CONSTRUCTION STANDARD SPECIFICATION

SECTION 13811

LIGHTING CONTROL EQUIPMENT

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.02 SUMMARY

A. This Section includes the following types of lighting controls:

1. Low voltage manual type momentary override switches
2. Programmable lighting control systems
3. Photo sensors
4. Power relays and contractors
5. Low voltage wiring

B. Low voltage is defined as 24 VAC + - 10% HZ for purposes of this section.

C. This Section DOES NOT address Lighting Control Systems for Large Conference Room and Auditorium type Spaces.

1.03 SUBMITTALS

A. General: Submit the following according to provisions of Standard Section 01330.

B. Supply manuals on system components to permit ease of installation, system operation and maintenance including, but not limited to the following:

1. Lighting control system step-by-step operating instructions.
2. Relay panel schedules indicating circuits connected, inputs assigned, area controlled, panel location and panel equipment details.

C. Lists of ballast and lamp combinations compatible with control systems, by manufacturer and catalog number. Acceptable ballast manufactures will be Universal or Advance. All fluorescent ballasts shall be electronic type.

D. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 1.

E. Record of field tests for tests specified in Part 3 of this Section.

F. Programming documentation for software.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms experienced in manufacturing and servicing equipment of the types and capacities indicated that have a record of successful in-service performance. Qualifications include ability to provide training, parts, and emergency repairs at the Project site within 24-hour response time.

B. Comply with NFPA 70, "National Electrical Code," for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code" Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.05 WARRANTY

A. Special Project Warranty: A written warranty mutually executed by manufacturer and the principal Installer, agreeing to replace programmable lighting control system components that fail in materials or workmanship within the special Project warranty period specified below. This warranty shall be in addition to, and not a limitation of, other rights and remedies the Owner may have against the Contractor under the Contract Documents.

B. Special Project Warranty Period: 2 years beginning on the date of Substantial Completion.

1.06 EXTRA MATERIALS

A. Furnish extra products as described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Relays: Single-pole mechanically held, 1 for every 10 installed.

2. Occupancy Sensors and Power Supply/Relay Packs: 1 for every 10 installed

3. Low-voltage light switch: 1 for every 10 installed

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. All components are to be supplied by same manufacturer. Manufacturer is to be a supplier of this type of equipment for over 10 years:

1. Low voltage control system shall be manufactured by:

a Douglas Lighting Controls, Inc.

b Hubbell Buildings Automation

c Intelligent Lighting Controls

d Lighting Control & Design

2.02 LIGHTING CONTROL SYSEM, GENERAL

A. Provide a complete low voltage lighting control system for the building shown on the plans and specified herein.

B. Lighting control system shall utilize networking technology based upon "LonWorks" and be LonMark certified to Level 3.1. System shall be able to operate as a stand-alone entity with the option of using a web server device so that programming and viewing of status can be accomplished by any PC connected to the same LAN or via the internet.

C. All relay panel interiors shall be pre-assembled complete with the necessary relays, transformers and devices. Relay panels that are wall mounted shall have interiors separate from enclosure so as to permit easy mounting, conduit installation and wire pull to enclosures. Enclosures mounted in the ceiling space are not required to have separate interiors.

2.03 RELAYS

A. Lighting control relays shall be mechanically latching and shall come complete with a manual ON/OFF switch. The mechanical switch shall continuously display the true state of the relay's internal contacts. Relays requiring control power for manual operation and/or status feedback are not acceptable.

B. Single pole relays shall be rated and UL listed for 120 or 277 VAC lighting loads at 20 amps.

C. Double pole relays shall be rated and UL listed for 208, 240 or 480 VAC lighting loads at 20 amps.

D. Each lighting control relay shall be contained in an individual molded casing and shall be capable of containing a short circuit fault current of 14,000 amperes. Relays with exposed electronic devices are not acceptable

E. Each lighting control relay shall be capable of controlling incandescent, fluorescent, electronic ballast and MHID lighting loads.

F. Lighting control relays shall include captive, color-coded screw terminals for both the line voltage and the low voltage connections.

2.04 PRE-ASSEMBLED RELAY PANELS

A. Where indicated on the drawings, provide a factory pre-assembled relay panel. The panel's enclosure shall be for surface or flush installation, with a screw-on cover or hinged door assembly as required.

B. The panel shall consist of a pre-assembled interior insert; UL/CSA approved with capacities for 12, 24, 36, 48 and 72 relays as required. Panel enclosure must be UL/CSA Approved.

C. Panel interior shall have the following pre-assembled and pre-wired:

1. Suitable divider separating class1 and class 2 compartments

2. Control transformer, UL/CSA approved for class 2 circuits

3. Low voltage relays as required by switched circuits shown on plans or schedules

4. Control devices as required

2.05 CONTROL ELECTRONICS

A. When groups of relays are to be switched by master switches or time controls and it still must be possible to switch individual relays by local switches, provide programmable relay scanner WRS-2224.

B. Each scanner shall be solid state and have 24 relay outputs. An output shall be capable of switching the connected relay ON and OFF and sensing if the connected relay is ON or OFF.

C. Each programmable relay scanner shall have 5 switch inputs to accommodate group switches. Each switch input can be set with the keypad built into the scanner to switch some or all of the 24 relay outputs of the scanner. Each switch input must indicate an ON state if any of the relays in the group is ON. If all relays are OFF, then indicate an OFF state to the group switch.

D. The scanner shall be able to provide an optical flick warn option for each of the 5 groups. After the flick warn, the occupant has 5 minutes to prevent the local lights from switching OFF by activating the local switch.

E. The scanner shall provide an optional time-out option. When activated, this option will allow any relay in the system when switched on, to be timed for a 2 hour interval before being switched off. Flick warn may also be added to this option.

F. The programming of the scanner shall be user friendly with instructions printed on the scanner label.

G. The relay scanner shall accept a plug-in module, WNX-2624 Network Node. The network node shall use LonWorks technology and shall be LonMark certified (V3.1). This node shall be capable of connecting to an FTT-10A data line to communicate with other scanners in different relay panels or with other vendors using LonWorks technology.

2.06 NETWORK MANAGER

A. Provide as required on the drawings a WNP-2150 Network Manager complete with web server capability. The system shall have the following features:

1. Program and control up to 60 Network Nodes

2. Allow Photo sensors to be connected on the data line and to assign multiple set points to different groups of relays

3. Provide Astronomic time clock capability

4. Display relay panels individually and allow relays to be assigned to groups by simple point and click

5. Schedules allow for 1024 events and 16 unique holiday schedules

6. Groups can be configured to have user settable flick warn, time out and cleaning variables

7. Flick warn and time out durations are user settable on an individual relay basis

8. Allow switches to control groups spanning all panels in the system

9. Web interface must use standard HTML pages that allow any PC with a Web Browser access to the system

10. Security access available with 4 levels

11. Diagnostic tools for queries of status of network devices, relays and log reports

12. Full backup and restore capabilities

2.07 SATELLITE PANELS

A. Where indicated on the drawings, provide a WSP-2718 Satellite Panel complete with 8 latching relays capable of switching 20 amp lighting loads and rated for 120/277/247VAC. Each panel is to be connected on to the data line network and configured using the WNP/2150 Network Manager and shall contain the following hardware features:

1. 10 switch inputs

2. 2 – 24VDC inputs for occupancy sensors requiring DC voltage

3. 1 DC power supply rated for 250ma for supplying power to occupancy sensors

4. 2 digital inputs for accepting signals from WPS-5533 or WPS-5527 photo sensors capable of sensing 0 – 6,000 footcandles.

B. Switch inputs are to be capable of switching individual relays, local groups of relays within the panel or global groups of relays system wide. Each switch input can be configured for connection to standard Douglas switches, momentary 24VAC switches or maintained contract 24VAC switches. Each input can also be configured to be ON or OFF only. The inputs may also be configured to have interlocking logic so that if the photo sensor has switched a relay off it is possible to set an input so a local wall switch cannot override the photo sensor relay on unless there is insufficient light.

C. In rooms with photo sensor control, it shall be possible to set relays to switch at different light levels so that as the amount of daylight changes, different amounts of artificial light can be switched on or off. It shall be possible to set a sequence of switching 3 lamp fixtures with a relay each for the single lamp and outer lamps as follows: As daylight increases, the single lamp relay is switched off first. The next step requires the outer lamp relay OFF and the single lamp relay ON

simultaneously. As daylight passes the maximum threshold, the single lamp relay is switched off. This sequence is reversed as daylight declines.

D. The Satellite Panels shall accept either 24VDC or 24VAC occupancy sensors. The inputs may be configured for OFF only or ON/OFF switching scenarios. It shall be possible to link the photo sensor control with occupancy sensing so that when light levels are high enough, the occupancy sensor will not switch the photo sensor controlled relays ON.

2.08 LOW VOLTAGE WALL SWITCHES

A. Low voltage control switches and switch hardware shall mount to standard wall boxes.

B. Switch modules shall be available with 1, 2, 3 and 4 switches per gang and shall fit into standard 'Decora' style switch plates.

C. Individual switches shall include an integral tri-state LED to indicate both ON and OFF states (red=ON, green=OFF).

D. Each switch shall be clearly identified with a paper switch label. The label shall be held in place with a clear plastic cap and shall be field replaceable should the operation of the switch change. Permanently etched switches are not acceptable.

E. Switches shall have color coded captive screw terminals. Use #18 AWG solid conductors.

F. Where required provide keyed switches to control lights. Switches shall include an integral tri-state LED to indicate both ON and OFF states (red=ON, green=OFF).

2.09 0-10V DIMMER SWITCHES

A. Dimmer switches shall be compatible with dimming ballasts using the 0-10V control protocol.

B. An LED indicator bar shall display the proportional level of the connected ballasts.

C. UP & DOWN buttons shall permit the operator to raise and lower the light level as required.

D. Where indicated on the lighting plans, the dimmer switches shall be combined with daylight sensors (WPS-5700) to limit the maximum electric light level. Manual dimmers cannot exceed the light level determined by the daylight sensor.

E. Each switch shall be capable of controlling up to 50 dimming ballasts.

2.010 OCCUPANCY SENSORS

A. Where required, provide a PIR occupancy sensor Model WRM-5104. The occupancy sensor shall control up to 4 Douglas relays directly. It shall also be possible to connect Douglas wall switches in parallel to each relay for occupant override if required

B. Occupancy sensor to include the following features:

1. Adjustable time out (30 sec to 30 min) and sensitivity

2. Tilt & swivel lens direction adjustment

3. Coverage of 1600 sq. ft., Indoor ceiling mount, ceiling heights 8' to 16' max

4. Function select – on/off switching or off-only switching

2.011 EXTERIOR PHOTOMETRIC SENSORS

A. Provide where required an exterior photometric sensor capable of sensing from 1-60,000 lux. The sensor shall be connected to the lighting control network via a 4-wire (2 power + 2 data) dataline.

B. The ambient light level shall be continuously monitored and be displayed by the Network Manager.

C. One exterior sensor shall be capable of controlling one, some or all relays in the entire lighting control network shall permit different relays to switch at different light levels. Lights shall be controlled by 'sensor only' or by a combination of time& light level.

2.012 INTERIOR PHOTOMETRIC SENSORS

A. Provide where required an interior photometric sensor capable of sensing from 1-60,000 lux. The sensor shall be connected to the lighting control network via a 4-wire (2 power + 2 data) dataline.

B. The ambient light level shall be continuously monitored and be displayed by the Network Manager

C. Each interior sensor shall be capable of controlling one, some or all relays in the entire lighting control network and shall permit different relays to switch at different light levels. Lights shall be controlled by 'sensor only' or by a combination of time & light level.

2.013 DIMMABLE DAYLIGHT SENSORS

A. Provide where required and indoor daylight sensor WPC-5700 for applications that harvest daylight by regulating the electronic dimmable fluorescent ballasts. The sensor shall regulate the ballast so that when natural light is bright the lamp is dim

and when natural light is dim the lamp is bright. The sensor shall be ceiling mounted and measures light reflected upward from the surface below. The sensor shall have a range setting and a set-point slider located under the front faceplate.

B. The sensor shall be compatible with Phillips/Advance Mark VII, Motorola Helios or any other ballast that uses the same 0-10V dimming control method. The sensor shall connect with 2 wires connected in parallel to a maximum of 50 ballasts. No other connections to the sensor are required for the dimming function.

2.014 LOW VOLTAGE WIRING

A. All wiring shall meet UL and NEC standards.

B. All low voltage wiring shall be 18-guage (#18AWG) unless otherwise specified. Color coded as per manufacturers recommendations. All low voltage wiring shall be run in EMT conduit. No exposed wiring will be allowed.

C. Dataline wiring between relay panels shall be 18 gage 2 conductor shielded. Color coded as red/black/shield. All low voltage wiring shall be run in EMT conduit. No exposed wiring will be allowed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install equipment according to manufacturer's written instructions.

B. Mount control equipment according to manufacturer's instructions and Section 16001, "Electrical Work".

C. Mounting heights indicated are to bottom of unit for suspended items and to center for wall-mounted ones.

3.02 CONTROL WIRING INSTALLATION

A. Install wiring between control devices as specified in Division 16 Section "Electrical Work" for hard wire connections.

B. Bundle, train, and support wiring in enclosures.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Arrange and pay for the services of factory-authorized service representatives to test, adjust and program the lighting control systems. Programming shall include assigning all switch inputs to the required

relays in each panel to ensure proper lighting operation. At the conclusion of programming, the contractor shall provide Sandia with an as-built drawing of all cabinets which will include a list of termination locations for all low-voltage switches.

B. Reports: Prepare written reports of tests and observations. Report defective materials and unsatisfactory test results. Record repairs and adjustments.

C. Test Labeling: Upon satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and testing organization and person.

D. Schedule visual and mechanical inspections and electrical tests within 7-days' notice

E. Visual and Mechanical Inspections: Include the following inspections:

1. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current project drawings

2. Check tightness of electrical connections with torque wrench calibrated within the previous 6 months. Use manufacturer's recommended torque values

3. Verify proper protective device settings and fuse types and ratings

4. Verify settings of photoelectric devices with photometer calibrated to NIST standards within the past 6 months

5. Exercise mechanical parts and operable devices according to manufacturer's instructions to verify proper operation.

F. Electrical Tests: Exercise particular caution when testing devices containing solid-state components. Perform the following tests according to manufacturer's instructions:

1. Insulation resistance tests of conducting parts of control components and connecting supply, feeder, and control circuits. Insulation resistance less than 100 megohms is not acceptable.

2. Continuity test of circuits.

3.04 CLEANING AND ADJUSTING

A. Remove paint spatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean equipment and devices internally and externally using methods and materials recommended by manufacturers.

B. Occupancy Adjustments: Upon request within 1 year of date of substantial completion, adjust light levels, make program changes, and adjust sensors and controls.

3.05 DEMONSTRATION

A. Training: Arrange and pay for the services of a factory-authorized service representative to demonstrate programmable lighting control system and train Owner's maintenance personnel. Allow a minimum of 2 working days for this training.

B. Train Owner's personnel to operate, service and maintain equipment and system components. Allow at least 4 hours to conduct training. Schedule training with at least 7 working days' notice.

3.06 COMMISSIONING

A. Operational Tests: Energize systems, program control, and check each controlled are for light levels and lamp and component noise. Use light meters appropriate for the test and calibrated to NIST standards. Adjust components and revise installation as required to correct deficiencies. Operate the system to prove compliance with requirements.

B. Correct malfunctions and retest until proper operation is achieved.

3.07 AS-BUILT DRAWINGS

A. The drawings issued for construction are representative of the work to be performed and of existing equipment. AS part of this contract, the Contractor shall provide Sandia National Laboratories with a set of "red-marked" prints, including all equipment relating to the fire protection system, both existing and contractor installed. The lighting drawings consist of plans, wiring, diagrams, and controller panel schedule. The marked-up prints shall show all junction boxes, conduit sizes, devices, and any other information relevant to the as-built condition. Conduit and junction box locations shall be shown on the as-builts if they were shown on the original plans.

END OF SECTION