

What

This fact sheet highlights key changes made to the 2016 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2019 Energy Code for nonresidential, high-rise residential and hotel/motel buildings. The 2019 Energy Code becomes effective January 1, 2020. All measures listed apply to nonresidential, high-rise residential and hotel/motel buildings, unless otherwise noted.

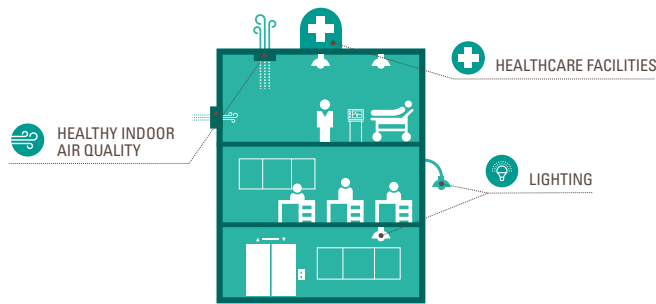


Figure 1— 2019 Energy Code Key Features Modified from *California Energy Commission Infographic*

Why?

Regularly updating the Energy Code helps ensure that builders use the most energy-efficient and energy-conserving technologies and construction practices, while being cost-effective over the lifespan of a building. California's energy-efficiency standards for buildings and appliances have saved consumers billions in lower electricity and natural gas bills.

The 2019 Energy Code for nonresidential, high-rise residential and hotel/motel buildings emphasizes better lighting and ventilation. It also extends energy-efficiency requirements to newly constructed healthcare facilities for the first time. The California Energy Commission estimates that it will reduce nonresidential building energy use by about 30 percent compared to the 2016 code, largely due to lighting improvements. This should result in lower energy bills and reduced greenhouse gas emissions.

Relevant Code Sections

2019 California Building Energy Efficiency Standards, Title 24, Part 6:

- [Section 100.0\(a\)](#) – Scope: Buildings Covered
- [Section 100.1\(b\)](#) – Definitions and Rules of Construction: Definitions
- [Section 110.6\(a\)](#) – Mandatory Requirements: Certification of Fenestration Products and Exterior Doors other than Field-fabricated
- [Section 120.0](#) – Mandatory Requirements
- [Section 120.1](#) – Requirements for Ventilation and Indoor Air Quality
 - 120.1(b) – High-rise Residential Buildings
 - 120.1(c) – Nonresidential and Hotel/Motel Buildings
 - 120.1(d) – Operation and Control Requirements for Minimum Quantities of Outdoor Air
 - 120.1(g) – Air Classification and Recirculation Limitations
- [Section 120.2](#) – Required Controls for Space Conditioning Systems
 - 120.2(e)3 – Shut-Off and Reset Controls: Occupancy Sensor Zone Controls
- [Section 130.1](#) – Mandatory Indoor Lighting Controls
 - 130.1(a) – Manual Area Controls

Multifamily

Occupancies R-1 and R-2 (R-3 includes single family, duplexes and townhomes and is subject to the single-family requirements of the Energy Code):

- Multifamily buildings 3-habitable stories or less above grade are addressed in the **low-rise residential** requirements of the Energy Code ([Subchapters 7, 8 & 9](#))
- Multifamily buildings 4-habitable stories or more above grade are addressed in the **nonresidential, high-rise residential and hotel/motel** requirements of the Energy Code ([Subchapters 3, 4, 5 & 6](#))

- 130.1(b) – Multi-Level Lighting Controls
- 130.1(c) – Shut-Off Controls
- 130.1(d) – Automatic Daylighting Controls
- 130.1(f) – Control Interactions
- **Section 130.2** – Outdoor Lighting Controls and Equipment
 - 130.2(b) – Luminaire Cutoff Requirements
 - 130.2(c) – Controls for Outdoor Lighting
- **Section 140.3** – Prescriptive Requirements for Building Envelopes
 - 140.3(a) – Envelope Component Requirements
 - 140.3(d) – Daylighting Design Power Adjustment Factors (PAFs)
- **Section 140.6** – Prescriptive Requirements for Indoor Lighting
- **Section 140.7** – Prescriptive Requirements for Outdoor Lighting
- **Section 140.9** – Prescriptive Requirements for Covered Processes
 - Section 140.9(c) – Laboratory and Factory Exhaust Systems
- **Section 141.0** – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Additions, Alterations, and Repairs
 - 141.0(b)2 – Alterations: Prescriptive Approach
 - 141.0(c) – Repairs
- **Section 150.1(c)8** – Prescriptive Standards/Component Package for Low-Rise Residential Buildings: Domestic Water-Heating Systems
- **Joint Reference Appendix JA4.5** – U-factor, C-factor, and Thermal Mass Data: Miscellaneous Construction
- **Joint Reference Appendix JA8** – Qualification Requirements for High Efficacy Light Sources
- **Nonresidential Reference Appendix NA6** – Alternate Default Fenestration Procedure to Calculate Thermal Performance
- **Nonresidential Alternative Calculation Method (ACM) Reference Manual Tables 2, 3 & 5**



Figure 2 – Solar PV systems may be installed with electric heat pump water heaters serving high-rise residential dwelling units or hotel/motel guest rooms as a new prescriptive water heating compliance option in the 2019 Energy Code

Healthcare Facility Highlights **Sections 100.0(a), 100.1(b)**

For the first time, the 2019 Energy Code extends requirements for a number of measures to newly constructed healthcare facilities, including hospitals. These measures include (but are not limited to) building envelope, lighting and mechanical systems.

There is a new [definition in Title 24, Part 6](#) to support this change. A “Healthcare Facility” is any building or portion thereof licensed pursuant to California Health and Safety Code Division 2, Chapter 1, Section 1204 or Chapter 2, Section 1250.

Healthcare Facilities are Occupancy I (Institutional) buildings including:

- I-2: Buildings and structures used for medical care on a 24-hour basis for more than five persons who are incapable of self-preservation, or classified as nonambulatory or bedridden

But not occupancies:

- I-1 (assisted living facilities)
- I-3 (prisons)
- I-4 (day care facilities)

To account for their special health and safety requirements, Healthcare Facilities are exempt from certain Energy Code requirements either entirely or because they are covered by other California codes. Many of these exceptions relate to mechanical and ventilation systems, and their control requirements. Some of these exemptions include:

- **Section 120.1(a)**: Ventilation requirements per Chapter 4 of the California Mechanical Code rather than Title 24, Part 6
- **Section 130.1(a)**: Manual Area Controls for lighting not required to be located in the same room with controlled lighting for psychiatric and secure areas because it may pose a health and safety hazard
- **Sections 130.1(b,c)**: Exempt from Multi-Level Lighting Controls and Lighting Shut-Off Controls
- **Sections 140.4(b-d,f,j-o)**: Exempt from most Prescriptive requirements for Space Conditioning Systems

The 2016 Energy Code definition for “Medical Buildings and Clinic Buildings” that were not Occupancy I has been removed from the 2019 Energy Code. Medical office buildings are considered Occupancy B not Occupancy I, so they are treated as normal office occupancies.

Envelope Highlights

New Glazed Door Definition Section 100.1(b): Any door with $\geq 25\%$ glazed area is considered a glazed door, and the entire door must meet applicable fenestration requirements.

Mandatory

Site-Built Fenestration Section 110.6(a): The maximum total area of new fenestration for which U-factor, solar heat gain coefficient (SHGC) and visible transmittance (VT) can be calculated using the [2019 Nonresidential Reference Appendix NA6](#) center-of-glass formula has been reduced from 1,000 ft² to 200 ft². This applies to nonresidential, high-rise residential and hotel/motel buildings. There are different area allowances for alterations and for low-rise residential buildings.

Exterior Doors Section 110.6: Exterior Doors must be labeled to indicate compliance with air leakage and U-factor requirements. Default values for doors can be found in [Joint Reference Appendix JA4.5](#)

Prescriptive

Vertical Windows in Demising Walls Section 140.3(a)3: Such windows are required to have U-factors less than or equal to the applicable area-weighted vertical fenestration U-factors from [Tables 140.3-B, C or D](#). Vertical windows in demising walls have no SHGC or VT requirements.

Tubular Daylighting Devices (TDD) Section 140.3(a)6: TDDs are a new skylight type added to Prescriptive [Table 140.3-B](#) for nonresidential buildings. They require a maximum area-weighted U-factor of 0.88 and a minimum area-weighted VT of 0.38, but they have no SHGC requirements.

Alterations Section 141.0(b)2A: A new note clarifies that glass replaced in an existing sash and frame, or sashes replaced in an existing frame are considered repairs, rather than alterations. In these cases, [Section 141.0\(c\)](#) requires that the replacement be at least equivalent to the original in performance.

Mechanical Highlights

Mandatory

MERV 13 Filters for New Ducted HVAC Section 120.1(b)1 & 120.1(c)1

New and complete replacement HVAC systems have new and updated Mandatory air filtration requirements. These apply to ducted forced-air space conditioning systems with over 10 feet of ducts, mechanical supply-only ventilation systems and the supply side of mechanical balanced ventilation systems. One important change is that the required filter efficiency has increased from MERV 6 (nominal 1” thick filter) to MERV 13 (nominal 2” thick filter, or equivalent 1” filter per [Equation 120.1-A](#)). Designers need to consider how this may impact system design airflow.

High-Rise Multifamily Ventilation and Indoor Air Quality Section 120.1(b)2

All new attached dwelling units of any size must meet [ASHRAE 62.2](#) ventilation and IAQ requirements as modified in [Section 120.1\(b\)2A](#), and must also comply with [Section 120.1\(b\)2B](#) regarding HERS testing and verification. The 2019 Energy Code increases total ventilation rates required for residences compared to the 2016 code. Important changes include:

Mechanical Ventilation Required Section 120.1(b)2Ai: Dwelling units may not meet ventilation requirements by using operable windows.

Mechanical Ventilation Airflow Rate Section 120.1(b)2Aiva: The Total Required Ventilation Rate is calculated per [Equation 120.1-B](#):

$$Q_{\text{tot}} = 0.03(A_{\text{floor}}) + 7.5(N_{\text{br}} + 1)$$

where:

Q_{tot} = Total Required Ventilation Rate, CFM

A_{floor} = Dwelling Unit Floor Area, ft²

N_{br} = Number of Bedrooms (must be ≥ 1)

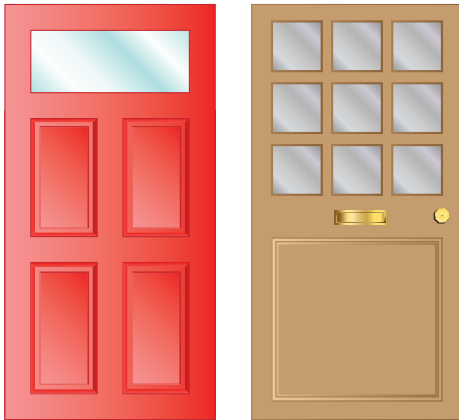


Figure 3 – Opaque Door (v) Glazed Door

Multifamily Ventilation Options [Section 120.1\(b\)2Aivb](#): For multifamily buildings, you have a choice between two options to provide required ventilation outside air to each unit:

1. Install a balanced ventilation system in which both supply and exhaust fans operate simultaneously in response to shared controls, and in which the cubic feet per minute (CFM) of mechanically controlled supply outside air and exhaust air are within 20% of each other OR
2. Install an unbalanced continuously operating supply ventilation system (supply fans only) or exhaust ventilation system (exhaust fans only) and also HERS-test and verify that the dwelling unit envelope meets certain air-leakage requirements ≤ 0.3 cfm at 50 Pa (0.2 in. of water) per ft² of dwelling unit envelope surface area

Airflow Performance [Section 120.1\(b\)2Bi](#): Multifamily ventilation outdoor airflow must be tested and HERS-verified to meet required rates.

Kitchen Range Hoods require minimum ventilation per [ASHRAE 62.2](#) Section 5 ([Section 120.1\(b\)2Biiia](#)) and maximum sound rating per [ASHRAE 62.2](#) Section 7.2 ([Section 120.1\(b\)2Avi](#)). This corresponds to 100 CFM ventilation for most kitchens and a sound rating of three sones or less. The installing contractor will need to provide an [NRCA Acceptance Testing](#) form confirming that the installed range hood is HVI-certified as meeting [ASHRAE 62.2](#) ventilation and sound requirements. After that is complete, a HERS rater must inspect the installed range hoods and verify that they are correctly listed in the [HVI Certified Home Ventilating Products Directory](#) and have been HVI-certified as meeting [ASHRAE 62.2](#) ventilation and sound requirements.

High-Rise Multifamily HERS Verifications

There are new HERS requirements for some high-rise residential Mandatory measures, such as checking HVI certification for kitchen range hoods, dwelling unit envelope leakage testing for unbalanced ventilation systems and outdoor airflow testing (see descriptions above). HERS testing and verification has not been common for high-rise residential buildings but these new Mandatory requirements are likely to change that. Under the 2019 Energy Code, building professionals must know when HERS verification is triggered, and schedule required testing and verification at the appropriate times in the construction process.

Nonresidential and Hotel/Motel Ventilation and Indoor Air Quality Requirements

Nonresidential and Hotel/Motel Ventilation Options [Sections 120.1\(c\)2](#) and [120.1\(c\)3](#): All occupiable nonresidential and hotel/motel spaces must meet minimum ventilation requirements through mechanical ventilation, natural ventilation plus mechanical ventilation or possibly natural ventilation alone.

Natural Ventilation [Section 120.1\(c\)2](#): Naturally ventilated spaces meeting the design criteria of [Section 120.1\(c\)2](#) must also have mechanical ventilation installed per [Section 120.1\(c\)3](#), with two exceptions. Natural ventilation is allowed without mechanical ventilation if: (1) ventilation openings are permanently open or controlled to stay open when occupied (controls must be easily accessible to occupants) or (2) there is no mechanical space conditioning serving the zone.

Mechanical Ventilation [Section 120.1\(c\)3](#): Required minimum CFM of outdoor air to the zone is the larger of that calculated by (1) multiplying updated [Table 120.1-A](#) minimum ventilation rates by net occupiable floor area of the ventilation zone or (2) for spaces with fixed seating or an expected number of occupants, multiplying number of occupants by 15 CFM/occupant of outside air.

Transfer Air (see [Exception to Section 120.1\(c\)3](#)) may be used to meet mechanical ventilation requirements if the total amount of outdoor air provided is enough to meet the ventilation requirements for each space individually and if the transfer air meets the new Air Classification and Recirculation Limitations.

Air Classification and Recirculation Limitations [Section 120.1\(g\)](#): The main idea of the new air classifications is to make sure that contaminated air from one space is not transferred to other spaces that have cleaner air. There are four Air Classes, and they range from Class 1 Air which is the cleanest and which can be recirculated or transferred to any other space, to Class 4 Air which is so contaminated that it cannot even be

Revised/Expanded 2019 Table 120.1-A: Minimum Ventilation Rates

[Table 120.1-A](#) has been substantially revised and expanded for the 2019 Energy Code. The old version of [Table 120.1-A](#) for the 2016 Energy Code showed ventilation rates in CFM/ft² of conditioned floor area (CFA) for 10 broad ventilation occupancies plus "all others" to cover any not included. The required ventilation rates for 2016 were the larger of CFA times 2016 [Table 120.1-A](#) values or the expected number of occupants times 15 CFM/occ, so ventilation calculations required doing both calculations and selecting the larger.

In the 2019 Energy Code, [Table 120.1-A](#) gives Area Outdoor Air Rates (R_a) in CFM/ft² of net occupiable area of the ventilation zone, and the table has expanded to 75 specific occupancy categories. Only occupancies with fixed seating require outdoor air calculations based on the number of occupants.

[Table 120.1-A](#) now also includes three additional columns of values:

- Minimum Air Rates for DCV (Demand Control Ventilation) in CFM/ft² which apply to [Section 120.1\(d\)4E](#)
- Air Class per [Section 120.1\(g\)](#) for transfer air used to meet ventilation requirements per the exception to [Section 120.1\(c\)3](#)
- Notes on some special cases within [Table 120.1-A](#), including Note F which allows ventilation rates to be reduced to zero in occupied standby mode for certain occupancy categories

recirculated back into the original room or transferred to other Class 4 zones. Class 2 Air can be recirculated or transferred to Class 2, Class 3 and Class 4 with some limitations, but not to Class 1. Class 3 Air can be recirculated within the original space it came from, but not transferred to any other spaces. There are exceptions for small amounts of Class 2 ($\leq 10\%$ outdoor air) and Class 3 ($\leq 5\%$ outdoor air) recirculated or transferred air when using energy recovery devices.

Estimated Air Classes for air leaving different occupancy spaces are listed in [Tables 120.1-A, B and C](#). When air from spaces with different Air Classes is mixed together, the new mixture is reclassified with the highest (i.e., most contaminated) air classification of any of the parts.

Exhaust Ventilation [Section 120.1\(c\)4](#): Exhaust airflow must be designed to meet the minimum rates in the new [Table 120.1-B](#).

Minimum Outdoor Air Control Requirements [Section 120.1\(d\)](#): Changes to demand control ventilation and occupant sensor ventilation controls include:

Required Demand Control Ventilation (DCV) [Section 120.1\(d\)3](#): Demand ventilation controls are required for spaces with design occupant density, or CBC egress occupant load density, of ≥ 25 people/1000 ft² (≤ 40 ft² per person), if the system serving the space has one or more of the following:

- An air economizer OR
- Modulating outside air control OR
- A maximum design outdoor airflow rate $> 3,000$ CFM

The controls must meet the requirements of [Section 120.1\(d\)4](#). The 2019 Energy Code removes exceptions to DCV for a number of specific occupancies and healthcare/medical buildings, while it adds new exemptions for daycare sickrooms, science labs, barber shops and nail salons.

Demand Control Ventilation Devices [Section 120.1\(d\)4](#): Minimum Air Rates for DCV in CFM/ft² have been added to [Table 120.1-A](#) for occupancy types that require DCV.

When the system is operating, the controls must maintain the minimum DCV ventilation levels for spaces with CO₂ sensors, while also maintaining ventilation that meets the Area Outdoor Air Rates (R_a) from [Table 120.1-A](#) for other spaces served by the system, or the exhaust air rate, whichever is greater.

Occupant Sensor Ventilation Control Devices [Sections 120.1\(d\)5 and 120.2\(e\)3](#):

There are two notable changes to these requirements:

1. Spaces that are required to have occupancy sensor ventilation devices according to [Section 130.1\(c\)](#) (offices ≤ 250 ft², multipurpose rooms $> 1,000$ ft², and classrooms, conference rooms and restrooms of any size), and that are also designated in the updated and revised [Table 120.1-A](#) as Note F (which allows ventilation to go down to zero when in stand-by mode) must be placed in occupied standby mode when all rooms in the zone are unoccupied for more than five minutes
2. Demand control ventilation is no longer an exception for occupancy sensor controls

Acceptance Testing Requirements [Section 120.5](#): As of October 1, 2021, the required mechanical system acceptance testing in 120.5 must be completed by a certified ATT (Acceptance Test Technician).

Prescriptive

Electric Heat Pump Water Heaters serving individual high-rise residential dwelling units and hotel/motel guest rooms, including additions and alterations, have new Prescriptive compliance options:

[Section 150.1\(c\)8Aiv](#): One heat pump water heater (not NEEA Tier 3) in combination with either added PV, or HERS-verified compact distribution and drain water heat recovery.

[Section 150.1\(c\)8Av](#): One NEEA Tier 3 heat pump water heater located in a garage or conditioned space. Climate Zones 1 and 16 also require:

- PV sized 0.3 kWdc larger than minimum from [Section 150.1\(c\)14](#) OR
- HERS-verified compact distribution

Lighting Highlights

Mandatory

Indoor Lighting Controls Section 130.1: There have been some clarifications to indoor lighting control requirements, including some new requirements and exceptions, plus a new code section on how different lighting controls must interact with each other.

Shut-Off Controls Section 130.1(c): There are several changes to this section, including:

- There is new, explicit code language that **all installed indoor lighting must have automatic controls to reduce lighting power when the space is typically unoccupied**
- Section 130.1(c)5: Restrooms of any size have been added to the list of space types that require occupancy sensors to turn off all lighting when the room is not occupied
- Exception 2 to Section 130.1(c) clarifies that luminaires providing required egress lighting must maintain minimum illumination levels per CBC Section 1008 while in partial-off mode

Automatic Daylighting Controls Section 130.1(d): There are three new exceptions to daylighting control requirements.

Automatic Daylighting Controls are **not** required for:

1. Exception 1: Areas under skylights if existing structures or natural objects block direct sunlight through the skylight between 8:00 am and 4:00 pm for more than 1,500 hours per year
2. Exception 2: Spaces next to vertical glazing below overhangs and with no vertical glazing above the overhangs, if the overhang projection-to-rise ratio is > 1.5 for South, East and West orientations or > 1.0 for North orientation
3. Exception 6: Lighting in sidelit daylit zones for retail sales areas and wholesale showrooms

Control Interactions Section 130.1(f): This new section defines the rules to allow different indoor lighting control types to work together seamlessly and meet all Section 130.1 control functions. This section is important because it explains how to deal with potentially conflicting requirements for different controls installed in the same space. For example, the manual area control for general lighting in a space (Section 130.1(a)) is required to allow all the other controls to set or adjust light levels per Sections 130.1(b) through (e). However, the shut-off control for a space (Section 130.1(c)) must also allow use of the manual area control to turn lights on, even if it overrides a pre-programmed schedule. Section 130.1(f) lists seven different control interaction possibilities.

See Section 141.0(b)21 Prescriptive highlight below for additional changes to indoor lighting control requirements for alterations.

Outdoor Lighting Controls and Equipment Section 130.2: There have been some changes to outdoor lighting cutoff requirements and the code language on outdoor lighting controls has been reorganized and revised.

Luminaire Cutoff Requirements Section 130.2(b)

- Changed the trigger for meeting Backlight, Uplight and Glare (BUG) requirements from > 150 watts to $\geq 6,200$ lumens
 - Outdoor luminaires with $\geq 6,200$ lumens must meet the BUG requirements of Title 24, Part 11 Section 5.106.8
- Exception 7 to Section 130.2(b) adds that outdoor lighting attached to high-rise residential or hotel/motel buildings and controlled from within a dwelling unit or guest room is exempt from cutoff requirements

Automatic Scheduling Controls Section 130.2(c)2: The 2019 Energy Code added this new section that consolidates and updates previous outdoor lighting controls. It requires automatic scheduling controls that:

- Can reduce lighting power by at least 50% and no more than 90%, and can turn off lighting when an area is not occupied

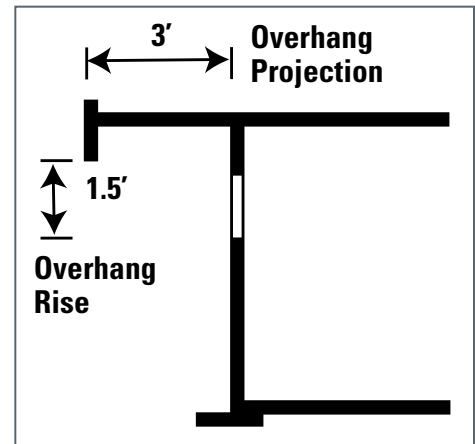


Figure 3 – Overhang Projection-to-Rise Ratio Example for Daylighting Controls Exception 2 to Section 130.1(d): In this example the Overhang Projection-to-Rise Ratio = $3'/1.5' = 2$

- Allow at least two separate nighttime schedules with independent lighting levels plus a two-hour override option
- Require acceptance testing
- May be combined with motion sensors or other outdoor lighting controls

Motion Sensing Controls [Section 130.2\(c\)3](#): The 2019 Energy Code added this new section that consolidates and updates previous outdoor lighting motion sensor control requirements, as follows:

- Motion sensors must be able to reduce lighting power by at least 50% and no more than 90%, and must be able to turn off lighting when an area is not occupied
- Motion sensors must be able to reduce lighting power within 15 minutes of area being vacated and to turn lights back on when occupied
- Controlled luminaire wattage per sensor must be $\leq 1,500$ watts
- Motion sensors (alone or in combination with other controls) are required for wall-mounted luminaires with bilaterally symmetric distribution (i.e., wall packs) mounted ≤ 24 feet above grade that illuminate building façades, ornamental hardscape or outdoor dining
 - They are also required for other outdoor luminaires where the bottom of the light fixture is mounted ≤ 24 feet above grade
- Exceptions 1 and 2 to [Section 130.2\(c\)3](#) state that motion sensors are not required for outdoor luminaires with ≤ 40 watts nor for exempt lighting in [Section 140.7\(a\)](#)
- Exception 3 to [Section 130.2\(c\)3](#) states that outdoor lighting may have minimum time out longer than 15 minutes or a minimum lighting power reduction greater than 50% to comply with any applicable health or life safety law, statute or regulation

Prescriptive

Indoor Lighting Power Allowances in [Section 140.6](#) have been reduced across the board based on improved LED lighting efficiencies. This is similar to ASHRAE 90.1.

- [Table 140.6-B](#) Complete Building Method LPDs reduced by about 36%
- [Table 140.6-C](#) Area Category Method LPDs reduced by about 31%
- [Table 140.6-G](#) Tailored Method General Lighting reduced by about 18.5%, with additional reductions for display and ornamental/special effects lighting

These allowances apply to nonresidential buildings and nonresidential spaces within high-rise residential and hotel/motel buildings. For designers who have not yet switched to LED lighting, these changes are likely to increase LED lighting use for those space types throughout California or require reconsideration of indoor lighting design strategies.

Outdoor Lighting Power Allowances in [Section 140.7](#) have been reduced overall based on improved LED lighting efficiencies:

- [Table 140.7-A](#) General Hardscape LPDs reduced by about 35%
- [Table 140.7-B](#) Additional Lighting Power Allowances for Specific Applications reduced by about 50%

These allowances apply to outdoor illuminated areas for nonresidential buildings and nonresidential outdoor illuminated areas associated with high-rise residential and hotel/motel buildings. For designers who have not yet switched to LED lighting, these changes are likely to increase LED lighting use for outdoor lighting throughout California or require reconsideration of outdoor lighting design strategies.

New Indoor Lighting PAF for Envelope Daylighting Devices plus Dimming: Lighting compliance credit is available for clerestory fenestration, interior/exterior horizontal slats and interior/exterior light shelves as defined in [Section 140.3\(d\)](#) when installed with continuous dimming daylighting controls per [Section 130.1\(d\)](#).

Altered Indoor Lighting Systems [Section 141.0\(b\)2l](#): The 2019 Energy Code requirements for indoor lighting alterations have been substantially revised. Alterations now include all lighting changes, and there are new alteration triggers, exceptions and changes to control requirements.

Prescriptive indoor lighting alteration requirements are triggered when 10% or more of the luminaires in an enclosed space are altered. This includes ballast/driver and lamp changes made at the same time, but not those made separately.

Alterations must meet the requirements of [Section 141.0\(b\)2l i, ii or iii](#):

- Lighting alterations** to meet lighting power requirements of [Section 140.6](#) and the lighting control requirements of [Table 141.0-F](#). This option requires compliance with all the same lighting power density (LPD) and control requirements as an entirely new lighting system, except that general and display/ornamental/special effects lighting does not need to be controlled separately if existing circuits are being reused. This allowance for reusing existing circuits applies to the options in [ii](#) and [iii](#) as well.
- If the alteration **does not exceed 80%** of the area category lighting power allowance in [Section 140.6](#), control requirements are reduced per [Table 141.0-F](#). By using less installed lighting power than the option in [i](#), the option in [ii](#) becomes exempt from multi-level, daylighting and demand response controls.
- If a **one-for-one luminaire replacement project** (i.e., retrofits) limited to a building or tenant space of $\leq 5,000$ ft² can show that the existing wattage is being reduced 40% with the altered luminaires, control requirements are reduced per [Table 141.0-F](#). This option is limited to small buildings or tenant spaces in which replacement lighting can be documented as 40% lower power than the existing lighting, but it gains exemption from multi-level, daylighting and demand response controls.

Prescriptive indoor lighting alteration requirements are not triggered for the following existing and new exceptions to [Section 141.0\(b\)2l](#):

- Exception 2: Changes to lighting in a room with only one luminaire
- Exception 3: Any alteration that would directly disturb existing asbestos, unless asbestos is being intentionally removed at the same time as the lighting alteration

- Exception 5: Any alteration limited to adding lighting controls or replacing lamps, ballasts or drivers
- Exception 6: Up to 50 one-for-one luminaire replacements (i.e., retrofits) in a year, either per complete floor of a building or per complete tenant in a multi-tenant building

Exception 4 for acceptance testing is unchanged: Acceptance testing is not required if controls are added to ≤ 20 luminaires.

Covered Process Highlights

Prescriptive

Laboratory and Factory Exhaust Systems Section 140.9(c): This section now covers factory exhaust systems as well as laboratory exhaust, and it has been expanded to include exhaust transfer air, fan power consumption and fume hood automatic sash closure.

Exhaust System Transfer Air Section 140.9(c)2: Conditioned supply air delivered to any space with mechanical exhaust must meet the requirements in Section 140.4(o).

Fan System Power Consumption Section 140.9(c)3: All newly installed fan exhaust systems > 10,000 CFM that serve a laboratory or factory, must meet subsection A and either B, C or D:

- Systems discharge per ANSI Z9.5-2012
- The exhaust fan system power must not exceed 0.85 W/CFM of exhaust air for systems with air filtration, scrubbers, or other air treatment devices. For all other exhaust fan systems, the system power must not exceed 0.65 W/CFM of exhaust air. Exceptions may apply.
- The volume flow rate at the stack must vary based on the measured 5-minute averaged wind speed and wind direction obtained from a calibrated local anemometer. Acceptance testing is required.
- The volume flow rate at the stack must vary based on the measured contaminant concentration in the exhaust plenum from a calibrated contaminant sensor installed within each exhaust plenum. Acceptance testing is required.

Fume Hood Automatic Sash Closure Section 140.9(c)4: Variable air volume (VAV) laboratory fume hoods with vertical only sashes located in fume hood intensive laboratories, as defined in Table 140.9-B, shall have an automatic sash closure system meeting specific requirements including acceptance testing.

Performance Method

How Prescriptive Changes Influence Performance Options

Reduced Prescriptive indoor lighting power allowances for nonresidential buildings and nonresidential spaces in high-rise residential and hotel/motel buildings eliminate a significant energy compliance trade-off in the Performance method. Designers who have already been using LED lighting in their projects may have become used to using that indoor lighting compliance credit to trade-off against other building features that were less energy efficient. The change in the indoor lighting energy budgets may require designers to rethink their strategies for some building envelope or mechanical system features.

Impact of Revised HVAC System Mapping in the 2019 Nonresidential Alternative Calculation Method (ACM) Reference Manual

Updates to the 2019 Nonresidential Alternative Calculation Method (ACM) Reference Manual, Section 5.1.2 HVAC System Map change the Performance method standard design HVAC system assumptions, and this is likely to change compliance results. Some of the biggest changes are:

2016 NR ACM ¹		2019 NR ACM ²	
Building Type	Standard Design	Building Type	Standard Design
Residential & Hotel/Motel Guest Room		Residential & Hotel/Motel Guest Room	
≤ 3 Floors	System 1 PTAC	≤ 7 Floors	System 1 SZAC
≥ 4 Floors	System 2 FPFC	≥ 8 Floors	System 2 FPFC
Nonresidential (not Covered Process)		Nonresidential (not Covered Process)	
< 10,000 ft ²		< 25,000 ft ²	
1 Floor	System 3 PSZ	≤ 3 Floors	System 7 SZVAV ³
> 1 Floor	System 5 PVAV	4 or 5 Floors	System 5 PVAV
		> 5 Floors	System 6 VAWS
10,000 - 150,000 ft		25,000 – 150,000 ft ²	
Any # Floors	System 5 PVAV	≤ 5 Floors	System 5 PVAV
		> 5 Floors	System 6 VAWS
> 150,000 ft ²		> 150,000 ft ²	
1 Floor	System 7 SZVAV	Any # Floors	System 6 VAWS
> 1 Floor	System 6 VAWS		

¹ See 2016 Nonresidential ACM Reference Manual Tables 4, 5 & 7 for details.

² See 2019 Nonresidential ACM Reference Manual Tables 2, 3 & 5 for details.

³ For 2019, System 7 SZVAV (Packaged Single Zone VAV with gas heating) for all space types except laboratories will have a minimum fan speed ratio of 0.5 for Standard Design cooling capacity ≥ 65 kBtu/h, and will actually be constant volume (minimum fan speed ratio of 1) for standard design cooling capacity < 65 kBtu/h. SZVAV systems for laboratories will have a minimum fan speed ratio of 0.2 for all standard design cooling capacities.

Table 1 – Nonresidential ACM: 2019 (v) 2016

The 2019 changes to the baseline system assumptions for small nonresidential buildings correspond to typical building practices better than some of the 2016 assumptions. This should help provide Performance compliance results that match design expectations for those building and system types.

For More Information

Primary Documents

- Energy Code Section 100.0 – Scope
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section100scope1.htm
- Energy Code Section 100.1 – Definitions and Rules of Construction
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1001definitionsandrulesofconstruction.htm
- Energy Code Section 110.6 – Mandatory Requirements for Fenestration Products and Exterior Doors
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1106mandatoryrequirementsforfenestrationproductsandexteri.htm
- Energy Code Section 120.0 – Mandatory Requirements
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1200general.htm
- Energy Code Section 120.1 – Requirements for Ventilation and Indoor Air Quality
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1201requirementsforventilationandindoorairquality.htm
- Energy Code Section 130.1 – Mandatory Indoor Lighting Controls
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1301mandatoryindoorlightingcontrols.htm
- Energy Code Section 130.2 – Outdoor Lighting Controls and Equipment
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1302outdoorlightingcontrolsandequipment.htm
- Energy Code Section 140.3 – Prescriptive Requirements for Building Envelopes
energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1403prescriptiverequirementsforbuildingenvelopes.htm
- Energy Code Section 140.6 – Prescriptive Requirements for Indoor Lighting
energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1406prescriptiverequirementsforindoorlighting.htm
- Energy Code Section 140.7 – Prescriptive Requirements for Outdoor Lighting
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1407prescriptiverequirementsforoutdoorlighting.htm
- Energy Code Section 140.9 – Prescriptive Requirements for Covered Process
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1409prescriptiverequirementsforcoveredprocesses.htm
- Energy Code Section 141.0 – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Additions, Alterations, and Repairs
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1410additionsalterationsandrepairsstoexistingnonresidential1.htm
- Energy Code Section 150.1(c)8 – Performance and Prescriptive Compliance Approaches for Low-Rise Residential Buildings: Domestic Water Heating Systems
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesforlowr.htm
- Energy Code Joint Reference Appendix JA4.5 – U-factor, C-factor, and Thermal Mass Data: Miscellaneous Construction
energycodeace.com/site/custom/public/reference-ace-2019/Documents/ja45miscellaneousconstruction.htm

- Energy Code Joint Reference Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixja8qualificationrequirementsforhighefficacylightsources.htm
- Energy Code Nonresidential Reference Appendix NA6 – Alternate Default Fenestration Procedure to Calculate Thermal Performance
energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixna6alternatedefaultfenestrationproceduretocalculatetherm1.htm
- Nonresidential Alternative Calculation Method (ACM) Reference Manual
energycodeace.com/site/custom/public/reference-ace-2019/Documents/1overview.htm

California Energy Commission Information & Services

- Energy Standards Hotline: 1-800-772-3300 (Free) or Title24@energy.ca.gov
- Online Resource Center:
energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center
 - The Energy Commission’s main web portal for the Energy Code, including information, documents and historical information

Additional Resources

- ASHRAE Technical Standards Bookstore (for ANSI/ASHRAE Standards 62.1 and 62.2)
ashrae.org/technical-resources/bookstore/standards-62-1-62-2
- HVI Certified Home Ventilating Products Directory
hvi.org/hvi-certified-products-directory/
- California Association of Building Energy Consultants (CABEC) Webinars
 - What’s New for Multifamily Ventilation in 2019!
 - 2019 Energy Code: Lighting Updates
cabec.org/learning/
- Energy Code Ace:
EnergyCodeAce.com
 - An online “one-stop-shop” providing no-cost tools, training and resources to help appliance and building industry professionals decode and comply with Title 24, Part 6 and Title 20. The site is administered by California’s investor-owned utilities. Of special interest:
 - Fact Sheets
energycodeace.com/content/resources-fact-sheets/
 - What’s Changed for 2019: Nonresidential, High-Rise Residential, Hotel/Motel
 - Residential High-Efficacy Lighting - Title 20 and Title 24, Part 6 JA8: Key Differences and Overlap
 - Reference Ace™ – Easily navigate Title 24, Part 6 documents using search and hyperlinks
energycodeace.com/content/tools-ace/tool=reference-ace
 - 2019 Energy Code
 - 2016 Energy Code
 - Training
energycodeace.com/training
 - Title 24: Where We’re Headed with the 2019 Standards
 - 2019 Title 24, Part 6: Where We’re Headed with the Nonresidential Standards
 - Decoding What’s New: Let’s Talk 2019 Title 24, Part 6 – Nonresidential

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