



STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

113-2018 Revised
7/27/18

Washington State Energy Code Development Standard Energy Code Proposal Form

Code being amended: Commercial Provisions Residential Provisions

Code Section # C405.2_____

Brief Description: This proposal adds interior lighting controls to the WSEC based on the existing requirements in ASHARE 90.1-2016. This proposal also clarifies requirements for warehouse and other spaces with 50% dimming requirements.

- o Adds requirements for Occupancy Sensor (OS) controls to reduce light levels 50% in corridor, stair well , library stacks
- o Adds requirements for OS controls to covered parking
- o Provides improved references to of specific lighting sections
- o Modifies text to assure the OS sensor are capable of providing 100% off as well as 50% dimming in warehouse and any other 50% dimming spaces.
- o Extend manual on requirement to time switch (not just to OS control)
- o Light reduction control (aka bi level control) required in all places not just time switch areas. These were previously required by WSEC 2012 and are currently including in 90.1-2016
- o Requires OS control to reduce light levels to 70% (30% turndown) in covered parking garages

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

C405.2 Lighting controls. 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 C405.2.8.
2. *Luminaire-level lighting controls* (LLC) and lighting controls as specified in Sections C405.2.1, C405.2.3 and C405.2.5. The LLC luminaire shall be independently configured to:
 - 2.1. Monitor occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
 - 2.2. Monitor ambient light, both electric and daylight, and brighten or dim artificial light to maintain desired light level.
 - 2.3. For each control strategy, configuration and re-configuration of performance parameters including: bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configuration.

Exception: Except for specific application controls required by Section C405.2.5, lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.
2. Means of egress illumination serving the exit access that does not exceed 0.02 watts per square foot of building area is exempt from this requirement. ~~Interior exit stairways, interior exit ramps and exit passageways.~~
3. Emergency egress lighting that is normally off.
4. Industrial or manufacturing process areas, as may be required for production and safety.

C405.2.1 Occupant sensor controls. Occupant sensor controls shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms.

2. Conference/meeting/multipurpose rooms.
3. Copy/print rooms.
4. Lounge/breakrooms.
5. Enclosed offices.
6. Open plan office areas.
7. Restrooms.
8. Storage rooms.
9. Locker rooms.
10. Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to- ceiling height partitions.
11. Warehouse storage areas.
12. Stairways and corridors
13. Library stacks^[mdk1]
14. Covered parking areas

Occupant sensor function controls in warehouse storage areas, stairways, corridors and library stacks shall comply with Section C405.2.1.2. Occupant sensor function controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor function controls in covered parking areas shall comply with Section C405.2.1.4. Occupant sensor controls for all other spaces shall comply with C405.2.1.1.

Exception:

1. Corridors in manufacturing facilities.

- ~~1.2. For each of the following space types, when under 300 square feet, Digital timer switch controls may be provided in lieu of occupant sensor controls in the following space types if under 300 square feet: copy/print rooms, storage rooms, janitorial closets. Digital timer switches shall comply with the following:~~
- ~~1.1.2.1. Turn lights on or off with operation of a button, switch or other manual means.~~
 - ~~1.2.2.2. Automatically turn lights off within 15 minutes of the lights being turned on. The means for setting the time delay shall not be visible on the front of the switch.~~
 - ~~1.3.2.3. The switch shall provide both audible and visual indication of impending time-out of the switch. Audible and visual indication shall be given at least once within five minutes of time-out of the switch. Visual indication shall consist of turning the lights momentarily off, and then back on.~~

C405.2.1.1 Occupant sensor control function. Occupant sensor (~~OS~~) controls ~~in warehouses shall comply with Section C405.2.1.2. Occupant sensor controls for open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls for all other spaces specified in Section C405.2.1 shall comply with all of the following:~~

1. They shall be configured to automatically turn off lights within 20 minutes of all occupants leaving the space.
2. They shall be manual on or shall be ~~controlled~~ configured to automatically turn the lighting on to not more than 50 percent power.

Exception: Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants.

3. They shall incorporate a manual control to allow occupants to turn lights off.

C405.2.1.2 Occupant sensor control function in warehouses, storage areas, stairways, corridors and library stack areas. Occupant sensor controls shall be configured to comply with all of the following:

1. Automatically reduce lighting power by not less than 50 percent within 20 minutes of all occupants leaving the area. ~~(In warehouses, the lighting in aiseways and open areas shall be controlled with occupant sensors that automatically reduce lighting power by not less than 50 percent when the areas are unoccupied.~~
2. The occupancy sensors shall control lighting in each aisleway and corridor independently, and shall not control lighting beyond the aisleway or corridor being controlled by the sensor.
- ~~2.3. Automatically turn lighting off within 20 minutes of all occupants leaving the space, or comply with C405.2.2 to turn lighting off when the building is vacant.~~

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m²) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall be configured to comply with all of the following:

1. ~~The controls shall be configured so that~~ General lighting ~~can be~~ is controlled separately in control zones with floor areas not greater than 600 square feet (55m²) within the open plan office space.
2. ~~The controls shall~~ Automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the open plan office space.
3. ~~The controls shall be configured so that~~ General lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably *uniform illumination* pattern within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is ~~vacant unoccupied~~ meet this requirement.
4. ~~The controls shall be configured such that any~~ Daylight responsive controls ~~will~~ activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.

C405.2.1.4 Occupant sensor control function in parking garages. Occupant sensor controls shall be configured to comply with all of the following:

1. Lighting power of each luminaire shall be automatically reduced by a minimum of 30% when there is no vehicle or pedestrian activity detected within a lighting zone for 20 minutes. Lighting zones for this requirement shall be no larger than 3600 ft².

Exceptions:

1. Lighting in daylight transitions zones and ramps without parking.
2. Covered parking garages with a total lighting power less than 0.07W/ft²[mdk2].
2. Automatically turn all lighting off within 20 minutes of all occupants leaving the space or comply with C405.2.2 to turn lighting off when building is vacant.

C405.2.2 Time switch controls. Each area of the building that is not provided with *occupant sensor controls* or digital timer switch controls complying with Section C405.2.1 shall be provided with time switch controls complying with Section C405.2.2.1.

Exception: Where a manual control provides light reduction in accordance with Section C405.2.2.2, time-switch controls shall not be required for the following:

1. Spaces where patient care is directly provided.
2. Spaces where an automatic shutoff would endanger occupant safety or security.
3. Lighting intended for continuous operation.
4. Shop and laboratory classrooms.
- 4-5. Dwelling and sleeping units

C405.2.2.1 Time switch control function. Each space provided with time switch controls shall also be provided with a manual control for light reduction in accordance with Section C405.2.2.2. Time switch controls shall comply with the following:

1. Have a minimum 7 day clock.
2. Be capable of being set for 7 different day types per week.
3. Incorporate an automatic holiday "shut-off" feature, which turns off all controlled loads for at least 24 hours and then resumes normally scheduled operations.
4. Have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.
5. Include an override switching device that complies with the following:
 - 1.1 The override switch shall be a manual control.
 - 1.2 The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
 - 1.3 Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m²).
6. Time switch controls are allowed to automatically turn on lighting to full power in corridors, lobbies, restrooms, storage rooms < 50ft², and medical areas of healthcare facilities. In all other spaces, time switch controls are allowed to automatically turn on the lighting to not more than 50-percent power.

Exceptions:

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:
 - 1.1 The time limit shall be permitted to be greater than 2 hours provided the switch is a captive key device.
 - 1.2 The area controlled by the override switch shall not be limited to 5,000 square feet (465 m²) provided that such area is less than 20,000 square feet (1860 m²).
2. ~~Where provided with manual control, the following areas are not required to have light reduction control:~~
 - ~~— Spaces that have only one luminaire with a rated power of less than 100 watts.~~
 - 2.1. ~~Spaces that use less than 0.6 watts per square foot (6.5 W/m²).~~
 - 2.2. ~~Corridors, lobbies, electrical rooms and mechanical rooms.[mdk3]~~

C405.2.3 Manual controls. ~~Where required by this code, All lighting shall have~~ manual controls ~~for lights shall~~ complying with the following:

1. They shall be in a location with *ready access* to occupants.
2. They shall be located where the controlled lights are visible, or shall identify the area served by the lights and indicate their status.
- 2.3. Each control device shall control an area no larger than a single room, or 2500 ft² if the room area is less than or equal to 10,000 ft², or 10,000 ft² if the room area is greater than 10,000 ft².

Exceptions:

1. A manual control may be installed in a remote location for the purpose of safety or security provided each remote control device has an indicator pilot light as part of or next to the control device and the light is clearly labeled to identify the controlled lighting.

2. Restrooms.

C405.2.2.23.1 Light reduction controls. ~~Spaces required to have light reduction controls shall have a manual~~ Manual controls shall be configured to provide light reduction control that allows the occupant to reduce the connected lighting load between 30% to 70% in a reasonably uniform illumination pattern. by at least 50 percent. Lighting reduction shall be achieved by one of the following *approved methods*:^[mdk4]

1. Controlling all lamps or luminaires.
2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.
3. Switching the middle lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.

Exceptions:

1. Light reduction controls are not required in daylight zones with *daylight responsive controls* complying with Section C405.2.4.

2. Where provided with *manual control*, the following areas are not required to have light reduction control:

2.1. Spaces that have only one luminaire with a rated power of less than 100 watts.

2.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m²).

3. Lighting in corridors, lobbies, electrical rooms, restrooms, storage rooms, airport concourse, baggage areas, dwelling and sleeping rooms, and mechanical rooms.

Purpose of code change:

Save energy and maintain consistency with 90.1-2016.

Your amendment must meet one of the following criteria. Select at least one:

- | | |
|--|--|
| <input type="checkbox"/> Addresses a critical life/safety need. | <input checked="" type="checkbox"/> Consistency with state or federal regulations. |
| <input checked="" type="checkbox"/> Addresses a specific state policy or statute.
(Note that energy conservation is a state policy) | <input type="checkbox"/> Addresses a unique character of the state. |
| | <input type="checkbox"/> Corrects errors and omissions. |

Check the building types that would be impacted by your code change:

- | | | |
|--|--|--|
| <input type="checkbox"/> Single family/duplex/townhome | <input checked="" type="checkbox"/> Multi-family 4 + stories | <input type="checkbox"/> Institutional |
| <input type="checkbox"/> Multi-family 1 – 3 stories | <input checked="" type="checkbox"/> Commercial / Retail | <input type="checkbox"/> Industrial |

Your name Mike Kennedy Email address mikekennedy@energysims.com

Your organization Mike D Kennedy Phone number 360-301-0098

Other contact name None

Instructions: Send this form as an email attachment, along with any other documentation available, to: sbcc@des.wa.gov. For further information, call the State Building Code Council at 360-407-9278.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

Economic Impact Data Sheet

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants and businesses.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost [Analysis tool](#) and [Instructions](#); use these [Inputs](#). **Webinars on the tool can be found [Here](#) and [Here](#)**)

In no case is the increased fixture life due to decreased operating hours considered in these calculations. Control costs are also based upon fluorescent fixtures. Cost to control newer LED fixtures are very likely to be less expensive.

Corridor OS Control: \$0.93/square foot of treatment (2011\$)

Stairwell OS Control \$0.50/square foot of treatment (2005\$)

Parking OS Control: \$0.27/square foot of treatment (2011\$)

Show calculations here, and list sources for costs/savings, or attach backup data pages

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

Corridor OS Control: 1.67 KWH/ square foot of treatment (or) [Click here to enter text](#).KBTU/ square foot

Stairwell OS Control: 2.4 KWH/ square foot of treatment (or) [Click here to enter text](#).KBTU/ square foot

Parking OS Control: 0.33 KWH/ square foot of treatment (or) [Click here to enter text](#).KBTU/ square foot

Show calculations here, and list sources for energy savings estimates, or attach backup data pages. Three pdfs with OFM LCC reports attached.

Corridor OS Control

2011 cost \$0.93/sf for 15 year measure. Includes installation and commissioning. Savings are estimated to be 36%. Assuming WSEC LPD of 0.53 W/sf * 8760 operation lighting savings are 1.67 kWh/sf. Source: Codes and Standards Enhancement Initiative (CASE) Lighting in Multifamily and Hotel Corridors. 2013 California Building Energy Efficiency Standards. October 2011.

Stairwell OS Control

Looked strictly at fluorescent bi-level fixtures. Found a delta fixture cost of \$103.45 and a savings of 21%-59% on weekdays and 34%-65% on weekends. Assuming 1 fixture per 207 ft², fixture cost is \$0.50/ft² (2005). Savings are 50% of 0.55 W/ft² power allowance operating 8760 for a total of 2.4 kWh/ft² Source: Lighting Research Program: Project 5.1 Bi-level Stairwell Fixture Performance Final Report. Architectural Energy Corporation for the CEC. CEC-500-2005-141-A16.

Garage OS Control

Based on calculations that were calibrated to several metering studies: Cost of installation and maintenance over 15 years was \$0.27/sf (2011), savings 22%. Combined with 0.15 W/sf power allowance savings are 0.29 kWh/sf. Source:

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

Codes and Standards Enhancement Initiative (CASE) Parking Garage Lighting and Controls. 2013 California Building Energy Efficiency Standards. October 2011. Cost data not well documented.

Garage Lighting. 76% reduction in lighting energy with fixtures that reduced power by 90%. Assuming a 30% reduction per ashrae the savings are 25%. Source: Use of Occupancy Sensors in LED Parking Lot and Garage Applications: Early Experiences, Final Report. Prepared in Support of the U.S. DOE GATEWAY Solid-State Lighting Technology Demonstration Program. B.R. Kinzey et al. October 2012. PNNL. Richland, Washington.

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

Presence of the controls will be no harder than determining the presence of the current control requirements for night shut off. Reading control specification to determine proper control may take 10 minutes. In medium and large projects the lighting system will need to be commissioned so ample documentation should be available about the controls.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.