

## SECTION 16950 - LOW VOLTAGE LIGHTING CONTROL SYSTEM

### PART 1 - GENERAL

#### 1.1 INTRODUCTION:

- A. This specification covers requirements for providing a complete and operable low voltage lighting control system ready for operation. This is a performance specification. The drawings indicate panel locations only. The electrical Contractor shall prepare drawings including device locations and riser diagram, cut sheets on all components and submit as shop drawings for approval.
- B. The work covered in this section is subject to all of the requirements in the General Conditions of the Specifications.
- C. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system.

#### 1.2 DESCRIPTION OF WORK:

- A. Extent of lighting control system work is indicated by drawings and by the requirements of this section. It is defined to include, but not but not be limited to:
  - 1. Low voltage switching system with relay/contactors panel(s), control switches, occupancy sensors, photocells and other controlling devices.
  - 2. Factory service:
    - a. Startup
    - b. Training
    - c. Documentation
    - d. Programming
    - e. Extended Warranty
- B. Types of lighting control equipment and wiring specified in this section include the following:
  - 1. Low Voltage Lighting Control Relay Panels
- C. Requirements are indicated elsewhere in this specification for work including, but not limited to, raceways and electrical boxes and fitting required for installation on control equipment and wiring.

#### 1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. Manufacturer shall be ISO 9001 certified.
- B. Component Pre-testing: All components and assemblies are to be factory pre-tested prior to installation.

- C. System Checkout: Factory trained technicians shall be available to functionally test each component after installation to verify proper operation and confirm that the panel wiring and addressing conform to the wiring documentation.
- D. System Support: Factory applications engineers shall be available for on-site training as well as telephone support.
- E. NEC Compliance: Comply with NEC as applicable to electrical wiring work.
- F. NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
- G. UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy
- H. FCC Emissions: All assemblies are to be in compliance with FCC emissions standards specified in Part 15 Subpart J for Class A applications.

#### 1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's data on lighting control system and components.
- B. Shop Drawings: Submit dimensional drawings of all lighting control system components and accessories.
- C. One Line Diagram: Submit a one-line diagram of the system configuration proposed if it differs from that illustrated in the riser diagram included in these specifications.
- D. Typical Wiring Diagrams: Submit typical wiring diagrams for all components including, but not limited to, relay panels, relays, low voltage switches, occupancy sensors, programmable panel master switches, programmable system switch panels, telephone override modules, data communications devices and wire, and the central operator computer.

### PART 2 - MATERIALS AND COMPONENTS

#### 2.1 BASIC LOW VOLTAGE SWITCHING SYSTEM:

- A. System Description:
  - 1. The Low Voltage Switching System shall consist of relay panel assemblies, occupancy sensors and photocells, as well as their associated wiring.
  - 2. The relay panels shall be mounted in electrical closets as indicated on the drawings. Numbered relays in the panels shall be wired to control power to each load as indicated on the Schedules included in the drawings. All power wiring will be identified with the circuit number controlling it at the load.
  - 3. Occupancy sensors and photocells shall be mounted in the spaces as indicated on the Reflected Ceiling Plans. Low voltage wiring from the switches and sensors to the relay panel shall be CLASS 2 or CLASS 2P (plenum rated) as required by the National Electrical Code and local

standards. Each low voltage wire shall be labeled with the relay number at each switch or sensor. Use only properly color-coded, stranded #20 AWG (or larger) wire as indicated on the drawings. All relays and switches shall be tested after installation to confirm proper operation and the loads recorded on the directory card in each panel.

B. Modular Relay Panels shall be UL listed and consist of the following:

1. Tub: Empty NEMA 1 enclosure sized as required.
  - a. Cover: Surface or Flush as required, hinged, lockable and shall restrict access to line voltage section.
  - b. Interior: Barrier for separation of high voltage (class 1) and low voltage (class 2) wiring. It shall include intelligence boards, power supply and control relays. Clock display and keypad shall be mounted on interior cabinet door for easy user access and programming.

C. Features:

1. Panel shall accept up to 12 single pole relays. Relays shall be individual latching relays with 20 Amp load contacts for ballast (including HID, magnetic or electronic type ballasts), tungsten and general purpose loads. Provide isolated auxiliary contacts for pilot light switching. Relays shall use quick connectors and be individually replaceable to facilitate ease of use.
2. The lighting control panel shall provide a stagger up delay, override push buttons, pilot light outputs, and LED status light indicators for each relay or contactor control channel.
3. The clock shall have a backlight display, user keypad and shall provide 12 channels of time or astronomical control. Preprogrammed lighting control scenarios shall include: scheduled on/off, manual on/scheduled off, manual on/automatic switch sweep off, astronomic or photocell on/off and astronomic or photocell control with scheduled on/off. Time clock shall provide up to 42 holidays, automatic daylight savings adjustment, astronomic coordinates by major cities, and help screens. Program memory shall be non-volatile and clock shall retain time keeping during power outages for at least 48 hours.
4. The panel shall have 12 universal switch inputs that are low voltage, self-configuring and shall not require programming to accept momentary on/momentary off switch, push button switch (cycling), maintained switch or 24VDC signals from occupancy sensors, photocells or other interfacing devices.
5. Occupancy sensor and time control shall be integrated to allow occupancy sensor control after hours with hold on of lighting during occupancy scheduled time. During occupied time, control scenarios shall be selectable for time schedule of lighting on or occupancy sensor detection of lighting on initially and then hold on of lighting during occupied hours. Control shall provide selectable occupancy sensor blink warning prior to shut off and adjustable occupancy sensor time delay from the time clock keypad.
6. After-hour interior lighting shut off control shall provide a full duration override time of 1 to 240 minutes with a warning blink five minutes prior to shutting the lighting off. An impending shut off will be cancelled and the

override period re-initialized through the operation of any assigned switch input.

7. After-hour interior lighting shut off control may be by line voltage power interrupt control to automatic control switches. The lighting control relay panel shall provide a warning blink signal to automatic control switches, thus allowing a five-minute delay prior to shutting off lighting. The lighting shut off event may be cancelled by pressing the automatic control switch push button. The lighting control panel time clock shall provide periodic lighting sweep signals to shut off automatic control switches.

## 2.2 APPROVED MANUFACTURERS:

- A. The Watt Stopper, Cooper Controls or approved equal.
- B. The Contractor shall be completely responsible for providing a system that meets this specification in its entirety. All deviations from this specification must be listed and individually signed off by the Engineer.
- C. Specifications are based on the following Watt Stopper/Legrand catalog numbers:
  1. Lighting control relay panel: LI24
  2. Low voltage exterior photocell: EM24-A2
  3. Automatic Control Switch: AS-100

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

- A. All lighting control panels, switches, occupancy sensors, photocells, etc., shall be mounted as indicated on the Reflected Ceiling Plans. All wiring shall be labeled clearly indicating which lighting control panel or device it connects to. Use only properly color-coded, stranded wire as indicated on the drawings. All relays, contactors, and switches shall be tested after installation to confirm proper operation, and all connected loads shall be recorded on the lighting control schedule for each panel.
- B. The lighting control panels shall be mounted in electrical closets or other locations as indicated on the drawings. The relay panel shall be wired to control the power of each load as indicated on the Lighting Control Schedules. All power wiring will be identified with the circuit breaker number controlling the load.

### 3.2 SUPPORT SERVICE:

- A. System Startup:
  1. Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all system components.
- B. Training:
  1. Manufacturer shall provide factory authorized application engineer to train owner personnel in the operation and programming of the lighting control system.

C. Documentation:

1. Manufacturer shall provide system documentation including:
  - a. System 1-line showing all panels, number and type of switches and sensors, etc.
  - b. Drawings for each panel showing hardware configuration and numbering.
  - c. Panel wiring schedules
  - d. Typical wiring diagrams for each component.

D. Programming:

1. Manufacturer shall provide system programming including:
  - a. Wiring documentation
  - b. Programmable Panel and System Switch Operation
  - c. Operating Schedules.

3.3 EXTENDED WARRANTY:

- A. Manufacturer shall provide a 1 year extended warranty in addition to a required one-year warranty for all system components.

END OF SECTION 16950