming Circuit: Two SCR dimmers, in inverse parallel configuration.
    - b. Dimming Curve: Modified "square law" as specified in IESNA's "IESNA Lighting Handbook"; control voltage is 0- to 10-V dc.
    - c. Dimming Range: 10 to 100 percent, OR 1 to 100 percent where required by lighting design considerations. Full output voltage not less than 98 percent of line voltage.
    - d. Voltage Regulation: Dimmer shall maintain a constant light level, with no visible flicker, when the source voltage varies plus or minus 2 percent in rms voltage.
- I. Circuit Breakers: Complying with UL 489 and classified as switch duty (SWD).

## **2.6 CONDUCTORS AND CABLES**

- A. Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

- B. Class 2 Control Cable: Multiconductor cable with stranded-copper conductors sized per manufacturer's recommendations. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### **PART 3 - INSTALLATION**

#### **3.1 WIRING INSTALLATION**

- A. Comply with NECA 1.
- B. Wiring Method: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

#### **3.2 IDENTIFICATION**

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identifying components and power and control wiring.
- B. Label each dimmer module with a unique designation.
- C. Label each scene control button with approved scene description.

#### **3.3 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Where required by scope of project, engage a factory-authorized service representative to perform initial test and inspection of components, assemblies, and equipment installations, including connections.
- C. Perform the following Tests and Inspections:
  - 1. Continuity tests of circuits.
  - 2. Operational Test: Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

- a. Include testing of modular dimming control equipment under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
- D. Remove and replace malfunctioning modular dimming control components and retest as specified above.
- E. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
- F. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain modular dimming controls.
- B. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control system specified in Section 260943.13 "Addressable-Fixture Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls."

### **3.5 COMMISSIONING**

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

END OF SECTION 260936