LIGHTING CONTROLS

GENERAL INFORMATION

1.1 Appropriate lighting design and associated controls are integral to the University's goals to reduce energy consumption.

1.2 The Engineer's proposed interior lighting control concept shall be identified at the project's schematic phase and communicated via the Basis of Design Report for review by CPM and Operations. It is strongly recommended that the project Engineer obtain Cx concurrence prior to starting Design Development.

1.3 **Preferred products shown in bold.** Any deviations from the requirements below must be requested in writing and submitted to Columbia Facilities Energy and Engineering prior to the Schematic Design submission for approval.

DESIGN REQUIREMENTS

2.1 For building-wide lighting retrofits for Local Law 88 compliance.

a. Lighting and lighting control systems shall be upgraded to comply with the current NYCECC.

b. No action is required in spaces with lighting and lighting controls which are already compliant with the 2009 NYC Energy Conservation Code (NYCECC).

2.2 For any renovation in which lighting systems are modified.

a. For projects in NYC: All impacted lighting and lighting controls shall be upgraded to comply with the current version of the NYCECC.

b. For projects outside of NYC: All impacted lighting and lighting controls shall be upgraded to comply with the current version of the local energy code.

c. Controls shall be local and include the ability to integrate with a remote, centralized lighting management system.

d. Controls shall be capable of Day 2 integration with the campus' BMS without hardware modification.

2.3 New construction projects and whole-building renovations:

a. For projects in NYC: Lighting and lighting control systems shall comply with the current version of the NYCECC.

b. For projects outside of NYC: Lighting and lighting control systems shall comply with the current version of the local energy code.

c. Provide a centralized lighting management system with dedicated servers.

d. Integrate the lighting control system with the building's BMS on Day 1.

2.4 Dimming

a. Manual

1. Provide continuous, manual dimming in all regularly occupied spaces (e.g. classrooms, labs, private offices, open offices, conference rooms, etc.) EXCEPT:

a. Main corridors, egress paths, and back-of-house and utility spaces (e.g. MER's, storage areas, etc.)

b. Spaces which are already LL88 compliant in buildings undergoing Local Law 88 retrofits

b. Automatic

1. Continuous dimming as preferred.

2. Do not provide automatic dimming (e.g. via daylight sensors, occupancy sensors, timeclock scheduling, etc.) in any space where variation in light levels may result in an unsafe condition (e.g. certain labs, workshops, MER's, etc.)

2.5 Automatic Shut-off

a. Do not provide automatic shut-off (e.g. via daylight sensors, occupancy sensors, timeclock scheduling, etc.) in any space where variation in light levels may result in an unsafe condition (e.g. certain labs, workshops, MER's, etc.)

2.6 If lighting controls will be subject to annual maintenance by a specialty vendor, any maintenance fees should be identified at the Schematic Design phase and included in the Client O & M costs.

2.7 Any proposed integration of the lighting controls with AV controls or the BMS shall be coordinated at the Schematic Design phase. If the CUIT network is required to facilitate integration, CUIT shall be engaged at the Schematic Design phase.

CONSTRUCTION REQUIREMENTS

3.1 The typical lighting control system architecture is illustrated in Figure 1.

3.2 Controls shall be wireless, except where noted in "Device Requirements," below.

a. Wireless communications for lighting controls shall occur on local, dedicated networks and at frequencies which do not interfere with Columbia's Wi-Fi network.

b. Any Wi-Fi signal which is broadcast by a lighting control device to facilitate system set-up shall be disabled when set-up is complete.

c. If permanent remote access to a local lighting control network is required, communication between the CUIT network and the local lighting control network shall be via a wired connection. Coordinate with CUIT.

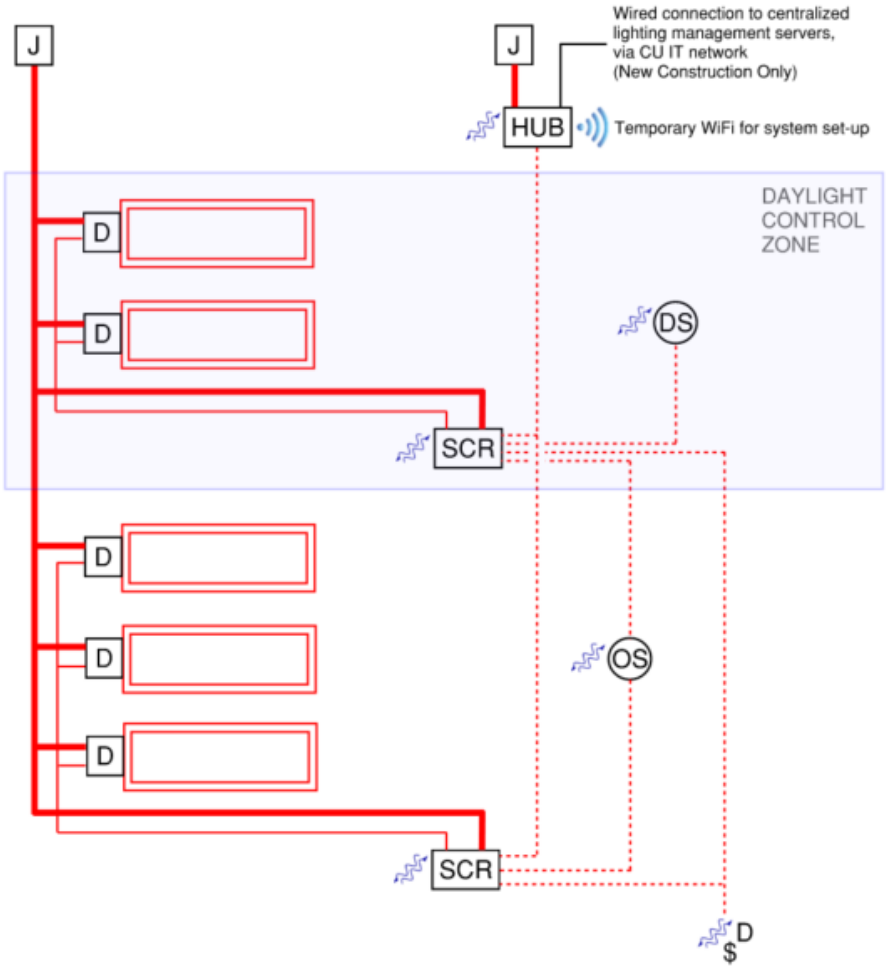

Figure 1. Typical Lighting Control System Architecture

3.3 Power

a. Battery-powered switching and sensing devices may be deployed when there are no equivalent, line-voltage devices or when running line-voltage power would be impractical.

b. Batteries

1. Batteries used in any lighting control devices shall be non-proprietary and available off-the-shelf from multiple manufacturers.

2. Batteries provided during initial system installation shall have a minimum expected lifetime of 10 years.

3.4 Retrofits

a. Where dimming is required, provide retrofit kits with dimmable drivers which are compatible with the specified dimming approach.

b. Provide switching and control relays for groups of fixtures in common control zones.

3.5 Accessibility

a. Lighting control devices shall be installed in easily accessible locations, i.e. safely within reach of a 19' single-person platform lift and, if concealed, installed above unobstructed, drop ceilings.

b. Any fixture in an inaccessible location (i.e. fixtures which cannot be safely accessed using a 19' single-person platform lift or fixtures which are installed in a hard or obstructed ceiling) shall be provided with a remote driver. The remote driver shall be installed in an easily accessible location.

3.6 Control Devices

a. Hub Device

1. The Hub device shall be capable of local, standalone control as well as integration with a remote, centralized lighting management system.

a. *New Construction*: Provide a centralized lighting management system and dedicated servers. Coordinate network integration with CUIT.

2. The Hub device shall be capable of Day 2 integration with the campus' BMS without hardware modifications. Any software required to facilitate BMS integration is not required on Day 1.

a. *New Construction*: Integrate the Hub device with the building's BMS on Day 1.

3. Minimize the number of Hub devices while ensuring adequate coverage of lighting control devices.

4. Control
    a. Communicate with switching and control relays.
    b. Wireless
5. Power
    a. Line voltage

b. Switching and Control Relays
1. Where possible, provide fixtures with integrated switching and control relays.
2. Where integrated switching and control relays are not available or not cost-effective, switching and control relay(s) may be field wired to one or multiple fixtures.
3. Field-wired switching and control relays should employ 0-10V dimming, the preferred campus standard.
    a. Compare the first cost of additional switching and control relays to the first cost savings which result from less low-voltage control wiring, and vice versa. Wireless switching and control relays may be provided for each fixture if this minimizes first cost and facilitates installation.
    b. Where 0-10V control is not practical or cost-effective, line-voltage (phase) dimming may be used. Ensure specified fixtures and fixture drivers are compatible with the specified dimming approach.
4. Control
    a. Communicate with Hub device, sensors, and switches.
    b. Wireless
5. Power
    a. Line voltage

c. Occupancy Sensor
1. Standalone as preferred (as in Figure 1).
    a. If a fixture-integrated sensor is required request an approval from CPM Design and Compliance.
2. Passive infrared type as preferred.
    a. Minimize the number of sensors while ensuring adequate coverage.
        1) Coordinate sensor placement with furniture and cubical partitions to eliminate sensor blind spots. In enclosed offices, open-offices or any other space where quiet, heads-down work may occur, ceiling-mounted occupancy sensors with line-of-sight to occupant work surfaces are recommended.

b. "Dual-Tech" sensors (passive infrared and ultrasonic) may be provided in locations where passive infrared does not provide adequate sensor coverage.

1) Some animals may be adversely affected by the frequencies used by ultrasonic sensors. Review with lab staff prior to implementation in animal labs or holding areas.

3. Control

a. Communicate with switching and control relays.

b. Wireless as preferred. Exceptions are noted in the 26 09 23S - LIGHTING CONTROLS SPECIFICATION GUIDE.

4. Power

a. Battery as preferred. Exceptions are noted in the 26 09 23S - LIGHTING CONTROLS SPECIFICATION GUIDE.

d. Vacancy Sensor

1. Standalone as preferred (as in Figure 1).

a. If a fixture-integrated sensor is required request an approval from CPM Design and Compliance.

2. Passive infrared type as preferred.

a. Minimize the number of sensors while ensuring adequate coverage.

1) Coordinate sensor placement with furniture and cubical partitions to eliminate sensor blind spots. In enclosed offices, open-offices or any other space where quiet, heads-down work may occur, ceiling-mounted occupancy sensors with line-of-sight to occupant work surfaces are recommended.

b. "Dual-Tech" sensors (passive infrared and ultrasonic) may be provided in locations where passive infrared does not provide adequate sensor coverage.

1) Some animals may be adversely affected by the frequencies used by ultrasonic sensors. Review with lab staff prior to implementation in animal labs or holding areas.

3. Control

a. Communicate with switching and control relays

b. Wireless as preferred. Exceptions are noted in 26 09 23S - LIGHTING CONTROLS SPECIFICATION GUIDE.

4. Power

a. Battery as standard. Exceptions are noted in the 26 09 23S - LIGHTING CONTROLS SPECIFICATION GUIDE.

e. Daylight Sensor
    1. Standalone as preferred (as in Figure 1).
        a. If a fixture-integrated sensor is required request an approval from CPM Design and Compliance.
    2. Minimize the number of sensors while ensuring adequate coverage.
    3. Control
        a. Communicate with switching and control relays
        b. Wireless
    4. Power
        a. Battery

f. Light Switch
    1. On / Off
    2. Manual dimming as required see section 2.4
    3. Control
        a. Communicate with switching and control relay
        b. Wireless
    4. Power
        a. Battery. Exceptions are noted in the 26 09 23S - LIGHTING CONTROLS SPECIFICATION GUIDE.

3.7 In mechanical rooms, loading docks, exposed ceilings, or where subject to physical damage, install low-voltage control wiring in EMT.

3.8 Close-out Requirements

a. Provide 5% attic stock for each control device type which is not listed in the Look Book.

b. Commissioning
    1. For all lighting control systems, the installing contractor shall complete the commissioning agent's pre-functional checklists and support functional testing alongside a commissioning agent.

c. Training
    1. The installing contractor shall provide training for Facilities Staff on the features of the lighting control system prior to acceptance.

d. Documentation
    1. Provide cutsheets, warrantees, and O&M manuals for all installed devices and systems.

2. As-builts
    a. Provide as-built lighting and lighting controls drawings which indicate:
        1) The location, type, circuit number, and panel number of all fixtures impacted by the job (i.e. any fixture which is new, upgraded, or relamped)
        2) The location, type, circuit number, and panel number of all control devices
        3) Panel locations
        4) Control zones and associated fixtures and control devices
    b. The as-built drawings are intended to document the system's functionality and facilitate maintenance. The locations of fixtures and control devices may be shown indicatively. Scaled locations of fixtures and devices are not required.

END OF SECTION