SECTION 260623

LIGHTING CONTROL DEVICES

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 1 Specification with completely editable text; therefore, any portion of the text can be modified by the A/E preparing the Solicitation Package to suit the project.***

*For Design/Build projects, do not delete the Notes to Specifier in this Section so that they may be available to Design/Build entity when preparing the Construction Documents.*

*For the Design/Build entity, this specification is intended as a guide for the Architect/Engineer preparing the Construction Documents.*

*The MPF specifications may also be used for Design/Bid/Build projects. In either case, it is the responsibility of the design professional to edit the Specifications Sections as appropriate for the project.*

*Text shown in brackets must be modified as needed for project specific requirements.* *See the “Using the USPS Guide Specifications” document in Folder C for more information.*

*The last date that USPS revised this standard specification section occurs in two places, at the end of this section and in the Table of Contents. If the date in this section matches the date in the Table of Contents, then you are using the latest version. Do not delete or revise the “last revised” date at the end of the section during the development of the Project Manual.*

*The footer in this section should be edited to replace the text, “USPS MPF SPECIFICATION” with the project name, and the blank date in the center should be replaced with the submission date, for interim design reviews, or the issue date of the completed Project Manual.*

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1. GENERAL
	1. SUMMARY
		1. Section Includes:
			1. Lighting control system for Workroom.
			2. Control of Interior/Exterior Lighting.
			3. Control of Administrative Area Lighting.
			4. Occupancy [and Photo] sensors
		2. Related Documents: The Contract Documents, as defined in Section 011000 - Summary of Work, apply to the work of this section. Additional requirements and information necessary to complete the work of this section may be found in other documents.
		3. Related Sections:
			1. Section 019113 - General Commissioning Requirements.
			2. Section 260500 - Common Work Results for Electrical.
			3. Section 260800 - Commissioning of Electrical Systems.
	2. REFERENCES
		1. National Electrical Manufacturers Association (NEMA):
			1. NEMA ICS 1 - General Standards for Industrial Control and Systems.
		2. National Fire Protection Association (NFPA):
			1. NFPA 70 - National Electrical Code.
			2. NFPA 101 - Life Safety Code
		3. Codes and Standards:
			1. International Building Code / National Electrical Code.
			2. Occupational Safety and Health Agency Standards.
			3. Illuminating Engineering Society Handbook.
			4. ASHRAE Standard 90.1.
			5. The International Energy Conservation Code.
		4. U.L. Standards:
			1. UL 916 Energy Management Equipment.
	3. SUBMITTALS
		1. As specified in Section 260500 – Common Work Results for Electrical.
			1. Product Data: Data for each component of the lighting control system indicating electrical characteristics and connection requirements.
				1. Lighting Control Components.
				2. Digital Interval Timer.
				3. Digital Time Switches.
				4. Exterior Photo-Sensor.
				5. Occupancy Sensors.
			2. Shop Drawings: Indicate electrical characteristics and connection requirements, including layout of completed assemblies, interconnecting cabling, dimensions, and power requirements.
			3. Assurance/Control Submittals:
				1. Certificates: Manufacturer's certificate that Products and components meet or exceed specified requirements.
				2. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.
		2. Section 017704 - Closeout Procedures and Training: Procedures for closeout submittals.
			1. Project Record Documents: Accurately record the actual locations of Products.
			2. Operating Instructions: Document training by furnishing a sign-in sheet with a description on the training provided, instructors name and organization and those who received training. Refer to 017704 1.3, 1.4 and 1.5 for more specific training.
	4. SYSTEM DESCRIPTION
		1. Each space enclosed by walls or floor-to-ceiling height partitions must be equipped with at least one automatic control device to independently control the general lighting within the space. This control device must automatically de-energize the space lighting within 30 minutes of all occupants leaving the space. Interior lighting for all spaces must utilize automatic occupancy sensors to turn off lighting in all spaces without occupant intervention.
		2. The workroom and enclosed platform lighting systems shall be provided to achieve the required light levels for the four lighting groups as shown on the drawings.
			1. Task Light Group (TLG): The lights in this group provide 50 footcandles of Task lighting for 1) Equipment operator stations and/or 2) Areas within a zone that require a higher light level for visual acuity. The TLG lighting is provided by luminaires located in task-specific areas apart from the normal Ambient Light Group grid pattern.
			2. Ambient Light Group (ALG): This illumination group shall provide 25 footcandles for operational zones where work is performed that requires less visual acuity than that needed for Task lighting. This will be the primary lighting provided for workroom activities.
			3. Area of Travel Light Group (AOTLG): This illumination lighting group requires a minimum average of 12.5 footcandles for areas of travel such as aisles and walkways when all other lights are turned off. Maintain the minimum average of 12.5 footcandles at all times. Luminaires within the “AOTLG” shall not be automatically controlled and shall be energized 24 hours/day.
			4. Egress Lighting Group (ELG): This is a condition in which power to the facility or the lighting circuitry is interrupted. During these conditions, an average of one footcandle must be maintained along all emergency egress routes in accordance with the National Fire Protection Agency 101 Life Safety code. The column mounted, emergency battery units within the workroom must provide this emergency egress lighting.
		3. The functional characteristic of each luminaire within the workroom and enclosed platform shall be as follows:
			1. All luminaires shall be automatically controlled by luminaire mounted occupancy sensors, unless otherwise indicated. The occupancy sensors must be appropriate for the luminaire mounting height within the workroom or platform.
			2. The occupancy sensors shall be luminaire mounted, passive infra-red type and must automatically turn the “TLG” and “ALG” lighting groups off within 20 minutes of the last detected presence within the Workroom.
		4. The lighting within exterior, open platform and canopies must be provided with bi-level control (0%, 50% to 100%). The lower output illumination level of 12.5 footcandles shall be automatically controlled by photo-sensor(s) and the higher output level of 25 footcandles must be both automatically and countdown timer controlled utilizing photocells with countdown timers fed downstream of the photo-sensor(s).
		5. Exterior lighting shall be energized by photo-sensor(s) and de-energized by time control functions.
			1. The control of the exterior and building mounted signs shall operate similar to the exterior lighting control scheme but shall utilize independent time schedules.
	5. QUALITY ASSURANCE
		1. Single Source: Provide occupancy sensors, photocells, time switches, digital override timer switches, and other lighting control components from a single lighting control system supplier.
		2. Qualifications:
			1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
			2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.
		3. Regulatory Requirements:
			1. Conform to requirements of NFPA 70 and NFPA 101.
			2. Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.
			3. Comply with NEC, NEMA and FCC Emission requirements for Class A applications.
			4. UL Approvals: Lighting control components are to be UL listed under UL 916 Energy Management Equipment.
		4. Testing:
			1. Component Pretesting: All component and assemblies are to be pretested and burned-in prior to installation.
			2. System Checkout: A factory trained technician shall test each component in the system after installation to verify proper operation. Submit check-out memo from factory representative.
			3. Functional testing of the lighting control system shall be provided by an independent commissioning authority in accordance with ASHRAE 90.1 - 2010. Refer to Section 260800 - Commissioning of Electrical Systems.
	6. DELIVERY, STORAGE, AND HANDLING
		1. Section 016000 - Product Requirements: Transport, Handle, Store, and protect products.
		2. Store products in clean, dry area; maintain temperature to NEMA ICS 1 requirements.
2. PRODUCTS

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**NOTE TO SPECIFIER**

Verify manufacturer information, product numbers, and availability at time of Project Manual preparation for Project.

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* 1. MANUFACTURERS
		1. Subject to compliance with project requirements, manufacturers offering products which may be incorporated in the work include the following:
			1. Cooper Controls, Peachtree City, GA (800) 553-3879.
			2. Encelium Technologies, inc., Philadelphia, PA (267) 286-0336.
			3. General Electric Company, Plainville, CT (800) 626-2000.
			4. Hubbell Building Automation, Inc, Austin, TX (888) 698-3242.
			5. Intermatic, Inc., Spring Grove, IL (815) 675-7000.
			6. Leviton, Little Neck, NY (800) 824-3005.
			7. Lighting Control & Design, Glendale, CA (800) 345-4448.
			8. Lutron Electronics,Co. Coopersburg, PA (800) 523-9466.
			9. Novitas, Culver City, CA (310) 568-9600.
			10. Sensor Switch, Wallingford, CT (800) 727-7583.
			11. Tork, Mount Vernon, NY (914) 664-3542.
			12. WattStopper, Santa Clara, CA (800) 879-8585.
		2. Section 016000 - Product Requirements: Product substitutions: Permitted by manufacturers listed in 2.1A

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**NOTE TO SPECIFIER**

Interval countdown timer switches are required for the control of the “high level” illumination within the exterior platforms/canopies of Mail Processing Facilities. Choose the appropriate Paragraph 2.2 A. for the interval countdown timer to be specified based on the required voltage and load rating.

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* 1. [DIGITAL (INTERVAL) TIMER SWITCH
		1. Provide flush wall mounted line voltage, digital, countdown timer switch with the following features:
			1. The timer switch shall be preset to turn loads “off” after a preset interval time of (4) hours maximum. Switch shall be equipped with manual on/off pushbutton.
			2. Timer switch shall mount in a standard single gang wall box and shall fit behind a decorator style face plate. The control switches shall not protrude more than 1/8 inch from the wall.
			3. Timer switch shall have no minimum load requirement and shall be capable of switching all solid-state LED or electronic fluorescent ballast loads: from 0 to 800 Watt @ 120 VAC - 60 Hz, and 0-1200 Watt @ 277 VAC - 60 Hz.
			4. Optional flash and beep warnings shall notify occupants when the interval countdown reaches one minute.
			5. The switch shall not require a neutral, simplifying installation and shall feature terminal style wiring, which makes installation easier.
			6. Basis of Design:
				1. Sensor Switch #PTS-720 (4 hour max.)
				2. Intermatic #EI215 (1800W @ 120 VAC).]

2.2 [LOW VOLTAGE-DIGITAL (INTERVAL) TIMER SWITCH

 A. Provide flush mounted, low voltage, digital, countdown timer switch with the following features:

1. The timer switch shall be programmable to turn loads “off” after a preset time interval of (4) hours maximum. Switch shall be equipped with manual “on/off” pushbutton.

2. Time switch shall be five terminal, completely self-contained control system that replaces a standard toggle switch and shall operate at 24 VAC/VDC/VAC half wave rectified.

3. Time scroll features shall allow manual overriding of the preset time-out period. Selecting time scroll UP shall allow time-out period to scroll up throughout the timer possibilities to the maximum. Time scroll DN (down) shall allow time-out period to scroll down to minimum.

4. Optional flash and beep warnings shall notify occupants when the interval countdown reaches one minute. Switch shall have a Liquid Crystal Display that the shows the timer’s countdown.

5. Timer switch shall have manual feature for timer reset where pressing the ON/OFF switch for more than 2 seconds resets the timer to the programmed time-out period.

6. Timer switch shall mount behind a decorator style face plate. The calibration switch for setting time-out, time scroll and warnings shall be concealed to prevent tampering of adjustments and hardware.

7. Sensor shall have no minimum load requirement and shall be capable of switching all solid-state LED and electronic fluorescent ballast loads at the rating of the power pack.

8. Switch shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1 percent. Sensors shall have standard five (5) year warranty and shall be UL and CUL listed.

9. Provide universal voltage, power pack for 24 VDC operating voltage to the timer switch.

10. Basis of Design: WattStopper TS-400-24.]

* 1. DIGITAL TIME SWITCH
		1. Provide 365/7 day, digital time switch with astronomical clock, holiday scheduling and automatic daylight savings time adjustment. Time switch shall have the following features:
			1. Provide maximum 2 hour manual override switch and capacitor carry-over (minimum 100 hours).
			2. Switch shall be compatible with all solid-state LED and electronic fluorescent ballast loads rated 20 Amps at 120 or 277 VAC, DPST.
			3. Provide indoor/outdoor plastic enclosure.
			4. Basis of Design:
				1. Tork/NSI #DG100A Series.
				2. Intermatic #ET2000 Series.
	2. DIGITAL MULTI-CHANNEL TIME SWITCH
		1. Provide 365/7 day, multi-channel, programmable, digital time switch with astronomical clock, holiday scheduling and automatic daylight savings time adjustment. Time switch shall have the following features:
			1. Provide maximum 2 hour manual override switch and capacitor carry-over (minimum 2 days) with lithium battery back-up for one year.
			2. Switch shall be compatible with all solid-state LED and electronic fluorescent ballast loads rated 20 Amps per channel at 120 or 277 VAC, SPST.
			3. Switch shall contain “LCD” screen for all programming and shall be [4] [8] [12] channel type.
			4. Provide indoor metal enclosure.
			5. Basis of Design:
				1. Tork/NSI #ELC Series.
				2. Intermatic #ET70000 Series.
	3. EXTERIOR PHOTOCONTROL SENSOR
		1. Provide weatherproof line voltage photo-sensor for measuring exterior light levels: ON @ 1 to 5 footcandles / OFF @ 3 to 15 footcandles. The photo-sensor shall be mounted facing north as indicated on the plans. The photo-sensor shall be rated as follows: 1800 Watts @ 120VAC; 4150 Watts @ 277 VAC.
			1. Basis of Design:
				1. Intermatic # K4141C (120/277 VAC).
				2. Tork/NSI #2001 (1800 Watts @ 120 VAC).
				3. Tork/NSI #2002 (4620 Watts @ 277 VAC).
	4. ANALOG, DUAL TECHNOLOGY, SINGLE RELAY, WALL BOX OCCUPANCY SENSOR
		1. Provide flush mounted, single relay, wall box type occupancy sensor with the following features:
			1. The Occupancy Sensor Switch shall be a designer-style, multiple-detection technology, universal voltage occupancy sensing wall switch.
			2. Sensor shall be designed to accept and control universal voltage (120VAC to 277VAC, 60Hz.) and rated to control up to 800-watt lighting loads @ 120VAC and 1200 Watts @ 277VAC.
			3. Sensor shall be a two-wire switch capable of handling the following loads:
				1. Incandescent / Quartz Halogen
				2. Solid-State LED
				3. Electronic Low-Voltage
				4. Magnetic Low-Voltage
				5. Fluorescent Non-Dimming Ballasts
			4. Sensor shall have a viewing area of not less than one hundred seventy (170°) degrees at an axial distance of 40 feet, 50 feet at 0 degrees, and shall have a total coverage area of not less than 4,000 square feet with an unobstructed view.
			5. Sensor shall utilize non-intrusive, passive dual detection technologies consisting of:
				1. Passive Infrared (PIR) to read and detect occupants’ body heat and movement, and;
				2. Enhanced microphonics to hear and detect occupancy throughout the entire space.
			6. Under no circumstances shall the unit emit energy of any type into the space that can potentially interfere with electrical, electronic, or medical devices (i.e. hearing aids), etc.
			7. Each unit shall provide manual on/automatic off operation and accept on/off commands from an unlimited number of multi-location 3-way Remotes.
			8. Remote stations shall provide multi-location On / Off control of the switch using conventional 3-way wiring.
			9. The unit shall, when manually turned off by the user, continue to monitor the space, but will not turn on the lights. User shall be able to, at anytime, override this feature by manually turning on the lights.
			10. The unit’s operational/parameter programming shall be accomplished with the unit installed and operational without the need to remove the unit (or its faceplate) from its installed location.
			11. Each unit shall provide a LED indicator to provide indication when the sensor detects movement.
			12. Device shall mount in a single gang wall box and be gangable with other designer-style electrical devices and faceplates.
			13. The Sensor shall be UL Listed to U.S. and Canadian standards for 120VAC to 277VAC capacity.
			14. Basis of Design:
				1. Sensor Switch #WSD-PDT Series.
				2. WattStopper #PW-100 Series.
	5. ANALOG DUAL TECHNOLOGY, DUAL RELAY, WALL BOX OCCUPANCY SENSOR
		1. Provide flush mounted, dual relay, wall box type occupancy sensor with the following features:
			1. The occupancy sensor switch shall be a designer style, multiple detection technology, universal voltage, occupancy sensing wall switch.
			2. Sensor shall be capable of detecting presence in the control area by detecting Doppler shifts in transmitted ultrasound and passive infrared heat changes. Sensor shall utilize Dual Sensing Verification Principal for coordination between ultrasonic and PIR technologies. Each sensing technology shall have a LED indicator that remains active at all times in order to very detection within the area to be controlled.
			3. Sensor shall feature a trigger mode where the end-user can choose which technology will activate the sensor. Selection of technologies for initial, maintain and re-trigger shall be done with DIP switches. Sensor shall have its trigger mode factory preset to allow for quick installation. In this default setting, both technologies must occur in order to initially activate lighting systems. Detection by either technology shall maintain lighting on, and detection by either technology shall turn lights back on after lights were turned off for 5 seconds or less in automatic mode and 30 seconds or less in manual mode.
			4. Sensor shall have 4 occupancy logic options for customized control to meet application needs.
			5. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
			6. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources.
			7. Sensor shall utilize SmartSet™ technology to optimize automatic time delay to fit occupancy usage patterns. The use of SmartSet shall be selectable with a DIP switch.
			8. Sensor shall utilize Zero Crossing circuitry on both relays to reduce stress on relays and increase sensor life.
			9. Sensor shall utilize two relays capable of simultaneously controlling independent lighting loads or circuits. The secondary relay shall be isolated, allowing for two-circuit control.
			10. Sensor shall have no minimum load requirement and shall be capable of switching from 0 to 800 Watt solid-state LED; 0 to 800 Watt fluorescent or 1/6 hp at 120 VAC, 60 Hz; and 0 to 1200 Watt fluorescent at 277 VAC, 60 Hz.
			11. Sensor shall feature a walk-thru mode, where lights turn off 3 minutes after the area is initially occupied, if no motion is detected after the first 30 seconds, set by a DIP switch.
			12. Sensor shall cover up to 1,000 s.f. for walking motion with a field view of 180 degrees and shall have automatic-ON or manual-ON operation for both relays adjustable for each relay.
			13. The sensor shall act as a “service switch” to allow operation in the unlikely event of a failure and shall be able to control incandescent, magnetic low voltage, electronic low voltage, “LED” solid state, and fluorescent lighting loads
			14. Sensors shall have a built-in light level featuring simple, one-step daylighting setup that works from 8 to 180 footcandles.
			15. Wall switch sensor shall be a completely self-contained control unit that replaces a standard toggle switch.
			16. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%. Sensor shall have standard 5-year warranty and shall be UL and CUL listed.
			17. Basis of Design: WattStopper #DW-200.

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**NOTE TO SPECIFIER**

Certain room configurations or functions may require “ultrasonic sensing” in lieu of the preferred “dual technology detection”. Edit Paragraph 2.8 below, accordingly.

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* 1. CEILING MOUNTED OCCUPANCY SENSOR
		1. Provide low voltage ceiling mounted, 360 degree, [dual technology] [ultrasonic] occupancy sensor with the following features.
			1. The sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound [and passive infrared heat] changes.
			2. [Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on.]
			3. Sensor shall have a retrigger feature in which detection [by either technology] shall retrigger the lighting system on within 5 seconds of being switched off.
			4. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing that automatically adjusts the detection threshold dynamically to compensate for changing levels of activity and airflow throughout controlled space.
			5. [The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.]
			6. To avoid false ON activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.
			7. Sensors shall utilize SmartSet™ technology to optimize time delay and sensitivity settings to fit occupant usage patterns. The use of SmartSet shall be selectable with a DIP switch. Sensors shall have a time delay that is adjusted automatically (with the SmartSet setting) or shall have a fixed time delay of 5 to 30 minutes.
			8. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.
			9. Sensor shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled. The LED can be disabled for applications that require less sensor visibility.
			10. Sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%. Sensors shall have standard 5 year warranty and shall be UL and CUL listed.
			11. Basis of Design: WattStopper [#DT-305] [#WT-2200].
			12. Provide universal voltage, power pack for 24 VDC operating voltage to the occupancy sensors. Power pack shall enable manual on, hold on, hold off and load shed for bi-level switching applications. Basis of Design: WattStopper BZ-150.
	2. LUMINAIRE INTEGRATED OCCUPANCY SENSOR
		1. Provide line voltage, low profile, luminaire integrated occupancy sensor with the following features.
			1. Sensor shall be factory or field installed within each luminaire and shall utilize passive infra-red technology to detect presence.
			2. Sensor shall be line voltage rated 0-800 Watts @ 120VAC and 0-1200 Watts @ 277VAC for all solid-state LED and electronic fluorescent lighting loads.
			3. Sensor shall be rated for indoor/outdoor installation, shall be UL listed and shall have a standard five (5) year warranty.
			4. Sensor shall be available with different lens choices to provide flexibility for varying luminaire mounting heights of 8 ft. to 40 ft. AFF.
			5. Sensor shall have adjustable time delay from 30 seconds to 30 minutes; set to 20 minutes.
			6. Basis of Design:
				1. WattStopper #FS-355.
				2. Leviton #OSFHP Series.

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**NOTE TO SPECIFIER**

Automated receptacle control or control of the retail area lighting may require the use of time-controlled relay panels. Include Paragraph 2.10 when relay panels are to be provided.

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* 1. RELAY PANELS AND DIGITAL SWITCHES
		1. Provide relay panels and capacities as indicated on the drawings. Panels shall be of modular construction and consist of the following components:
			1. The relay panel shall contain mechanically held latching control relays. Control relays shall be individually UL listed and shall bear labels indicating compliance. Control relays shall be specifically designed for control of 120, or 277VAC loads including but not limited to incandescent, low-voltage, neon, cold cathode, LED, fluorescent and HID lighting sources at a full 20 AMPS and motor loads of 1/2 Hp @ 120 VAC or 1.5 Hp @ 277 VAC. Control relays shall be designed with a mechanical latching mechanism that shall hold the relay in its last activated state indefinitely, with no change of state during an interruption of power. Each control relay shall include a mechanical means of turning the relay ON or OFF without the need for electrical power of any kind.
			2. Cover shall be configured for [surface] [flush] wall mounting of the panel. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
			3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable, mechanically held, latching type relays. The panel interiors shall include the following features:
				1. Provision for one or two optional control and automation cards.
				2. Removable, plug-in terminal blocks with screw-less connections for all low voltage terminations.
				3. Individual terminal block, override push button, and LED status light for each relay
				4. Switch inputs associated with each relay and group channel shall support two or three wire, momentary or maintained contact switches.
				5. Isolated contacts within each relay shall provide true relay state to the electronics. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems.
				6. Group, channel, and pattern control of relays shall be provided through a simple button-press interface within the panel. Any group of relays can be associated with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override push buttons and LED displays.
				7. Each relay and channel terminal block shall provide a 24V pilot light signal. It shall be possible to configure the system for support for any Class 2 pilot light voltage with the use of an auxiliary power supply.
				8. Single pole mechanically held relays with modular plug-in design. Relays shall provide the following ratings and features:

Electrical:

30 amp ballast at 277V

20 amp tungsten at 120V

1.5 HP motor at 120V

14,000 amp short circuit current at 277V.

Mechanical:

Individually replaceable, 1/2-inch KO mounting with removable Class 2 wire harness

Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel

Dual line and load terminals each support two #14 – #12 solid or stranded conductors

Tested to 250,000 mechanical on/off cycles

Isolated low voltage contacts provide for true relay status feedback and pilot light indication.

* + - * 1. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.
			1. The relay panel shall include in the control module an astronomical timeclock with programmable geographic location.
			2. Communication over the control network shall allow any switch input from any device to be linked to any relay output or group of relay outputs in the lighting control system for complete, unrestricted control.
			3. Power Failure and Power-Up Options: Each relay panel shall be provided with circuitry that shall automatically shut down the controller whenever the incoming power fails. Upon restoration of incoming control power, the relay panel electronics shall be restarted and resume normal operations, and all circuits will be maintained in the condition they were last in.
			4. The control system shall be provided with spare relays as indicated on the relay panel schedules and any required programming expandability for the spare relays.
			5. Basis of Design:
				1. Lighting Control and Design - “Blue Box LT Series”.
				2. Substitutions permitted as listed in paragraph 2.1A.
		1. Intelligent digital switching shall be provided operating on the dual twisted pair communication wire. Switches shall be available in single, dual, quad, or octal (1-button, 2-button, 4-button, or 8-button) designs. The single, dual, and quad devices shall mount in a standard single-gang box, the octal version in a two-gang box.
			1. Each button shall be individually programmable. Programming of buttons shall not require the use of a computer or other programming device. It shall be possible to assign relays or channels to buttons using a simple button press interface. Each button can control any one of the following options:
				1. Any individual relay in any single panel.
				2. Any group of relays in any single panel.
				3. Any group of relays in the system (via network clock, Automation Appliance, or WinControl software package).
			2. Switches shall be constructed of non-breakable Lexan on all exposed parts and shall include a matching screw-less Lexan wall plate.
			3. Switch LED pilot lights shall flash green to indicate impending off sweep during the five-minute grace period following blink warning of the lights. Once the button is pressed, the LED will change to Red to acknowledge the occupant's override command to keep lights ON.
			4. Multiple data line switches programmed to control the same relay or relay group shall indicate the same status automatically.
			5. Each switch shall also include a locator light illuminating the switch for easy location in the dark.
			6. The dual, quad, and octal switches shall all include a single master button that will override all relays controlled by the individual buttons OFF, or Restore them to their original state. Each switch's master button configuration can be altered to perform a Master ON/OFF, OFF Only, or Disabled function if desired.
			7. Each switch shall be available in a Key lock version to avoid unauthorized control.
			8. Basis of Design:
				1. Lighting Control and Design - “Chelsea” Series.
				2. Substitutions permitted as listed in paragraph 2.1A.
1. EXECUTION
	1. EXAMINATION
		1. As specified in Section 260500 – Common Work Results for Electrical.
	2. INSTALLATION
		1. The Lighting Control System shall be installed and wired completely as shown on the plans by the contractor, who shall make all necessary wiring connections to external devices and equipment.
	3. FIELD QUALITY CONTROL
		1. As specified in Section 260500 – Common Work Results for Electrical.
		2. Perform operational testing on lighting control system to verify proper operation and field wiring connections.
		3. System Start Up and Commissioning
			1. Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components.
			2. Lighting control devices shall be tested to ensure that they are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer’s installation instructions.
				1. Provide functional performance testing as required by Section 260800 – Commissioning of Electrical Systems.
		4. System Training
			1. Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and controls.
		5. System Programming
			1. Manufacturer shall provide system programming including:
				1. Wiring documentation.
				2. Switch operation.
				3. Operating schedules.

END OF SECTION

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