PART 0 A/E INSTRUCTIONS

0.01 DESIGN REQUIREMENTS

A. Minimum lighting control (base scope of work) shall include all corridors. The lighting in all the corridors shall be turned on (if not already on) if the security system triggers an alarm. The lighting will need to be manually turned off once the security system has been cleared by DPS security personnel.

B. Lighting should be circuited such that full lighting control can be achieved by the lighting control panel.

C. For new buildings, lighting design shall include lighting control panels, capable of interfacing with the Integrated Building Automation System (IBAS).

D. For remodel projects, depending on extent of the remodel, engineer shall provide lighting control panels. Consult DPS Project Manager.

E. For building additions, engineer shall provide lighting control panels. Lighting control panels shall be sized to accommodate as much of the existing building lighting as possible. Lighting control panel shall be capable of interfacing with IBAS.

F. Engineer may use as an alternate Smart Breaker Panels to control lighting and other loads for the IBAS. Smart breakers can be used to control HVAC and other controllers without additional I/O hardware. This solution can be used for new buildings, remodels, or additions.

G. All lighting controls must use BACnet protocol or a BACnet gateway to integrate into DPS IBAS. Refer to Section 15975 – Integrated Building Automation System (IBAS) for interface requirements.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The intent of this section is to furnish and install a Lighting Control System as part of the complete Integrated Building Automation System (IBAS).

B. Any network connected computer shall be able to display information on all lighting control in the building through secured user access.

C. The Lighting Control System, as part of the IBAS shall be fully integrated and installed as a complete package. The System shall include all wiring, conduit, installation supervision, calibration, adjustments, and checkout necessary for a complete and fully operational system.

1.02 COMMISSIONING

A. Commission the Lighting Control System as part of the IBAS. Refer to the commissioning sections for further detalis.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. TRIATEK Lighting, Inc.

B. MicroLite Corp.

C. Matrix Control Systems

D. Hi Solutions Field Commander

2.02 QUALITY ASSURANCE

A. The IBAS Lighting Control System shall be furnished and installed by Integrated Control Systems, Inc. located in Golden, CO (303-277-0708).

2.03 MATERIALS

A. Lighting Control Panels (LCP):

1. Overview:

   a) Integration to IBAS: The LCP's will interface to the IBAS over a twisted pair of wires. Each lighting circuit from the LCP will be controlled by the IBAS over the twisted pair between the LCP's and the IBAS communication bus. All scheduling, monitoring and control of lighting circuits will be from the IBAS software. Each lighting circuit from the LCP must be a mapable point to the IBAS. All graphic lighting control floor plans will be on IBAS software.

   b) The LCP shall consist of a preassembled enclosure with separate high and low voltage sections, CPU, Interface Board, interconnect cables, power supply, high voltage cover and primary fusing.

   c) The LCP shall be mounted in electrical closets. The relays in the enclosure shall be wired to control the power to each load with all power wiring indexed with the relay controlling it at the load.

   d) Dry contact switches or digital series switches and occupancy sensors shall be mounted in the spaces as indicated. The LCP must be capable of accepting these dry contact and digital switches directly. Software in the LCP shall provide the capability to set the switch input as either momentary on, momentary off, momentary toggle, or maintained. Momentary switches shall have the capability to be assigned timers to assure the lights are turned off after the timer has expired. The LCP shall provide the capability to set the polarity of each of its switch inputs to normally open or normally closed. The input shall be programmable in order to determine whether or not it will flash the zone it is assigned to. Wiring from the switches and sensors to the IBAS or "LCP" shall be CLASS 2 or CLASS 2P (plenum rated) as required by the National Electrical Code and local standards. 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 Panel Wiring Schedule in each LCP.

   e) The LCPs shall be factory wired for a minimum of 8, 16, 32, 48 or 60-relay capacity. The LCP shall be expandable only by adding additional relays. Systems that require additional automation cards will be unacceptable. All panels shall be factory wired for their maximum capacity eliminating the need to purchase additional automation cards in the future. All relays shall have modular connectors so expansion or replacement will be simple.

   f) Each LCP shall provide manual override of any of its zones and the relays assigned to zones without the need for additional hardware or software.

B. Hardware Features:

1. Enclosure: NEMA 1 enclosure. Maximum of 14" wide and 4' deep, height shall vary depending on the relay capacity of the enclosure. A barrier shall be provided to separate the low voltage compartment from the high voltage compartment. A cover secured by screws shall be provided to enclose the high voltage compartment. It shall be properly marked to warn of the danger of high voltage. The unit shall be wired for its maximum capacity of relays. The unit shall provide the capability to accept any number of relays up to its maximum capacity without requiring the addition of any automation cards or interface boards. Any number of relays, up to the maximum size, may be installed in any one of the sizes listed. Where an enclosure does not have the maximum number of relays installed as furnished initially, additional relays may be added by placing the relay in the enclosure and plugging its connections onto the relay interface board which comes with the enclosure. Door shall be hinged with key lock and painted to match enclosure

2. CPU: The unit shall provide intelligence required to control relay on/off staging and timing, zone timing, zone assignments, zone changes, override timing, flash timing, RS 485 serial communications port, local manual programming, and status displays/indications. A minimum of twenty-four (24) switch inputs shall be provided with the capability to expand to one-hundred-

twenty (120) for integration into the IBAS. The unit shall be capable of a minimum of sixty (60) zones. Each zone shall be fully programmable. Each zone shall be controllable by any of the LCP's switch inputs. Only the number of zones required by the installer need be implemented, but sixty minimum shall be furnished. Any relay must be assignable to any zone and the capability of assigning any relay to any zone without rewiring of any kind is required. Zone assignment shall be field changeable without changing hardware of any kind including jumpers, memory chips (ROM), or other plugs. Assignments shall be stored in nonvolatile memory so that setup and assignments are not lost during power outages or brown outs. Battery backed memory will not be allowed. The CPU shall provide individual relay pulse control so that all circuits are not turned on or off simultaneously, but are staged on to prevent line surges.

3. Relay Interface Module: Each of the low voltage coils on the LCP relays shall plug into an interface for ease of installation and replacement. Systems that use screw terminals to connect the low voltage coil portion of the relay will not be acceptable. Systems that do not use an interface module separate from the panel controller shall not be acceptable.
4. Panel Setup & Local Programming: All features shall be programmable by a Laptop or PC that has LPPK configuration software. Software shall be compatible with operating systems using Windows 98 or later.
5. Software/Pushbutton Addressing: The unit address shall be software selectable between 1- 255 and through the use of pushbuttons on the unit.
6. Manual override for each individual zone shall be provided on the CPU as well as manual override lever on each relay.
7. Emergency Override Module (EOM): The LCP shall provide the capability, as an alternative option, to offer a redundant controller to turn all relays on in the LCP should its CPU fail. The EOM shall mount in the LCP and provide a single override switch to activate all relays in the LCP.
8. Light Level Sensor Input for Triatek Lighting PHOTO Series light level sensor.
9. Status LED's: The unit shall provide status indicated by bar-graph LED's for each of the 60 lighting zones, 60 outputs. These shall indicate zone flash selection, programmable blink times, flash warning, programmable flash times, input status, on/off status, relays assignment to zones, normal operation indication, security mode, parameter review, and manual override mode. These LED's shall provide status of unit, zone status, relay status, and indication of zones, which are in the manual override or flash mode.
10. Relays: Relays shall be momentary-pulsed mechanically latching relays using a dual coil technology rated at 20 amps, 120-277 VAC. They shall attach to the barrier and plug into the Relay Interface Board. Relays that use screw terminations for low voltage connections shall not be acceptable. Relays shall have built in lever for manual override. Lever shall also indicate status of relay, and not require power to operate. Relay shall be rated for a minimum of 150,000 cycles at full load. All relays shall be factory wired for low voltage control and shall not have to be rewired in the field regardless of panel zoning requirements.
11. Power Supply: The unit shall provide a single transformer with primary fusing. It shall be capable of 120V or 277V +10%, primary power. Units with single primary transformers will be unacceptable. A grounding stud shall be provided in the high voltage compartment to ground primary power.
12. High Voltage Compartment Divider: (HVCD) The LCP shall provide the capability to divide 120V from 277V within the high voltage compartment. The HVCD shall mount in the high voltage compartment between the relays as a barrier between the two different voltages. The HVCD shall not require any tools for mounting and can be placed between any of the LCP relays.

13. Door: The LCP shall provide a door with attractive textured paint finish with Polane T Polyurethane enamel paint or equal. A pocket shall be provided on the inside of the door to house the LCP manual and schedules.
14. Digital Override Switches: Digital switches that communicate over a Cat 6 digital device network shall be provided with the following minimum features:
    a) Each digital switch shall provide a push button switch with an embedded dual color LED to indicate the status of the lighting group controlled by the digital switch.
    b) All digital switches shall reside on a sub network from the lighting control network and provide a dipswitch to select the lighting group to be controlled. Digital switches that reside on the lighting control network and use a network address shall not be acceptable.
    c) Setting the lighting group to be controlled by the digital switch shall be done locally on the switch through a dipswitch. Systems that use only a remote addressing system shall not be accepted.
    d) The digital switches shall have removable terminal blocks for easy wiring.
    e) Each digital switch shall be mounted with a Decora style plate.
    f) Each digital switch shall provide LED's to visually indicate data is being receiving, data is being transmitting, and the digital device network is busy.
    g) The digital switch pushbutton shall illuminate RED when the lights are on and GREEN when the lights are off. Systems that do not provide multi color LEDS embedded in the pushbutton switch are not acceptable.
    h) The digital switch shall have a mechanical life of a minimum of 1,000,000 operations.
    i) The digital switch shall provide audible click when pressed.
    j) The digital switch shall mount in a standard single gang junction box.
    k) The digital switch shall communicate over a digital device network with a minimum of sixty, 2-button digital switches on one network.
    l) Each digital switch pushbutton shall provide a removable cap for insertion of a printed label to describe lights controlled.
    m) The digital switch network shall be 18 AWG, two twisted pair wire.
    n) Each digital switch shall be able to control any one of sixty lighting groups in the panel controller.

C. Software Features:
1. Switch Inputs: A minimum of 24 switch inputs shall be provided with the capability to expand to 120 for integration into the IBAS. Each input must be programmable for maintained, momentary on, momentary off or momentary toggle (on/off). Any of the momentary switch inputs must have the capability to be assigned to a programmable software timer to assure lights will be turned off after this time expires. Each input must have the capability to be assigned as either a normally closed or normally open contact.
2. 60 Output Capability: The unit shall provide switching for up to 60 loads. Outputs shall be sequenced to reduce the inrush effects on the power system.
3. Commanded Load Feedback: The unit shall provide feedback of the commanded state of each lighting zone.
4. Selectable Output Energize Time: The unit shall provide selectable energize durations from 0.024 to 1.56 seconds. All circuits shall not be turned on or off simultaneously, but staged on and off to prevent line surges.

5. Zone and Relay Assignment Feature: The LCP shall provide the software capability to group any or all of the unit's Relays to any zone without the use of any tools. Also, assignments shall be easily changed in the field without changing hardware, memory chips, or relay control wiring connections.
6. LED Display Feature: The LCP shall provide software to illuminate LED's to indicate status of zones and contactors. If a zone is in the flash mode the zone LED must flash rather than a steady on.
7. Light Level Sensor Input for Triatek Lighting PHOTO Series light level sensor.
8. Switch Input Timer Feature: The LCP shall provide the software capability to assign a timer to any of the momentary switch inputs to assure the lights are turned off after the software timer has expired. Systems that rely only on sweeping the off will not be acceptable. The timer shall be programmable from 1 minute to 18 hours.
9. Zone Priority Feature: The LCP shall provide the software capability to setup priorities for each of the zones because multiple switch inputs can be assigned to the same zone so an order of priority may need to be established.
10. Serial Priority Feature: The LCP shall provide the capability to have serial commands override or not override switch inputs. This feature only applies to systems that utilize the RS-485 communication capability.
11. Flash Mode Feature: The LCP shall provide the software capability to flash the lights (latch/unlatch) associated with any input. This feature shall be programmable for any of the LCP switch inputs.
12. On Time After Flash Warning Feature: The LCP shall provide the software capability to set the length of time the lights will be on after the lights have been flashed.
13. Flash Warning Time Feature: The LCP shall provide the software capability to set the length of the flash off time during the Flash Warning.
14. Maximum Relays in System Feature: The LCP shall provide the software capability to set the maximum number of active relays.
15. Maximum Switch Inputs in System Feature: The LCP shall provide the software capability to select the maximum number of switch inputs the unit will monitor.
16. Input Polarity Feature: The LCP shall provide the software capability to set each switch input for either normally open or normally closed contacts.
17. Checking Input Status Feature: The LCP shall provide the software capability to display the status of each of the unit's switch inputs.
18. Programmable Switch Input Feature: The LCP shall provide the software capability to select zones controlled by switch input, type of input (maintained, momentary on, momentary off, or momentary toggle contact.
19. LED Time Out Feature: The LCP shall provide the software capability to put the LED's to sleep much like a screen saver on a PC. This will prolong the LED life and reduce heat buildup in the unit. To wake the LED's up any one of the LCP pushbuttons shall be pressed.
20. Manual Override Feature: The LCP shall provide the software capability to manually override any of the unit's zones from the CPU. Zones that are placed in manual override shall not execute serial commands or switch input requests. In addition to the relay lever, the unit shall also provide a manual override button to manually override all of its relays.
21. EPROM and EEPROM Diagnostic Feature: The LCP shall provide the software capability to run a diagnostic check of the unit's EPROM (Electrically Programmable Read Only Memory) and EEPROM (Electrically Erasable Programmable Read Only Memory) at any time. If the LCP

detects any problem with its memory after power up it will indicate a problem exists by flashing a warning LED.

22. All program information shall be stored in nonvolatile memory so that the program information is not lost in the event of a power outage. Battery backed memory shall not be allowed eliminating the need to replace batteries.

PART 3 EXECUTION

3.01 INSTALLATION PRACTICES

A. Installation of Lighting Control System (LCS):

1. Contractor shall furnish and install a complete Lighting Control System as part of the (IBAS) for all the lighting control panels.
2. Where work specified under other Sections of this Specification connects to equipment or systems that are listed and described in this Section, the Contractor shall provide proper connection(s) to such equipment, including trade coordination.

B. Control System Wiring:

1. All conduit, wiring, accessories and wiring connections required for the installation of the Lighting Control System as part of the IBAS, as herein specified, shall be provided by the Div. 16 Contractor unless shown otherwise. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.

3.02 TRAINING

A. The controls contractor shall provide the following training services:

1. One day of on-site orientation by a field engineer who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the control system software layout and naming conventions, and a walk through of the facility to identify panel and device locations.
2. Operator Training: Operator training shall include the detailed review of the control installation drawings, points list, and equipment list. The instructor shall then walk through the building identifying the location of the control devices installed. For each type of system, the instructor shall demonstrate how the system accomplishes the sequence of operation.
3. From a computer, the operator shall demonstrate the software features of the system. As a minimum, the operator shall demonstrate and explain logging on, setting passwords, setting up a schedule, trend, point history, alarm, and archiving the database.

END OF SECTION 17820