



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. C405.3
9.2.2.3
- 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. 1 RCNY §5000-01(g)(3)
- 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]. R404.1
C405.1
9.1.1
- 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. C405.3.2
9.2.2
- 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 C405.3.2.1
9.2.2.1

- 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).

LIGHTING FIXTURE SCHEDULE									
Fixture ID	LOCATION	MANUFACTURER/ MODEL	LAMP TYPE	# OF LAMPS/ FIXTURE	FIXTURE WATTAGE (Watt)	LAMP EFFICACY (Lumens/Watt)	FIXTURE EFFICACY (Lumens/Watt)	TOTAL # OF FIXTURES	NOTES
A1	Apt Foyer	QWERT/ Model-number-LE-1234-5678	LED	1	26	98	---	82	2700K
A2	Apt Bathroom	WERTY/ Model-number-LE-2345-6789	LED	1	35	92	---	126	3000K
C1	Lobby	ERTYU/ Model-number-LE-3456-7890	LED	1	53	---	83	25	6'
C2	Corridor	RTYUI/ Model-number-LE-4567-8901	LED	1	20	---	87	56	4'
B1	Storage	TYUIO/ Model-number-CFL-5678-9012	Compact FL	2	28	91	---	18	14W T5 (2)

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)

C405.3.2.2
9.2.2.2

- 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].

R404.1
C405.1
9.4.4



Figure LE-2. **High-Efficacy Lamp examples**
Source: basc.pnnl.gov

OCCUPANT 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 ≤ 300 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.

C405.2.1
Table 9.6.1

Occupant Sensor (OS) Control Function (NOT for Open Plan Offices, Cafeteria and Fast Food Dining Areas ≥ 300 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.

C405.2.1.1
9.4.1.1.b
9.4.1.1.c

OS Controls in Open Plan Offices, Cafeteria and Fast Food Dining Areas ≥ 300 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.
- See page [LE-4] for required Time-switch and Light-reduction controls.

C405.2.1.1
C405.2.1.3
9.4.1.1.h

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.

C405.2.1.4
9.4.1.1

*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

C405.2.2

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.

C405.2.2.1

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

C405.2.2.2

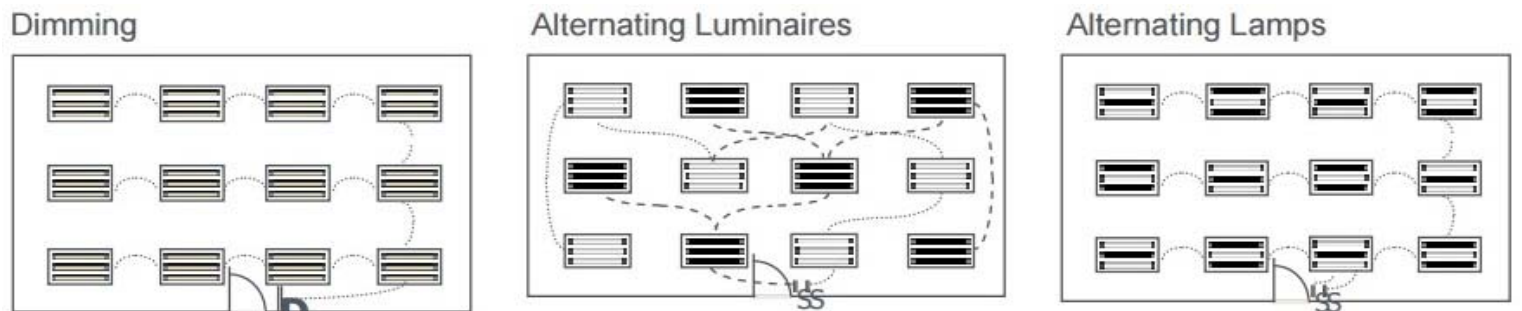


Figure LE-4.
Light-Reduction
Controls Method by

a) Control of all lamps/luminaires

b) Dual switching of alternate rows of luminaires

c) Switching middle lamp luminaires independently

Source: energycodes.gov

*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:

C405.2.2

- 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.

C405.2.2.2

- For areas/rooms where exemptions of certain lighting controls are sought, the lighting plans and narratives must provide clear information to satisfy the exemption requirements.



Figure LE-5.a. Patient care area Exempt from Time-Switch Controls
Source: energy.gov/eere



Figure LE-5.b. Daylight zone with automatic controls Exempt from Light-Reduction Controls
Source: energycodes.gov/training

*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.

C405.2.3
9.4.1.1.e & f
9.7.2.3

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.

C405.2.3.2
3.2

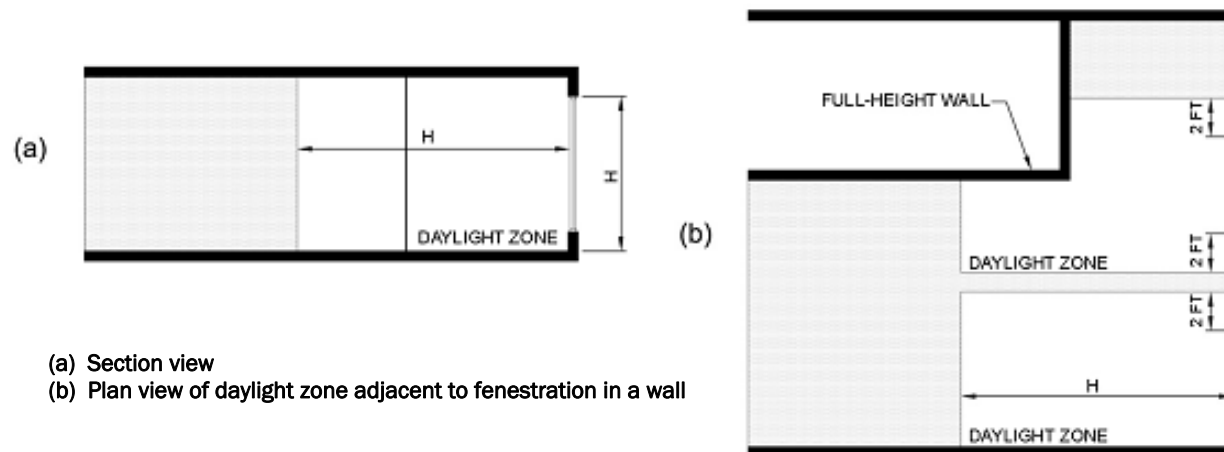


Figure LE-6.
Sidelit Zone

• 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.

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

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.

C405.2.3.3
3.2

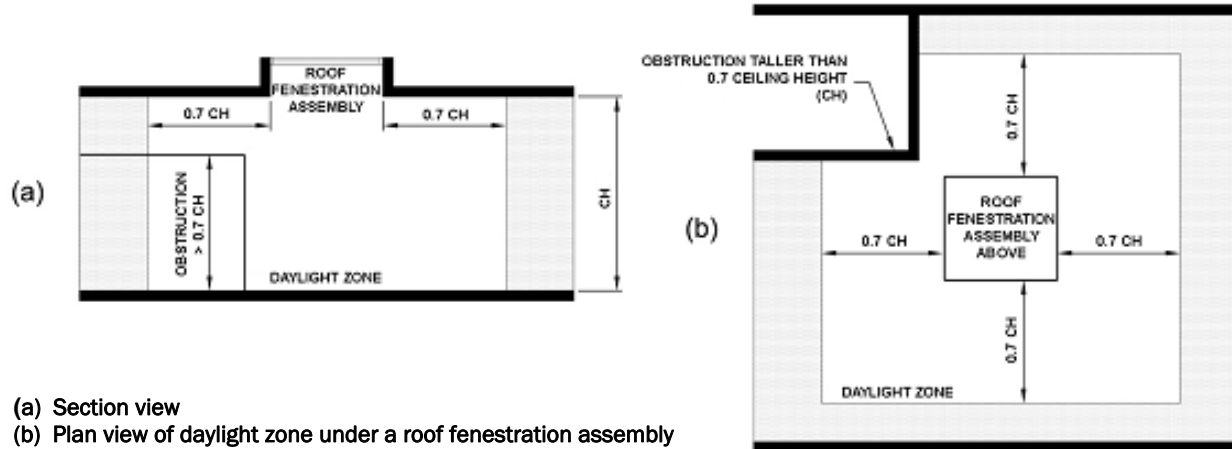


Figure LE-7.
Toplit Zone

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

- 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.

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

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.

C405.4.1
9.4.2

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).

C405.4.1
1 RCNY §5000-01
(g)(3)(ii)
9.4.2

$$\begin{array}{rclcl} \text{Maximum Allowed Exterior} & = & \text{Base Site Allowance} & + & \text{Individual Allowance per Area Type} \\ \text{Lighting Power} & & \text{(per Lighting Zone)} & & \text{(Tradable/Non-Tradable Surfaces)} \end{array}$$

- 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.

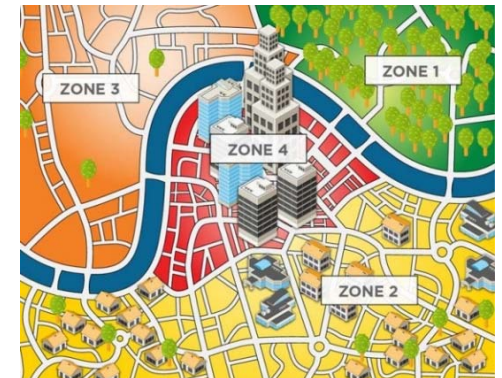
Lighting Zone 1: Park land

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

Exterior Lighting Zone _____



Source: energycodes.gov

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

Exterior Lighting Controls

- Daylight shutoff: Lights automatically turned off when daylight satisfies the lighting needs
- 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
- 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-hr after the business closing to 1-hr before opening, or when no activity detected for 15 minutes
- Exterior time-switch control function: Controls with 7-different-day-type-programmable clock and automatic holiday setback
- 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

C405.2.6

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.

1 RCNY §5000-01
(g)(3)

▪ 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.

C408.3
9.7.3.1

▪ 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.

C405.2.4
9.4.1.3

▪ 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.

C405.2.4
9.4.1.3

▪ 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 $\geq 40\%$ and no exterior obstructions within 20 ft is reduced in responsive to daylight by minimum 50%.

9.4.1.2

▪ Exit Signs

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

C405.1.1
9.4.5

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.

C405.9
8.4.1

■ 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.

8.4.2

■ 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.

R404.2
C405.5
8.4.5
8.4.6

■ 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.

C405.12
8.4.3

(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:

C405.11
10.4.5.1

- 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 ≥ 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.

C405.8.1
10.4.3

■ 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

C405.8.1.1
10.4.3.5

■ 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.

C405.8.2
10.4.4

■ Commercial Kitchen

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

C405.10
10.4.6

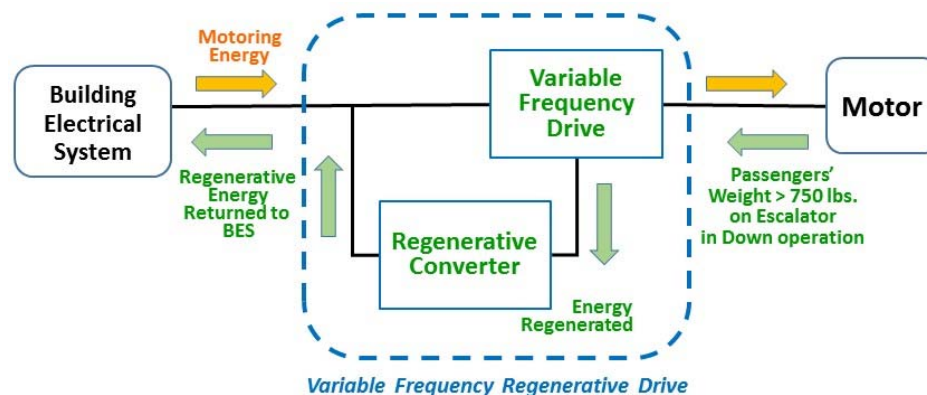


Figure LE-11.
Escalator Variable Frequency Regenerative Drive