



**2016 STRETCH CODE SUPPLEMENT TO THE 2016 NEW YORK STATE
ENERGY CONSERVATION CONSTRUCTION CODE**

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PREFACE

Purpose and Intent of NYStretch-Energy

This 2016 Stretch Energy Code Supplement to the 2016 New York State Energy Conservation Construction Code (hereinafter referred to as “NYStretch-Energy”) is intended as an above code minimum standard, overlaying the 2016 New York State Energy Conservation Construction Code (hereinafter referred to as the “Energy Code,” for voluntary local adoption by the authority having jurisdiction.

For point of reference, the Energy Code is contained in Title 19 of the New York Codes, Rules and Regulations (NYCRR), Part 1240 and in the publications incorporated by reference in 19 NYCRR Part 1240, which include:

- *2015 International Energy Conservation Code* (Second Printing May 2015);
- *ANSI/ASHRAE/IES Standard 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential Buildings* (July 2014 Printing);
- *2016 Supplement to the New York State Energy Conservation Construction Code* (Revised 2016); and,
- The other reference standards mentioned and/or referred to in 19 NYCRR Part 1240.

The Energy Law of New York State, Article 11, *allows* municipalities to adopt and enforce a local energy conservation construction code more stringent than the Energy Code. Any municipality which adopts a local energy conservation construction code in accordance with Article 11 must file a copy of such code and any amendments or revisions thereof with the state fire prevention and building code council within thirty days after promulgation. For additional information please contact the Department of State, Building Standards and Codes.

New York State energy policy is, as described in the Energy Law of New York State, Article 3, “to encourage conservation of energy in the construction and operation of new commercial, industrial, agricultural and residential buildings, and in the rehabilitation of existing structures, through heating, cooling, ventilation, lighting, insulation and design techniques and the use of energy audits and life-cycle costing analysis.” Improving energy efficiency and using renewable energy sources are common sense measures for conserving energy, reducing carbon emissions and reducing building operation expenses. NYStretch-Energy offers municipalities a more energy efficient alternative to the minimum state Energy Code, applicable to all building types.

Development

The NYStretch-Energy was developed as a tool for municipalities to bridge advancing energy codes and market support for more efficient and “green” buildings. NYStretch Energy was developed through a combination of research, technical development including energy simulations, stakeholder advisory groups and internal review, and provides greater than 10% energy savings over the 2015 International Energy Conservation Code.

Marginal Markings

Solid vertical lines in the left-hand margin of Parts 1 and 2 indicate a technical change from the requirements of the 2016 New York State Energy Conservation Construction Code. Black, right-facing arrows in the left-hand margin indicate deletion from the requirements of the 2016 New York State Energy Conservation Construction Code.

Unaffected Provisions

The Chapters, Sections, Tables and other provisions in the Energy Code that are not amended by NYStretch-Energy shall continue in full force and effect. Nothing in NYStretch-Energy shall be construed as deleting all or part of any unaffected provision.

PART 1

AMENDMENTS TO 2016 ENERGY CONSERVATION CONSTRUCTION CODE COMMERCIAL PROVISIONS

1.1 Addition of new definition to Section C202 (General Definitions):

NETWORKED GUEST ROOM CONTROL SYSTEM. A control system, accessible from the front desk or other central location associated with a Group R-1 building, that is capable of identifying the occupancy status of each guest room according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guest room separately.

1.2 Amendments to Section C401.2 (Application):

C401.2 Application. *Commercial buildings* shall comply with one of the following compliance paths:

1. ASHRAE Compliance Path: The requirements of *ASHRAE 90.1-2013 (as amended)*. If modeled, the building energy cost shall be equal to or less than 90 percent of the standard reference design building and shall also comply with Sections C402.5 and C409. If not modeled, the building shall also comply with Sections C402.5, C404.5.3, 405.5, C406 and C409.
2. Prescriptive Compliance Path: The requirements of Sections C402 through C405, and Sections C408 and C409. In addition, *commercial buildings* shall comply with Section C406 and tenant spaces shall comply with Sections C402 through C405, and Section C406.1.1.
3. Performance Compliance Path: The requirements of Sections C402.5, C403.2, C404, C405.2, C405.3, C405.5, C405.6, C407, C408 and C409. The building energy cost shall be equal to or less than 75 percent of the standard reference design building.

1.3 Amendments to Table C402.1.4 (OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD):

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	4 EXCEPT MARINE		5 AND MARINE 4		6	
	All other	Group R	All other	Group R	All other	Group R
Roofs						
Insulation Entirely above roof deck	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032
Metal buildings	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.029
Attic and other	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade						
Mass	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071
Metal building	U-0.052	U-0.050	U-0.050	U-0.052	U-0.050	U-0.052
Metal framed	U-0.064	U-0.064	U-0.055	U-0.064	U-0.049	U-0.057
Wood framed and other ^c	U-0.064	U-0.064	U-0.051	U-0.064	U-0.051	U-0.051
Walls, below grade						
Below-grade wall ^c	C-0.119	C-0.092	C-0.119	C-0.092	C-0.092	C0.063
Floors						
Mass ^d	U-0.057	U-0.051	U-0.057	U-0.051	U-0.051	U-0.057
Joist/framing	U-0.033	U-0.033	U-0.033	U-0.033	U-0.027	U-0.033
Slab-on-grade floors						
Unheated slabs	F-0.52	F-0.54	F-0.52	F-0.51	F-0.51	F-0.434
Heated slabs ^f	F-0.65	F-0.65	F-0.65	F-0.65	F-0.58	F-0.58
Opaque doors						
Swinging	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37

For SI: 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No requirement, LS = Liner system.

a. Use of Opaque assembly *U*-factors, *C*-factors, and *F*-factors from ANSI/ASHRAE/IESNA 90.1 Appendix A shall be permitted, provided the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/ISNEA 90.1 Appendix A.

- b. Opaque assembly *U*-factors based on designs tested in accordance with ASTM C 1363 shall be permitted. The *R*-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the *F*-factor requirements for heated slabs.
- d. “Mass floors” shall include floors weighing not less than:
 1. 35 pounds per square foot of floor surface area; or
 2. 25 pounds per square foot of floor surface area where the material weight is not more than 120 pounds per cubic foot.
- e. These *C*-, *F*- and *U*-factors are based on assemblies that are not required to contain insulation.
- f. Evidence of compliance with the *F*-factors indicated in the table for heated slabs shall be demonstrated by the application of the unheated slab *F*-factors and *R*-values derived from ASHRAE 90.1 Appendix A.

1.4 Amendments to Table C402.4 (BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS):

**Table C402.4
BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

CLIMATE ZONE	4	5	6
Vertical Fenestration			
U-Factor			
Fixed fenestration	0.38	0.38	0.36
Operable fenestration	0.45	0.45	0.43
Entrance doors	0.77	0.77	0.77
SHGC			
PF < 0.2		0.40	
0.2 ≤ PF < 0.5		0.40	
PF ≥ 0.5		0.40	
Skylights			
<i>U</i> -Factor	0.50	0.50	0.50
SHGC	0.40	0.40	0.40

1.5 Amendments to Section C402.5 (Air leakage—thermal envelope (Mandatory)).

C402.5 Air leakage--thermal envelope (Mandatory). The *building thermal envelope* shall comply with Sections C402.5.1 through C402.5.8.

1.6 Amendments to Section C402.5.1 (Air barriers).

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout building thermal envelope. The continuous air barrier shall be permitted to be located on the inside or outside of the building thermal envelope, located within the assemblies composing the building thermal envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1 and C402.5.1.2.

1.7 Amendments to Section C402.5.1.2 (Air barrier compliance options).

C402.5.1.2 Air barrier compliance options. A continuous air barrier in buildings having a gross conditioned floor area equal to or greater than the value specified in Table C402.5.1.2, shall comply with the provisions of Section C402.5.1.2.1. A continuous air barrier for the opaque building envelope in buildings having a gross conditioned floor area less than the value specified in Table C402.5.1.2, shall comply with one of the following:

1. Section C402.5.1.2.1.
2. Section C402.5.1.2.2 and Section C408.4.
3. Section C402.5.1.2.3 and Section C408.4.

1.8 Addition of new Table C402.5.1.2 (MINIMUM BUILDING SIZE REQUIRING AIR LEAKAGE TESTING).

**Table C402.5.1.2
MINIMUM BUILDING SIZE REQUIRING AIR LEAKAGE TESTING**

CLIMATE ZONE	4		5		6	
	All other	Groups R & I	All other	Groups R & I	All other	Groups R & I
Building floor area ft ² (m ²)	75,000 (7,000)	9,000 (800)	40,000 (3,700)	6,000 (600)	40,000 (3,700)	6,000 (600)

1.9 Replace Section C402.5.1.2.1 (Materials) with Section C402.5.1.2.1 (Building thermal envelope testing).

C402.5.1.2.1 Building thermal envelope testing. The building thermal envelope shall be tested in accordance with ASTM E 779 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft² (0.2 L/s•m²) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa).

Exceptions:

1. For buildings having greater than 50,000 square feet (5,000 m²) of gross conditioned floor area, air leakage testing shall not be required on the whole building provided that the following portions of the building are tested:
 - 1.1. The entire floor area of all stories that have any spaces directly under a roof.
 - 1.2. The entire floor area of all stories that have a building entrance or loading dock.
 - 1.3. Representative above-grade sections of the building totaling not less than 25 percent of the wall area enclosing the remaining conditioned space.

The measured air leakages shall be area-weighted by the surface areas of the building envelope addressed in items 1.1 through 1.3, to determine a whole building value. The test applied in 1.3 shall be applied to the remainder of the building envelope surface area not tested in accordance with 1.1 and 1.2.
2. For buildings having greater than 50,000 square feet (5,000 m²) of gross conditioned floor area, air leakage testing shall not be required on the whole building where there is an air barrier continuity plan included in the construction documents to test or inspect for continuity and defects of each type of unique air barrier joint or seam in the building envelope. A report identifying all needed actions taken to correct defects and seal leaks shall be submitted to the code official and the building owner, and shall be deemed to satisfy the requirements of this section.
3. Where the measured air leakage rate exceeds 0.40 cfm/ft² (2.0 L/s•m²) but does not exceed 0.60 cfm/ft² (3.0 L/s•m²), a diagnostic evaluation using smoke tracer or infrared imaging shall be conducted while the building is pressurized and any leaks noted shall be sealed where such sealing can be performed without destruction of existing building components. In addition, a visual inspection of the air barrier shall be conducted and any leaks noted shall be sealed where such sealing can be performed without destruction of existing building components. A report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to satisfy the requirements of this section.

1.10 Addition of new Section C403.2.4.8 (Automatic control of HVAC systems serving guest rooms).

C403.2.4.8 Automatic control of HVAC systems serving guest rooms. Each guest room in Group R-1 buildings containing over 50 guest rooms shall be provided with controls complying with the provisions of Sections C403.2.4.8.1 and C403.2.4.8.2. Card key controls comply with these requirements.

1.11 Addition of new Section C403.2.4.8.1 (Temperature set point controls).

C403.2.4.8.1 Temperature set point controls. Each guest room in Group R-1 buildings containing over 50 guest rooms shall be provided with controls that are capable of, and configured to, automatically raise the cooling set point and lower the heating set point by not less than 4°F (2°C) from the occupant set point within 30 minutes after the occupants have left the guest room. The controls also shall be capable of, and configured to, automatically raise the cooling set point to not lower than 80°F (27°C) and lower the heating set point to not higher than 60°F (16°C) when the guest room is unrented, has been continuously unoccupied for 16 hours, or a networked guest room control system indicates that the guest room is unrented and has been unoccupied for 30 minutes. Networked guest room control systems that can return the thermostat to default occupied set points 60 minutes prior to the time a guest room is scheduled to be occupied are not precluded by this section. Cooling systems that can limit relative humidity with a set point not lower than 65 percent Relative Humidity during unoccupied periods are not precluded by this section.

1.12 Addition of new Section C403.2.4.8.2 (Ventilation controls).

C403.2.4.8.2 Ventilation controls. Each guest room in Group R-1 buildings containing over 50 guest rooms shall be provided with controls that are capable of, and configured to, automatically turn off room ventilation and exhaust fans within 30 minutes of inoccupancy, or isolation devices capable of automatically shutting off outdoor air supply and exhaust air.

Exception: Guest room ventilation systems are not precluded from having an automatic daily pre-occupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change.

1.13 Amendments to Section C404.5 (Efficient heated water supply piping).

C404.5 Efficient heated water supply piping and fixtures. Heated water supply piping shall be in accordance with Section C404.5.1 or C404.5.2. The flow rate through 1/4-inch piping shall be not greater than 0.5 gpm. The flow rate through 5/16-inch piping shall be not greater than 1 gpm. The flow rate through 3/8-inch piping shall be not greater than 1.5 gpm. Fixtures supplying heated water shall be in accordance with Sections C404.5.3 and C404.5.4.

1.14 Addition of new Section C404.5.3 (High-efficiency faucets).

C404.5.3 High-efficiency faucets. The flow rate of a lavatory faucet installed in a dwelling unit shall not exceed 1.5 gpm (0.11 L/s) at 60 psi (414 kPa).

1.15 Addition of new Section C404.5.4 (Shower heads).

C404.5.4 Shower heads. The flow rate of fixed and handheld shower heads shall not exceed 2.0 gpm at 80 psi.

1.16 Amendments to Section C405.1 (General).

C405.1 General. This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption. Dwelling units within multi-family buildings shall comply with Section R404.1. All other dwelling units shall comply with either Section R404.1, or with Sections C405.2.4 and C405.4. Sleeping units shall comply with Section C405.2.4, and either Section R404.1 or C405.4.

Exception: Dwelling units within commercial buildings shall not be required to comply with Sections C405.2 through C405.5, provided that they comply with Section R404.1.

Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with Section C403.2.15 or C403.2.16.

1.17 Amendments to Section C405.2.1 (Occupant sensor controls).

C405.2.1 Occupant sensor controls. Occupant *sensor controls* shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms.
2. Conference/meeting/multipurpose rooms.
3. Copy/print rooms.
4. Lounges.
5. Employee lunch and break rooms.

6. Private offices.
7. Open plan office areas.
8. Restrooms.
9. Storage rooms.
10. Janitorial closets.
11. Locker rooms.
12. Other spaces 300 square feet (28 m²) or less that are enclosed by floor-to-ceiling height partitions.
13. Warehouses.

1.18 Amendments to Section C405.2.1.1 (Occupant sensor control function).

C405.2.1.1 Occupant sensor control function. Occupant sensor controls in spaces other than warehouses and open plan office areas, as specified in Section C405.2.1 shall comply with the following:

1. Automatically turn off lights within 30 minutes of all occupants leaving the space.
2. Be manual on or controlled to automatically turn the lighting on to not more than 50 percent power.

Exception: Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants.

3. Shall incorporate a *manual control* to allow occupants to turn lights off.

1.19 Addition of new Section C405.2.1.3 (Occupant sensor control function in open plan office areas).

C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces 300 square feet or less in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that general lighting within the open plan office space can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m²).
2. The controls shall automatically turn off general lighting in all control zones within 20 minutes of inoccupancy.
3. The controls shall be configured so that general lighting power in each control zone is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes of inoccupancy. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement.
4. The controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.

1.20 Amendments to Section C405.2.2 (Time-switch controls).

C405.2.2 Time-switch controls. Each area of the building that is not provided with *occupant sensor controls* complying with Section C405.2.1.1 shall be provided with *time switch controls* complying with C405.2.2.1.

Exception: Where a *manual control* provides light reduction in accordance with Section C405.2.2.2, automatic controls shall not be required for the following:

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

1.21 Amendments to Section C405.2.3 (Daylight-responsive controls).

C405.2.3 Daylight-responsive controls. Daylight-responsive controls complying with Section C405.2.3.1 shall be provided to control the electric lights within daylight zones in the following spaces:

1. Spaces with a total of more than 150 watts of general lighting within sidelight daylight zones complying with Section C405.2.3.2. General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4.
2. Spaces with a total of more than 150 watts of general lighting within toplight daylight zones complying with Section C405.2.3.3.

Exceptions: Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.
2. Lighting that is required to have specific application control in accordance with Section C405.2.4.
3. Sidelight daylight zones on the first floor above grade in Group A-2 and Group M occupancies.

1.22 Amendments to Section C405.2.4 (Specific application controls).

C405.2.4 Specific application controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.
3. Sleeping units shall have control devices of systems that automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes of inoccupancy.

Exceptions:

1. Lighting and switched receptacles controlled by card key controls.
2. Spaces where patient care is directly provided.
4. Permanently installed luminaires within dwelling units shall be provided with controls complying with either Section C405.2.2.2 or C405.2.1.1.
5. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided that the control device is readily accessible.
6. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.
7. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.

1.23 Amendments to Section C405.4.1 (Total connected interior lighting power).

C405.4.1 Total connected interior lighting power. The total connected interior lighting power shall be determined in accordance with Equation 4-9.

$$TCLP = [SL + LV + LTPB + \text{Other}] \quad (\text{Equation 4-9})$$

where:

TCLP = Total connected lighting power (watts).

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

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

LTPB = Wattage of line-voltage lighting tracks and plug-in busways as the specified wattage of the luminaires, but at least 30 W/lin. ft. (100 W/lin m), or the wattage limit of the system's circuit breaker, or the wattage limit of other permanent current-limiting devices on the system.

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

Exceptions:

1. The connected power associated with the following lighting equipment is not included in calculating total connected lighting power.
 - 1.1. Professional sports arena playing field lighting.
 - 1.2. Emergency lighting automatically off during normal building operation.

- 1.3. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with visual impairment and other medical and age-related issues.
- 1.4. Lighting in interior spaces that have been specifically designated as a registered interior historic landmark.
- 1.5. Casino gaming areas.
- 1.6. Mirror lighting in dressing rooms.
2. Lighting equipment used for the following shall be exempt provided that it is in addition to general lighting and is controlled by an independent control device:
 - 2.1. Task lighting for medical and dental purposes.
 - 2.2. Display lighting for exhibits in galleries, museums and monuments.
3. Lighting for theatrical purposes, including performance, stage, film production and video production.
4. Lighting for photographic processes.
5. Lighting integral to equipment or instrumentation and installed by the manufacturer.
6. Task lighting for plant growth or maintenance.
7. Advertising signage or directional signage.
8. In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment.
9. Lighting equipment that is for sale.
10. Lighting demonstration equipment in lighting education facilities.
11. Lighting *approved* because of safety or emergency considerations, inclusive of exit lights.
12. Lighting integral to both open and glass-enclosed refrigerator and freezer cases.
13. Lighting in retail display windows, provided the display area is enclosed by ceiling-height partitions.
14. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.
15. Exit signs.

1.24 Amendments to Table C405.4.2(1) (INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD).

**TABLE C405.4.2(1)
INTERIOR LIGHTING POWER ALLOWANCES:
BUILDING AREA METHOD**

BUILDING AREA TYPE	LPD (w/ft²)
Automotive facility	0.71
Convention center	0.76
Courthouse	0.90
Dining: bar lounge/leisure	0.90
Dining: cafeteria/fast food	0.79
Dining: family	0.78
Dormitory ^{a,b}	0.61
Exercise center	0.65
Fire station ^a	0.53
Gymnasium	0.68
Health care clinic	0.82
Hospital ^a	1.05
Hotel/motel ^{a,b}	0.75
Library	0.78
Manufacturing facility	0.90
Motion picture theater	0.83
Multifamily ^c	0.68
Museum	1.06
Office	0.79
Parking garage	0.15
Penitentiary	0.75
Performing arts theater	1.18
Police station	0.80
Post office	0.67
Religious building	0.94
Retail	1.06
School/university	0.81
Sports arena	0.87
Town hall	0.80
Transportation	0.61
Warehouse	0.48
Workshop	0.90
^a Where sleeping units are excluded from lighting power calculations by application of R404.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted. ^b Where dwelling units are excluded from lighting power calculations by application of R404.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted. ^c Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.	

1.25 Amendments to Table C405.4.2(2) (INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD).

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

COMMON SPACE TYPES^a	LPD (w/ft²)
Atrium	
Less than 40 feet in height	0.03 per foot in total height
Greater than 40 feet in height	0.40 + 0.02 per foot in total height
Audience seating area	
In an auditorium	0.63
In a convention center	0.82
In a gymnasium	0.65
In a motion picture theater	1.14
In a penitentiary	0.28
In a performing arts theater	2.03
In a religious building	1.53
In a sports arena	0.43
Otherwise	0.43
Banking activity area	0.86
Breakroom (See Lounge/Breakroom)	
Classroom/lecture hall/training room	
In a penitentiary	1.34
Otherwise	0.96
Conference/meeting/multipurpose room	1.07
Confinement cells	0.81
Copy/print room	0.56
Corridor	
In a facility for the visually impaired (and not used primarily by the staff) ^b	0.92
In a hospital	0.92
In a manufacturing facility	0.29
Otherwise	0.66
Courtroom	1.39
Computer room	1.33
Dining area	
In a penitentiary	0.96
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.00
In bar/lounge or leisure dining	0.93
In cafeteria or fast food dining	0.63
In family dining	0.71
Otherwise	0.63
Electrical/mechanical room	0.43
Emergency vehicle garage	0.41

(continued)

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

COMMON SPACE TYPES^a	LPD (w/ft²)
Food preparation area	1.06
Guest room ^{c,d}	0.77
Laboratory	
In or as a classroom	1.20
Otherwise	1.45
Laundry/washing area	0.43
Loading dock, interior	0.58
Lobby	
In a facility for the visually impaired (and not used primarily by the staff) ^b	2.03
For an elevator	0.68
In a hotel	1.06
In a motion picture theater	0.45
In a performing arts theater	1.70
Otherwise	1.00
Locker room	0.48
Lounge/breakroom	
In a healthcare facility	0.78
Otherwise	0.62
Office	
Enclosed	0.93
Open plan	0.81
Parking area, interior	0.14
Pharmacy area	1.34
Restroom	
In a facility for the visually impaired (an not used primarily by the staff) ^b	0.96
Otherwise	0.85
Sales area	1.22
Seating area, general	0.42
Stairway (See space containing stairway)	
Stairwell	0.58
Storage room	0.46
Vehicular maintenance area	0.56
Workshop	1.14
BUILDING TYPE SPECIFIC SPACE TYPES^a	LPD (w/ft²)
Facility for the visually impaired ^b	
In a chapel (and not used primarily by the staff)	1.06
In a recreation room (and not used primarily by the staff)	1.80
Automotive (See Vehicular Maintenance Area above)	
Convention Center—exhibit space	0.88
Dormitory—living quarters ^{c,d}	0.54
Fire Station—sleeping quarters ^c	0.20
Gymnasium/fitness center	
In an exercise area	0.50
In a playing area	0.82

(continued)

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

BUILDING TYPE SPECIFIC SPACE TYPES^a	LPD (w/ft²)
Healthcare facility	
In an exam/treatment room	1.68
In an imaging room	1.06
In a medical supply room	0.54
In a nursery	1.00
In a nurse's station	0.81
In an operating room	2.17
In a patient room ^e	0.62
In a physical therapy room	0.84
In a recovery room	1.03
Library	
In a reading area	0.82
In the stacks	1.20
Manufacturing facility	
In a detailed manufacturing area	0.93
In an equipment room	0.65
In an extra high bay area (greater than 50' floor-to-ceiling height)	1.05
In a high bay area (25-50' floor-to-ceiling height)	0.75
In a low bay area (less than 25' floor-to-ceiling height)	0.96
Museum	
In a general exhibition area	1.05
In a restoration room	0.85
Performing arts theater—dressing room	0.36
Post Office—Sorting Area	0.68
Religious buildings	
In a fellowship hall	0.55
In a worship/pulpit/choir area	1.53
Retail facilities	
In a dressing/fitting room	0.50
In a mall concourse	0.90
Sports arena—playing area	
For a Class I facility ^e	2.47
For a Class II facility ^f	1.96
For a Class III facility ^g	1.70
For a Class IV facility ^h	1.13
Transportation facility	
In a baggage/carousel area	0.45
In an airport concourse	0.31
At a terminal ticket counter	0.62
Warehouse—storage area	
For medium to bulky, palletized items	0.35
For smaller, hand-carried items	0.69

^a In cases where both a common space type and a building area specific space 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 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.

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

^e Class I facilities consist of Professional facilities; and Semi-professional, Collegiate, or Club facilities with seating for 5,000 or more spectators.

^f Class II facilities consist of Collegiate and Semi-professional facilities with seating for fewer than 5,000 spectators; Club facilities with seating for between 2,000 and 5,000 spectators; and Amateur League and High School facilities with seating for more than 2,000 spectators.

^g Class III facilities consist of Club, Amateur League, and High School facilities with seating for 2,000 or fewer spectators.

^h Class IV facilities consist of Elementary School and Recreational facilities, and Amateur League and High School facilities without provisions for spectators.

1.26 Amendments to Section C405.5 (Exterior lighting (Mandatory)).

C405.5 Exterior lighting power requirements. A building complies with this Section where its total connected exterior lighting power calculated under Section C405.5.1 is not greater than the exterior lighting power allowance calculated under Section C405.5.2.

Exception: Where *approved* because of historical, safety, signage or emergency considerations.

1.27 Amendments to Section C405.5.1 (Exterior building lighting power).

C405.5.1 Total exterior connected building 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.

Exception: Lighting used for the following exterior lighting applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Lighting approved because of safety considerations.
2. Emergency lighting automatically shut 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 is 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 public monuments

1.28 Addition of new Section C405.5.2 (Exterior lighting power allowance).

C405.5.2 Exterior lighting power allowance. The total exterior lighting power allowance is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated by lighting that is powered through the energy service to the building. Lighting power allowances are specified in Table C405.5.2(2). The lighting zone for the building exterior is specified in Table C405.5.2(1) unless otherwise specified by the authority having jurisdiction.

1.29 Amendments to TABLE C405.5.2(2) (INDIVIDUAL LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS).

**TABLE C405.5(2)
INDIVIDUAL LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS**

		LIGHTING ZONES			
		Zone 1	Zone 2	Zone 3	Zone 4
Base Site Allowance (Base allowance is usable in tradable or nontradable surfaces.)		350 W	400 W	500 W	900 W
Tradable Surfaces (Lighting power densities for uncovered parking areas, building grounds, building entrances and exits, canopies and overhangs and outdoor sales areas are tradable.)	Uncovered Parking Areas				
	Parking areas and drives	0.03 W/ft ²	0.04 W/ft ²	0.6 W/ft ²	0.08 W/ft ²
	Building Grounds				
	Walkways and ramps less than 10 feet wide	0.50 W/linear foot	0.50 W/linear foot	0.60 W/linear foot	0.70 W/linear foot
	Walkways and ramps 10 feet wide or greater, plaza areas special feature areas	0.10 W/ft ²	0.10 W/ft ²	0.11 W/ft ²	0.14 W/ft ²
	Dining areas	0.65 W/ft ²	0.65 W/ft ²	0.75 W/ft ²	0.95 W/ft ²
	Stairways	0.60 W/ft ²	0.70 W/ft ²	0.70 W/ft ²	0.70 W/ft ²
	Pedestrian tunnels	0.12 W/ft ²	0.12 W/ft ²	0.14 W/ft ²	0.21 W/ft ²
	Landscaping	0.03 W/ft ²	0.04 W/ft ²	0.04 W/ft ²	0.04 W/ft ²
	Building Entrances and Exits				
	Pedestrian and vehicular entrances and exits	14 W/linear foot of opening width	14 W/linear foot of opening width	21 W/linear foot of opening width	21 W/linear foot of opening width
	Entry canopies	0.20 W/ft ²	0.25 W/ft ²	0.40 W/ft ²	0.40 W/ft ²
	Loading docks	0.35 W/ft ²	0.35 W/ft ²	0.35 W/ft ²	0.35 W/ft ²
	Sales Canopies				
	Free-standing and attached	0.40 W/ft ²	0.40 W/ft ²	0.60 W/ft ²	0.70 W/ft ²
	Outdoor Sales				
	Open areas (including vehicle sales lots)	0.20 W/ft ²	0.20 W/ft ²	0.35 W/ft ²	0.50 W/ft ²
Street frontage for vehicle sales lots in addition to "open area" allowance	No allowance	7 W/linear foot	7 W/linear foot	21 W/linear foot	
Nontradable Surfaces (Lighting power density calculations for the following applications can be used only for the specific application)	Building facades	No allowance	0.075 W/ft ² of gross above-grade wall area	0.113 W/ft ² of gross above-grade wall area	0.15 W/ft ² of gross above-grade wall area
	Automated teller machines (ATM) and night depositories	135 W per location plus 45 W per additional ATM per location	135 W per location plus 45 W per additional ATM per location	135 W per location plus 45 W per additional ATM per location	135 W per location plus 45 W per additional ATM per location

and cannot be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the "Tradable Surfaces" section of this table.)	Uncovered entrances and gatehouse inspection stations at guarded facilities	0.50 W/ft ² of covered and uncovered area	0.50 W/ft ² of covered and uncovered area	0.50 W/ft ² of covered and uncovered area	0.50 W/ft ² of covered and uncovered area
	Uncovered loading areas for law enforcement, fire, ambulance and other emergency service vehicles	0.35 W/ft ² of covered and uncovered area	0.35 W/ft ² of covered and uncovered area	0.35 W/ft ² of covered and uncovered area	0.35 W/ft ² of covered and uncovered area
	Drive-up windows/doors	200 W per drive-through	200 W per drive-through	200 W per drive-through	200 W per drive-through
	Parking near 24-hour retail entrances	400 W per main entry	400 W per main entry	400 W per main entry	400 W per main entry

For SI: 1 foot = 304.8 mm, 1 watt per square foot = W/0.0929 m².

1.30 Addition of new Section C405.5.2.1 (Additional exterior lighting power).

C405.5.2.1 Additional exterior lighting power. Any increase in the exterior lighting power allowance is limited to the specific lighting application indicated in Table C405.5.2(3). The additional power shall be used only for the luminaires that are serving these applications and shall not be used for any other purpose.

1.31 Addition of new TABLE C405.5.2(3) (LIGHTING POWER ALLOWANCE FOR SPECIAL EXTERIOR AREAS).

**TABLE C405.5.2(3)
LIGHTING POWER ALLOWANCE FOR SPECIAL EXTERIOR AREAS**

	LIGHTING ZONES			
	Zone 1	Zone 2	Zone 3	Zone 4
Building facades	No allowance	0.075 W/ft ² of gross above-grade wall area	0.113 W/ft ² of gross above-grade wall area	0.15 W/ft ² of gross above-grade wall area
Automated teller machines (ATM) and night depositories	270 W per location plus 90 W per additional ATM per location			
Entrances and gatehouse inspection stations at guarded facilities	0.75 W/ft ² of covered and uncovered area.			
Loading areas for law enforcement, fire, ambulance and other emergency service vehicles	0.5 W/ft ² of covered and uncovered area			
Drive-up windows and doors	400 W per drive through			
Parking near 24-hour retail entrances.	800 W per main entry			

1.32 Replacement of Section 405.7 (Electrical transformers (Mandatory)).

C405.7 Whole building energy monitoring. Measurement devices shall be installed at the building site to monitor the energy use of each building. Measurement devices shall be installed to monitor the building use of the following types of energy supplied by a utility, energy provider, or plant that is not within the building:

1. Natural gas
2. Fuel oil
3. Propane
4. Steam
5. Chilled Water
6. Hot Water

The measurement devices shall have the capability to record electrical energy use every 60 minutes and report that use on an hourly, daily, monthly and annual basis and retain the recorded data for not less than 36 months.

Exceptions: The following are not required to have measurement devices with recording capabilities in accordance with this Section:

1. Buildings less than 25,000 square feet.
2. Individual tenant spaces having a gross floor area of less than 10,000 square feet.
3. *Dwelling Units.*
4. Common areas in Group R-2 buildings having a gross floor area less than 10,000 square feet.
5. Fuel use for on-site emergency equipment.

1.33 Addition of new Section C405.10 (Automatic receptacle controls).

C405.10 Automatic receptacle controls. Automatic controls shall be provided for not less than 50 percent of all 125 volt 15- and 20-Ampere receptacles in private offices, conference rooms, printing and copying rooms, break rooms, classrooms and individual workstations in Group B and E occupancies and for not less than 25 percent of branch circuits installed to supply electrical power to modular furniture in Group B and E occupancies. Such receptacles shall be uniformly distributed throughout each space and labeled in accordance with NFPA 70. Such automatic controls shall comply with one of the following:

1. Automatic controls shall be capable of operating on a scheduled basis using a time-of-day operated control device to turn off receptacles at specific programmed times and provide for an independent program schedule.
2. Independent program schedules for automatic controls shall be configured to control receptacles in areas that are not greater than 5,000 square feet.
3. Independent program schedules for automatic controls shall be configured to control receptacles in areas on a single floor.
4. Automatic control shall be by means of an occupant sensor that can turn off receptacles within 30 minutes of inoccupancy.
5. Automatic control shall be by means of an automated signal from another control or alarm system that can turn off receptacles within 20 minutes of inoccupancy.

Exception: Automatic receptacle controls need not be provided in specific spaces where approved by the code official based on the need for continuous power to receptacles or for safety or security reasons associated with the space.

1.34 Replacement of Section C406.1 (Requirements)

C406.1 Requirements. Buildings shall comply with at least two of the following Sections, at least one of which must be Section C406.2, C406.3, or C406.4.

1. More efficient HVAC equipment plus dedicated outdoor air system in accordance with Section C406.2.
2. Reduced air infiltration in accordance with Section C406.3.
3. Enhanced envelope performance in accordance with Section C406.4.
4. Energy recovery ventilation in accordance with Section C406.5.

5. Reduced energy use in service water heating in accordance with Section C406.6.
6. More efficient HVAC equipment performance in accordance with Section C406.7.

1.35 Delete Section C406.1.1.

1.36 Replacement of Section C406.2 (More efficient HVAC equipment performance).

C406.2 More efficient HVAC equipment plus Dedicated Outdoor Air System. Unitary heat pumps and variable refrigerant flow air conditioners and heat pumps shall exceed the minimum efficiency requirements listed in Consortium for Energy Efficiency (CEE) Tier 2 or Tier 1, where applicable if Tier 2 is not provided. The building shall be equipped with an independent ventilation system designed to provide not less than the minimum 100-percent outdoor air to each individual occupied space.

1.37 Replacement of Section C406.3 (Reduced lighting power density).

C406.3 Reduced air infiltration. Air infiltration shall be verified by whole building pressurization testing conducted in accordance with ASTM E779 or ASTM E1827 by an independent third party. The measured air leakage rate of the building envelope shall not exceed 0.25 cfm/ft² (2.0 L/s•m²) under a pressure differential of 0.3 in. water (75 Pa), with the calculated surface area being the sum of the above and below grade building envelope. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.

Exception: Buildings having over 250,000 square feet (25,000 m²) of conditioned floor area where air leakage testing is conducted on representative above-grade sections of the building. Tested areas shall total not less than 25 percent of the conditioned floor area and shall be tested in accordance with this Section.

1.38 Replacement of Section C406.4 (Enhanced digital lighting controls).

C406.4 Enhanced envelope performance. The total UA of the building thermal envelope as designed shall be not less than 15 percent below the total UA of the building thermal envelope in accordance with Section C402.1.5.

1.39 Replacement of Section C406.5 (On-site renewable energy).

C406.5 Energy recovery ventilation. Mechanical systems shall have an energy recovery system in accordance with Section C403.2.7. If a building is otherwise required to install an energy recovery system per Section C403.2.7, this package shall not be used to comply with Section C406.1.

1.40 Replacement of Section C406.6 (Dedicated outdoor air system).

C406.6 Reduced energy use in service water heating. This Section shall apply to only the following occupancy types:

1. Assembly Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
2. Assembly Group A-3: Health clubs and spas.
3. Factory Group F: Laundries.
4. Institutional Group I-2: Hospitals, psychiatric hospitals and nursing homes.
5. Residential Group R-1: Boarding houses, hotels or motels.
6. Residential Group R-2: Buildings residential occupancies.
7. Buildings showing a service hot water load of 10 percent or more of total energy loads, as shown with an energy analysis as described in Section C407.

1.41 Addition of new Section C406.6.1 (Load fraction).

C406.6.1 Load fraction. The building service water-heating system shall be sized to provide not less than 60 percent of hot water requirements, or sized to provide 100 percent of hot water requirements if the building shall otherwise comply with Section C403.4.5, and comply with one or more of the following options:

1. Service water heating shall comply with Table C406.6.
2. Waste heat recovery from service hot water, heat-recovery chiller, building equipment, process equipment, or a combined heat and power system.
3. Solar water-heating system.

1.42 Addition of new TABLE C406.6 (SERVICE WATER HEATING PERFORMANCE).

**TABLE C406.6
SERVICE WATER HEATING PERFORMANCE**

Equipment Type	Size Category (Input)	Performance Required
Gas storage water heaters – Condensing	<200,000 Btu/h	≥ 91% thermal efficiency or energy factor
Gas instantaneous water heaters	>50,000 Btu/h and <200,000 Btu/h	0.82 Energy Factor, electronic ignition
	≥200,000 Btu/h	≥94% thermal efficiency, electronic ignition, condensing only

1.43 Replacement of Section C406.7 (Reduced energy use in service water heating).

C406.7 More efficient HVAC equipment performance. Equipment shall exceed the minimum efficiency requirements listed in Tables C403.2.3(1) through C403.2.3(7) by 10 percent, in addition to the requirements of Section C403. Where multiple performance requirements are provided, the equipment shall exceed all requirements by 10 percent. Equipment not listed in Tables C403.2.3(1) through C403.2.3(7) shall provide no more than 10 percent of the total building system capacity.

1.44 Delete Section C406.7.1 (Load fraction).

1.45 Amendments to Section C407.1 (Scope).

C407.1 Scope. This section establishes criteria for compliance using total building performance. The following systems and loads shall be included in determining the total building performance: heating systems, cooling systems, service water heating, fan systems, lighting power, receptacle loads and process loads.

Exception: Energy used to recharge or refuel vehicles that are used for on-road and offsite transportation purposes.

1.46 Addition of new Section C408.4 (Building envelope commissioning).

C408.4 Air barrier commissioning. Prior to passing final inspection, the registered design professional shall provide evidence of air barrier commissioning and completion in accordance with the provisions of this Section.

Exception: Buildings that have met the air leakage testing requirement of Section C402.5.1.2.1.

1.47 Addition of new Section C408.4.1 (Documentation).

C408.4.1 Documentation. Construction documents shall include documentation of the continuous air barrier components included in the design and a field inspection checklist that includes all requirements necessary for maintaining air barrier continuity and durability in accordance with Section C402.5.1.

1.48 Addition of new Section C408.4.2 (Field inspections).

C408.4.2 Field inspections. Reports from field inspections during project construction showing compliance with continuous air barrier requirements including proper material handling and storage, use of approved materials and material substitutes, proper material and surface preparation, and air barrier continuity at building thermal envelope penetrations shall be provided to the owner and, upon request, to the code official.

1.49 Addition of new Section C408.4.3 (Report).

C408.4.3 Report. A final commissioning report indicating compliance with the continuous air barrier requirements shall be provided to the building owner and, upon request, to the code official.

1.50 Addition of new SECTION C409 (SYSTEM COMMISSIONING).

**SECTION C409
SYSTEM COMMISSIONING**

1.51 Addition of new Section C409.1 (General (Mandatory)).

C409.1 General (Mandatory). Buildings shall comply with at least one of the following Sections:

1. Additional on-site renewable energy in accordance with Section C409.2
2. Energy monitoring in accordance with Section C409.3
3. Electric vehicle service equipment capable in accordance with Section C409.4.
4. Interoperable automated demand-response (AutoDR) infrastructure in accordance with Section C409.5.

1.52 Addition of new Section C409.2 (On-site renewable energy).

C409.2 On-site renewable energy. The total minimum rating of onsite renewable energy systems shall be one of the following:

1. Not less than 1.71 Btu/hr/ft² or 0.50 w/ft² of conditioned floor area.
2. Not less than 3% of energy use within the building for mechanical, service hot water heating and lighting regulated in Chapter 4 [CE].

1.53 Addition of new Section C409.3 (Energy monitoring).

C409.3 Energy monitoring. Buildings with a gross conditioned floor area over 25,000 square feet shall comply with Sections C409.3.1 through C409.3.5. Buildings shall be equipped to measure, monitor, record and report energy consumption data for each end-use category required by Section C409.3.2.

Exception: Individual tenant spaces are not required to comply with this section provided that such spaces have their own utility services and meters and have less than 5,000 square feet of conditioned floor area.

1.54 Addition of new Section C409.3.1 (Electrical energy metering).

C409.3.1 Electrical energy metering. Meters or other measurement devices shall be provided to collect electrical energy consumption data for each end-use category required by Section C409.3.2. The electrical energy consumption data shall include all electrical energy supplied to the building and its associated site, including energy for site lighting, parking, recreational facilities, and other areas that serve the building and its occupants.

1.55 Addition of new Section C409.3.2 (End-use metering categories).

C409.3.2 End-use metering categories. Meters or other approved measurement devices shall be provided to collect energy use data for each end-use category specified in Table C409.3.2. These meters shall have the capability to collect energy consumption data for the whole building or for each separately metered portion of the building. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all the energy used by that category. Not more than 5 percent of the measured load for each end-use category specified in Table C409.3.2 shall be from a load not within that category.

Exceptions:

1. HVAC and water heating equipment serving only an individual dwelling unit does not require end-use metering.
2. End-use metering is not required for fire pumps, stairwell pressurization fans or any system that operates only during testing or an emergency.

1.56 Addition of new TABLE C409.3.2 (ENERGY USE CATEGORIES).

**TABLE C409.3.2
ENERGY USE CATEGORIES**

LOAD CATEGORY	DESCRIPTION OF ENERGY USE
Total HVAC system	Heating, cooling and ventilation including, fans, pumps, boilers, chillers and water heating. Energy used by 120 volt equipment, or by 208/120 volt equipment that is located in a building where the main service is 480/277 VAC, need not be included in the total HVAC system energy use.
Interior lighting	Lighting systems located within the building.
Exterior lighting	Lighting systems located on the building site but not within the building.
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets.
Process loads	Any single load that is not included in an HVAC, lighting, or plug load category and that exceeds 5 percent of the peak connected load of the whole building including, data centers, manufacturing equipment and commercial kitchens.
Building operations and other miscellaneous loads	The remaining loads not included elsewhere in this table including, vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas, and snow-melt systems.

1.57 Addition of new Section C409.3.3 (Meters).

C409.3.3 Meters. Meters and other measurement devices required by this Section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C409.3.4. Source meters shall be any digital-type meter. Lighting, HVAC and other building systems that can monitor their energy consumption shall not require meters. Current sensors are an alternative to meters, provided that they have a tested accuracy of +/-2 percent. Required metering systems and equipment shall be able to provide not less than hourly data that is fully integrated into the data acquisition system and produce a graphical energy report in accordance with Sections C409.3.4 and C409.3.5.

1.58 Addition of new Section C409.3.4 (Data acquisition systems).

C409.3.4 Data acquisition systems. A data acquisition system shall have the capability to store data from the required meters and other sensing devices for not less than 36 months. The data acquisition system shall be able to store real-time energy consumption data and provide hourly, daily, monthly, and yearly logged data for each end-use category required by Section C409.3.2.

1.59 Addition of new Section C409.3.5 (Graphical energy report).

C409.3.5 Graphical energy report. A permanent reporting mechanism shall be provided in the building that can be accessed by building operation and management personnel. The reporting mechanism shall have be able to graphically provide the energy consumption data for each end-use category required by Section C409.3.2 for not less than every hour, day, month and year for the previous 36 months.

1.60 Addition of new Section C409.4 (Electrical vehicle service equipment capable).

C409.4 Electrical vehicle service equipment capable. Parking garages and open parking lots shall provide either:

1. 208/240 V 40 amp outlets for 5% of the total parking spaces; or
2. Panel capacity and conduit for the future installation of such outlets for 5% of the total parking spaces.

1.61 Addition of new Section C409.5 (Interoperable automated demand-response (AutoDR) infrastructure).

C409.5 Interoperable automated demand-response (AutoDR) infrastructure. Buildings shall contain automatic control systems that can reduce HVAC and lighting equipment to lower electric peak demand of the building. Buildings shall comply with the following:

1. HVAC systems with direct digital control (DDC) to the zone level shall be programmed to allow centralized demand shed for noncritical zones.
2. HVAC equipment with variable speed control shall be programmed to allow remote adjustment of maximum speed of the equipment.
3. Lighting systems with central control shall be programmed to allow remote reduction of total connected lighting power.

1.62 Amendments to Section C502.2.3 (Building mechanical systems).

C502.2.3 Building mechanical systems. New mechanical systems and equipment that are part of the addition shall comply with Section C403 as amended or supplemented.

1.63 Amendments to Section C503.6 (Lighting systems).

C503.6 Lighting systems. New lighting systems that are part of the alteration shall comply with Section C405 as amended or supplemented.

PART 2

AMENDMENTS TO 2016 ENERGY CONSERVATION CONSTRUCTION CODE RESIDENTIAL PROVISIONS

2.1 Amendments to Section R401.2 (Compliance).

R401.2 Compliance. Projects shall comply with Sections R406 and R407.

Exception: Projects other than detached one and two-family dwellings having not more than three stories above grade plane may comply with Section R405, Section R407 and the provisions of Sections R401 through R404 labeled “Mandatory.”

2.2 Amendments to Section R402.4.1.1 (Installation).

R402.4.1.1 Installation. The components of the building thermal envelope as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer’s instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction.

An approved third party shall inspect all components and verify compliance. The inspection shall include an open wall visual inspection of all components included in Table R402.4.1.1 and shall meet the RESNET Grade I insulation requirements.

Post-construction or rough-in testing and verification shall be performed by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional.

2.3 Addition of new Section R403.3.6 (Duct system sizing (Mandatory)).

R403.3.6 Duct system sizing (Mandatory). Ducts shall be sized in accordance with ACCA Manual D based on calculations made in accordance with Section R403.7 and Section R403.8.

2.4 Addition of new Section R403.5.5 (Hot water fitting and fixture consumption (Mandatory)).

R403.5.5 Hot water fitting and fixture consumption (Mandatory). Installed lavatory faucets and showerheads shall comply with the maximum flow rates in Table R403.5.5.

2.5 Addition of new TABLE R403.5.5 (MAXIMUM FIXTURE AND FITTING FLOW RATES FOR REDUCED HOT WATER CONSUMPTION).

**TABLE R403.5.5
MAXIMUM FIXTURE AND FITTING FLOW RATES FOR REDUCED HOT WATER CONSUMPTION**

FIXTURE OR FIXTURE FITTING TYPE	MAXIMUM FLOW RATE
Lavatory faucet	1.5 gpm at 60 psi
Showerheads ¹	2.0 gpm at 80 psi

2.6 Amendments to TABLE R403.6.1 (MECHANICAL VENTILATION SYSTEM FAN EFFICACY).

**TABLE R403.6.1
MECHANICAL VENTILATION SYSTEM FAN EFFICACY**

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

¹ Includes hand showers, body sprays, rainfall panels and jets

For SI: 1 cfm = 28.3 L/min

2.7 Addition of new Section R403.6.2 (Balanced and HRV/ERV systems (Mandatory)).

R403.6.2 Balanced and HRV/ERV systems (Mandatory). A heat recovery ventilator (HRV) or energy recovery ventilator (ERV) shall be installed per manufacturer's instructions. The HRV/ERV must be sized adequately for the specific application, which will include the buildings conditioned area, and number of occupants.

Exception: When a balanced ventilation system is designed and installed according to requirements of the 2015 International Residential Code (IRC)², Section M1507.3, providing outdoor air at the rate required in Section M1507.3.3 and Table M1507.3.3 (1). Outdoor air supplied per IRC Section M1507.3.1, using the return side of the building's heating and/or cooling system air handler for supply air, shall be permitted to comply with this section. In the balanced system design, an equal amount of exhaust air must be provided by a continuous run, or intermittent run fan or fans, located remotely from the source of supply air. Intermittent run fans shall be sized per Table M1507.3.3(1) and fan capacities adjusted for run time per Table M1507.3.3(2). The air handler capacity intake shall also be adjusted for run time per Table M1507.3.3(2).

R403.6.2.1 Verification: Installed performance of the mechanical ventilation system shall be tested and verified by a HERS Rater, HERS Rating Field Inspector, or an applicable BPI Certified Professional, and measured using a flow hood, flow grid, or other airflow measuring device in accordance with either RESNET Standard Chapter 8 or ACCA Standard 5.

2.8 Amendments to Section R404.1 (Lighting equipment (Mandatory)).

R404.1 Lighting equipment (Mandatory). Not less than 90 percent of the permanently installed lighting fixtures shall use lamps with an efficacy of at least 65 lumens per watt, or have a total luminaire efficacy of at least 45 lumens per watt.

Exception: Low-voltage lighting.

2.9 Addition of new Section R404.2 (Electrical power packages (Mandatory)).

R404.2 Electrical power packages (Mandatory). Projects shall comply with the following:

1. Solar-ready zone. Detached one or two family dwellings where the net floor area is greater than 1,400 square feet shall comply with the requirements of Appendix RB.
2. Electrical Vehicle Service Equipment Capable. Detached one or two family dwellings and townhouses with onsite parking shall provide a 208/240V 40-amp outlet for each dwelling unit or panel capacity and conduit for the future installation of such an outlet. Outlet or conduit termination shall be adjacent to the parking area. For residential occupancies where there is a common parking area, provide either:
 1. 208/240V 40-amp outlets for 5% of the total parking spaces; or
 2. Panel capacity and conduit for the future installation of 208/240V 40-amp outlets for 5% of the total parking spaces.

2.10 Amendments to Section R406.3 (Energy Rating Index).

R406.3 (N1106.3) Energy Rating Index. The Energy Rating Index (ERI) shall be a numerical integer value that is based on a linear scale constructed such that the ERI reference design has an Index value of 100 and a residential building that uses no net purchased energy has an Index value of 0. Each integer value on the scale shall represent a 1-percent change in the total energy use of the rated design relative to the total energy use of the ERI reference design. The ERI shall consider all energy used in the residential building. Energy used to recharge or refuel a vehicle for on-road (and offsite) transportation purposes shall not be included in the ERI reference design or the rated design.

² This is a reference to the 2015 International Residential Code, Second Printing, which was issued in January 2016.

2.11 Amendments to TABLE R406.4 (MAXIMUM ENERGY RATING INDEX).

TABLE R406.4
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	MAXIMUM ERI FOR ≥ 3,000 SQUARE FEET	MAXIMUM ERI FOR < 3,000 SQUARE FEET, AND OTHER THAN 1- OR 2-FAMILY BUILDINGS
4	50	54
5	50	54
6	50	54

2.12 Add new Section R407 (ADDITIONAL EFFICIENCY OPTIONS).

SECTION R407 ADDITIONAL EFFICIENCY OPTIONS

R407.1 Requirements. Projects shall comply with at least one of the following:

1. More efficient HVAC performance in accordance with Section R407.2
2. Heat recovery ventilation (HRV) system in accordance with Section R403.6.2. The Exception in R403.6.2 shall not be applied if used for compliance with this Section.
3. High efficiency water heater or solar thermal hot water heater in accordance with Section R407.3

R407.2 More efficient HVAC performance. Heating and cooling equipment shall meet at least one of the following efficiency requirements:

1. Gas, propane or oil-fired furnaces shall have a minimum AFUE of 94%
2. Gas, propane or oil-fired boilers shall have a minimum AFUE of 92%
3. Closed-loop ground source heat pump with a minimum COP of 3.3

R407.3 High efficiency water heating or solar thermal hot water heater. Hot water heating systems shall meet one of the following:

1. Natural gas or propane water heating with a minimum UEF of 0.84 or electric heat pump hot water heater with a minimum UEF of 2.0. On-demand natural gas or propane water heaters shall not include any buffer tank or hot water storage capacity outside the water heater itself.
2. A solar thermal hot water heating system with a minimum of 40 square feet of gross collection area. The solar hot water heating panels shall have a total solar resource fraction that is not less than 75%.

2.13 Amendments to Section R502.1.1.2 (Heating and cooling systems).

R502.1.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the addition shall comply with Section R403 as amended or supplemented.

2.14 Amendments to Section R503.1.4 (Lighting).

R503.1.4 Lighting. New lighting systems that are part of the alteration shall comply with Section R404.1 as amended or supplemented.

Exception: Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.