Lighting System Performance

Modify the 2021 International Energy Conservation Code as follows:

Add new definition as follows:

LIGHTING CONTROL ZONE. A designation used when calculating the proposed lighting system performance in accordance with C409, of one or more luminaires within a single interior space or subspace controlled by one or more lighting controls or one or more luminaires lighting an exterior area or surface controlled by one or more lighting controls.

PROPOSED LIGHTING SYSTEM. The combination of luminaires and lighting controls included in the construction documents.

PROPOSED LIGHTING SYSTEM PERFORMANCE. The annual lighting site *energy* in kWh of *lighting systems* calculated for a *proposed lighting system* in accordance with C409.

REFERENCE LIGHTING SYSTEM PERFORMANCE. The annual lighting site *energy* in kWh of a lighting system design intended for use as a reference case when using Lighting System Performance as an alternate path for minimum standard compliance of *lighting systems* in accordance with Section C405.5.

Revise as follows:

C405.1.2 ~~C405.4~~Lighting for plant growth and maintenance.
Not less than 95 percent of the permanently installed luminaires used for plant growth and maintenance shall have a photon efficiency of not less than 1.6 µmol/J as defined in accordance with ANSI/ASABE S640.

C405.4 ~~C405.5~~Exterior lighting power requirements.
The total connected exterior lighting power calculated in accordance with Section C405.4.1~~C405.4.1~~ shall be not greater than the exterior lighting power allowance calculated in accordance with Section C405.4.2~~C405.5.2.~~

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C405.4.1 ~~C405.5.1~~Total connected exterior building exterior lighting power.
The total exterior connected lighting power shall be the total maximum rated wattage of all lighting that is powered through the energy service for the building.

Exception: Lighting used for the following applications shall not be included.

1. Lighting *approved* because of safety considerations.
2. Emergency lighting automatically off during normal business operation.
3. Exit signs.
4. Specialized signal, directional and marker lighting associated with transportation.
5. Advertising signage or directional signage.
6. Integral to equipment or instrumentation and installed by its manufacturer.
7. Theatrical purposes, including performance, stage, film production and video production.
8. Athletic playing areas.

9. Temporary lighting.
10. Industrial production, material handling, transportation sites and associated storage areas.
11. Theme elements in theme/amusement parks.
12. Used to highlight features of art, public monuments and the national flag.
13. Lighting for water features and swimming pools.
14. Lighting controlled from within dwelling units, where the lighting complies with Section R404.1.

C405.4.2C405.5.2Exterior lighting power allowance.

The exterior lighting power allowance (watts) is calculated as follows:

1. Determine the Lighting Zone (LZ) for the building according to Table C405.4.2(1)~~C405.5.2(1)~~, unless otherwise specified by the code official.
2. For each exterior area that is to be illuminated by lighting that is powered through the energy service for the building, determine the applicable area type from Table C405.4.2(2)~~C405.5.2(2)~~. For area types not listed, select the area type that most closely represents the proposed use of the area.
3. Determine the total area or length of each area type and multiply by the value for the area type in Table C405.4.2(2)~~C405.5.2(2)~~ to determine the lighting power (watts) allowed for each area type.
4. The total exterior lighting power allowance (watts) is the sum of the base site allowance determined according to Table C405.4.2(2)~~C405.5.2(2)~~, plus the watts from each area type.

Portions of table not shown remain unchanged.

TABLE C405.4.2(1)~~C405.5.2(1)~~ EXTERIOR LIGHTING ZONES

Portions of table not shown remain unchanged.

TABLE C405.4.2(2)~~C405.5.2(2)~~ LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS

Portions of table not shown remain unchanged.

TABLE C405.4.2(3)~~C405.5.2(3)~~ INDIVIDUAL LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS

C405.4.2.1~~C405.5.2.1~~Additional exterior lighting power.
Additional exterior lighting power allowances are available for the specific lighting applications listed in Table C405.4.2(3)~~C405.5.2(3)~~. These additional power allowances shall be used only for the luminaires serving these specific applications and shall not be used to increase any other lighting power allowance.

Add new text as follows:

C405.5Alternate Compliance Path

C405.5.1Lighting System Performance.
The *proposed lighting system* complies with the standard if
1. the *proposed lighting system* satisfies the provisions of Sections C405.1 and C409and
2. the *proposed lighting system performance* is less than or equal to the *reference lighting system performance*.

Existing Buildings. All components of the proposed *lighting system* shown on architectural drawings or installed in *existing buildings* shall be modeled when calculating the *proposed lighting system performance*.

Trade-Offs Limited to Building Permit\. When the *building* permit being sought applies to less than the whole *building*, parameters relating to unmodified existing conditions or to future *building* components shall be identical for both the *proposed lighting system performance* and the *reference lighting system performance*. Future building components shall meet the prescriptive requirements of Section C405.2 and C405.3.

Performance and Reference Designs. *The proposed lighting system performance* and *reference lighting system performance* shall be calculated in accordance with Section C405.5.1 using the procedures of Sections C405.5.2 – C405.5.8.

C405.5.2Proposed Lighting System Performance.
Use the following steps to determine the *proposed lighting system performance,* in accordance with the procedures of Sections C405.5.2 through C405.5.8.

C405.5.2.1Interior Lighting.
1. Determine the appropriate *building* type(s) of the *proposed lighting system* from Table C405.3.2(1) and the *gross lighted floor area* in ft^2 (m^2) of each *building* type. For *building* types not listed, selection of a reasonably equivalent type shall be permitted.
2. Identify all of the *spaces* and or subspaces in *proposed lighting system* based on the requirements in Section C405.3.
3. For *space* types not listed, selection of the closest similar category shall be permitted.
4. Each identified *space* or subspace shall be assigned to one of the *building* types identified in Section C405.5.1.1 Item 1.
5. For each *lighting control zone* within a *space* or subspace allocate the type, quantity and wattage of each installed *luminaire* and the associated lighting control types. The wattage of all lighting *equipment* shall be determined in accordance with Equation 4-10 and Section C405.3.1. Lighting controls types shall be based on Table C409.3.3(2).

C405.5.2.1Exterior Lighting.
1. Determine the exterior lighting zonefrom Table C405.4.2(1).
2. Identify the applicable lighting building exterior areas type of each exterior building area that is design to be illuminated as permitted in Table C405.4.2(2) and Table C405.4.2(3) and determine the applicable unit (e.g., area (square feet) (square meters), length (linear feet) (linear meters), number of ATMs, etc.) of each surface. Include any exterior areas or surfaces listed as an exception to Section C405.4.1 and indicate that those areas or surfaces are exempt.
3. For each building exterior area or surface that is designed to be illuminated determine the type, quantity and wattage of each installed *luminaire* lighting that area or surface. The wattage of all lighting *equipment* shall be determined in accordance with Sections C405.3 and C405.5.1.

Add new Section C409 text as follows:

C409Lighting System Performance

C409.1 Minimum Information.
The following minimum information shall be specified to calculate the *proposed lighting system* performance and the *reference lighting system performance.*

C409.1.1 Building Information.

The building area type and the associated *gross lighted floor area* in ft^2 (m^2) of each *building* area type shall be specified. Each *building* area type shall be chosen from Table C405.3.2. The appropriate exterior lighting zone from Table C405.4.2(1) shall be specified

C409.1.2 Interior Space Information.
The space type, *gross lighted floor area* in ft^2 (m^2) and ceiling height of shall be specified for each *space* or subspace identified in accordance with Section C405.5.1.1. Each *space* type shall be chosen from Table C405.3.2(2).

C409.1.2.1 For Sidelighting.
The number of windows, *fenestration* head height in ft (m), total horizontal exterior *wall* length in ft (m) and total *fenestration* horizontal length in ft (m) of each *space* or subspace shall be specified. The user shall also be permitted to enter *primary sidelighted area* and *secondary sidelighted area* calculated *in* accordance with Section C405.2.4.2.

C409.1.2.2 For Toplighting with Skylights.
The number of *skylights*, *skylight* area in ft^2 (m^2), *skylight well* factor in ft (m) and *visible* transmittance shall be specified. The user shall also be permitted to enter the *daylighted area under skylights* calculated in accordance with Section C405.2.4.3 or C405.2.4.4.

C409.1.3 Luminaire Schedule.
The *lamp* type, wattage per *luminaire*, name and description of each unique *luminaire* in the *proposed lighting system* shall be specified. Interior *luminaires* and exterior *luminaries* shall be specified in separate tables. The total watts, length, voltage, breaker amps and whether a current limiter is installed shall be specified for *luminaires* designated as line-voltage lighting track.

C409.1.4 Interior Space Lighting Luminaires and Controls.
For each *lighting control zone* in a *space* or subspace the zone name, *luminaire* type, *luminaire* quantity and lighting control types shall be specified. Users shall specify one of the allowable interior lighting control configurations listed in Table C409.3.4(1).

C409.1.5 Exterior Area Lighting

C409.1.5.1 For Exterior Lighting Surfaces.
The name, surface area type and area in ft^2 (m^2) or length in ft (m) shall be specified.

C409.1.5.2 For Additional Exterior Lighting Power.
The name, surface area type and area in ft^2 (m^2) or length in ft (m) shall be specified.

C409.1.6 Exterior Lighting Luminaires and Controls.
For each tradeable or non-tradeable exterior surface the surface name, *luminaire* type, *luminaire* quantity or length in linear ft (m), fixture mounting height and lighting control types shall be specified. Applicable exterior lighting control types are listed in Table C409.3.3(2).

C409.2 Reporting Requirements.
A report detailing the calculation of the *proposed lighting system performance* and *reference lighting system performance* shall contain the following information.

1. Name and contact information of the entity executing the Lighting System Performance and date of report.
2. Location of the building, including street address, climate zone, and exterior lighting zone.
3. Tables summarizing the minimum information described in Section C409.1.
4. Simulation program used to perform the simulation
5. Table summarizing the calculated proposed lighting system performance and reference lighting system performance differentiated by exterior lighting and interior lighting annual lighting energy in kWh.

C409.3 Simulation Requirements

C409.3.1 Calculation Tool.
The calculation tool shall be a computer-based software program. The calculation tool shall be capable of providing the calculations described in this appendix. Examples of calculation tools include (but not limited) Microsoft Excel, Google Sheets, or custom-built software.

1: The calculation tool shall be approved by the *authority having jurisdiction* and shall, at a minimum, have the ability to explicitly calculate the *reference lighting system performance* for interior and exterior *lighting systems* based only on the inputs for the *proposed lighting system performance.*

2:The calculation tool shall have the ability to explicitly calculate the *proposed lighting system performance* and *reference lighting system performance* of a *proposed lighting system*. Neither the *proposed lighting system performance* nor the *reference lighting system performance* are predictions of actual energy consumption for the *proposed lighting system* after construction. Actual experience will differ from these calculations because of variations such as occupancy and building operation.

C409.3.2 Compliance Calculations.

The *proposed lighting system performance* and *reference lighting system performance* shall be calculated using the same

1. Calculation tool
2. hours of operation, and
3. exterior lighting zone from Table C405.4.2(1).

C409.3.3 General Project Requirements

C409.3.3.1 Building and Space Types.

1. *Building* types shall be selected from Table C405.3.2(1) and the associated area of each applicable type shall be determined.
2. All interior *spaces* and subspaces, in the *proposed design*, determined in accordance with Section C405.5.1.1 shall be included in the Lighting System Performance calculation. The appropriate *space* type for each space and sub-space shall be determined from Table C405.3.2(2).
3. Each *space* or subspace shall be assigned one of the *building* types determined in accordance with Section C405.5.1.1(a). The sum of the areas of *spaces* and/or subspaces assigned to a *building* type shall not exceed the user-defined area of that *building* type.
4. For each *space* or subspace users shall enter the required information in Section C409.1.2 for each applicable daylighting type: sidelighting, toplighting with *skylights* and toplighting with roof monitors.
5. For each *space* or subspace with *toplighting* via *skylights* users shall enter the required information for the *skylight effective aperture*

C409.3.3.2 Daylight Area.

For each *space* or subspace the *daylight area* of each applicable daylighting type shall be the smaller of:

1. The maximum *daylight area* determined in accordance with Section C409.3.3.2.1, or
2. The user defined value for *daylight area* determined in accordance with Sections C405.2.4.2, C405.2.4.3, or C405.2.4.4 3, or
3. The user-defined floor area of a *space* or subspace.

C409.3.3.2.1 Calculated Daylight Area.

The maximum *daylight area* of each applicable daylighting type in a *space* or subspace shall be determined using Equations 4-16 through 4-21 and the following requirements:

1. The maximum *primary sidelighted area* shall be the smaller of the values calculated using Equations 4-16 and 4-17.
2. The maximum *secondary sidelighted area* shall be the smaller of the values calculated using Equations 4-18 and 4-19.
3. The calculated *daylight area under skylights* shall be determined by Equation 4-20 and shall assume that there are no interior obstructions.
4. The calculated *daylight area under roof monitors* shall be determined by Equation 4-21 and shall assume that there are no interior obstructions.

$PSA_{MAX} = (FL_{HOR} + NumWin \times HH) \times HH$

(Equation 4-16)

where:

PSA_{MAX} = Maximum *primary sidelighted area* in ft^2 (m^2)

FL_{HOR} = *The user-defined total fenestration horizontal length in ft (m) in a space or subspace*

HH = *The user-defined head height in ft (m) of fenestration in a space or subspace*

NumWin = The user-defined number of windows in a space or subspace. Fenestration separated by an opaque exterior wall assembly shall be considered separate windows.

$PSA_{MAX} = (EWL_{HOR} + NumWin \times HH) \times HH$

(Equation 4-17)

where:

PSA_{MAX} = *Maximum primary sidelighted area in ft^2 (m^2)*

EWL_{HOR} = *The user-defined exterior wall horizontal length in ft (m) a space or subspace*

HH = *The user-defined head height in ft (m) of fenestration in a space or subspace*

NumWin = The user-defined number of windows in a space or subspace. Fenestration separated by an opaque exterior wall assembly shall be considered separate windows.

$SSA_{MAX} = (FL_{HOR} + NumWin \times HH) \times HH$

(Equation 4-18)

where:

SSA_{MAX} = *Maximum secondary sidelighted area in ft^2 (m^2)*

FL_{HOR} = *The user-defined total fenestration horizontal length in ft (m) in a space or subspace*

HH = *The user-defined head height in ft (m) of fenestration in a space or subspace*

NumWin = The user-defined number of windows in a space or subspace. Fenestration separated by an opaque exterior wall assembly shall be considered separate windows.

$SSA_{MAX} = (EWL_{HOR} + NumWin \times HH) \times HH$

(Equation 4-19)

where:

SSA_{MAX} = *Maximum secondary sidelighted area in* ft^2 (m^2)

EWL_{HOR} = *The user-defined exterior wall horizontal length in ft (m) a space or subspace*

HH = The user-defined head height in ft (m) of fenestration in a space or subspace

NumWin = The user-defined number of windows in a space or subspace. Fenestration separated by an opaque exterior wall assembly shall be considered separate windows.

$TSD_{max} = SkyNum \times \pi \times [(0.7 \times CH) + average (square\ root\ (ASky/\pi, square\ root\ 2 \times square\ root\ (Asky)/2]^2$

(Equation 4-20)

where:

TSDmax = Maximum toplighted area from skylight area in ft^2 (m^2)

SkyNum = The user-defined number of skylights in a space or subspace

ASky = The user-defined area of a single skylight ft^2 (m^2) *in a space or subspace*

CH = The user-defined ceiling height in ft (m) of a space or subspace

$TDM_{max} = NumMon \times MonWidth \times SH$

(Equation 4-21)

where:

TDMmax = Maximum toplighted area from roof monitors in ft^2 (m^2)

NumMon = The user-defined number of roof monitors in a space or subspace

MonWidth = The user-defined width of the roof monitors in a space or subspace

SH = The user-defined sill height of the roof monitors in a space or subspace

C409.3.3.3 Operating Hours.

1. The annual operating hours of each space, subspace, or lighting control zone shall be determined using Table C409.3.3(1) and the corresponding *building* type in the *proposed lighting system* assigned to that *space*, subspace or lighting control zone.

2. The identified *building* type in the *proposed lighting system* with the largest number of nighttime operating hours shall be selected as the basis for all exterior lighting calculations in Sections C409.3.4.2 and C409.3.5.2. The nighttime operating hours for each *building* type shall be the sum of the before midnight operating hours (BMOH) and the after midnight operating hours (AMOH) from Table C409.3.3 Item 1.

C409.3.4Calculation of Proposed Lighting Performance.
The proposed lighting system performance shall be calculated in accordance with Sections C409.3.4.1 through C409.3.4.3

C409.3.4.1Annual Interior Lighting Energy.

1. The annual interior lighting energy in kWh of the *proposed lighting system*shall be calculated by summing the annual interior lighting energy of each *lighting control zone*.
2. Each *lighting control zone* in the *proposed lighting system* shall be assigned to a *space* or subspace and one or more of the interior lighting control types from Table C409.3.3(2). Users shall only be able to select one of the approved interior lighting control code combinations from Table C409.3.4(1).
3. Calculate the lighting control savings factor for each *lighting control zone*. The lighting control savings factor shall be calculated by summing the weighted lighting control savings value of each lighting control type in the assigned lighting control code. The weighted lighting control savings value shall be calculated using Equation 4-22.

   $$WLCSV = LCSV \times WF$$ **(Equation 4-22)**

   where:

   WLCSV = Weighted Lighting Control Savings Value. WLCSV is calculated for each lighting control type in an approved lighting control code.

   LCSV = Lighting Control Savings Value selected from Table C409.3.4.2 based on *space* type and lighting control type

   WF = Weighting Factor from Table C409.3.4(1) based on the lighting control type in an approved lighting control code.

4. The annual interior lighting energy of each *lighting control zone* in the *proposed lighting system*shall be calculated using Equation 4-23. Each calculation shall only include one *space*/subspace and one *luminaire* type. Additional calculations shall be created for each *luminaire* type when a *lighting control zone* serves includes more than one *luminaire* type. All calculations created for the same *lighting control zone* shall use the same lighting control code from Table C409.3.4(1) when calculating the *lighting control savings factor*.

   $$AILE_{LCZ} = LumQty \times LUMPwr \times (1-LCSF_{INT}) \times AOH/1000$$ **(Equation 4-23)**

   where:

   $AILE_{LCZ}$ = Annual interior lighting energy of a *lighting control zone* in kWh

   LumQty = *Luminaire* quantity

   LumPwr = *Luminaire* power in watts (W)

   $LCSF_{INT}$ = Interior lighting control savings factor calculated in accordance with C409.3.4.1(c)

AOH = Annual operating hours from Table C409.3.3(1) determined in accordance with Section C409.3.3.3(a)

C409.3.4.2Annual Exterior Lighting Energy.

1. The annual exterior lighting energy of the *proposed lighting system*shall be calculated by summing the annual exterior lighting energy in kWh of each exterior *building* area or surface designed to be illuminated.

   Exception to C409.3.4.2
   Exterior lighting meeting the exception to Section C405.4 or the exception to Section C405.2.7 shall not be included in the calculation of the *proposed lighting system performance*.

2. Each exterior *building* area or surface designed to be illuminated in the *proposed lighting system*shall be assigned one or more of the exterior lighting control types from Table C409.3.3(2). Users shall only be able to select one of the approved exterior lighting control code combinations from Table C409.3.4(3).

3. The annual exterior lighting energy shall be calculated using Equation 4-24 for each exterior *building* area or surface designed to be illuminated in the *proposed lighting system*. Each calculation shall only include one luminaire type. Additional calculations shall be created for each *luminaire* type when an exterior *building* area or surface is illuminated by more than one *luminaire* type.

$$AELE_{EBA} = LumQty \times LumPwr \times (1-LCS_{EXT}) \times 8760 / 1000 \quad \textbf{(Equation 4-24)}$$

where:

$AELE_{EBA}$ = Annual exterior lighting energy in kWh of an exterior *building* area or surface designed to be illuminated

LumQty = *Luminaire* quantity

LumPwr = *Luminaire* power in watts (W)

$LCSF_{EXT}$ = Exterior lighting control savings factor from Table C409.3.3(5) based on the proposed exterior lighting control code

C409.3.4.3Proposed Lighting System Performance.
The proposed lighting system performance shall be calculated by summing the annual interior lighting energy and the annual exterior lighting energy of the proposed design.

C409.3.5Calculation of Reference Lighting System Performance.
Reference lighting system performanceshall be calculated by summing the total reference annual interior lighting energy determined in accordance with Section C409.3.5.1 and the total reference exterior lighting energy determined in accordance with C409.3.5.2.

C409.3.5.1Annual Interior Lighting Energy.

1. The total reference annual interior lighting energy shall be the sum of the reference annual interior lighting energy ($AILE_{REF}$) of each *space* or subspace. The reference annual interior lighting energy ($AILE_{REF}$) of each *space* or subspace shall be calculated using Equation 4-25.

$$AELE_{REF} = [(LP - LP_{DA}) \times (1-CSF_{NDL}) + (LP_{DA}) \times (1-CSF_{DL}) \times AOH / 1000$$

(Equation 4-25)

where:

$AILE_{REF}$ = Reference design case annual internal lighting energy in kWh of a *space* or subspace

LP = reference lighting power of a *space* or subspace

LP_{DA} = reference *daylight area* lighting power of a *space* of subspace determined in accordance with Section C409.3.5.1

CSF_{NDL} = non-daylighting *control savings factor* of a *space* or subspace from Table C409.3.5.1(1)

CSF_{DL} = daylighting *control savings factor* of a *space* or subspace from Table C409.3.5(1)

AOH = Annual operating hours from Table C409.3.3(1) determined in accordance with Section C409.3.3.3 Item 1

If a lighting control is not selected for the lighting control zone, the AOH defaults to 8,760 hours.

2. For each *space* or subspace:

   2.1 The reference lighting power (LP)is determined by multiplying the user-provided area by the *lighting power density* from Table C409.3.5.1(1). for the given *space* type.

   2.2 The non-daylighting *control savings factor* (CSF_{NDL}) and the daylighting *control savings factor* (CSF_{DL}) shall be determined from Table C409.3.5.1(1) for the given *space* type.

   2.3 The *daylight area* lighting power (LP_{DA}) shall be the largest of the following:

      2.3.1. ***Primary sidelit area*lighting power (C405.2.4 Item 1):** Equals the product of the *primary sidelit area* in ft^2 (m^2) and the *lighting power density* inW/ft^2 (W/m^2) for the given *space* type. If the product is less than or equal to 75W the *primary sidelit area* lighting power shall be set to 0W.

      2.3.2 **Sidelit area lighting power (C405.2.4 Item 2):** Equals the product of the *lighting power density* inW/ft^2 (W/m^2) for the given *space* type and the sum of the *primary sidelit area* and the *secondary sidelight area* in ft^2 (m^2). If the product is less than or equal to 150W the Sidelighted area lighting power shall be set to 0W.

      2.3.3 ***Daylight area under toplight*lighting power (C405.2.4 Item 3):** Equals the product of the *daylight area under skylights*in ft^2 (m^2) and the *lighting power density* inW/ft^2 (W/m^2) for the given *space* type. If the product is less than or equal to 75 W the *daylight area under skylight* lighting power shall be set to 0W.

C409.3.5.2Annual Exterior Lighting Energy.

1. Total Reference exterior lighting power shall be the sum of the annual site lighting power plus the Reference annual exterior lighting energy ($AELE_{REF}$) for each exterior building area or surface designed to be illuminated in the *proposed lighting system*and as permitted in Tables C405.4.2(2) and C405.4.2(3) for the applicable lighting zone in Table C405.4.2(1).

2. $AELE_{REF}$ shall be calculated using Equations 4-26 through 4-29 based on the applicable exterior lighting control strategy from Table C409.3.5.2(2) for each exterior building area and for the site. Exception to C409.3.5.2 Item 2

Luminaires, in the *proposed design*, assigned to uncovered parking areas with a rated input wattage of greater than 78W and a mounting height of 24ft (7.3m) or less above the ground shall be assigned exterior control strategy D and use Equation 4-29 when calculating $AELE_{REF}$

Control Strategy A:

$AELE_{REF} = 4{,}380 \times LP / 1000$

(Equation 4-26)

where:

$AELE_{REF}$ = Reference design case annual external lighting energy in kWh of a *space* or subspace

LP = reference lighting power of the site allowance, or any tradeable or non-tradeable exterior building area or surface determined by multiplying the user-provided units (e.g., area, length, or quantity) of an exterior building area or surface by the corresponding lighting power allowancefrom Tables C405.4.2(2) and C405.4.2(3).

Control Strategy B:

$AELE_{REF} = (2{,}196 + AMOH) \times LP / 1000$

(Equation 4-27)

where:

$AELE_{REF}$ = Reference design case annual external lighting energy in kWh of a *space* or subspace

LP = reference lighting power of the site allowance, or any tradeable or non-tradeable exterior building area or surface determined by multiplying the user-provided units (e.g., area, length, or quantity) of an exterior building area or surface by the corresponding lighting power allowancefrom Tables C405.4.2(2) and C405.4.2(3).

AMOH = after midnight operating hours from Table C409.3.3(1) as determined by Section C409.3.3.3(b).

Control Strategy C:

$AELE_{REF} = [(2{,}196 + AMOH) \times LP + (2{,}184 - AMOH) \times 0.5 \times LP / 1000$

(Equation 4-28)

where:

$AELE_{REF}$ = Reference design case annual external lighting energy in kWh of a *space* or subspace

LP = reference lighting power of the site allowance, or any tradeable or non-tradeable exterior building area or surface determined by multiplying the user-provided units (e.g., area, length, or quantity) of an exterior building area or surface by the corresponding lighting power allowancefrom Tables C405.4.2(2) and C405.4.2(3).

AMOH = after midnight operating hours from Table C409.3.3 Item 1 as determined by Section C409.3.3.3 Item 2.

Control Strategy D:

$AELE_{REF}$ = 4,380 x 0.5 x LP / 1000

(Equation 4-29)

where:

$AELE_{REF}$ = Reference design case annual external lighting energy in kWh of a *space* or subspace

LP = reference lighting power of the site allowance, or any tradeable or non-tradeable exterior building area or surface determined by multiplying the user-provided units (e.g., area, length, or quantity) of an exterior building area or surface by the corresponding lighting power allowance from Tables C405.4.2(2) and C405.4.2(3).

AMOH = after midnight operating hours from Table C409.3.3(1) as determined by Section C409.3.3.3 Item 2.

BMOH = before midnight operating hours from Table C409.3.3(1) as determined by Section C409.3.3.3 Item 2.

Table C409.3.3(1) Interior and Exterior Lighting Annual Operating Hours

Building Type	Annual Interior Building Operating Hours	Before Midnight Operating Hours (BMOH)	After Midnight Operating Hours (AMOH)
Automotive Facility	3,289	0	0
Convention Center	3,357	1,508	
Courthouse	2,938	0	0
Dining: Bar Lounge/Leisure	5,073	2,184	0
Dining: Cafeteria / fast food	5,073	2,184	0
Dining: Family	5,073	2,184	0
Dormitory	2,876	2,196	2,184
Exercise Center	3,357	1,508	0
Fire station	5,439	2,196	2,184
Gymnasium	4,193	780	0
Healthcare Clinic	5,439	2,196	2,184
Hospital	5,439	2,196	2,184
Hotel	3,589	2,196	2,184
Library	3,585	1,300	0
Manufacturing Facility	3,289	0	0
Motel	3,589	2,196	2,184
Motion Picture Theater	3,357	1,508	0
Multiple family	2,876	2,196	2,184

Building Type	Annual Interior Building Operating Hours	Before Midnight Operating Hours (BMOH)	After Midnight Operating Hours (AMOH)
Museum	3,585	1,300	0
Office	2,938	0	0
Parking Garage	6,734	0	0
Penitentiary	3,589	2,196	2,184
Performing Arts Theater	3,357	1,508	0
Police Station	5,439	2,196	2,184
Post Office	2,938	0	0
Religious Building	3,357	1,508	0
Retail	3,585	1.300	0
School / University	4,193	0	0
Sports Arena	3,357	1,508	0
Town Hall	2,938	0	0
Transportation	5,439	2,196	2,184
Warehouse	2,837	0	0
Workshop	3,289	0	0

Table 409.3.3(2) Interior and Exterior Lighting Control Types

Code	Name	Description
Interior Lighting Control Types		
NC	No Control	
MS	Manual Switch	
MD	Manual Dimmer	
VS	Vacancy Sensor	
OS	Occupancy Sensor	
DD	Daylight Dimming	
IT	Institutional Tuning	
Sch	Schedule	
Exterior Lighting Control Types		
NC	No Control	No exterior lighting control
PC	Photocell	Dusk to dawn photocell with full off control
ES	Exterior Occupancy Sensor	
TS_{PWRRED}	Timeswitch - 50% Power Reduction	Timeswitch that reduces fixture power by 50% between the hours of 12AM and 6AM.
TS_{ALLOFF}	Timeswitch - full off	Timeswitch that turns fixtures off between the hours of 12AM and 6AM.
TC	Timeclock	Astronomical time clock

Table C409.3.4(1) Allowable Interior Lighting Control configurations

Lighting Control Code	Weighting Factor by Control Type	Lighting Control Code	Weighting Factor by Control Type
1 Interior Lighting Control			
MS	MS: 100%	DD	DD: 100%
MD	MD: 100%	IT	IT: 100%
VS	VS: 100%	SCH	Sch: 100%
OS	OS: 100%	NC	NC: 0%
Allowable combinations of 2 different Interior Lighting Controls			
MS-VS	MS:0%, VS:100%	VS-IT	VS:83%, IT:100%
MS-DD	MS:100%, DD:95%	VS-SCH	VS:100%, SCH:100%
MS- SCH	MS:100%, Sch:100%	OD-DD	OS:75%, DD:65%
MD-VS	MD:100%, VS:83%	OS-IT	OS:83%, IT:100%
MD-DD	MD:100%, DD:71%	OS-SCH	OS:100%, SCH:100%
MD-IT	MD:80%, IT:100%	DD-IT	DD:78%, IT:100%
MD-SCH	MD:100%, Sch:100%	DD-SCH	DD:100%, SCH:100%
VS-DD	VS:70%, DD:65%	IT-SCH	IT:100%, SCH:100%
Allowable combinations of 3 different Interior Lighting Controls			
MS-VS-DD	MS: 0%, VS: 70%, DD: 65%	MD-DD-SCH	MD: 100%, DD: 71%, SCH: 100%
MS-VS-IT	MS: 0%, VS: 83%, IT: 100%	MD-IT- SCH	MD: 80%, IT: 100%, SCH: 100%
MS-VS- SCH	MS: 0%, VS: 100%, SCH: 100%	VS-DD-IT	VS: 56%, DD: 52%, IT: 100%
MS-DD-IT	MS: 100%, DD: 78%, IT: 100%	VS-DD- SCH	VS: 70%, DD: 65%, SCH: 100%
MS-DD- SCH	MS: 100%, DD: 95%, SCH: 100%	VS-IT- SCH	VS: 83%, IT: 100%, SCH: 100%
MS-IT- SCH	MS: 80%, IT: 100%, SCH: 100%	OS-DD-IT	OS: 65%, DD: 56%, IT: 100%
MD-VS-DD	MD: 80%, VS: 70%, DD: 65%	OS-DD- SCH	OS: 75%, DD: 65%, SCH: 100%
MD-VS-IT	MD: 80%, VS: 63%, IT: 100%	OS-IT- SCH	OS: 83%, IT: 100%, SCH: 100%
MD-VS- SCH	MD: 100%, VS: 83%, SCH: 100%	DD-IT- SCH	DD: 78%, IT: 100%, SCH: 100%
MD-DD-IT	MD: 65%, DD: 55%, IT: 100%		
Allowable combinations of 4 different Interior Lighting Controls			
MS-VS-DD-IT	MS: 0%, VS: 56%, DD: 52%, SCH: 100%		
MS-VS-DD- SCH	MS: 0%, VS: 70%, DD: 65%, SCH: 100%		
MS-VS-IT- SCH	MS: 0%, VS: 83%, IT: 100%, SCH: 100%		
MS-DD-IT- SCH	MS: 100%, DD: 78%, IT: 100%, SCH: 100%		
MD-VS-DD-IT	MD: 68%, VS: 59%, DD: 55%, IT: 100%		
MD-VS-DD- SCH	MD: 80%, VS: 70%, DD: 65%, SCH: 100%		
MD-DD-IT- SCH	DD: 65%, DD: 55%, IT: 100%, SCH: 100%		
VS-DD-IT- SCH	VS: 56%, DD: 52%, IT: 100%, SCH: 100%		
OS-DD-IT- SCH	OS: 65%OS, DD: 56%, IT: 100%, SCH: 100%		
Allowable combinations of 5 different Interior Lighting Controls			
MS-VS-DD-IT- SCH	MS: 0%, VS: 56%, DD: 52%, IT: 100%, SCH: 100%		
MD-VS-DD-IT- SCH	MD: 68%, VS: 59% DD: 55%, IT: 100%, SCH: 100%		

Table C409.3.4(2) Lighting Controls Savings Value by Lighting Control Type and Space Type

Common *Space* Types	MS	MD	VS	OS	DD	IT	SCH
	Lighting Control Savings Values						
Atrium	-	-	-	-	-	-	-
Atrium: <0 ft in height	2%	20%	24%	24%	28%	20%	0%
Atrium: >40 ft in height	2%	20%	24%	24%	28%	20%	0%
Audience Seating Area							
Auditorium	50%	50%	6%	6%	28%	20%	0%
Gymnasium	50%	50%	6%	6%	28%	20%	0%
Motion picture theater	50%	50%	6%	6%	28%	20%	0%
Penitentiary	50%	50%	6%	6%	28%	20%	0%
Performing arts theater	50%	50%	6%	6%	28%	20%	0%
Religious facility	50%	50%	6%	6%	28%	20%	0%
Sports arena	50%	50%	6%	6%	28%	20%	0%
Otherwise	50%	50%	6%	6%	28%	20%	0%
Banking Activity Area	10%	20%	34%	24%	28%	20%	0%
Breakroom (See Lounge/Breakroom)							
Classroom/Lecture Hall/Training Room							
Penitentiary	5%	20%	29%	24%	28%	20%	0%
Otherwise	5%	20%	29%	24%	28%	20%	0%
Computer room, data center	XX%	XX%	XX%	XX%	XX%	XX%	XX%
Conference/Meeting/ Multipurpose Room	20%	20%	50%	40%	28%	20%	0%
Confinement Cells	10%	20%	0%	0%	28%	20%	0%
Copy/Print Room	5%	20%	29%	24%	28%	20%	0%
Corridor							
Facility for the visually impaired (and not used primarily by the staff)[1]	0%	20%	30%	30%	28%	20%	0%
Hospital	0%	20%	30%	30%	28%	20%	0%
Otherwise	0%	20%	40%	40%	28%	20%	0%
Courtroom	0%	20%	24%	24%	28%	20%	0%
Computer Room	0%	20%	24%	24%	28%	20%	0%
Dining Area							
In bar/lounge or leisure dining	0%	20%	6%	6%	28%	20%	0%
In ccafeteria or fast food dining	0%	20%	6%	6%	28%	20%	0%
In facility for the visually impaired (and not used primarily by the staff)[1]	0%	20%	6%	6%	28%	20%	0%
In Family dining	0%	20%	6%	6%	28%	20%	0%
In ppenitentiary	0%	20%	6%	6%	28%	20%	0%
Otherwise	0%	20%	6%	6%	28%	20%	0%
Electrical/Mechanical Room	50%	20%	49%	40%	28%	20%	0%
Emergency Vehicle Garage	5%	20%	29%	24%	28%	20%	0%

Common *Space* Types	**MS**	**MD**	**VS**	**OS**	**DD**	**IT**	**SCH**
	Lighting Control Savings Values						
Food Preparation Area	0%	20%	24%	24%	28%	20%	0%
Guest Room	See Section C405.1.1.						
Laboratory							
In or as a classroom	0%	20%	24%	24%	28%	20%	0%
Otherwise	0%	20%	24%	24%	28%	20%	0%
Laundry/Washing Area	0%	20%	24%	24%	28%	20%	0%
Loading Dock, Interior	0%	20%	24%	24%	28%	20%	0%
Lobby							
For an eelevator	0%	20%	24%	24%	28%	20%	0%
In a facility for the visually impaired (and not used primarily by the staff)[1]	0%	20%	24%	24%	28%	20%	0%
In a hotel	0%	20%	24%	24%	28%	20%	0%
In a mootion picture theater	0%	20%	24%	24%	28%	20%	0%
In a performing arts theater	0%	20%	24%	24%	28%	20%	0%
Otherwise	0%	20%	24%	24%	28%	20%	0%
Locker Room	5%	20%	29%	24%	28%	20%	0%
Lounge/Breakroom							
In a healthcare facility	0%	20%	24%	24%	28%	20%	0%
Otherwise	0%	20%	24%	24%	28%	20%	0%
Office							
Enclosed	5%	20%	29%	24%	28%	20%	0%
Open	0%	20%	24%	24%	28%	20%	0%
Parking Area, Interior	0%	20%	0%	50%	28%	20%	0%
Pharmacy Area	0%	20%	24%	24%	28%	20%	0%
Restroom							
In a facility for the visually impaired (and not used primarily by the staff)[1]	0%	20%	73%	73%	28%	20%	0%
Otherwise	0%	20%	73%	73%	28%	20%	0%
Sales Area	0%	20%	24%	24%	28%	20%	0%
Seating Area, General	50%	20%	6%	6%	28%	20%	0%
Stairwell	0%	20%	30%	30%	28%	20%	0%
Storage Room	40%	20%	52%	24%	28%	20%	0%
Vehicular Maintenance Area	0%	20%	24%	24%	28%	20%	0%
Workshop	0%	20%	24%	24%	28%	20%	0%
Automotive (See “Vehicular Maintenance Area”)							
Convention Center—Exhibit *Space*	0%	20%	24%	24%	28%	20%	0%
Dormitory—Living Quarters	80%	20%	80%	24%	28%	20%	0%
Facility for the visually impaired[1]	-	-	-	-	-	-	-
Recreation room/common living room (and not used primarily by staff)	0%	20%	24%	24%	28%	20%	0%
-	-	-	-	-	-	-	-

Common *Space* Types	**MS**	**MD**	**VS**	**OS**	**DD**	**IT**	**SCH**
	Lighting Control Savings Values						
Fire Station—Sleeping Quarters	80%	20%	80%	24%	28%	20%	0%
Gymnasium/Fitness Center							
In an exercise area	0%	20%	24%	24%	28%	20%	0%
In a laying area	0%	20%	24%	24%	28%	20%	0%
Healthcare Facility							
Exam/treatment room	2%	20%	24%	24%	28%	20%	0%
Imaging room	2%	20%	24%	24%	28%	20%	0%
Medical supply room	10%	20%	34%	24%	28%	20%	0%
Nursery	2%	20%	24%	24%	28%	20%	0%
Nurse's station	2%	20%	24%	24%	28%	20%	0%
Operating room	2%	20%	24%	24%	28%	20%	0%
Patient room	2%	20%	24%	24%	28%	20%	0%
Physical therapy room	2%	20%	24%	24%	28%	20%	0%
Recovery room	2%	20%	24%	24%	28%	20%	0%
Library							
Reading area	0%	20%	24%	24%	28%	20%	0%
Stacks	0%	20%	24%	24%	28%	20%	0%
Manufacturing Facility							
Detailed manufacturing area	0%	20%	24%	24%	28%	20%	0%
Equipment room	0%	20%	24%	24%	28%	20%	0%
Extra high bay area	-	-	-	-	-	-	-
(>50 ft *floor*-to-ceiling height)	0%	20%	24%	24%	28%	20%	0%
High bay area	-	-	-	-	-	-	-
(>25 to 50 ft *floor*-to-ceiling height)	0%	20%	24%	24%	28%	20%	0%
Low bay area	-	-	-	-	-	-	-
(<25 ft *floor*-to-ceiling height)	0%	20%	24%	24%	28%	20%	0%
Museum							
General exhibition area	0%	20%	24%	24%	28%	20%	0%
Restoration room	0%	20%	24%	24%	28%	20%	0%
Performing Arts Theater—Dressing Room	10%	20%	34%	24%	28%	20%	0%
Post Office—Sorting Area	0%	20%	24%	24%	28%	20%	0%
Religious Facility							
Fellowship hall	10%	20%	24%	24%	28%	20%	0%
Worship/pulpit/choir area	20%	20%	24%	24%	28%	20%	0%
Retail Facilities							
Dressing/fitting room	0%	20%	24%	24%	28%	20%	0%
Mall concourse	0%	20%	0%	24%	28%	20%	0%
Sports Arena—Playing Area[2]							

Common *Space* Types	MS	MD	VS	OS	DD	IT	SCH
	Lighting Control Savings Values						
Class I facility	20%	20%	0%	0%	28%	20%	0%
Class II facility	20%	20%	0%	0%	28%	20%	0%
Class III facility	20%	20%	0%	0%	28%	20%	0%
Class IV facility	20%	20%	0%	0%	28%	20%	0%
Transportation Facility							
Baggage/carousel area	0%	20%	24%	24%	28%	20%	0%
Airport concourse	0%	20%	24%	24%	28%	20%	0%
Ticket counter	0%	20%	24%	24%	28%	20%	0%
Warehouse—Storage Area							
Medium to bulky, palletized items	0%	20%	24%	24%	28%	20%	0%
Smaller, hand-carried items[3]	0%	20%	24%	24%	28%	20%	0%

Table C409.3.4(3) Allowable Exterior Lighting Control configurations and Control Savings Factors

Exterior Lighting Control Codes	Exterior Lighting Control Savings Factors	Exterior Lighting Control Codes	Exterior Lighting Control Savings Factors
Single Exterior Lighting Control			
NC	0%	TS_{PWRRED}	12%
PC	50%	TS_{ALLOFF}	25%
		TC	50%
Allowable combinations of multiple exterior lighting controls			
PC-ES	75%	TC-ES	75%
PC-TS_{PWRRED}	62%	TC-TS_{PWRRED}	62%
PC-TS_{ALLOFF}	75%	TC-TS_{ALLOFF}	75%
PC-ES-TS_{PWRRED}	80%	ES-TS_{PWRRED}	56%
PC-ES-TS_{ALLOFF}	85%	ES-TS_{ALLOFF}	62%

Table C409.3.1(1) Reference Lighting Control Strategies for Building Interiors

Common *Space* Types	LPD	CFNDL	CFDL	Common *Space* Types	LPD	CFNDL	CFDL
Atrium				Sales Area	1.05	0%	28%
<20 ft in height	0.48	2%	30%	Seating Area, General	0.23	0%	28%
>40 ft in height	0.60	2%	30%	Storage Room	0.51	40%	40%
Audience Seating Area							
In an auditorium	0.61	50%	64%				
In a gymnasium	0.23	50%	64%	Vehicular Maintenance Area	0.60	0%	28%
In a motion picture theater	0.27	50%	50%	Workshop	1.26	0%	28%
In a penitentiary	0.67	50%	64%	Automotive (See “Vehicular Maintenance Area”)	0.60	0%	28%

Common *Space* Types	LPD	CFNDL	CFDL	Common *Space* Types	LPD	CFNDL	CFDL
In a performing arts theater	1.16	50%	50%	Convention Center—Exhibit *Space*	0.61	0%	28%
In a religious building	0.72	50%	64%	Dormitory—Living Quarters	0.50	80%	80%
In a sports arena	0.33	50%	64%	Facility for the visually impaired			
Otherwise	0.23	50%	64%	In a chapel (and not used primarily by the staff)	0.70	0%	28%
Banking Activity Area	0.61	10%	38%	In a recreation room (and not used primarily by the staff)	1.77	0%	28%
Breakroom (See Lounge/Breakroom)				Fire Station—Sleeping Quarters	0.23	80%	80%
Classroom/Lecture Hall/Training Room				Gymnasium/Fitness Center			
In a penitentiary	0.89	29%	43%	In an exercise area	0.90	0%	28%
Otherwise	0.71	29%	43%	In a playing area	0.85	0%	28%
Computer Room, data center	0.94	29%	43%	Healthcare Facility			
Conference/Meeting/ Multipurpose Room	0.97	30%	44%	In an exam/treatment room	1.40	2%	30%
Confinement Cells	0.70	10%	10%	In an imaging room	0.94	2%	2%
Copy/Print Room	0.31	29%	43%	In a medical supply room	0.51	40%	40%
Corridor				43%	0.92	2%	30%
In a facility for the visually impaired (and not used primarily by the staff)[1]	0.71	20%	34%	In a nurse's station	1.17	2%	30%
In a hospital	0.71	0%	28%	In an operating room	2.26	2%	2%
Otherwise	0.41	20%	34%	In a patient room	0.68	2%	30%
Courtroom	1.20	0%	28%	In a physical therapy room	0.91	2%	30%
Dining Area				In a recovery room	1.25	2%	30%
In a bar /lounge or leisure dining	0.86	10%	38%				
In a cafeteria or fast food dining	0.40	0%	28%	Library			
In a facility for the visually impaired (and not used primarily by the staff)[1]	1.27	0%	28%	In a reading area	0.96	0%	28%
In a family dining	0.60	0%	28%	In the stacks	1.18	12%	34%
In a penitentiary	0.42	0%	28%	Manufacturing Facility			
Otherwise	0.43	0%	28%	In a detailed manufacturing area			
					0.80	0%	28%
				In an equipment room	0.76	50%	64%
				In an extra high bay area	1.42	0%	28%
				(>50 ft *floor*-to-ceiling height)			
				In a high bay area			
				(>25 to 50 ft *floor*-to-ceiling height)		0%	28%

Common *Space* Types	LPD	CFNDL	CFDL	Common *Space* Types	LPD	CFNDL	CFDL
					1.24		
				In a low bay area	0.86	0%	28%
				(<25 ft *floor*-to-ceiling height)			
Electrical/Mechanical Room	0.43	50%	50%	Museum			
Emergency Vehicle Garage	0.52	5%	33%	In a general exhibition area	0.31	0%	28%
Food Preparation Area	1.09	0%	28%	In a restoration room	1.10	0%	28%
Guest Room	0.41	0.41			0.41	10%	33%
Laboratory				Post Office—Sorting Area	0.76	12%	32%
In or as a classroom	1.11	12%	34%	Religious Facility			
All other laboratories	1.33	0%	28%	In a fellowship hall	0.54	10%	33%
Laundry/Washing Area	0.53	0%	28%	In a worship/pulpit/choir area	0.85	20%	38%
Loading Dock, Interior	0.88	0%	28%	Retail Facilities			
				In a dressing /fitting room	0.51	24%	24%
Lobby				In a mall concourse	0.82	0%	28%
Facility for the visually impaired (and not used primarily by the staff)[1]	1.69	12%	26%	Sports Arena—Playing Area[2]			
Elevator	0.65	0%	28%	Class I facility	2.94	0%	28%
Hotel	0.51	0%	28%	Class II facility	2.01	0%	28%
Motion picture theater	0.23	0%	28%	Class III facility	1.30	0%	28%
Performing arts theater	1.25	12%	32%	Class IV facility	0.86	0%	28%
All other lobbies	0.84	12%	32%	Natatorium[2]			
Locker Room	0.52	24%	24%	Class I facility	2.94	0%	28%
Lounge/Breakroom				Class II facility	2.01	0%	28%
Healthcare facility	0.42	24%	38%	Class III facility	1.30	0%	28%
All other lounges/breakrooms	0.59	24%	38%	Class IV facility	0.86	0%	28%
Office				Transportation Facility			
Enclosed and ≤250 ft^2	0.74	29%	43%	At a terminal ticket counter	0.51	0%	28%
Enclosed and >250 ft^2	0.66	5%	33%	In a baggage/carousel area	0.39	0%	28%
Open plan	0.61	5%	33%	In an airport concourse	0.25	0%	28%
Parking Area, Interior	0.15	40%	58%	Warehouse—Storage Area			
Pharmacy Area	1.66	0%	0%	Medium to bulky, palletized items	0.33	12%	34%
Restroom				Smaller, hand-carried items[3]	0.69	12%	34%
Facility for the visually impaired (and not used primarily by the staff)[1]	1.26	73%	73%				
All other restrooms	0.63	73%	73%				

Table C409.3.5.2(2) Reference Lighting Control Strategies for Building Exteriors

Lighting Power Allowances for Building Exteriors	Exterior Lighting Control Strategy	Non-Tradeable Exterior Surfaces	Exterior Lighting Control Strategy
Base Site Allowance	A	Building façade (area)	B
Parking areas and drives	C	ATM and night depository	A
Walkways and ramps <10’ wide	C	Additional ATM	A
Walkways and ramps >10’ or greater, plaza areas, special features areas	C	Uncovered entrances and gatehouse inspection stations at guarded facilities	A
Dining Areas	C	Uncovered loading areas for law enforcement, fire, and other emergency	C
Stairways	A	Drive-through windows / doors	C
Pedestrian Tunnels	A	Parking near 24-hour retail entrance	A
Landscaping	B		
Pedestrian and Vehicle Entrance / Exit	C		
Entry Canopies	C		
Loading Docks	C		
Free-Standing and attached Sales Canopy	C		
Open Area Sales	C		
Street Frontage	C		

Reason:
This represents an alternate compliance path to the prescriptive requirements in the IECC for lighting controls and lighting power. Currently lighting fixtures and controls are treated independently but Lighting System Performance takes their interdependence into account and allows a designer to establish trade-offs between lighting power and the benefits of lighting controls. The proposal develops a reference design based on meeting the prescriptive compliance requirements. The reference design calculates the energy use of the system (reference lighting design power x operating hours x controls factor = reference energy [kWh]). If the proposed design annual lighting energy consumption is equal to or less than the annual lighting consumption of the reference design, the project meets this compliance path. This option provides more flexibility for practitioners. ANSI/ASHRAE/IES Standard 90.1 and some municipalities are considering this alternate compliance path.

Cost Impact:

The code change proposal will neither increase nor decrease the cost of construction.

This is an alternate compliance path and therefore has no direct impact on the cost of construction. The Reference Design case used as the basis of comparison for a Proposed Design is compliant with all mandatory and prescriptive lighting system criteria in the 2021 IECC. Participating projects would have to demonstrate their project used the same amount or less energy than a design meeting prescriptive requirement. This option allows for practitioner flexibility by allowing them to balance the benefits of [lighting controls against the benefits of low power lighting fixtures.