



July 10, 2019

Attention: Krista Braaksma
WSEC State of Washington

Dear Krista,

Reference: Proposed Energy Code Lighting Changes

This letter is to summarize the attached Amendatory Section which has been modified as follows:

1. Section C405.2.2.2 Changed “artificial” to “electric” in reference to light. All light is real, some is just generated by the sun and other light is generated by electricity. (p.3)
2. Section C405.2.1.5 Corrected a typo changing “officers” to “offices” (p.4)
3. Section C405.2.4 suggest adding the word “general” in front of “lighting”. We need to separate general lighting from other lighting. For instance, in classrooms, the teaching wall is often perpendicular to the window wall and wallwashers will often times be in three different daylight zones. They must all be controlled together. (p.14)
4. Section C405.2.1.1 suggest adding the word “general” in front of “lighting” for the same reason as stated above. (p.15)
5. Section C405.2.1.1.4 the phrase “in a location with ready access was added to the calibration mechanism for daylight sensors. These sensors are typically either in the ceiling or in a light fixture in the ceiling. That generally means getting on a ladder to access it. Is that readily accessible? This is just a question. There really is not any other option for their location. (p.15)
6. Section C405.4.1 Exceptions – ASHRAE includes exceptions for lighting in pulpits and choir areas. Where we have an exception for plant growth lighting, in ASHRAE it is for “support of non-human life forms”. This is useful when designing animal research spaces where a separate night light is necessary in addition to general illumination. (p.39)
7. Section C405.4.2.2.1 - Added some minor wordsmithing to align with ASHRAE text. Under Equation 4-11 changed 500 to 1000 to align with ASHRAE. This is important for very small retail establishments. (p.42-43)
8. Table C405.4.2(1) Interior Lighting Power – Building Area Method – I’ve added two columns. The first represents the values recently approved by ASHRAE and also adopted by IECC for 2021. As most people are aware, these are based on revised models that more accurately represent what can be expected when using current technology LED fixtures and lamps. The second added column shows current WSEC 2015 values and is included for easy reference. (p.44-45)

Because of the work that has gone into developing the values from ASHRAE, we would like to recommend that they be incorporated into the next version of the Washington State Energy Code.

Reference: Proposed Energy Code Lighting Changes

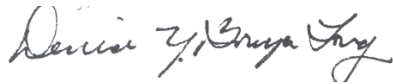
9. Table C405.4.2 (2) Interior Lighting Power Allowances Space-by-Space, Similar to table 1, two comns have been added with the same reasoning and recommendation. (p.46-54)

In addition, for this table, we have moved footnotes to the category descriptions, rather than having them in the values column. ASHRAE has a blanket allowance for decorative and other non-general lighting of 0.75 w/ft. rather than include this, we have amended footnote C to include externally illuminated signage and then added this footnote to Common Space by Space types and Building Specific Space-by-space types. Footnote N has been added to dining spaces (except penitentiaries)

Thank you for your consideration

Regards,

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Subject: OTS-C405 DFong questions comments -v1.docx

Hi Krista - Attached are the other edits mentioned in my cover letter. Thanks.

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-40501 Section C405.1—General. C405.1 General

((~~mandatory~~)). This section covers lighting system controls, the maximum lighting power for interior and exterior applications, electrical energy consumption, vertical and horizontal transportation systems, and minimum efficiencies for motors and transformers.

((~~EXCEPTION: Dwelling units within commercial buildings shall not be required to comply with Sections C405.2 through C405.6 provided that they comply with Section R404.1.~~))

Dwelling units within multifamily buildings shall comply with this section. All other dwelling units in dormitory, hotel and other residential occupancies that are not classified as multifamily residential occupancies shall comply with Section C405.2.5 and with this section or Section C405.4. No less than 90 percent of the permanently installed lighting serving dwelling units or sleeping units shall be provided by lamps with an efficacy of not less than 60

lumens per watt or luminaire with an efficacy of not less than 55 lumens per watt.

Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C410.2.

Transformers, uninterruptable power supplies, motors and electrical power processing equipment in data center systems shall comply with Section 8 of ASHRAE Standard 90.4 in addition to this code.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40501, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-40501, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-40502 Section C405.2—Electrical power and lighting systems. C405.2 Lighting controls ((~~mandatory~~)). Lighting systems shall be provided with controls ((~~as specified in Sections C405.2.1 through C405.2.8~~)) 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~~ electric 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 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. ((Interior exit stairways, interior exit ramps, and exit passageways.)) 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.
3. Emergency egress lighting that is normally off.
4. Industrial or manufacturing process areas, as may be required for production and safety.

(~~5. Luminaire level lighting controls that control interior lighting. The LLC luminaire shall be independently configured to:~~

- ~~5.1. Monitor occupant activity to brighten or dim its lighting when occupied or unoccupied, respectively.~~
- ~~5.2. Monitor ambient light (both electric light and daylight) and brighten or dim electric light to maintain desired light level.~~
- ~~5.3. Configuration and reconfiguration of performance parameters, including bright and dim setpoints, time outs, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations, for each control strategy.~~
- ~~5.4. Meet the operational and commissioning requirements of Sections C405.2.1, C405.2.2, C405.2.3, C405.2.4 and C408.))~~

Commented [FD1]: All light is real, some is just generated by electricity

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40502, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-40502, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405021 Section C405.2.1—Occupant sensor controls.

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. Lounges/breakrooms.
5. ((~~Employee lunch and break rooms.~~)) Enclosed offices.
6. ((~~Private offices.~~)) Open plan office areas.
7. Restrooms.
8. Storage rooms.
9. ((~~Janitorial closets.~~
- 10.)) Locker rooms.

~~((11-))~~ 10. Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.

~~((12-))~~ 11. Warehouse ~~((s-))~~ storage areas.

12. Enclosed fire rated stairways.

13. Service corridors.

14. Covered parking areas.

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

EXCEPTIONS:

1. Corridors in manufacturing facilities.

2. Digital timer switch controls may be provided in lieu of occupant sensor controls in the following space types in under 300 square feet: Copy/print rooms, storage rooms, and janitorial closets. Digital timer switches shall comply with the following:

2.1. Turn lights on or off with operation of a button, switch or other manual means.

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.

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 5 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 controls shall comply with all of the following:

1. They shall be configured to automatically turn off lights within ~~((30))~~ 20 minutes of all occupants leaving the space.

2. They shall be manual on or ((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 entrances 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~~((. In~~

~~warehouses, the lighting in aisleways 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. The~~

~~occupancy sensor shall control lighting in each aisleway~~

~~independently, and shall not control lighting beyond the aisleway~~

~~being controlled by the sensor))~~, **storage areas and service corridors.**

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.

2. Control lighting in each aisleway and corridor independently, and shall not control lighting beyond the aisleway or corridor being controlled by the sensor.

3. Automatically turn lighting off within 20 minutes of all occupants leaving the space, or comply with Section C405.2.2 to turn lighting off when the building is vacant.

4. Restore lighting to full power when occupants enter the space.

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. General lighting is controlled separately in control zones with floor areas not greater than 600 square feet (55 m²) within the open plan office space.

2. Automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the open plan office space.

3. General lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is unoccupied meet this requirement.

4. Daylight responsive control 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 percent 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 3,600 square feet.

Exceptions:

1.1. Lighting in daylight transition zones and ramps without parking.

1.2. Covered parking garages with a total lighting power less than 0.07 watts per square foot.

2. Automatically turn all the lighting off within 20 minutes of all occupants leaving the space and restore lighting to full power when occupants enter the space, or comply with Section C405.2.2 to turn lighting off when the building is vacant.

C405.2.1.5 Occupant sensor control function in enclosed fire rated

stairways. Occupant sensor controls shall be configured to automatically reduce lighting power by not less than 50 percent when no occupants have been detected in the stairway for a period not exceeding 20 minutes and restore lighting to full power when occupants enter the stairway. All portions of stairways shall remain illuminated to meet the requirements of Section 1009 of the *International Building Code* when the lighting power is reduced.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405021, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-405021, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405022 Section C405.2.2—Time switch controls.

C405.2.2 Time switch controls. Each area of the building that is not provided with *occupant sensor controls* (~~(complying with Section C405.2.1.1)~~) or digital timer switch controls complying with Section

~~((C405.2.6))~~ 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-automatic)~~) C405.2.3.1, time switch controls shall not be required for the following:

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

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)~~) C405.2.3.1. 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 lighting 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:
 - 5.1. The override switch shall be a manual control.

5.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.

5.3. 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 less than 50 square feet, and medical areas of health care 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 ((malls, arcades, auditoriums, single tenant retail spaces, industrial facilities and arenas)) 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 ((override)) switch is a captive key device.
 - 1.2. The area controlled by the override switch ((is permitted to be greater than)) shall not be limited to 5,000 square feet (465 m²), ((but shall not be greater)) 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:
 - 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).
 - 2.3. Corridors, equipment rooms, public lobbies, electrical or mechanical rooms.

~~**C405.2.2.2 Light reduction controls.** Spaces required to have light-reduction controls shall have a manual control that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by at least 50 percent. Lighting reductions shall be achieved by one of the following approved methods:~~

- ~~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.~~

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

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405022, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-405022, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405023 Section C405.2.3—Manual controls. C405.2.3

Manual controls. All lighting shall have manual controls (~~(for lights shall comply)~~) complying with the following:

1. They shall be (~~(readily accessible)~~) 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.

3. Each control device shall control an area no larger than a single room, or 2,500 square feet if the room area is less than or equal to 10,000 square feet, or 10,000 square feet if the room area is greater than 10,000 square feet.

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.

C405.2.3.1 Light reduction controls. Manual controls shall be configured to provide light reduction control that allows the occupant to reduce the connected lighting load between 30 and 70 percent.

Lighting reductions shall be achieved by one of the following approved methods:

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).

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

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405023, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-405023, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405024 Section C405.2.4—Daylight responsive

controls. C405.2.4 Daylight responsive controls. *Daylight responsive controls* complying with Section C405.2.4.1 shall be provided to control the general lighting within *daylight zones* in the following spaces:

1. ((~~Sidelight daylight~~)) Sidelit zones as defined in Section C405.2.4.2 with more than two *general lighting* fixtures within the combined primary and secondary ((~~sidelight daylight~~)) sidelit zones.

2. ((~~Toplight daylight~~)) Toplit zones as defined in Section C405.2.4.3 with more than two *general lighting* fixtures within the *daylight zone*.

EXCEPTION: *Daylight responsive controls* are not required for the following:

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[14]

NOT FOR FILING OTS-1233.2

Commented [FD2]: Need to separate general lighting from specialty lighting like wallwasher, art lighting, etc. Also makes it consistent with paragraphs below and **C405.2.4.1.1**

1. Spaces in health care facilities where patient care is directly provided.
2. (~~Dwelling units and sleeping units.~~
3.) Lighting that is required to have specific application control in accordance with Section C405.2.4.
(~~4. Sidelight daylight~~) 3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.
- (~~5.~~) 4. Daylight zones where the total proposed lighting power density is less than 35 percent of the lighting power allowance per Section C405.4.2.

C405.2.4.1 Daylight responsive controls function. Where required,

daylight responsive controls shall be provided within each space for control of general lighting lights in that space and shall comply with all of the following:

1. Lights in primary (~~(sidelight daylight)~~) sidelit zones shall be controlled independently of lights in secondary (~~(sidelight daylight)~~) sidelit zones in accordance with Section C405.2.4.2.

EXCEPTION: Spaces enclosed by walls or ceiling height partitions with no more than three general lighting fixtures may have combined daylight zone control of primary and secondary daylight zones provided *uniform illumination* can be achieved.

2. Lights in (~~(toplight daylight)~~) toplit zones in accordance with Section C405.2.4.3 shall be controlled independently of lights in (~~(sidelight daylight)~~) sidelit zones in accordance with Section C405.2.4.2.

3. *Daylight responsive controls* within each space shall be configured so that they can be calibrated from within that space by authorized personnel.

4. Calibration mechanisms shall be (~~(readily accessible)~~) in a location with ready access.

5. *Daylight responsive controls* shall be configured to completely shut off all controlled lights in that zone.

6. Lights in (~~(*sidelight*–*daylight*)~~) *sidelit* zones in accordance with Section C405.2.4.2 facing different cardinal orientations (i.e., within 45 degrees of due north, east, south, west) shall be controlled independently of each other.

EXCEPTION: Up to two light fixtures in each space are permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

7. Incorporate time-delay circuits to prevent cycling of light level changes of less than three minutes.

8. The maximum area a single *daylight responsive control* device serves shall not exceed 2,500 square feet (232 m²).

9. Occupant override capability of daylight dimming controls is not permitted, other than a reduction of light output from the level established by the daylighting controls.

C405.2.4.1.1 Dimming. *Daylight responsive controls* shall be configured to automatically reduce the power of *general lighting* in the daylight zone in response to available daylight, while maintaining *uniform illumination* in the space through one of the following methods:

1. Continuous dimming using dimming ballasts/dimming drivers and daylight-sensing controls. The system shall reduce lighting power

continuously to less than 15 percent of rated power at maximum light output.

2. Stepped dimming using multi-level switching and daylight-sensing controls. The system shall provide a minimum of two steps of uniform illumination between 0 percent and 100 percent of rated power at maximum light output. Each step shall be in equal increments of power, plus or minus 10 percent.

General lighting within daylight zones in offices, classrooms, laboratories and library reading rooms shall use the continuous dimming method. Stepped dimming is not allowed as a method of daylight zone control in these spaces.

C405.2.4.2 (~~(Sidelight daylight)~~) **Sidelit zone.** The (~~(sidelight daylight)~~) sidelit zone is the floor area adjacent to vertical fenestration which complies with the following:

1. Where the *fenestration* is located in a wall, the (~~(sidelight daylight)~~) sidelit zone includes the primary and secondary daylight zones. The primary daylight zone shall extend laterally to the nearest full height wall, or up to 1.0 times the height from the floor to the top of the *fenestration*, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.4.2(1). The

secondary daylight zone begins at the edge of the primary daylight zone and extends laterally to the nearest full height wall, or up to 2.0 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.4.2(1).

2. (~~Where the fenestration is located in a rooftop monitor, the sidelight daylight zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.4.2(2) and C405.2.4.2(3).~~

3.) Where clerestory fenestration is located in a wall, the (~~sidelight daylight~~) sidelit zone includes a lateral area twice the depth of the clerestory fenestration height, projected upon the floor at a 45 degree angle from the center of the clerestory fenestration. The longitudinal width of the (~~daylight~~) sidelit zone is calculated the same as for fenestration located in a wall. Where the 45 degree angle is interrupted by an obstruction greater than 0.7 times the ceiling height, the (~~daylight~~) sidelit zone shall remain the same

lateral area but be located between the clerestory and the obstruction, as indicated in Figure C405.2.4.2 ~~((4))~~ (2).

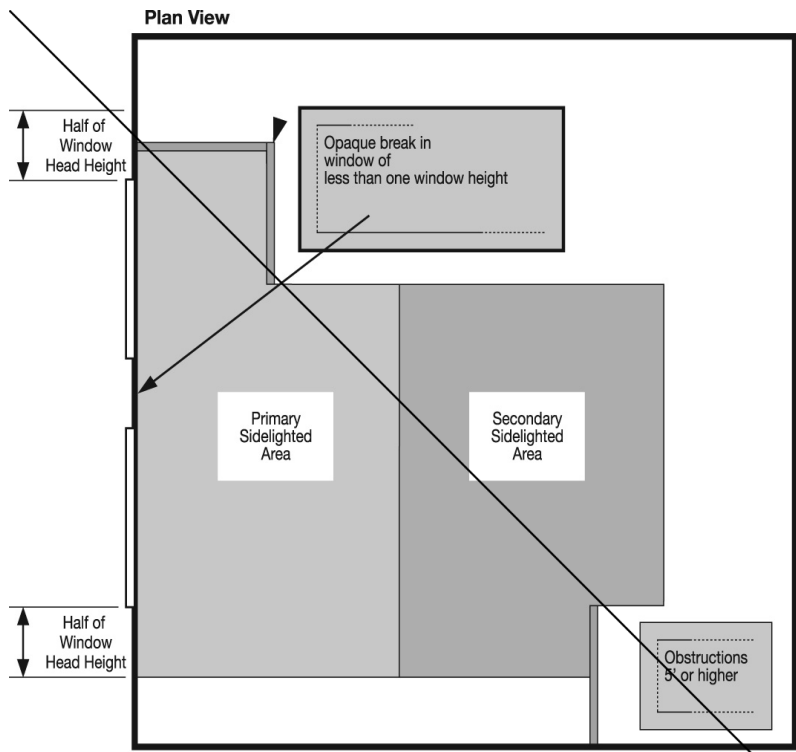
~~((4))~~ 3. If the rough opening area of a vertical fenestration assembly is less than 10 percent of the calculated primary ~~((daylight))~~ sidelit zone area for this fenestration, it does not qualify as a ~~((daylight))~~ sidelit zone.

~~((5. Where located in existing buildings,))~~ 4. The visible transmittance of the fenestration is no less than 0.20.

~~((6))~~ 5. In parking garages with floor area adjacent to perimeter wall openings, the ~~((daylight))~~ sidelit zone shall include the area within 20 feet of any portion of a perimeter wall that has a net opening to wall ratio of at least 40 percent.

Figure C405.2.4.2(1)

~~((Daylight))~~ **Sidelit Zone Adjacent to Fenestration in a Wall**
((



Computing the secondary sidelighted area.

))

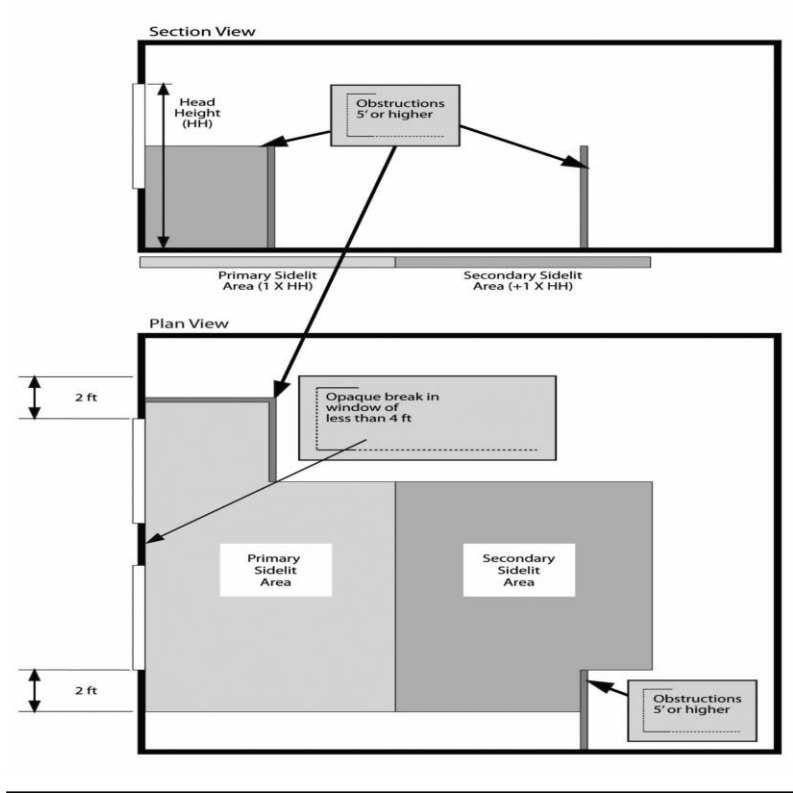
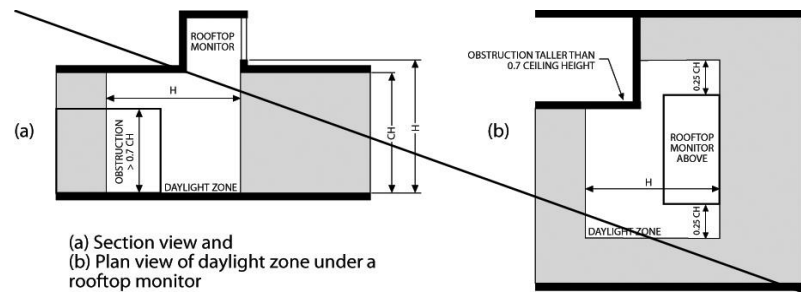


Figure C405.2.4.2(2)

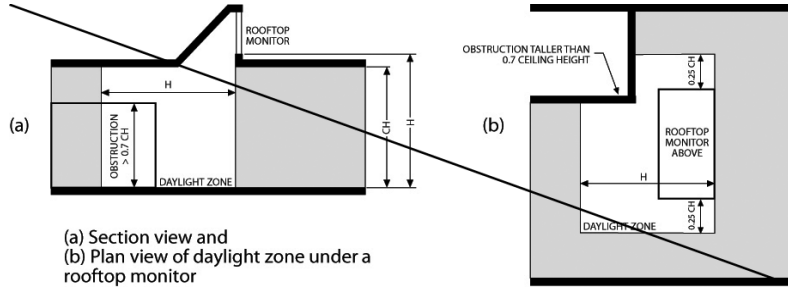
~~((Daylight Zone Under a Rooftop Monitor~~



(a) Section view and
(b) Plan view of daylight zone under a rooftop monitor

~~Figure C405.2.4.2(3)~~

~~Daylight Zone Under a Sloped Rooftop Monitor~~

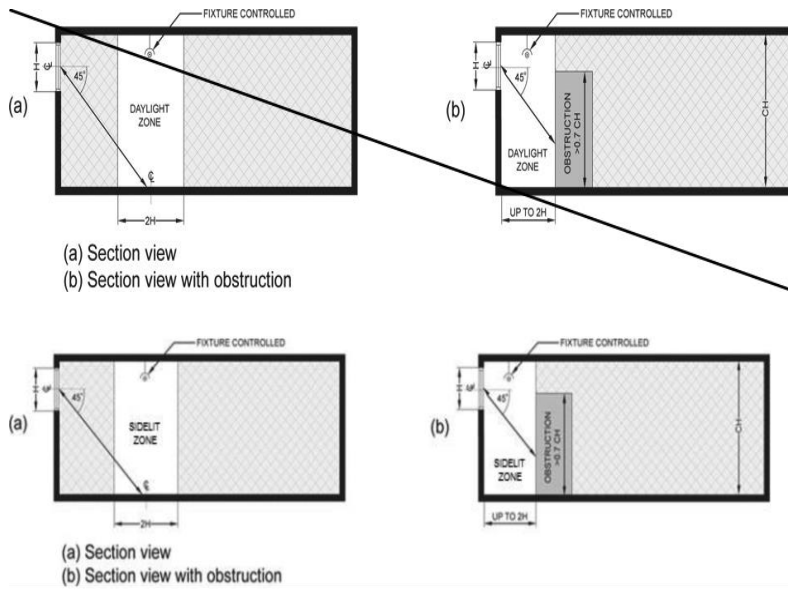


(a) Section view and
(b) Plan view of daylight zone under a rooftop monitor

Figure C405.2.4.2(4)

Daylight)) Sidelit Zone Adjacent to Clerestory Fenestration in a Wall

((



(a) Section view
(b) Section view with obstruction

(a) Section view
(b) Section view with obstruction

))

C405.2.4.3 ((Toplight daylight) Toplit zone. The ((toplight

daylight) toplit zone is the floor area underneath a roof fenestration assembly which complies with the following:

1. The ((toplight daylight) toplit zone shall extend laterally and longitudinally beyond the edge of the roof fenestration assembly to the nearest obstruction that is taller than 0.7 times the ceiling

height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.2.4.3(1).

2. Where the fenestration is located in a rooftop monitor, the toplit zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.4.3(2) and C405.2.4.3(3).

3. Where (~~toplight daylight~~) toplit zones overlap with (~~sidelight daylight~~) sidelit zones, lights within the overlapping area shall be assigned to the (~~toplight daylight~~) toplit zone.

(~~3. Where located in existing buildings,~~) 4. The product of the visible transmittance of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly, divided by the area of the (~~daylight~~) toplit zone is no less than 0.008.

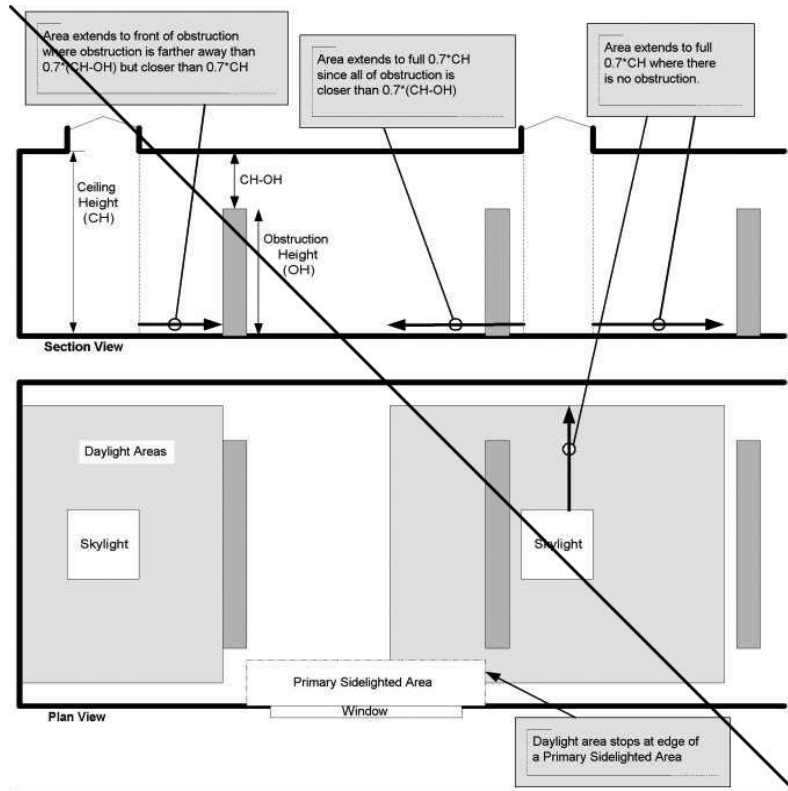
(~~4.~~) 5. Where located under atrium fenestration, the (~~daylight~~) toplit zone shall include the bottom floor area directly beneath the atrium fenestration, and the top floor directly under the

atrium fenestration, as indicated in Figure C405.2.4.3((+2)) (4). The ((daylight)) toplit zone area at the top floor is calculated the same as for a ((toplight-daylight)) toplit zone. Intermediate levels below the top floor that are not directly beneath the atrium are not included.

Figure C405.2.4.3(1)

((Daylight)) Toplit Zone Under a Rooftop Fenestration Assembly

((



))

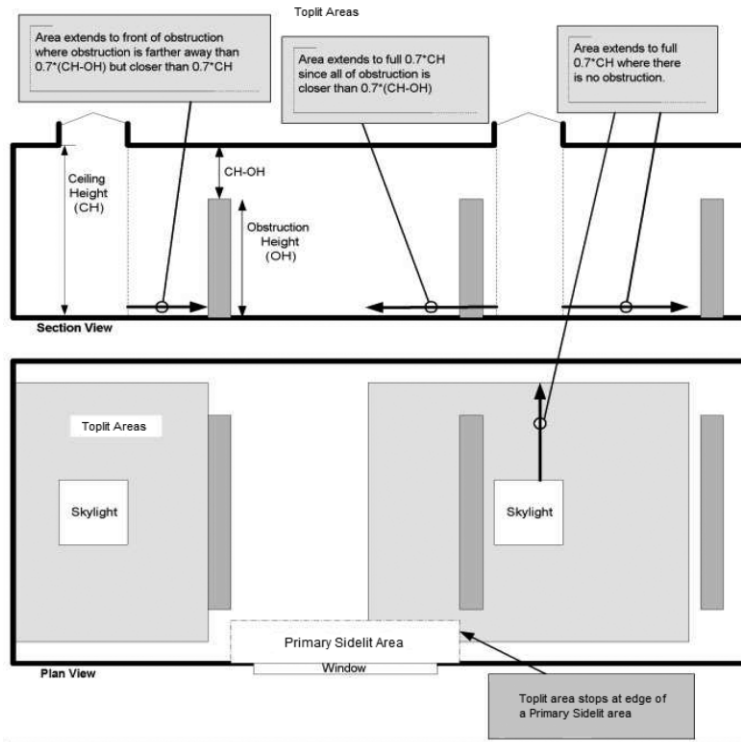


Figure C405.2.4.3(2)

Toplit Zone Under a Rooftop Monitor

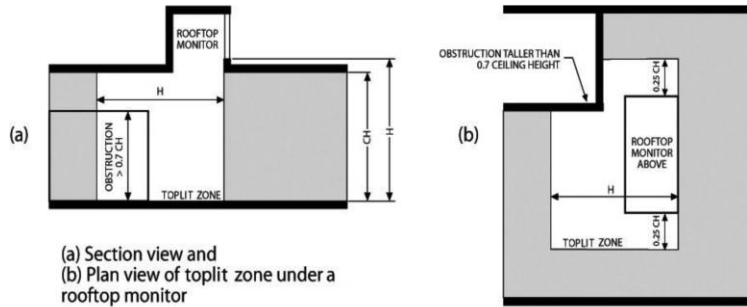


Figure C405.2.4.3(3)

Toplit Zone Under a Sloped Rooftop Monitor

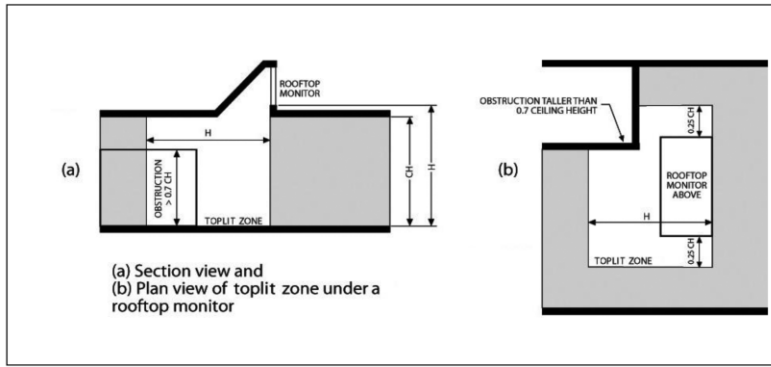
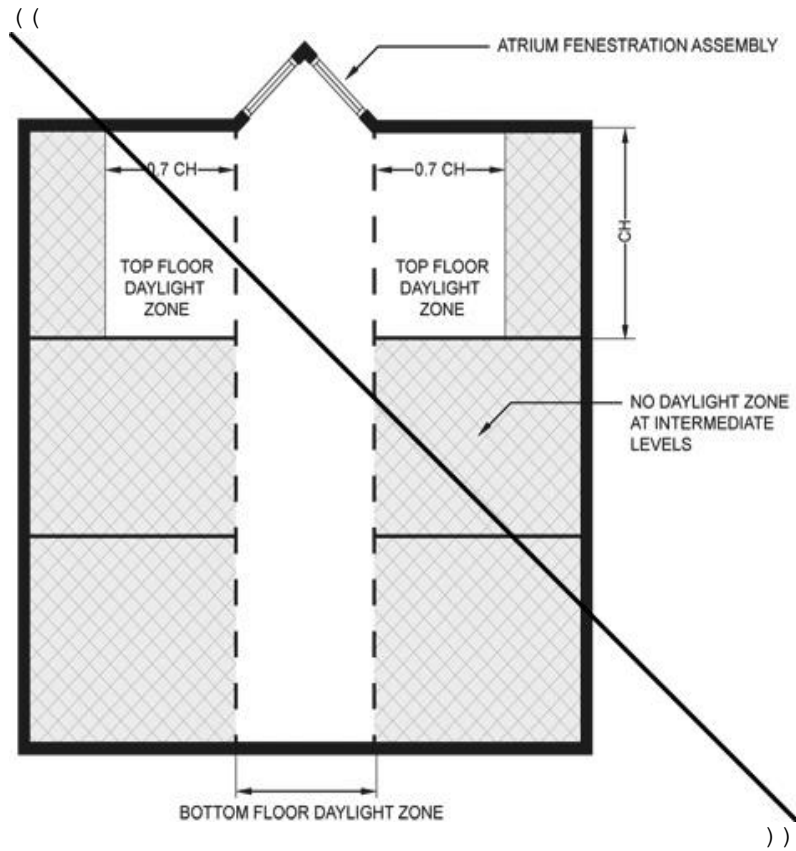
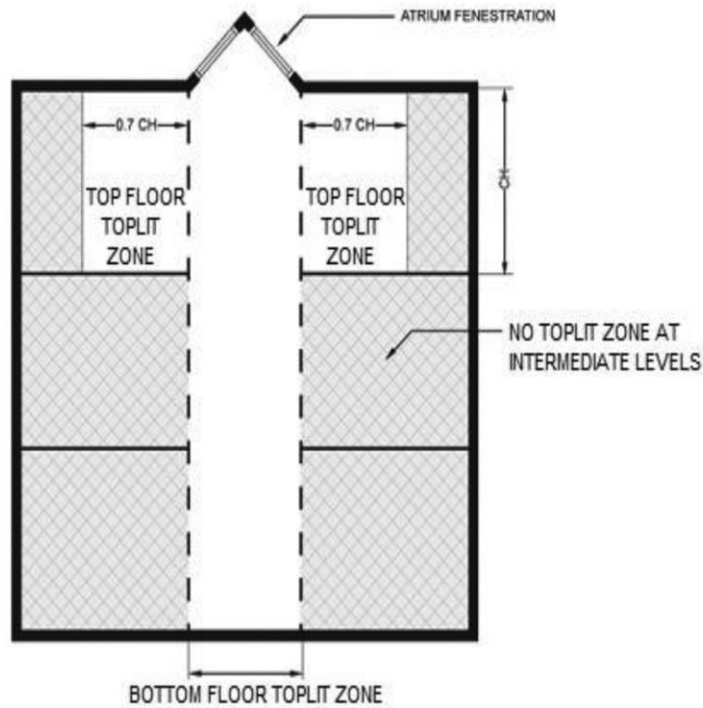


Figure C405.2.4.3 ((-2)) (4)

((Daylight)) Toplit Zone Under Atrium Fenestration





[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405024, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-405024, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405025 Section C405.2.5—Additional lighting controls. C405.2.5 Additional lighting controls. Specific application

lighting shall be provided with controls, in addition to controls required by other sections, for the following:

~~1. ((Display and accent light shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.~~

~~2. Lighting in cases used for display case purposes shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.~~

~~3. Hotel and motel sleeping units and guest suites)~~ The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time switch control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting separately from the general lighting in the space:

1.1. Display and accent.

1.2. Lighting in display cases.

1.3. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.

1.4. Lighting equipment that is for sale or demonstration in lighting education.

2. Sleeping units shall have control device(s) or systems configured to automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes after all occupants (~~(leave the room)~~) have left the unit.

EXCEPTIONS: 1. Lighting and switched receptacles controlled by (~~(eaptive key systems)~~) card key controls.
2. Spaces where patient care is directly provided.

~~((4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall be automatically shut off whenever that space is unoccupied and shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided that the control device is readily accessible.~~

~~5.)~~ 3. Permanently installed luminaires within dwelling units shall be provided with controls complying with either Section C405.2.1.1 or C405.2.2.2.

4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space. Each control zone shall be no greater than the area served by a single luminaire or 4,000 square feet, whichever is larger.

~~((6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control that is~~

~~independent of the controls for other lighting within the room or space.~~

7.) 5. Luminaires serving the exit access and providing means of egress illumination required by Section 1006.1 of the *International Building Code*, including luminaires that function as both normal and emergency means of egress illumination shall be controlled by a combination of listed emergency relay and occupancy sensors, or signal from another building control system, that automatically shuts off the lighting when the areas served by that illumination are unoccupied.

EXCEPTION: 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.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405025, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-405025, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405026 Section C405.2.6—(~~Digital timer switch~~)

Exterior lighting controls. (~~C405.2.6 Digital timer switch controls.~~

~~For each of the following space types, when under 300 square feet,~~

~~digital timer switch controls may be provided in lieu of occupancy sensor controls:~~

- ~~1. Copy/print rooms.~~
- ~~2. Storage rooms.~~
- ~~3. Janitorial closets.~~

~~**C405.2.6.1 Digital timer switch function.** Digital timer switches shall comply with the following:~~

- ~~1. Turn lights on or off with operation of a button, switch or other manual means.~~
- ~~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.~~
- ~~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.)) **C405.2.6 Exterior lighting controls.** Exterior lighting systems shall be provided with controls that comply with Sections C405.2.6.1 through C405.2.6.4. Decorative lighting systems shall comply with Sections C405.2.6.1, C405.2.6.2, and C405.2.6.4.~~

~~EXCEPTIONS: 1. Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security or eye adaption.~~

2. Lighting controlled from within dwelling units.

C405.2.6.1 Daylight shutoff. Lights shall be configured to automatically turn off when daylight is present and satisfies the lighting needs.

C405.2.6.2 Façade and landscape lighting shutoff. Building façade and landscaping lighting shall be configured to automatically shutoff for a minimum of 6 hours per night or from not later than 1 hour after business closing to not earlier than 1 hour before business opening, whichever is less.

EXCEPTION: Areas where an automatic shutoff would endanger safety or security.

C405.2.6.3 Lighting setback. Lighting that is not controlled in accordance with Section C405.2.6.2 shall be controlled so that the total wattage of such lighting is automatically reduced by not less than 30 percent by selectively switching off or dimming luminaires at one of the following times:

1. From not later than 12 midnight to 6 a.m.
2. From not later than 1 hour after business closing to not earlier than 1 hour before business opening.
3. During any period when no activity has been detected for 15 minutes or more.

C405.2.6.4 Exterior time-switch control functions. Time-switch

controls for exterior lighting shall comply with the following:

1. They shall have a clock capable of being programmed for not fewer than 7 days.
2. They shall be capable of being set for 7 different day types per week.
3. They shall incorporate an automatic holiday setback feature.
4. They shall have program backup capabilities that prevent the loss of program and time settings for a period of at least 10 hours in the event that power is interrupted.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405026, filed 1/19/16, effective 7/1/16.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405027 ((~~Section C405.2.7 Exterior lighting controls.~~)) **Reserved.** ((~~C405.2.7 Exterior lighting controls. Lighting for exterior applications other than emergency lighting that is intended to be automatically off during building operation, lighting~~

~~specifically required to meet health and life safety requirements or decorative gas lighting systems shall:~~

- ~~1. Be provided with a control that automatically turns off the lighting as a function of available daylight.~~
- ~~2. Where lighting the building façade or landscape, the lighting shall have controls that automatically shut off the lighting as a function of dawn/dusk and a set opening and closing time.~~
- ~~3. Where not covered in Item 2, the lighting shall have controls configured to automatically reduce the connected lighting power by at least 30 percent from no later than 12 midnight to 6 a.m. or from one hour after business closing to one hour before business opening or during any period when no activity has been detected for a time of no longer than 15 minutes.~~

~~Time switches shall be capable of retaining programming and the time setting for at least 10 hours without power.~~

EXCEPTION: ~~Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security or eye adaption.))~~

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405027, filed 1/19/16, effective 7/1/16.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405028 Section C405.2.8—Area controls. C405.2.8

Area controls. The maximum lighting power that may be controlled from a single switch or automatic control device shall not exceed that which is provided by a 20 ampere circuit loaded to not more than 80 percent. A master control may be installed provided the individual switches retain their capability to function independently. Circuit breakers may not be used as the sole means of switching.

EXCEPTION: Areas less than 5 percent of the building footprint for footprints over 100,000 ft².

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405028, filed 1/19/16, effective 7/1/16.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-40504 ((~~Section C405.3 Exit signs.~~)) Reserved.

((~~C405.3 Exit signs (mandatory). Internally illuminated exit signs shall not exceed 5 watts per side.~~))

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40504, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-40504, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-40505 Section C405.4—Interior lighting power requirements. C405.4 Interior lighting power requirements

~~((prescriptive))~~). A building complies with this section if its total connected interior lighting power calculated under Section C405.4.1 is no greater than the interior lighting power allowance calculated under Section C405.4.2.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40505, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-40505, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405051 Section C405.4.1—Total connected interior lighting power. C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-10.

$$TCLP = [((\cancel{SL} + \cancel{LV} + \cancel{LTPB})) \underline{LVL + BLL + TRK + POE} + \text{Other}]$$

(Equation 4-10)

Where:

TCLP = Total connected lighting power (watts).

~~((SL = Labeled wattage of luminaires for screw-in lamps.~~

~~LV = Wattage of the transformer supplying low-voltage lighting.~~

~~LTPB = Wattage of line-voltage lighting tracks and plug-in busways as the specified wattage of the luminaires but at least 50 W/lin. ft., or the wattage limit of the system's circuit breaker, or the wattage limit of other permanent current limiting devices on the system.)~~ LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps, the rated wattage of the lamp, which must be minimum 60 lumens/watt.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating the lamp.

TRK = For lighting track, cable conductor, rail conductor and plug-in busway systems that allow the addition and relocation of luminaires without rewiring. The wattage shall be one of the following:

1. The specified wattage of the luminaires, but not less than 16 W/lin. ft. (52 W/lin. m).

2. The wattage limit of the permanent current limiting devices protecting the system.

3. The wattage limit of the transformer supplying the system.

POE = For other modular lighting systems served with power supplied by a driver, power supply for transformer including, but not limited to, low-voltage lighting systems, the wattage of the system shall be the maximum rated input wattage of the driver, power supply or transformed published in the manufacturer's catalogs, as specified by UL 2108 or 8750. For power-over-Ethernet lighting systems, power provided to installed nonlighting devices may be subtracted from the total power rating of the power-over-Ethernet systems.

Other = The wattage of all other luminaires and lighting, sources not covered above and associated with interior lighting verified by data supplied by the manufacturer or other *approved* sources.

((EXCEPTIONS: ~~1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.~~

~~1.1. Professional sports arena playing field lighting.~~

~~1.2. Emergency lighting automatically off during normal building operation.~~

~~1.3. Lighting in spaces specifically designed for use by occupants with special lighting needs including the visually impaired and other medical and age-related issues.~~

~~1.4. Casino gaming areas.~~

~~1.5. General area lighting power in industrial and manufacturing occupancies dedicated to the inspection or quality control of goods and products.~~

~~1.6. Lighting in sleeping units, provided that the lighting complies with Section R404.1.~~

~~1.7. Mirror lighting in dressing rooms.~~

2. Lighting equipment used for the following shall be exempt provided that it is in addition to general lighting and is controlled by an independent control device:

- 2.1. Task lighting for medical and dental purposes.
- 2.2. Display lighting for exhibits in galleries, museums and monuments.
3. Lighting for theatrical purposes, including performance, stage, film production and video production.
4. Lighting for photographic processes.
5. Lighting integral to equipment or instrumentation and is installed by the manufacturer.
6. Task lighting for plant growth or maintenance where the lamp efficacy is not less than 90 lumens per watt.
7. Advertising signage or directional signage.
8. In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment.
9. Lighting equipment that is for sale.
10. Lighting demonstration equipment in lighting education facilities.
11. Lighting *approved* because of safety or emergency considerations, inclusive of exit lights.
12. Lighting integral to both open and glass enclosed refrigerator and freezer cases.
13. Lighting in retail display windows, provided the display area is enclosed by ceiling height partitions.
14. Furniture mounted supplemental task lighting that is controlled by automatic shutoff.
15. Lighting used for aircraft painting.))

The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.

1. Television broadcast lighting for playing areas in sports arenas.

2. Emergency lighting automatically off during normal building operation.

3. Lighting in spaces specifically designed for use by occupants with special lighting needs including those with visual impairment and other medical and age-related issues.

4. Casino gaming areas.

5. General area lighting power in industrial and manufacturing occupancies dedicated to the inspection or quality control of goods and products.

6. Mirror lighting in dressing rooms.

7. Task lighting for medical and dental purposes that is in addition to general lighting and controlled by an independent control device.

8. Display lighting for exhibits in galleries, museums and monuments that is in addition to general lighting and controlled by an independent control device.

9. Lighting for theatrical purposes, including performance, stage, film production and video production.

10. Lighting for photographic processes.

11. Lighting integral to equipment or instrumentation and installed by the manufacturer.

12. Task lighting for plant growth or maintenance where the lamp efficacy is not less than 90 lumens per watt.

13. Advertising signage or directional signage.

14. Lighting for food warming.

15. Lighting equipment that is for sale.

Commented [FD3]: ASHRAE also has lighting for pulpits and choir areas as an exception

Commented [FD4]: In ASHRAE it says "support of non-human life forms" which helps with animal research areas that me needs secondary lights for night observation

16. Lighting demonstration equipment in lighting education facilities.

17. Lighting approved because of safety considerations.

18. Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.

19. Furniture mounted supplemental task lighting that is controlled by automatic shutoff.

20. Exit signs.

21. Lighting used for aircraft painting.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-405051, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-405051, filed 2/1/13, effective 7/1/13.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective 7/1/16)

WAC 51-11C-405052 Section C405.4.2—Interior lighting power requirements. C405.4.2 Interior lighting power allowance. The total

interior lighting power allowance (watts) is determined according to Table C405.4.2(1) using the Building Area Method, or Table C405.4.2(2) using the Space-by-Space Method, for all areas of the building covered in this permit.

C405.4.2.1 Building area method. For the Building Area Method, the interior lighting power allowance is the floor area for each building area type listed in Table C405.4.2(1) times the value from Table C405.4.2(1) for that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type as listed in Table C405.4.2(1). Where this method is used to calculate the total interior lighting power for an entire building, each building area type shall be treated as a separate area.

C405.4.2.2 Space-by-Space Method. For the Space-by-Space Method, the interior lighting power allowance is determined by multiplying the floor area of each space times the value for the space type in Table C405.4.2(2) that most closely represents the proposed use of the space, and then summing the lighting power allowances for all spaces. Tradeoffs among spaces are permitted.

Each area enclosed by partitions that are 80 percent of the ceiling height or taller shall be considered a separate space and

assigned the appropriate space type from Table C405.4.2(2). If a space has multiple functions where more than one space type is applicable, that space shall be broken up into smaller subspaces, each using their own space type. Any of these subspaces that are smaller in floor area than 20 percent of the enclosed space and less than 1,000 square feet need not be broken out separately.

a. C405.4.2.2.1 Additional interior lighting power. ~~Where~~ When

using the Space-by-Space Method, an increase in the interior lighting power allowance is ~~permitted~~ allowed for specific lighting functions. Additional power shall be ~~permitted~~ allowed only ~~where~~ if the specified lighting is installed and automatically controlled, separately from the general lighting, to be turned off during nonbusiness hours. This additional power shall be used only for the specified luminaires and shall not be used for any other purpose. An increase in the interior lighting power allowance is ~~permitted~~ for lighting equipment to be installed in sales areas and specifically designed and directed to highlight merchandise. The additional lighting power shall be determined in accordance with Equation 4-11.

(Equation 4-11)

Additional Interior Lighting Power Allowance = ~~500-1000~~
watts + (Retail Area 1 × ((~~0.6~~) 0.45 W/ft²) + (Retail Area
2 × ((~~0.6~~) 0.45 W/ft²) + (Retail Area 3 × ((~~1.4~~) 1.05
W/ft²) + (Retail Area 4 × ((~~2.5~~) 1.87 W/ft²).

Where:

Retail Area 1 = The floor area for all products not listed in
Retail Area 2, 3 or 4.

Retail Area 2 = The floor area used for the sale of vehicles,
sporting goods and small electronics.

Retail Area 3 = The floor area used for the sale of furniture,
clothing, cosmetics and artwork.

Retail Area 4 = The floor area used for the sale of jewelry,
crystal and china.

EXCEPTION: Other merchandise categories are permitted to be included in Retail Areas 2 through 4, provided that justification documenting the need for additional lighting power based on visual inspection, contrast, or other critical display is *approved* by the code official.

[Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR
16-03-072, § 51-11C-405052, filed 1/19/16, effective 7/1/16. Statutory
Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05
RCW. WSR 13-04-056, § 51-11C-405052, filed 2/1/13, effective 7/1/13.]

AMENDATORY SECTION (Amending WSR 16-03-072, filed 1/19/16, effective
7/1/16)

