

LIGHTING LAYOUT GUIDE SERIES

CONTROLS GUIDE 3

KEY TIPS

To achieve a net zero energy building, design teams must go beyond basic control methods and use Luminaire Level Lighting Controls (LLLC) systems.

If the task lighting and the ambient lighting are controlled separately, then there is the potential for even deeper savings and higher user acceptance.

If LLLC system is combined with a task/ambient lighting design (fixtures are put over each work station), then fewer fixtures are needed, reducing costs, and task light levels can be maintained.

Larger systems often have a lower cost per luminaire as many of the system costs are fixed and do not increase with scale.

LIGHTING CONTROLS

LUMINAIRE LEVEL LIGHTING

THE OPPORTUNITY

As energy codes and energy efficiency goals become more demanding, there is a need to maximize energy savings from commercial lighting systems. While traditional lighting control strategies can yield considerable benefits, LLLCs show promise of deeper savings. It is no longer enough to have lighting in a large area be either ON or OFF, it must adapt to individual needs in response to changing occupancy, daylight, desired light level, and external energy grid conditions. A General Services Administration (GSA) study[^] indicated that the typical office worker is away from their desk half of the time, if this vacancy can be captured, then energy savings can be maximized.

THE SOLUTION

Rather than a conventional approach where lighting control zones are defined and controlled as a unit, the LLLC strategy incorporates a complete set of sensors (occupancy, daylight, user tuning, and even air temperature) into each luminaire. Then each fixture becomes a semi-autonomous zone, capable of responding to small changes in the area under each luminaire. Some of these systems use innovative methods of communicating and self-commissioning such as wireless radio or even infrared signals to create connectivity within the system. This level of granularity can yield significant savings.

| BENEFITS | ATTRIBUTES OF LLLCs |
|---------------------------|---|
| Flexibility | Each fixture has its own unique digital address that can be reprogrammed as needed. |
| Granular Control | Ability for fine discrimination, resulting in more savings. |
| Easier Commissioning | No need to interpolate performance over a large zone area. |
| Manufacturer Partnerships | Manufacturers offer luminaire embedded components, making commissioning easier. |



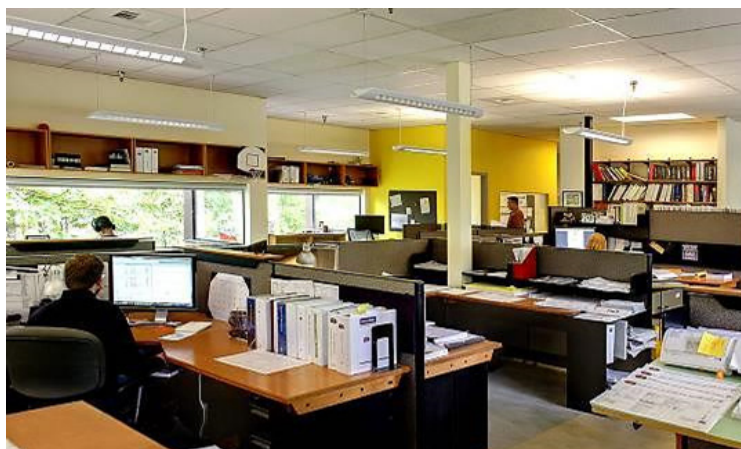
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LIGHTING NETWORK

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PROPERTIES OF LLLC PRODUCTS

| TYPE | DESCRIPTION | BENEFITS | TECH NOTES |
|------------------------------|--|--|--|
| Occupancy or Vacancy Sensor | Capability to regulate lighting or other equipment based on detection of people in the space. | Energy savings and maintenance cost reduction. | Must have occupancy sensing capability. |
| Daylight Sensor | Capability to regulate the electric lighting in response to changing daylight conditions in the space. | Energy savings. | Must have the ability to continuously dim luminaire output. |
| Task Tuning w/ High-end Trim | Adjustability of the output of individual lights or groups of lights to a set level. Must have the ability to set a maximum light level. | Energy savings and occupant satisfaction. | Task tuning and high end trim must be field reconfigurable. |
| Dimming | A lighting control strategy that varies the light output of the luminaire. | Energy savings and occupant satisfaction. | Capability to continuously dim to at least 10%. Power consumption to dimming ratio must be mostly linear. Must have capability for full power off at minimum dim signal. |
| Networked | Capability including all devices to connect as a network, exchange information, configure to the individual device level. | Business value through information exchange. Reduced wiring, maintenance, and reconfiguration cost. Energy savings through zone flexibility. Improved measure persistence. | Must be networked and field reconfigurable. Can be wired or wireless. |
| Zoning | Capability to be configured in groups, sometimes overlapping, to enable various lighting strategies. | Reduced costs (wiring, maintenance, reconfiguration). Energy savings. Improved measure persistence. | Zones must be configurable through a programming interface, such as remote control Graphic User Interface (GUI). Must be able to define different zones by strategy and layered on top of one another, e.g. daylighting and occupancy. |
| Security | Capability to prevent unauthorized access to the system or any other connected systems. | Robust security. Full integration into a Building Management System (BMS). | Standards based encryption. Monitoring of access and security of system. Compliance with a network security standard. |



Individual work stations here are lit based on occupancy and proximity to the windows.

▲ Office of Real Property Management Performance Measurement Division, GSA. (2012). *Workplace Utilization and Allocation Benchmark*. http://www.gsa.gov/graphics/ogp/Workspace_Utilization_Benchmark_July_2012.pdf