Residential and Nonresidential

High-Rise and Low-Rise Multifamily

What is High-Rise and Low-Rise Multifamily?

Multifamily buildings contain multiple dwelling units that share common walls and may also share common floors or ceilings. Hotel and motel buildings are not considered multifamily.

Building type, and the number of habitable stories in a multifamily building dictates whether it is considered "high-rise" or "low-rise"- and which of the Title 24, Part 6 Building Energy Efficiency Standards (Energy Standards) requirements apply to it. Multifamily buildings with four or more habitable stories are considered high-rise, while buildings with three or fewer habitable stories, and duplexes and townhomes are considered low-rise.

Why? When applying the Energy Standards, it is important to properly identify the project as low-rise or high-rise multifamily. Multifamily projects are complicated because a mixture of nonresidential and residential requirements apply based on the space types within the building. In addition, there are specific high-rise residential requirements for some Prescriptive requirements. See Table 1 for a summary of which sections in the Energy Standards apply to multifamily building types.

2016 California Building Energy Efficiency Standards		
Project Type	**Requirement Type**	**Relevant Sections**
All Occupancies		
Scope, Definitions and Rules of Construction	All occupancies	100.0-100.2
Mandatory Requirements	All occupancies	110.0-110.11
Low-Rise Residential		
Common Area Indoor Lighting	Nonresidential*	130.0, 130.1, 130.4, 140.3, 140.6
Dwelling Unit Indoor Lighting and Outdoor Lighting	Residential	130.0, 150.0, 150.1
HVAC, Envelope and DHW	Residential	150.0, 150.1
Pool/Spa Systems	Residential	150.0
Additions, Alterations, Repairs	Residential	150.2
High-Rise Residential		
Dwelling Unit Indoor Lighting and Outdoor Lighting (Controls Within Unit)	Residential	130.0, 150.0, 150.1
Common Area Indoor Lighting and Outdoor Lighting (Controls Outside Unit)	Nonresidential	120.8, 130.0, 130.1, 130.2, 130.4, 140.3, 140.6, 140.7
Electrical Power Distribution	Nonresidential	130.5
HVAC	Nonresidential	120.0-120.5, 120.8, 140.4
Envelope	High-rise Residential	120.7, 120.8, 140.3
DHW	Residential	120.3, 120.8, 120.9, 140.5
Pool/Spa Systems	Residential	150.0
Additions, Alterations, Repairs	Nonresidential	141.0

* May be able to use residential requirements based on common area as percentage of conditioned floor area (see Section 150.0(k)6)

Table 1: Multifamily Projects: Applicable Energy Standards Sections

Mandatory, Prescriptive, Performance

Mandatory requirements that apply to both low- and high-rise multifamily buildings can be found in Sections 110.0 through 110.11 of the Energy Standards.

In addition to meeting these Mandatory requirements, either a Prescriptive or Performance compliance path may be followed for multifamily projects. The Performance path is most commonly used, as it allows flexibility to trade-off performance between building systems. In order to verify compliance using the Performance path, compliance software certified by the California Energy Commission (Energy Commission) must be used. The compliance software compares the building design to a similar building that meets Prescriptive requirements (except for HVAC systems). Mandatory requirements must always be met, and cannot be traded off even when using the Performance approach.

Solar Ready Areas

Newly constructed buildings are required to either include an allocated solar ready area, or show compliance with the appropriate exceptions found in Section 110.10. A solar ready area or "solar zone" is a section of the roof designated and reserved for the future installation of a solar electric or solar thermal system.

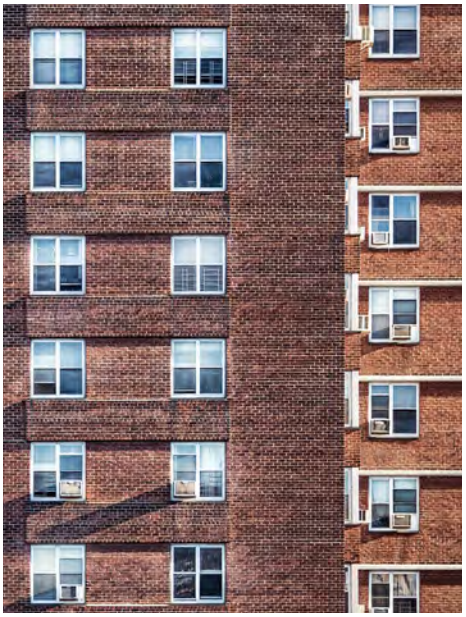
- **Sizing:** The solar area must comprise no less than 15% of the total roof area of the building (less any skylight area) and may consist of multiple sub-areas provided that each sub-area is at least 80ft^2 with no dimension less than 5 feet
- **Location:** The solar area must be located on the roof or overhang of the building, or on the roof or overhang of another structure located within 250 feet of the building, or on covered parking installed with the building project

Section 110.10 also includes requirements for orientation, shading, structural design loads, interconnection pathways for electrical service and service panel requirements. There are some exceptions to these requirements for multifamily projects, including:

- Multifamily projects are not required to comply with service panel requirements in Section 110.10(e)
- High-rise multifamily projects with 11 or more habitable stories are not required to comply with solar ready requirements in Section 110.10
- Meeting alternative compliance options such as installing ENERGY STAR® appliances outlined in Section 110.10(b)1B

Envelope

Mandatory and Prescriptive requirements for roofs, walls, floors and windows vary depending on construction type, and whether the project is low-rise or high-rise. Table 2 summarizes these requirements, though more assembly details can be found in Joint Appendix JA4. Also note that in the 2016 Energy Standards, only U-factors are specified for Mandatory requirements. R-values have been included in Table 2 to give a sense of insulation levels necessary to achieve these U-factors.



Low-Rise	Mandatory	Prescriptive
Roof		See Table 150.1-A, requirements differ by climate zone
Wood	0.043 (appx R-22) 0.054 for alterations	
Wall		
2x4	0.102 (appx R-13)	
2x6	0.074 (appx R-19)	
Floor		
Wood	0.037 (appx R-19)	
Fenestration	0.058	
High-Rise	**Mandatory**	**Prescriptive**
Roof		See Table 140.3-C, requirements differ by climate zone
Wood	0.075 (appx R-13)	
Metal	0.098 (appx R-19)	
Wall		
2x4	0.110 (appx R-11)	
Metal	0.151 (appx R-13 w R-2 continuous)	
Demising	0.099 (wood) or 0.151 (metal)	
Floor		
Other	0.071 (appx R-11)	
Raised Mass	0.269	
Fenestration	NA	

Table 2: Maximum U-factor Requirements for Envelope Assemblies

Prescriptive cool roof requirements also apply to multifamily projects, as specified in Section 140.3 for high-rise residential, and Section 150.1 for low-rise residential. Section 141.0 and Section 150.2 describe when these requirements apply to additions and alterations.

HVAC Systems

For newly constructed low-rise and high-rise buildings, HVAC systems must meet minimum equipment efficiencies and controls requirements in Section 110.2 for the applicable system type. For high-rise residential projects, mandatory ventilation, control, pipe insulation, distribution (ducts) and acceptance testing requirements are found in Sections 120.1-120.5. Similar Mandatory requirements for low-rise residential projects are found in Section 150.0.

Prescriptive requirements for HVAC systems in high-rise projects are found in Section 140.4. These include requirements for load calculations, fan efficacy, controls, economizers, hydronic systems and duct leakage and testing among others. Prescriptive requirements for low-rise projects, such as refrigerant charge verification, ventilation cooling and prohibition of bypass ducts are found in Section 150.1.

Efficiency requirements for air conditioners and heat pumps under 65kBtu can be found in Table C-2 for single phase and Table C-3 for three phase units in the Appliance Efficiency Regulations (Title 20).

Domestic Hot Water (DHW) Systems

Mandatory requirements for both low-rise and high-rise DHW systems can be found in Section 110.3. Requirements for low-rise can be found in Sections 150.0(n) and 150.0(j), and high-rise requirements can found in Section 120.3.

- Systems for low-rise residential that use gas or propane water heaters to serve individual dwelling units must include the following components:
  - A 120V electrical receptacle that is within 3 feet of the water heater and accessible to the water heater with no obstructions ***and***
  - A Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed ***and***
  - A condensate drain that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assistance ***and***
  - A gas supply line with a capacity of at least 200,000 Btu/hr
- Water heating recirculation loops serving multiple dwelling units must meet the requirements of Section 110.3(c)5
- Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC), or by a listing agency that is approved by the Energy Commission Executive Director
- Instantaneous water heaters with an input rating greater than 6.8 kBtu/hr (2kW) must meet the requirements of Section 110.3(c)7

Prescriptively, both low-rise and high-rise projects must meet requirements in Section 150.1(c)8:

- Systems serving individual dwelling units must be gas or propane, and either a storage type water heater with an input of 105,000 Btu/hr or less, or an instantaneous type water heater with an input of 200,000 Btu/hr or less
  - The gas storage heater must pass HERS insulation checks for Quality Insulation Installation (QII)
  - Gas storage heaters with storage volume greater than 55 gallons must have HERS verification that pipes are insulated, and must meet more stringent efficiency requirements applicable to that equipment class
- Systems serving multiple dwelling units must meet the minimum efficiency requirements of Sections 110.1 and 110.3 of the Energy Standards and have a recirculation loop equipped with an automatic control system which controls pump operation based on hot water demand and return temperature
- A solar water heating system with a minimum solar savings fraction of 0.20 in Climate Zones 1-9 or 0.35 in Climate Zones 10-16 is Prescriptively required for central systems serving multiple dwelling units

Dwelling Unit Lighting

Lighting requirements inside dwelling units are Mandatory (rather than Prescriptive) and are the same for low-rise and high-rise multifamily buildings. For a list of which spaces in high-rise residential buildings are subject to the residential lighting requirements, refer to Section 130.0(b). For a complete description of the residential lighting requirements that apply to dwelling units, see Section 150.0(k) and Table 150.0-A. The Energy Code Ace fact sheet on Residential Lighting provides additional details.

Common Area Lighting

For high-rise projects complying prescriptively, common areas must comply with the applicable nonresidential lighting standards discussed in Section 140.6. For low-rise buildings, common areas can either comply with nonresidential requirements, or the requirements can be based on the percentage of conditioned floor area made up by these common areas. Indoor common areas with a combined floor area of:

- ≤20% Conditioned Floor Area require that permanently installed lighting for these areas consist of high efficacy luminaires and be controlled by an occupant sensor
- >20% of Conditioned Floor Area must comply with the applicable requirements for nonresidential indoor lighting
  - In addition, lighting installed in corridors and stairwells must be controlled by partial-off sensors that reduce the lighting power in each space by at least 50% when unoccupied

Lighting for Parking Lots and Carports

Requirements for outdoor lighting of parking areas are based on vehicle capacity.

- Parking lots or carports designed for fewer than eight vehicles may use residential outdoor lighting requirements or adhere to the basic requirements for outdoor residential lighting:
  - Must be high efficacy like indoor lighting
  - Must include manual on/off switch and one of the following:
    - Photo-control and motion sensor
    - Photo-control and automatic time switch control
    - Astronomical time switch control
    - Energy Management Control System
- Parking lots, carports, or garages designed for eight or more vehicles are required to meet the nonresidential lighting requirements, including lighting power density limits. See Sections 130.0, 130.2, 130.4 and 140.7 for requirements
- Parking garages are considered interior spaces and therefore do not require photo or astronomic controls

Electrical Distribution

Section 130.5 covers requirements for electrical distribution relevant to nonresidential portions of multifamily projects. This section includes requirements for:

- Service Metering
- Separation of Electrical Circuits
- Voltage Drop
- Receptacle Controls

These requirements are discussed further in the Energy Code Ace fact sheet on Electrical Power Distribution.

Commissioning

Mixed use, such as high-rise projects that have nonresidential spaces, trigger commissioning requirements in Section 120.8. These requirements are mandatory, and apply to systems serving the nonresidential portions of the building. Whether commissioning activities during construction are required or not depends on conditioned floor area being 10,000 ft^2 or more. In mixed-use projects, only the nonresidential portion of the conditioned floor area is considered.

Forms – Which and When

Low-Rise: Use residential compliance forms applicable to the project and nonresidential lighting forms for common areas when these areas are 20% or more of the total building square footage. Low-rise multifamily projects that use the Performance compliance approach will use an approved residential compliance software that produces the applicable CF1R-PRF-01-E form.

High-Rise: Use nonresidential compliance forms for envelope, HVAC, outdoor lighting, and common area lighting as applicable to the project. As the Performance compliance path is used for most multifamily projects, the approved nonresidential compliance software will produce the applicable NRCC-PRF-01-E form.

For More Information

Primary Sources

General Provisions for All Occupancies:

- Section 100 – Scope and Definitions and Rules of Construction
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1000scope.htm
- Section 110 – Systems and Equipment - General
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1100systemsandequipmentgeneral.htm
- Reference Appendix JA4 – U-factor, C-factor, and Thermal Mass Data
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/appendixja4ufactorcfactorandthermalmassdata.htm

Low-Rise Residential:

- Section 130 – Lighting Systems and Equipment and Electrical Power Distribution Systems - General
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Section 150 – Mandatory Features and Devices
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1500mandatoryfeaturesanddevices.htm

High-Rise Residential:

- Section 120 – Envelope, Ventilation, Space-Conditioning and Water Heating - General
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1200general.htm
- Section 130 – Lighting Systems and Equipment and Electrical Power Distribution Systems - General
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Section 140 – Performance and Prescriptive Compliance Approaches
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1400performanceandprescriptivecomplianceapproaches.htm
- Section 141 – Additions, Alterations, and Repairs
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/sec1410additionsalterationsrepairstoexistingbuildingsthatwillben.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/title24/orc/
  – The Energy Commission's main web portal for Energy Standards, including information, documents, and historical information
- Home Energy Rating System (HERS) Program Sub-site:
  energy.ca.gov/HERS/
- What is Your Home Energy Rating booklet
  energy.ca.gov/HERS/booklet.html
- California Building Climate Zone Map:
  energy.ca.gov/maps/renewable/building_climate_zones.html

Additional Resources

- California Lighting Technology Center (CLTC) Guides:
  – Nonresidential Lighting: What's New in the 2016 Title 24, Part 6 Code?
  cltc.ucdavis.edu/publication/2016-title-24-code-changes-nonresidential
  – Residential Lighting: What's New in the 2016 Title 24, Part 6 Code?
  cltc.ucdavis.edu/publication/2016-title-24-code-changes-residential
- Energy Code Ace:
  EnergyCodeAce.com
  – An online "one-stop-shop" providing free resources and training 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.

  Please register with the site and select an industry role for your profile in order to receive messages about all our free offerings!

  Of special interest:
  - Application Guides:
    energycodeace.com/content/application-guides/
    – Nonresidential Lighting and Electrical Power Distribution
    – Residential Lighting
  - Fact Sheets:
    EnergyCodeAce.com/content/resources-fact-sheets/
    – HERS Measures Quick Reference Sheet
  - Trigger Sheets:
    EnergyCodeAce.com/content/resources-trigger-sheets/
    – Residential HVAC Alterations
    – Nonresidential Small Commercial HVAC Alteration
  - Forms Ace:
    energycodeace.com/content/forms-ace/
    – An interactive tool designed to help you determine which Title 24, Part 6 Forms are applicable to your specific project

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