119-2018 Revised 7/27/18

STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development

Standard Energy Code Proposal Form

Code being amended: ☒ Commercial Provisions ☐ Residential Provisions

Code Section # C405.4.2_____

Brief Description: This proposal modifies the connected lighting power equation, the lighting power allowance ceiling height adjustment, and the lighting power allowances.

- Definitions are added to properly account for Solid State Lighting and Power Over Ethernet lighting.
- The accounting of the connected lighting power is modified to provide better alignment with current lighting technology. Adjustments have been made to make it easier to utilize low cost line voltage pin and screw base fixtures.
- The lighting power allowances are reduced 10% from WSEC 2015 value in most categories. Relative to the integrated draft the reductions proposed here represent ~ 8% reduction in building area allowances and ~5% reduction in space-by-space allowances.
- The space-by-space ceiling height adjustments are reduced and threshold heights increased so only extraordinary buildings are allowed additional power.

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.)

Definitions

LOW-VOLTAGE LIGHTING. A lighting system consisting of an isolating power supply, the low voltage luminaires, and associated equipment that are all identified for the use. ~~The output circuits of the power supply operate at 30 volts (42.4 volts peak) or less under all load conditions.~~[mdk1]

SOLID STATE LIGHTING (SSL) is a family of light sources that includes: semiconductor light emitting diodes (LEDs); organic light emitting diodes (OLEDs) and polymer light emitting diodes (PLEDs).

SOLID STATE LIGHTING DRIVER is a device that uses semiconductors to control and supply DC power for LED starting and operation. The drivers operate from multiple supply sources of 600V maximum at a frequency of 50 or 60 hertz.

POWER-OVER-ETHERNET LIGHTING (POE) are light sources powered by DC current utilizing Ethernet cables

C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-10.

TCLP = [~~*SL + LV + LTPB*~~*LVL + BLL +* ~~*LED*~~*SSL1 + SSL2 + POE + TRK* + Other] [mdk2]

(Equation 4-10)

Where:

TCLP	=	Total connected lighting power (watts)
~~*SL*~~	=	~~Labeled wattage of luminaires for screw-in lamps.~~
LVL		[mdk3] For luminaires with lamps connected directly to building power, such as line voltage lamps, the larger of 16 Watts or the rated wattage of the lamp. If rated luminaire wattage is less than the sum of the lamps then the rated luminaire wattage can be used.
~~*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.~~
BLL	=	For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating the lamp.[mdk4]
~~*LED*~~	=	~~For light emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.~~
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 ~~50~~ 16 W/lin. ft. (~~164~~ 52 W/lin. m).[mdk5] 2. The wattage limit of the permanent current-limiting devices protecting the system 3. The wattage limit of the transformer supplying the system.
SSL1		For inseparable SSL luminaires and SSL luminaires with remotely mounted drivers, the maximum rated wattage shall be the maximum rated input wattage of the SSL when tested in accordance with UL 1598, 2108, 8750, or IES LM-79
SSL2		For LED tape lighting and LED linear lighting with LED tape lighting components, the maximum rated wattage shall be the sum of the installed length of the tape lighting times its rated linear power density in watts per linear feet, or the maximum rated input wattage of the driver or power supply providing power to the lighting system, with tape lighting tested in accordance with UL 2108, 8750, or IES LM-79.
POE		For other modular lighting systems served with power supplied by a driver, power supply or 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 transformer published in the manufacturer's catalogs, as specified by UL 2108 or 8750. For power-over-Ethernet lighting systems, power provided to installed non-lighting devices may be subtracted from the total power rating of the power-over-Ethernet system.
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.

C405.4.2.2.1 Additional interior lighting power. Where using the Space-by-Space Method, an increase in the interior lighting power allowance is permitted for specific lighting functions. Additional power shall be permitted only where 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 specifically to highlight merchandise. The additional lighting power shall be determined in accordance with Equation 4-11:

Additional interior lighting power allowance = 500 watts + (Retail Area 1 x 0.45 W/ft^2) + (Retail Area 2 x 0.45 W/ft^2) + (Retail Area 3 x 1.05 W/ft^2) + (Retail Area 4 x 1.87 W/ft^2)

(Equation 4-11)

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.

TABLE C405.4.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD[mdk6]

Building Area Type	LPD (w/ft²)		
	Option 1: Unchanged	Option 2 Best of Integrated Draft and SEC [mdk7]	Option 3 Best of Integrated Draft and 189.1-2017
Automotive facility	0.64	0.58	0.64
Convention center	~~0.81~~0.76	0.73	0.51
Court house	0.81	0.73	0.74
Dining: Bar lounge/leisure	0.79	0.71	0.69
Dining: Cafeteria/fast food	0.72	0.65	0.66
Dining: Family	0.71	0.64	0.61
Dormitory[a,b]	0.46	0.41	0.52
Exercise center	~~0.67~~0.65	0.60	0.61
Fire station[a]	~~0.54~~0.53	0.49	0.50
Gymnasium	~~0.75~~0.68	0.68	0.67
Health care clinic	0.70	0.70	0.68
Hospital[a]	0.84	0.84	0.84
Hotel[a,b]	0.70	0.63	0.70
Library	~~0.94~~0.78	0.78	0.72
Manufacturing facility	0.89	0.80	0.60
Motion picture theater	0.61	0.55	0.61
Multifamily[c]	0.41	0.37	0.41
Museum	0.80	0.72	0.68
Office	0.66	0.59	0.66
Parking garage	~~0.16~~0.15	0.14	0.12
Penitentiary	0.65	0.59	0.65
Performing arts theater	1.00	0.90	0.85
Personal Service – salon, cleaners, laundromat		0.60[mdk8]	0.60
Police station	0.70	0.63	0.68
Post office	~~0.70~~0.67	0.63	0.62
Religious building	0.80	0.72	0.70
Retail	1.01	0.91	0.91
School/university	0.70	0.63	0.67
Sports arena	0.62	0.56	0.62
Town hall	0.71	0.64	0.71
Transportation	0.56	0.50	0.51
Warehouse	0.40	0.36	0.40
Workshop	~~0.95~~0.90	0.90	0.83

TABLE C405.4.2(2)
INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD

COMMON SPACE-BY-SPACE TYPES[a]	LPD[d] (w/ft²)		
COMMON SPACE-BY-SPACE TYPES[a]	Option 1: Unchanged	Option 2 Best of Integrated Draft and SEC	Option 3 Best of Integrated Draft and 189.1-2017
Atrium - ~~First~~ Less than 40 feet in height[e]	0.02 per ft. ht.	0.024 per ft. ht.	0.023 per ft. ht.
Atrium – ~~–~~ Greater than ~~Above~~ 40 feet in height[e] [mdk9]	0.03 + 0.02 per ft. ht.	0.32 + 0.016 per ft. ht.	0.30+ 0.015 per ft. ht.
Audience/seating area - Permanent			
In an auditorium	0.50	0.45	0.50
In a convention center	0.66	0.59	0.65
In a gymnasium	0.34	0.31	0.34
In an motion picture theater	0.91	0.82	0.64
In a penitentiary	~~0.22~~0.28 [mdk10]	0.28	0.28
In an performing arts theater	1.94	1.75	1.34
In a religious building	1.22	1.10	0.98
In a sports arena	0.34	0.31	0.34
Otherwise	0.34	0.31	0.34
Banking activity area	0.81	0.73	0.79
Breakroom (see Lounge/breakroom)			
Beauty salon, barber area		1.00 [mdk11]	1.00
Classroom/lecture/training			
In a penitentiary	1.07	0.96	1.06
Otherwise	~~1.00~~0.96	0.90 [mdk12]	0.74
Computer room	~~1.37~~1.33	1.23	1.16
Conference/meeting/multipurpose	0.98	0.88	0.93
Copy/print room	~~0.58~~0.56	0.52	0.5
Corridor			
In a facility for the visually impaired (and not used primarily by the staff)[b]	0.74	0.74	0.74
In a hospital	0.63	0.63	0.63
In a manufacturing facility	~~0.33~~0.29	0.29	0.28
Otherwise	0.53	0.48 [mdk13]	0.53
Courtroom	1.38	1.24	0.98
Dining area [mdk14]			
In a bar/lounge or leisure dining	0.86	0.77	0.62
In cafeteria or fast food dining	0.52	0.47	0.52
In a family dining area	0.71	0.64	0.54
In a facility for the visually impaired (and not used primarily by the staff)[b]	1.52	1.52	1.48
In a penitentiary	0.77	0.69	0.72
Otherwise	0.52	0.47	0.52
Electrical/mechanical	~~0.76~~0.43	0.43	0.39
Emergency vehicle garage	~~0.45~~0.41	0.41	0.41
Food preparation	0.79	0.71	0.79
Guest room[g,h]	0.38	0.38	0.38
Laboratory			

In or as a classrooms	1.02	0.92	1.02
Otherwise	1.45	1.31	1.24
Laundry/washing area	~~0.48~~0.43	0.43	0.43
Loading dock, interior	0.38	0.34	0.38
Lobby[c]			
In a facility for the visually impaired (and not used primarily by the staff)[b]	1.44	1.44	1.3
For an elevator	0.51	0.46	0.51
In a hotel	0.85	0.77	0.68
In a motion picture theater	0.42	0.38	0.38
In a performing arts theater	1.60	1.44	0.82
Otherwise	0.72	0.65	0.72
Locker room	~~0.60~~0.48	0.48	0.45
Lounge /breakroom			
In a health care facility	0.74	0.67	0.53
Otherwise	0.58	0.52	0.44
Office[f]			
Enclosed	0.89	0.80	0.85
Open plan	0.78	0.70 [mdk15]	0.78
Parking area, interior	~~0.15~~0.14	0.13	0.11
Pharmacy area	0.91	0.82	0.91
Restroom			
In a facility for the visually impaired (and not used primarily by the staff)[b]	~~0.97~~0.96	0.96	0.81
Otherwise	0.78	0.70	0.75
Sales area	~~1.27~~1.22	1.14	1.06
Seating area, general	~~0.43~~0.42	0.39	0.38
Stairway (See space containing stairway)			
Stairwell	0.55	0.50	0.5
Storage room	~~0.50~~0.46	0.45	0.43
Vehicular maintenance	0.54	0.49	0.53
Workshop	~~1.27~~1.14 [BK(16]	1.14	1.09

BUILDING SPECIFIC SPACE-BY-SPACE TYPES

BUILDING SPECIFIC SPACE-BY-SPACE TYPES[a]	**LPD[d] (w/ft²)**		
BUILDING SPECIFIC SPACE-BY-SPACE TYPES[a]	**Option 1: Unchanged**	**Option 2 Best of Integrated Draft and SEC**	**Option 3 Best of Integrated Draft and 189.1-2017**
Automotive (see Vehicular maintenance, above)			0.53
Convention center - Exhibit space	0.88	0.88	0.69
Dormitory living quarters[g,h]	0.30	0.27	0.46
Facility for the visually impaired[b]			
In a chapel (and not used primarily by the staff)[b]	1.06	1.06	0.89
In a recreation room (and not used primarily by the staff)[b]	1.80	1.74	1.53

Fire stations[g]			
Engine rooms	0.45	0.45	0.45
Sleeping quarters	0.18	0.18	0.18
Gymnasium/fitness center			
In an exercise area	0.50	0.50	0.50
In a playing area	0.82	0.82	0.75
BUILDING SPECIFIC SPACE-BY-SPACE TYPES[a]	**LPD[d] (w/ft²)**		
Health care facility			
In an exam/treatment room	1.33	1.33	1.16
In an imaging room	1.06	1.06	0.98
In a medical supply room	0.54	0.54	0.54
In a nursery	0.70	0.70	0.94
In a nurse's station	0.57	0.57	0.75
In an operating room	1.51	1.51	1.87
In a patient room[g]	0.50	0.50	0.45
In a physical therapy room	0.73	0.73	0.85
In a recovery room	0.92	0.92	0.89
Library[f]			
In a reading area	0.74	0.67	0.77
In the stacks	1.20	1.20	1.08
Manufacturing facility			
In a detailed manufacturing area	0.93	0.93	0.86
In an equipment room	0.59	0.53	0.61
In an extra high bay area (> 50-foot floor-ceiling height)	0.84	0.76	0.73
In a high bay area[h] [mdk17] (25 - 50-foot floor-ceiling height)	0.75	0.75	0.58
In a low bay area[e] (< 25-foot floor-ceiling height)	0.95	0.86	0.61
Museum			
In a general exhibition area	0.84	0.76	0.61
In a restoration room	0.82	0.74	0.77
Performing arts theater dressing/fitting room	0.32	0.29	0.35
Post office—Sorting area	0.68	0.68	0.66
Religious building			
In a fellowship hall	0.51	0.46	0.42
In a worship pulpit/choir area	1.22	1.10	0.98
Retail			
In a dressing/fitting room	0.50	0.50	0.49
In a mall concourse	0.88	0.79	0.79
Sports arena—Playing area			
For a Class 1 facility[i]	2.41	2.17	2.26
For a Class 2 facility[j]	1.54	1.39	1.45
For a Class 3 facility[k]	0.96	0.86	1.08
For a Class 4 facility[l]	0.58	0.52	0.72
Transportation			
In a baggage/carousel area	0.42	0.38	0.4
In an airport concourse	0.29	0.26	0.22
At a terminal ticket counter	0.62	0.58	0.48
Warehouse—Storage area			

For medium to bulky palletized items[g]	0.35	0.35	0.27
For smaller, hand-carried items[g]	0.69	0.68[mdk18]	0.65

For SI: 1 foot = 304.8 mm, 1 watt per square foot = 11 W/m^2.

a. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply.

b. A facility for the visually impaired is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.

c. For spaces in which lighting is specified to be installed in addition to, and controlled separately from, the general lighting for the purposed of highlighting art or exhibits, provided that the additional lighting power shall not exceed 0.5 W/ft^2 of such spaces.

d. The watts per square foot may be increased by ~~2~~ 1 [mdk19]percent per foot of ceiling height above 20 feet, unless specifically directed otherwise by subsequent footnotes.

e. Footnote d may not be used for these occupancy types.

f. The watts per square foot may be increased by ~~2~~ 1 [mdk20]percent per foot of ceiling height above ~~9~~ 12 feet. Footnote d may not be used for these occupancy types.

g. [The watts per square foot may be increased by 1 percent per foot of ceiling height above 40 feet. Footnote d may not be used for these occupancy types.[mdk21]

~~g.~~h. Where sleeping units are excluded from lighting power calculations by application of Section R404.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

~~h.~~i. Where dwelling units are excluded from lighting power calculations by application of Section R404.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

~~i.~~j. Class I facilities consist of professional facilities; and semi-professional, collegiate or club facilities with seating for 5,000 or more spectators.

~~j.~~k. Class II facilities consist of collegiate and semi-professional facilities with seating for fewer than 5,000 spectators; club facilities with seating between 2,000 and 5,000 spectators; and amateur league and high school facilities with seating for more than 2,000 spectators.

~~k.~~l. Class III facilities consist of club, amateur league and high school facilities with seating for 2,000 or fewer spectators.

~~l.~~m. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high school facilities without provisions for spectators.

Purpose of code change:

Save energy.

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

☐ Addresses a critical life/safety need.

☒ Consistency with state or federal regulations.

☒ Addresses a specific state policy or statute.
(Note that energy conservation is a state policy)

☐ Addresses a unique character of the state.

☐ Corrects errors and omissions.

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

☐ Single family/duplex/townhome

☒ Multi-family 4 + stories

☐ Institutional

☐ Multi-family 1 – 3 stories

☒ Commercial / Retail

☐ Industrial

Your name	Mike Kennedy	Email address	mikekennedy@energysims.com
Your organization	Mike D Kennedy	Phone number	360-301-0098
Other contact name	None		

STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

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.

Economic Impact Data Sheet

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

Reduced utility bills and ability to utilize cheaper screw base fixtures are the primary benefits. Combined with the changes from the WSEC 2015 that are part of the WSEC 2018 Integrated Draft it represents a 10% reduction in lighting power. As an increment from the integrated draft the reductions proposed here represent ~ 8% reduction in building area allowances and ~5% reduction in space-by-space allowances. Energy used for lighting will decrease by a like margin.

It should be possible to meet the proposed code levels in 2020 for considerably less first cost than was required by the WSEC 2015 in 2016. LED lighting dominates the new building lighting market and DOE estimates costs are decreasing. Lamp costs are estimated to drop 32% from 2016 levels by 2020. DOE also estimates LED luminaire efficiency will increase by 23% over that same period.[1]
The proposal also relaxes the accounting for proposed fixture wattage. Previously screw and pin base fixtures were counted at the UL listed wattage for the fixture which is often 100 watts. This meant that screw base fixtures were hard to utilize within the allowed lighting power. This proposal limits the screw base fixture wattage to 18 watts per socket which will allow screw base fixtures to be used. This will substantially reduce costs for down lights and sconces. In recent cost data collected for Title 24 a dedicated LED track head cost $305 while an A socket track head with LED lamp costs $66.

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**)

$0/square foot (For residential projects, also provide $Click here to enter text./ dwelling unit)

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

The cost of this proposal depends upon fixture make up. Projects utilizing significant amounts of track, can, or wall sconce fixtures will see reduced costs. Projects not utilizing these fixtures will need to purchase slightly more efficient fixtures.

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

0.175KWH/ square foot (or) Click here to enter text.KBTU/ square foot

(For residential projects, also provide Click here to enter text.KWH/KBTU / dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

The savings from this proposal will be modest. In office, lighting power will be reduced 10.7% from 0.66 W/sf to 0.59 W/sf. Assuming 2500 hours per year of operation. Assuming VRF heating and cooling the interactive effects will cancel out.
List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

The change in the proposed fixture wattage calculation should simplify verification of the proposed fixture wattage and very slightly decrease compliance time. The lighting power changes should have no additional impact. The increase of

[1] **Solid State Lighting 2017 Suggested Research Topics Supplement: Technology and Market Context, U.S. Department of Energy, September 2017**

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

ceiling heights will decrease review time as many less submittals will qualify for this negating the need to cross reference lighting and ceiling heights in many cases.

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