Luminaire Level Lighting Controls and Oregon Energy Code

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OR Code Compliance Pathways

90.1-2016* Current
90.1-2019 Future

Statewide Alternative Method (SAM)
Allows IECC 2018* until October 2020

*Includes several administrative amendments
Commercial Energy Code

Oregon Building Codes Division is moving towards quick adoption of ASHRAE 90.1 as state code within a year of publication

- ASHRAE 90.1-2016 in October 2019
- ASHRAE 90.1-2019 next

Incorporation of Architecture 2030 Framework for estimating energy consumption and renewables for a Zero Net Energy Building

Benefits of 90.1 Include

- Quicker, less resource-intensive, streamlined adoption (i.e. more buildings under advanced code)
- More predictable
- Comprehensive cost analysis
- Well-supported
Code Progression

Improvement in ASHRAE Standard 90.1 (Year 1975-2016)

Normalized Energy Use (1975 Use = 100)

Year

Source: Pacific Northwest National Laboratory
Codes are becoming more and more efficient, and Controls are a major factor


**OR Code and LLLC**

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specified in Sections C405.2.1 through C405.2.6.

2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.4 and C405.2.5. The LLLC luminaire shall be independently capable of:
   
   2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
   
   2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.
   
   2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.
OR Code and LLLC

ASHRAE 90.1 – no direct mention of LLLC for code compliance, but it can be incorporated as a compliance strategy to meet many of the control requirements, including:
- Partial automatic on
- Bilevel lighting control
- Automatic daylight responsive control
- Automatic partial/full off
- Scheduled shutoff

<table>
<thead>
<tr>
<th>Common Space Types¹</th>
<th>LPD, W/m²</th>
<th>RCR Threshold</th>
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<tbody>
<tr>
<td>Office</td>
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<td></td>
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<tr>
<td>Enclosed and ≤250 ft²</td>
<td>0.93</td>
<td>8</td>
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<tr>
<td>Enclosed and &gt;250 ft²</td>
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</tr>
</tbody>
</table>
Why Lighting Controls?

- Energy Code Compliance
- Additional Energy Savings
- Faster Installation
- Flexibility
What is LLLC?

- Integrated Sensors
- Individually Addressable
- Networkable
- Compatible Components
LLLC Capabilities

- Addressability
- Networkability
- Occupancy Sensing
- Daylight Harvesting/Photocell Control
- Continuous Dimming
- High-End Trim
- Zoning
Why Use LLLC?

• Augment Efficient Source Technology
• Combine Control Schemes
• Take Advantage of LED Dimmability
• Faster Installation
• Automatic Code Compliance
• Non-Energy Benefits
Deeper Energy Savings

- Compounded Control Schemes
Simple LLLC Systems

- Comprehensive or Simple Projects
- Minimal Components
- Standard Control Capabilities/Vocabulary
- Standard 4-Step Configuration on Site
Comprehensive LLLC Systems

• Larger projects
• Additional Devices Required
• Optional Control Capabilities
• Additional/3rd Party Configuration/Training
Fewer Components

Without LLLC
- Dimming Driver
- Occupancy and Daylight Sensors
- LED Luminaire

With LLLC
- LED luminaire with integrated, wireless occupancy / daylight sensing and dimming driver
Historical Lighting Control

- Dimming Driver
- Occupancy and Daylight Sensors
- LED Luminaire
- Lots of Wiring
**LLLC Installation Advantages**

- Labor Savings
- Relieved Wiring Frustration
- Faster Project Completion
- Simple Configuration
- Future Expandability
- Reconfigurable
Dynamic LLLC Control

- Code-required control zones
- Granular control zone potential
Non-Energy Benefits

- Asset Tracking
- Space Utilization
- Indoor Positioning/Wayfinding
- Room Scheduling
- Remote Diagnostics
- External Systems Integration
- Security
- Futureproofing
NEBs: Asset Tracking

• Energy Code Compliance
• Additional Energy Savings
• Faster Installation
• Flexibility
NEBs: Space Utilization
NEBs: Indoor Positioning/Wayfinding
NEBs: Room Scheduling
NEBs: External Systems Integration
NEBs: Security
NEBs: Futureproofing
Selecting LLLC Systems

- DLC Technical Requirements
- DLC NLC Qualified Product List
Design Considerations

- Ease of Design
- Easy to document
- Easy to price

Lighting systems shall comply with all lighting controls requirements including:

Daylight Sensing  Occupancy Sensing  Light Reduction  Automatic Shut Off

OR

Comply with requirements for Luminaire Level Lighting Controls
Design Considerations

- Ease of Installation
  - Part of the fixture
  - Great for retrofits
- Flexibility
  - During design
  - During construction
  - Post Occupancy
Design Considerations

• Occupant Comfort
  • Individual control of fixtures via individual dimmer or software
  • Dimming
  • More accurate occupancy sensing
Design Considerations

- Beyond Traditional Lighting Controls
  - How is the space being used?
  - Density maps
  - Occupancy Limits
  - Targeted Cleaning
  - Heat maps
  - Asset tracking
  - Contact tracing
Design Considerations

- What are the potential downsides?
  - Aesthetics
  - Controlling different fixtures
  - Controlling different sources
Design Considerations

• What are the potential downsides?
  • Getting fixture manufactures onboard
  • Client capabilities
Questions? Comments?
Thank You!