How-to Guide: Supporting Documentation

In Compliance with
2020 New York City Energy Conservation Code

- GENERAL
- BUILDING ENVELOPE
- MECHANICAL SYSTEMS
- LIGHTING & ELECTRICAL POWER
- OTHER REQUIREMENTS

NOTE: In this How-To Guide: Supporting Documentation, selected Energy Code provisions have been generalized, summarized, rephrased, and/or highlighted. This guide is intended: 1) To provide general guidance for the job applications seeking compliance with the 2020 NYCECC; 2) Not to replace or represent the entire 2020 NYCECC and related regulations of the City of New York and the Department of Buildings; and 3) Not to provide complete compliance solutions for any particular type of job or work. Comprehensive mandates, applicability, exemptions, exceptions and options will be found in the 2020 NYCECC and related regulations of the City of New York and the Department of Buildings.
**INTERIOR LIGHTING POWER**

- **Maximum Allowed Interior Lighting Power**
  - Light fixture layout plans and light fixture schedules must demonstrate that the proposed interior lighting power density (watts/sf) is not greater than the maximum allowed interior lighting power density.
  - Light fixture schedules must be complete with the fixture identification key, lamp/fixture type, number of lamps per fixture, fixture wattage, lamp/fixture efficacy (in lumens/watt), and quantities that match the light fixture layout plans.
  - Light fixture schedules must support the lighting energy analysis report: e.g., Lamps/Fixture, # of Fixtures, and Fixture Wattage listed in Lighting COMcheck report on EN-drawings and must match those values in light fixture schedules on RCP drawings. Refer to the page [GE-3].
  - Fixture efficacy values (lumens/watt), and/or fixtures' low-voltage information, when pertaining to exemption of certain lighting power/controls requirements, must also be listed in the light fixture schedules.

- **Allowance Calculation Method**
  - The maximum allowed interior Lighting Power Density (LPD) must be determined by *either* the Building Area Method, or the Space-by-Space Method. These may not be used in combination.
  - The selection of one method between the two, by which the allowed LPD of the job application is determined, must be justified by the building/space programs and work scope of the job application.

- **Building Area Method**

  **Interior Lighting Power Allowance** = The *floor area of each Building area type* x the LPD value for the *Building area type* from Table C405.3.2(1), or Table 9.5.1

  - For the purposes of this method, an ‘area’ is defined as all contiguous spaces that accommodate or are associated with a single building area type, as listed in Table C405.3.2(1).

<table>
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<tr>
<th>Fixture ID</th>
<th>LOCATION</th>
<th>MANUFACTURER/ MODEL</th>
<th>LAMP TYPE</th>
<th># OF LAMPS/FIXTURE</th>
<th>FIXTURE WATTAGE (Watt)</th>
<th>LAMP EFFICACY (Lumens/Watt)</th>
<th>FIXTURE EFFICACY (Lumens/Watt)</th>
<th>TOTAL # OF FIXTURES</th>
<th>NOTES</th>
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<td>Compact FL</td>
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<td>28</td>
<td>91</td>
<td>--</td>
<td>18</td>
<td>14W T5 (2)</td>
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</table>

*Figure LE-1. Sample Lighting Fixture Schedule for Residential Building*
**INTERIOR LIGHTING POWER**

- **Space-by-Space Method**
  
  Interior Lighting Power Allowance = Sum of (the floor area of each Space type x the LPD value for the Space type from Table C405.3.2(2), or Table 9.6.1)

  - The space type in the Table that most closely represents the proposed use of each space must be selected so that all spaces in the work scope are accounted for in the calculation.
  
  - Trade-offs among spaces are permitted in this method.

- **High-Efficacy Lamps or Luminaires**

  - For Residential buildings, also for Dwelling units within Commercial buildings, a minimum of 90% of the permanently installed lighting fixtures must have:
    
    a) Lamp efficacy ≥ 65 lumens/watt, or
    
    b) Luminaire efficacy ≥ 45 lumens/watt

  - To validate the above, light fixture schedules must clearly identify lamp/luminaire efficacy of each light fixture, and also lamp/luminaire counts of all lighting fixtures. See Figure LE-1 on the page [LE-1].

![High-Efficacy Lamp examples](basc.pnnl.gov)

*Figure LE-2. High-Efficacy Lamp examples*

*Source: basc.pnnl.gov*
**Occasional Sensor Controls***

- **Where Required**
  - Occupant sensor controls are required in spaces including: classrooms, conference rooms, copy rooms, lounges/ break rooms, enclosed offices, open plan offices, restrooms, storage rooms, locker rooms, warehouse storage areas, janitor closets, corridors/transition areas, cafeteria/fast food dining areas, egress illumination (stairways, exit access), and other spaces \( \leq 300 \text{ sf} \).
  - Light fixture layout plans, fixture schedules, and the controls narrative must clearly identify the location of occupant-sensor-controlled light fixtures and the connected sensor/control devices.

- **Occupant Sensor (OS) Control Function** (NOT for Open Plan Offices, Cafeteria and Fast Food Dining Areas \( \geq 300 \text{ sf} \))
  
  - **Automatic-Off**: Drawings must specify that occupant sensor controlled luminaires are *automatically turned off within 15 minutes* of all occupants leaving the space.
  
  - **Manual-On or Maximum 50% Automatic-On**: Lights turned off by occupant sensor controls must be either manually on, or controlled to be *automatically on maximum 50%* of the lighting power in the space.
  
  - **Manual-On ONLY**: Lights turned off by occupant sensor controls must be only manually on – i.e., max. 50% automatic-on is not allowed – in the following spaces: classrooms, conference/meeting rooms, employee break rooms, and offices < 200 sf. The sensors and controls in these spaces must not have an override switch that converts from manual-on to automatic-on functionality.
  
  - **Full Automatic-On**: Only in the following spaces, occupant sensors with full automatic-on are allowed: open plan offices, public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the building occupants.
  
  - **Manual Control to Turn Off**: Occupant-sensor-controlled luminaires must also be equipped with manual controls that allow occupants to turn lights off.

- **OS Controls in Open Plan Offices, Cafeteria and Fast Food Dining Areas \( \geq 300 \text{ sf} \)**
  
  - The maximum control zone area controlled by one (1) occupant sensing device is 600 sf.
  
  - A minimum of 80% of all lighting must be automatically turned off within 15 minutes of all occupants leaving the space.
  
  - Daylight responsive control shall not activate general lighting controls when no occupancy is detected in these spaces.
  

- **OS Controls for Egress Illumination**
  
  - Luminaires servicing Exit access and providing Means of Egress illumination must have controls that automatically reduce the lighting power by 50% when unoccupied for more than 15 minutes.
  
  - OS with Full Automatic-On of the lighting are allowed
  
  - Means of Egress illumination of < 0.02 watt/sf and the Building-Code-designated Emergency lighting are exempt from this requirement.

*For complete controls requirements on ASHRAE 90.1 per space type, refer to Section 9.4.1 and Table 9.6.1.*
**TIME-SWITCH & LIGHT-REDUCTION CONTROLS**

- **Where Required**
  - Spaces where “Occupant Sensor Control Function” in page [LE-3] are not provided, and
  - Open Plan Offices, Cafeteria and Fast Food Dining Areas ≥ 300 sf

Both Time-switch controls and Light-reduction controls must be provided. The controls’ function and locations must be clearly specified on drawings.

- **Time-Switch Controls** (Programmed)
  Time-switch controls must be designed to:
  1) Have a minimum 7-day clock,
  2) Allow to program 7-different day types/week,
  3) Have an automatic holiday ‘shutoff’ feature,
  4) Have program backup capabilities in case of power interruption, and
  5) Include a manually-controlled override switch that, when initiated, permits the controlled lighting to remain on for a maximum of 2 hours, and that individually controls a maximum area of 5,000 sf.

- **Light-Reduction Controls** (Manual)
  - Spaces with time-switch controls must also be provided with manual light-reduction controls that allow the occupant to reduce the connected lighting load by minimum 50%.
  - Light fixture layout plans must clearly indicate the light-reduction control method, the options of which are as follows:
    1) Control of all lamps/luminaires
    2) Dual switching of alternate rows of luminaires
    3) Switching middle lamp luminaires independently
    4) Switching each lamp/luminaire

*For complete controls requirements on ASHRAE 90.1 per space type, refer to Section 9.4.1 and Table 9.6.1.*
**TIME-SWITCH & LIGHT-REDUCTION CONTROLS**

### Where Time-Switch Controls are Exempt

If the spaces listed below are provided with *manual lighting-reduction controls*, time-switch controls are *not* required:

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

### Where Light-Reduction Controls are Exempt

Light reduction controls are *not* required in *daylight zones with daylight responsive controls* complying with Section C405.2.3.

*For complete controls requirements on ASHRAE 90.1 per space type, refer to Section 9.4.1 and Table 9.6.1.*
**DAYLIGHT-RESPONSIVE CONTROLS**

### Control Function
- For spaces having electric lights > 100 watts within daylight zones, independent controls for the lights within daylight zones must be specified.
- For this purpose, light fixture layout plans must clearly *delineate the boundary of each daylight zone*, and indicate separate circuiting and switch control for each zone boundary.
- Daylight-responsive controls must be designed to be capable of a complete shutoff of lights within each daylight zone, and must be installed such that authorized professionals can readily access the controls for calibration.

### Sidelit Zone
- The sidelit zone must be identified on drawings in the floor area *adjacent to vertical fenestration*.
- When the fenestration is located in a wall, the sidelit zone extends:
  - (a) Laterally to the nearest full-height wall, or up to 1-times the height from the floor to the top of the fenestration, and
  - (b) Longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 ft, whichever is less.
- For the criteria of the sidelit zone following ASHRAE, refer to the definition of ‘daylight area’ in ASHRAE Section 3.2.

*For complete controls requirements on ASHRAE 90.1, refer to Section 9.4.1 and Table 9.6.1.

*For the Sidelit Zones defined by ASHRAE, i.e., Primary Sidelighted Area and Secondary Sidelighted Area, refer to Figure 3.2-3 and Figure 3.2-4.*
**Daylight-Responsive Controls***

- **Toplit Zone**
  - The toplit zone must be identified on drawings in the floor area *underneath a roof fenestration assembly*.
  - The toplit zone extends laterally and longitudinally beyond the edge of the roof fenestration assembly:
    (a) To the nearest obstruction that is taller than 0.7-times the ceiling height, or
    (b) Up to 0.7-times the ceiling height, whichever is less.
  - For the criteria of the toplit zone following ASHRAE, refer to the definition of ‘daylight area’ in ASHRAE Section 3.2.

*For complete controls requirements on ASHRAE 90.1, refer to Section 9.4.1 and Table 9.6.1.*

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![Diagram of Toplit Zone](image)

(a) Section view
(b) Plan view of daylight zone under a roof fenestration assembly

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*For the Daylight Zones under Rooftop Monitors following ECC, refer to Figure C405.2.3.3(2) and Figure C405.2.3.3(3).*

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*For the Toplit Zones defined by ASHRAE, i.e., Daylight area under Roof monitors and Daylight area under Skylight, refer to Figure 3.2-1 and Figure 3.2-2.*
**EXTERIOR LIGHTING POWER**

- **Maximum Allowed Exterior Lighting Power**
  - Light fixture layout plans and light fixture schedules must demonstrate:
    - Proposed exterior lighting power density (watts/sf) ≤ Maximum allowed exterior lighting power density
  - Light fixture schedules must be complete with fixture identification keys, fixture/lamp type, number of lamps per fixture, and fixture wattages and quantities that match the light fixture layout plans.

- **Calculation of Maximum Allowance**
  - The maximum allowed building exterior lighting power must be computed based on Table C405.4.2(2) or Table 9.4.2-2 for the applicable Exterior Lighting Zone per 1 RCNY §5000-01(g)(3)(ii).

\[
\text{Maximum Allowed Exterior Lighting Power} = \text{Base Site Allowance (per Lighting Zone)} + \text{Individual Allowance per Area Type ( Tradable/Non-Tradable Surfaces)}
\]

- Trade-offs are allowed only among exterior lighting applications in the Tradable Surfaces of Table C405.4.2(2), or Table 9.4.2-2.

**Exterior Lighting Zone**

- Lighting Zone 1: Park land
- Lighting Zone 2: All R districts, R districts with C overlays and MX districts
- Lighting Zone 3: M districts, except MX; C districts, except C5, C6 and C overlays on R districts
- Lighting Zone 4: C5 and C6 districts

**Figure LE-8. Exterior Lighting Zone per 1 RCNY §5000-01 (g)(3)(ii)**

Source: energycodes.gov

- **Exterior Lighting Controls**
  - (a) Daylight shutoff: Lights automatically turned off when daylight satisfies the lighting needs
  - (b) Decorative lighting shutoff: Building façade and landscape lighting automatically shut off within 1 hour of business closing and until 1 hour or less prior to business opening
  - (c) Lighting setback: For lighting not controlled per the (b) above, controls to automatically reduce the lighting by minimum 50% during 12am - 6am, or from 1-hour after the business closing to 1-hour before opening, or when no activity detected for 15 minutes
  - (d) Exterior time-switch control function: Controls with 7-different-day-type-programmable clock and automatic holiday setback
  - (e) Outdoor parking area lighting control: Luminaires of wattage > 78 W and mounted at 24’ or less above the ground controlled to automatically reduce the power by minimum 50% when no activity detected for 15 minutes

See 9.4.1.2, & 9.4.1.4 for ASHRAE
**Other Lighting Requirements**

- **Narrative on Lighting System and Controls**
  On drawings where light fixture layout plans and schedules are documented, a narrative must be provided to describe the function and operation of mandatory lighting and power controls.

- **Lighting System Functional Testing**
  Drawings must specify the requirements that:
  - The approved agency must certify that the installed lighting control systems including occupant sensor controls, time-switch controls, and daylight-responsive controls have been tested and perform as intended.
  - Documents certifying the installed lighting controls meet documented performance criteria of Section C405 must be provided to the building owner within 90 days of the receipt of the certificate of occupancy.

- **Hotel Guestrooms**
  For hotel and motel guestrooms (sleeping units or guest suites), drawings must specify a master control device that is capable of automatically switching off all installed luminaires and switched receptacles within 20 minutes of all occupants leaving the guestroom.

- **Display and Accent Lighting**
  Display lights, accent lights, and lighting in display cases must be controlled by a dedicated control that is independent of the controls for other lighting within the room or space. Controls’ locations must be clearly noted on the light fixture layout plans.

- **Parking Garage**
  Parking garage lighting must be designed so that:
  1) Lighting is automatically shut off during periods when the space is scheduled to be unoccupied.
  2) Luminaire lighting power is automatically reduced by minimum 30% within 15 minutes of no activity detected in each lighting zone of maximum 3,600 sf.
  3) Luminaires for covered garage entrances and exits are separately controlled so the lighting power is automatically reduced by minimum 50% from sunset to sunrise.
  4) The power to luminaires within 20 ft of perimeter walls with opening-to-wall ratio ≥ 40% and no exterior obstructions within 20 ft is reduced in responsive to daylight by minimum 50%.

- **Exit Signs**
  Light fixture schedules must indicate that the wattage of exit signs (internally illuminated type signs) is maximum 5 watts per side.
**ELECTRICAL POWER REQUIREMENTS**

- **Voltage Drop**
  The total voltage drop across the feeder conductors and branch circuits combined must not exceed 5%, unless the feeder conductors and branch circuits are dedicated to emergency services.  
  
- **Automatic Receptacle Control**
  Drawings must specify that:
  - Minimum 50% of receptacles in spaces including private offices, conference rooms, and classrooms, etc., and
  - Minimum 25% of branch circuit feeders in modular furniture are automatically controlled:
    a) On a scheduled basis, or
    b) By occupant sensors, or
    c) By an automated signal from another control or alarm system.

- **Separate Metering for Dwelling Units and Large Tenant Spaces**
  Drawings must indicate that:
  - Each dwelling unit in a Group R-2 building must be provided with a separate electrical meter.
  - Each covered tenant space in a new building must be provided with a separate meter or sub-meter to measure the electrical consumption of each space. Refer to Section 28-311.2 of the Administrative Code of the City of New York for definitions.
  - Locations of electrical meters must be shown on plan drawings.

- **Electrical Energy Monitoring for Whole Building**
  (1) New buildings \( \geq 25,000 \) sf, or new Group R buildings with common area \( \geq 10,000 \) sf, must have measurement devices capable of recording electrical energy use every 60 minutes (every 15 minutes for ASHRAE) and the capability to report that use on an hourly, daily, monthly and annual basis.

  (2) New buildings and tenants of new buildings must have measurement devices capable of monitoring electrical energy use separately for:
    a) Total electrical energy,
    b) HVAC systems,
    c) Interior lighting,
    d) Exterior lighting, and
    e) Receptacle circuits. [Note (2) is for ASHRAE only.]

- **Supplied Energy Monitoring for Whole Building**
  - For new buildings \( \geq 25,000 \) sf, or new Group R buildings with common area \( \geq 10,000 \) sf, measurement devices must be installed to individually monitor energy use of the following types of energy supplied by provider/plant outside the building:
    a) Natural gas
    b) Fuel oil
    c) Propane
    d) Steam
    e) Chiller water
    f) Hot water
### Electrical Power Requirements

#### Elevator Cabs
Drawings must specify that:
- **Lighting efficacy**: For each elevator cab’s interior lighting, total lumens divided by total watts must be $\geq 35$ lumens/watt.
- **Ventilation fan power**: Ventilation fans in elevator cabs without their own air-conditioning system must not consume power $> 0.33$ watts/cfm.
- **Controls to de-energize**: When stopped and unoccupied with doors closed for over 15 minutes, cab interior lighting and ventilation systems must be automatically controlled to be de-energized.

#### Traction Elevator Power Conversion System
New traction elevators with a rise $\geq 75'$ in new buildings must have a power conversion system with the following:
- **Induction Motors**: with a Class IE2 efficiency rating, or approved alternative technologies
- **Transmissions**: not reducing the efficiency of the combined motor/transmission below that shown for the Class IE2 motor for elevators with capacities below 4,000 lbs.
- **Regenerative Drive**: recovering potential energy released during motion and supplying it to the building electrical system

#### Escalators and Moving Walks
- **Automatic speed reduction**: Drawings must specify that escalators and moving walks have controls to automatically reduce speed when not conveying passengers.
- **Regenerative Drive**: An escalator designed either for one-way down operation only or for reversible operation must have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when the escalator is loaded with passengers whose combined weight $> 750$ lbs. See Figure below.

#### Commercial Kitchen
Commercial kitchen equipment must comply with the minimum efficiency requirements of the Tables listed in the section (at right).