

Get More From Your Lighting Retrofit

The Practical Role of a Sequence of Operations

A sequence of operations is critical for ensuring today's advanced lighting control systems, such as Luminaire-Level Lighting Controls (LLLC), perform as expected. As retrofit lighting projects tend to move quickly, this step can be overlooked especially when a lighting designer is not involved. Without a sequence of operations, electrical distributors and contractors supporting the project are often left to interpret customer needs. A clear sequence of operations developed during initial planning prevents confusion when it comes to programming the new controls. It documents how the lighting for each space will behave, aligns expectations early, and demonstrates the added value and flexibility of the LLLC system. A sequence of operations is not just documentation, it is a communication tool that can save time and money, reduce callbacks, support better outcomes, and improve customer experience.



1 Why Sequences of Operations Matter in Lighting System Retrofits

Retrofit projects differ significantly from new construction because they often begin with legacy wiring, mixed fixture types, and spaces whose uses have changed over time. A well-developed sequence of operations bridges these gaps by clearly documenting which control capabilities will be used in each space, the required light levels, and how each zone should behave.

In retrofit environments, sequence of operations development typically involves a facility manager or building owner, someone who understands how each space functions, along with the lighting/control provider supplying the equipment, which can be an electrical distributor, contractor, or other service provider. The key is to work together early in the process to create an operational plan that reflects real-world needs, rather than assumptions from a design drawing.

A well-documented sequence of operations not only demonstrates the efficiency, flexibility, and granularity of today's advanced controls, such as LLLC, to the customer, it also streamlines programming during installation and enables easy re-tuning later without rewiring, a critical advantage in retrofit projects where changes are common.

Example: In a retrofit of a K-12 classroom wing with LLLC retrofit kits, the sequence of operations defined separate daylight harvesting zones near the windows, task-tuning levels for teaching walls and student desk areas, and vacancy-dimming settings for transitional times between classes. By outlining these behaviors ahead of installation, teachers knew exactly how the system would perform and the school realized more than 45% energy savings.

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How to Develop a Retrofit-Specific Sequence of Operations

Step 1

Inventory Existing Conditions

Retrofit Focus: Identify circuiting, control zones, daylight, and sensor types.

Example: Room 202 shares a circuit with corridor lights.

Step 2

Define Intent

Retrofit Focus: Clarify desired operation and control response.

Example: Lights dim to 30% after 15 min. vacancy.

Step 3

Map Functions to LLLC Capabilities

Retrofit Focus: Assign functions to each luminaire or sensor node.

Example: Each LLLC fixture serves as an occupancy and daylight sensor.

Step 4

Document Exceptions

Retrofit Focus: Capture areas that cannot meet full control due to wiring limits.

Example: Storage room has switch-only control.

Step 5

Review and Validate

Retrofit Focus: Include owner/operator and occupants feedback before commissioning.

Example: Confirm night-cleaning override behavior.

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Leveraging LLLC Flexibility

LLLCs offer a high degree of flexibility in retrofit projects, allowing lighting conditions to be customized to the needs of each space. LLLC simplifies retrofit sequence of operations because intelligence lives in each fixture. While various advanced control technologies can achieve this, LLLC provides the simplest path because all intelligence is built directly into each luminaire. This eliminates the complexity of coordinating separate sensors or wiring while still delivering full advanced-control functionality.

Key benefits to highlight:

- **Wireless zoning:** Modify sequences post-install via software, no re-wiring or electricians required.
- **Granular control:** Adjust occupancy or daylight response at the individual luminaire level for greater precision.
- **Future readiness:** LLLC systems can integrate with other building systems such as HVAC, plug loads, and security; LLLC streamlines this through built-in sensors and standardized communication pathways.
- **Operational clarity:** With LLLC or other advanced controls, the sequence of operations becomes a living document that can evolve with building use, making ongoing optimization faster and more accessible.

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Encourage Use of Standard Templates

The Lighting Controls Academy (LCA) provides free sequence of operations templates that align with recommended practices developed by the Illuminating Engineering Society (IES) through ANSI/IES LP-16. LP-16 was created to establish clear, plain-language documentation of how lighting controls are intended to function after installation. These templates are customizable, focused on facility types, and easy to populate, saving valuable time and ensuring consistency. LCA templates and additional information on LP-16 can be found here:

<https://lightingcontrolsacademy.org/>

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Sample Retrofit Sequence of Operations

Most building owners or facility staff have little or no prior exposure to sequences of operations, so examples should be kept simple and relatable. The goal is to show how a sequence of operations clarifies expectations and communicates how the lighting system will behave, not to overwhelm them with technical details. This practice also streamlines setup for installers.

Mode	Trigger	LLLC Response
Occupied (daylight present)	Occupancy detected	Fixtures dim to maintain 30 footcandles at desks
Partial Vacancy	No motion for 10 min	Fixtures dim to 20%
Full Vacancy / After-hours	No motion > 10 min	Fixtures off; cleaners badge enables 50%
Fire Alarm / Loss of Power	Alarm active / power loss	Emergency fixtures 100%



Putting It into Practice

- 1. Document early:** Gathering information during the audit or proposal stages helps ensure the sequence of operations becomes part of the job planning upfront and not as an afterthought.
- 2. Use templates:** Leverage LCA's sequence of operations forms to save time, improve consistency, and ensure all elements are being captured.
- 3. Use the sequence of operations as a sales tool:** A well-developed sequence of operations demonstrates the granularity, flexibility, and future-readiness of advanced controls, helping customers visualize the value beyond simple LED replacement.
- 4. Train your team and local facility staff:** Make the sequence of operations part of commissioning and turnover documentation so facility staff understand how the system is intended to operate and how adjustments can be made in the future.
- 5. Review annually:** As space use and occupancy patterns change, the sequence of operations should evolve. With LLLC and other advanced controls, re-tuning is straightforward, aligning performance with real-world needs.

Closing

A sequence of operations is the bridge between installing efficient fixtures and unlocking their full operational potential. With LLLC, flexibility is built in with a well-crafted sequence of operations that ensures customers experience that value from day one and long into the future.



To learn more, email info@mnLLLC.org or visit www.mnLLLC.org.