

Advanced High-Resolution Controls for Dimmable LED Lighting for Offices

Specification & Procurement Support Materials



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Appendix D: Project Team Members and Typical Tasks

(based on the typical project timeline, with tasks sorted by project team member)

1. Owner

- a. Set project goals (i.e. energy reduction, light level target values, etc.).
- b. Set budget for design, equipment and installation.
- c. Review and approve recommendations from lighting designer or other specifier for lighting plan, luminaires, lighting control systems, schedules, control profiles, etc.
- d. Provide guidance as to scheduling and staging the work. **For example, will work be done at night? On weekends? Will a floor be partially vacated so work can be done during the day?**
- e. Submit bid package to qualified electrical contractors.
- f. Arrange for procurement of equipment (negotiate pricing, review and agree to Terms and Conditions, submit purchase orders, etc.).
- g. Review and approve formal “submittal” drawings from luminaire vendor(s) and lighting control system vendor (after soliciting comments from lighting designer and electrical engineer).

2. Building maintenance/engineering staff

- a. Install or assist with installation of power and occupancy loggers (if desired by the owner) in advance of the retrofit design work to establish baseline conditions (e.g., maximum connected load, typical daily or weekly energy usage, etc.).
- b. Obtain as-built drawings of existing spaces showing existing luminaires, ceiling grid, etc. Drawings must be in CAD format in order for design and engineering consultants to do their work. **It is also desirable to have drawings showing the current furniture layout.**
- c. Perform blink test to determine which branch circuits control which existing luminaires. Mark up drawings to indicate existing (as-built) branch circuitry and communicates this information to the lighting designer and electrical engineer. This must include a precise determination about which fixtures or fixture segments are powered by EM (emergency) lighting circuits.
- d. Assist during installation by providing access to the space, turning branch breakers on and off as required by the electrical contractor, etc.
- e. Receive and store drawings and any other pertinent information from luminaire vendors to assist in replacing defective fixture components or entire luminaires.
- f. Receive and store record drawings, operation manuals and any other pertinent information from lighting control system vendors.
- g. Receive training from lighting control system vendor on the system’s operation (including normal operation, checking and clearing alarms/alerts/etc., how and where backup files are stored, etc.).

- h. Maintain contact information for all vendors to assist in troubleshooting or replacing defective components.

3. Owner's IT staff

- a. Formulate guidelines for the connectivity and security aspects of a lighting control system (e.g., preferred network topology, control signal transmission methods, remote access to systems, etc.).
- b. Review recommendations for lighting control systems based on IT guidelines.
- c. Obtain IP addresses and/or any other pertinent information required to make a lighting control system work during and after installation.

4. Lighting designer

- a. Assist owner in setting project goals (e.g., energy reduction and light level target values), as well as budget.
- b. Receive drawings and any other required information from maintenance and/or building engineering staff.
- c. Check and record existing light levels at representative locations throughout existing space. Existing light levels should be checked at night with no daylight contribution, as well as during daytime hours. **Note that if daytime light levels clearly exceed current standards for task illuminance, there's a good chance that the space is a great candidate for energy savings by deploying a lighting control system with daylight harvesting capabilities.**
- d. Determine applicable codes and specific requirements (e.g., required lighting control equipment, zoning, power density limits, etc.). **This task may be performed by a lighting designer or electrical engineer.**
- e. Create schedules for normal lighting control system operation based on input from owner.
- f. Research viable LED luminaires or retrofit kits.
- g. Draw new lighting plan using new LED luminaires or retrofit kits.
- h. Calculate new light levels using calculation software (e.g., Visual, AGI, etc.).
- i. Calculate new emergency light levels using calculation software and reviews results with electrical engineer. **Note that only a licensed electrical engineer has legal authority to officially verify that new luminaires and lighting control systems will meet applicable emergency code requirements.**
- j. Create control profiles ("sequences of operation") based on input from owner.
- k. Research viable lighting control systems.
- l. Review new lighting plan, new LED fixture candidates or retrofit kits, as well as lighting control system candidates, with owner and project team.
- m. Create drawings and specifications showing all luminaire locations, desired zoning, lighting control system components and/or any other information pertinent to the project. **Note that this task may be completed by a lighting designer and/or electrical engineer. Lighting designers typically do not provide drawings and specifications for**

emergency lighting, nor typically create drawings for power distribution, riser diagrams, etc. Therefore, at the outset of the project, it is imperative to determine who will create which drawings and specifications. Typically, a lighting designer will create drawings and specifications that address much – but not all – of the required equipment, zoning, EM designations, etc. Typically, lighting designers are not licensed electrical engineers. Therefore, a licensed engineer will be responsible for issuing all “final” documents. Also note that most commercial office buildings have some form of rudimentary lighting control system already installed in the space. The most typical control system is a low-voltage relay system that turns lighting circuits on and off according to a preprogrammed schedule. It’s extremely important that any existing lighting control system does not interfere in any way with the normal operation of a new system. It is vastly preferable to disconnect and remove any existing lighting control system (such as a low-voltage relay system). At the absolute minimum, it is essential to maintain constant power to a new system and to the luminaires they control. Therefore, even if an existing system is not disconnected and removed from the building, it should be reprogrammed to keep all circuits energized all the time.

- n. Prepare bid package describing the project and installation work to prospective electrical contractors. Note that at this point in the process, luminaire and lighting control system vendors have expended a very significant amount of time providing input, drawings, etc. The owner may desire to have preliminary reviews with one or more prospective electrical contractors during an earlier phase of the work to gauge the potential cost of the retrofit project.
- o. Review and comment on formal “submittal” drawings from luminaire vendor(s) and lighting control system vendor. Review comments with electrical engineer and owner.
- p. Attend meetings with electrical contractor in advance of and/or during installation to educate the electrical contractor about the fixtures and lighting control equipment.
- q. Communicate with lighting control system vendors about schedules and control profiles to insure that commissioning is done accurately and in a timely manner. Note that schedules and control profiles should already have been completed and incorporated into the specifications early on in the project work.
- r. Check light levels after commissioning to insure that the control system is performing as specified.
- s. Perform a walk-through(s) after completion of installation and create a punch-list showing items that need to be corrected before final acceptance by owner.

5. Electrical engineer

- a. Determine applicable codes and specific requirements (e.g., required lighting control equipment, zoning, power density limits, etc.). This task may be performed by the lighting designer or electrical engineer.
- b. Provide input on viability of recommended lighting control system(s) based on existing branch circuitry, electrical closets, etc.
- c. Review and verify new emergency light levels based on calculations performed by the lighting designer. Note that only a licensed electrical engineer has legal authority to

officially verify that new luminaires and lighting control systems will meet applicable emergency code requirements.

- d. Create drawings and specifications showing all luminaire locations, desired zoning, lighting control system components and/or any other information pertinent to the project. Note that this task may be completed by a lighting designer and/or electrical engineer. Lighting designers typically do not provide drawings and specifications for emergency lighting, nor typically create drawings for power distribution, riser diagrams, etc. Therefore, at the outset of the project, it is imperative to determine who will create which drawings and specifications. Typically, a lighting designer will create drawings and specifications that address much – but not all – of the required equipment, zoning, EM designations, etc. Typically, lighting designers are not licensed electrical engineers. Therefore, a licensed engineer will be responsible for issuing all “final” documents. Also note that most commercial office buildings have some form of rudimentary lighting control system already installed in the space. The most typical control system is a low-voltage relay system that turns lighting circuits on and off according to a preprogrammed schedule. It’s extremely important that any existing lighting control system does not interfere in any way with the normal operation of a new system. It is vastly preferable to disconnect and remove any existing lighting control system (such as a low-voltage relay system). At the absolute minimum, it is essential to maintain constant power to a new system and to the luminaires they control. Therefore, even if an existing system is not disconnected and removed from the building, it should be reprogrammed to keep all circuits energized all the time.
- e. Prepare bid package describing the project and installation work to prospective electrical contractors. Note that at this point in the process, luminaire and lighting control system vendors have expended a very significant amount of time providing input, drawings, etc. The owner may desire to have preliminary reviews with one or more prospective electrical contractors during an earlier phase of the work to gauge the potential cost of the retrofit project.
- f. Issue all final schedules and control profiles.
- g. Prepare documents (drawing and specification package) for submission to building department or other AHJ (authority having jurisdiction).

6. Expediter

- a. Submit documents (drawing and specification package) to building department or other AHJ (authority having jurisdiction) as required, and obtain applicable installation permits.

7. Luminaire vendor(s)

- a. Create drawings showing all required details including mounting, typical run configurations, electrical connections and any additional components such as on-board controllers, UL924 relays, etc. Luminaire vendors typically do not prepare and issue formal “submittal” drawings before receiving a purchase order for the project. However, it’s very common for the project team to be unaware of certain luminaire details that might have a major impact on the project until formal submittal drawings have been prepared and issued for review. This may include, for example, mounting details, required hardware, wiring methods, run configurations, etc. Therefore, during

this phase, it is highly desirable to require any prospective luminaire vendor(s) to at least submit “informal” drawings showing every detail of the fixtures being considered. Once a purchase order is finally issued, it should be easy for the luminaire vendor(s) to convert any “informal” drawings into formal “submittal” drawings for official approval by the project team.

- b. Create formal “submittal” drawings showing all required details including mounting, typical run configurations, electrical connections and any additional components such as on-board controllers, UL924 relays, etc. Submit drawings to the owner and project team for approval.
- c. Indicate what additional equipment, if any, must be ordered prior to installation if that equipment is not on the original purchase order for either luminaires or the lighting control system. For example, a luminaire vendor may or may not provide all required mounting hardware, or remote junction boxes required for wiring the fixtures. These determinations should already have been made during the design and specification process because they have a major affect on the cost and scheduling of the work. If for any reason they have not, then it is essential to finalize these determinations during the procurement phase so that any additional equipment can be obtained prior to the start of installation.
- d. Fabricate fixtures using standard wire colors. Leads from new fixtures should be labeled, and should not contain any unnecessary conductors.
- e. Ship fixtures to job site with clear and concise documentation about what is (or is not) being shipped. Any equipment on back-order must be clearly noted in all shipping documentation.

8. Lighting control system vendor

- a. Create drawings describing the lighting control system (e.g., one-line diagrams, details such as mounting requirements, etc.). Additionally, all wiring connections must be clearly indicated on the drawings. As noted in the specifications, lighting control system vendors typically do not provide project-specific drawings showing wiring connections for all equipment. In many cases, catalog sheets are provided that show typical connections. However, it’s not uncommon for a specific project to require wiring connections that are not shown on the catalog sheets. Therefore, it’s essential for the vendor to provide project-specific details about all wiring connections to avoid incorrectly wiring equipment on-site, which may lead to damaging or destroying luminaires or lighting control equipment. In addition, similarly to luminaires, formal “submittal” drawings for lighting control systems are not typically prepared prior to the vendor receiving a purchase order. Just as with luminaires, during this phase, it is highly desirable to require any prospective lighting control system vendor to at least submit “informal” drawings showing every detail of the system being considered. Once a purchase order is finally issued, it should be easy for the lighting control system vendor to convert any “informal” drawings into formal “submittal” drawings for official approval by the project team.
- b. Create formal “submittal” drawings describing the lighting control system (e.g., one-line diagrams, details such as mounting requirements, etc.). Additionally, all wiring connections must be clearly indicated on the drawings. Submit drawings to the owner and project team for approval.

- c. Indicate what additional equipment, if any, must be ordered prior to installation if that equipment is not on the original purchase order for either luminaires or the lighting control system. For example, a lighting control system vendor may not typically provide a rack for holding the server, assuming that an existing space will be available in a rack already installed in an IT room. What if there isn't? Similarly, lighting control system vendors typically do not include quantities (lengths) for low-voltage cable required to connect sensors, switches, etc. Additionally, it is not uncommon for a vendor to assume that there is space on an owner's existing server, obviating the need to supply a dedicated server for the lighting control system. These determinations should already have been made during the design and specification process because they have a major affect on the cost and scheduling of the work. If for any reason they have not, then it is essential to finalize these determinations during the procurement phase so that any additional equipment can be obtained prior to the start of installation.
- d. Ship lighting control system components to job site with clear and concise documentation about what is (or is not) being shipped. Any equipment on back-order must be clearly noted in all shipping documentation.
- e. Provide support to the lighting designer, electrical engineer and/or electrical contractor during installation (answering installation questions, etc.).
- f. Provide personnel to verify that the control system is correctly installed (prior to commissioning).
- g. Provide personnel to commission the control system. There may or may not be applicable code or other requirements (e.g., LEED) requiring that a third-party commissioning agent commission the lighting control system.

9. Electrical contractor

- a. If required, install power and/or occupancy loggers (such as CTs, etc.) to determine baseline information.
- b. Attend meetings with owner, project team and/or vendors as required to understand the scope of work.
- c. Prepare proposal for installing equipment and submit to the owner for approval.
- d. Install luminaires and lighting control system according to drawings and specifications created by the lighting designer and electrical engineer.
- e. Provide electricians on-site during lighting control system commissioning (usually performed by a third-party commissioning agent or lighting control system vendor).

10. Third-party commissioning agent

- a. Provide personnel to commission the control system. There may or may not be applicable code or other requirements (e.g., LEED) requiring that a third-party commissioning agent commission the lighting control system.