



## What's Included in this Fact Sheet?

This fact sheet highlights key changes made to the 2019 Title 24, Part 6 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2022 Energy Code for multifamily buildings. The 2022 Energy Code becomes effective January 1, 2023. All measures listed apply to all multifamily buildings unless otherwise noted. There are separate requirements for dwelling units and common use areas.

Generally, multifamily buildings in the Energy Code are buildings with three or more dwelling units, excluding townhouses. The 2022 Energy Code clarifies the definition of a multifamily building as a building in one of the following groups:

- ◊ Occupancy Group R-2, other than a hotel/motel building or timeshare property
- ◊ Occupancy Group R-3 that is a non-transient congregate residence, other than boarding houses of more than 6 guests and alcohol or drug abuse recovery homes of more than 6 guests
- ◊ Occupancy Group R-4

Residential Occupancy Groups R-2, R-3 and R-4 are set by the California Building Code (Title 24, Part 2) independently of the Energy Code (Title 24, Part 6).

- ◊ R-2 includes buildings with sleeping units or three or more dwelling units with primarily permanent residents.
- ◊ R-3 overall includes single family and duplex residences, but R-3 also includes some multifamily congregate residences with primarily permanent residents, such as dormitories.
- ◊ R-4 covers supervised residential environments for more than six ambulatory clients and up to 16 total residents, excluding staff. R-4 includes assisted living facilities such as residential care facilities and group homes and social rehabilitation residences such as halfway houses and drug treatment facilities.

## How to Use this Fact Sheet

Use this fact sheet for highlights on the ways in which the Energy Code has changed in 2022 for multifamily buildings. For detail about the code changes, refer to the *Multifamily Buildings: What's Changed in 2022 Fact Sheet*.

Highlights and details about the code changes for other building types are given in the following fact sheets:

- ◊ *Nonresidential Buildings: What's New in 2022?*
- ◊ *Nonresidential Buildings: What's Changed in 2022?*
- ◊ *Single-family Buildings: What's New in 2022?*
- ◊ *Single-family Buildings: What's Changed in 2022?*

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## Why Did the Energy Code Change?

The 2022 Energy Code is an important part of California's work to reduce carbon emissions and fight climate change. The Energy Code is updated every three years with the mandate to increase building energy efficiency while staying cost-effective for building owners over the lifespan of a building.

- ✦ Increases in energy efficiency and on-site generation:
- ✦ Reduce utility bills
- ✦ Improve indoor comfort and air quality
- ✦ Increase market value
- ✦ Reduce greenhouse gas emissions (GHG)

The California Energy Commission (CEC) estimates that over 30 years the 2022 Energy Code will provide \$1.5 billion in consumer benefits and reduce 10 million metric tons of GHG – equivalent to taking nearly 2.2 million gas cars off the road for a year.

For multifamily buildings alone, the CEC estimates that the 2022 Energy Code will reduce net CO<sub>2</sub> emissions by close to 10,000 metric tons per year compared to the 2019 Energy Code, the equivalent of taking 2,240 gas cars off the road each year. This is the result of encouraging electric heat pump space heating instead of gas furnaces, new photovoltaic and battery storage measures and other improvements to building envelope and HVAC component efficiency.

### ***BENEFITS OF THE 2022 ENERGY CODE ACROSS ALL BUILDING TYPES***

- ✦ Increases on-site renewable energy generation from solar
- ✦ Increases electric load flexibility to support grid reliability
- ✦ Reduces emissions from newly constructed buildings
- ✦ Reduces air pollution for improved public health
- ✦ Encourages adoption of environmentally beneficial efficient electric technologies

## Decarbonization Goals

California is aiming to reduce its greenhouse gas emissions (GHG) while creating an energy system that is resilient to climate risks, spurring innovation and a low-carbon transition nationally and internationally. Per the CEC Energy Assessment, California has some of the most ambitious climate and energy goals in the world.

### GHG Emission Reduction Goals

#### Assembly Bill 32:

1990 levels by 2020

#### Senate Bill 32:

40% below 1990 levels by 2030

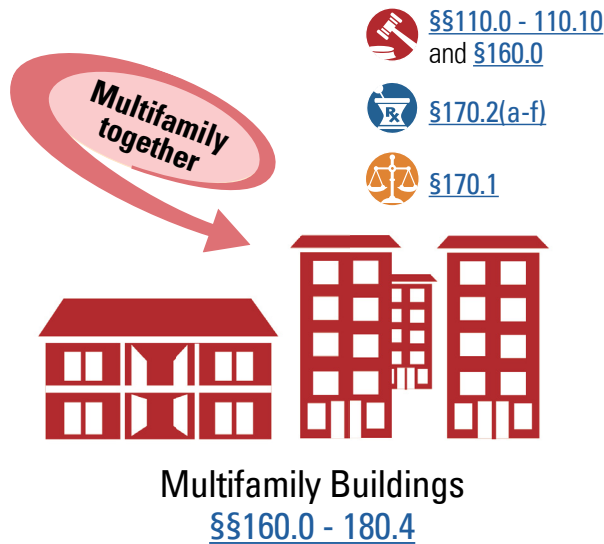
#### Executive Order S-3-05:

80% below 1990 levels by 2050

This can be achieved through a variety of measures, such as incremental steps toward “carbon neutral” buildings, and timely balancing of onsite energy production and consumption in support of a healthy, stable grid. The Energy Code supports reaching these goals.

Learn more from the CEC Building Decarbonization Assessment at [bit.ly/CEC-building-decarbonization](https://bit.ly/CEC-building-decarbonization)

# Where to Find Multifamily Building Requirements in the 2022 Energy Code



One of the largest changes to the structure of the 2022 Energy Code is that the Energy Code requirements for all multifamily buildings have been moved into their own subchapters, rather than being combined with single-family residential or nonresidential building types.

In past Energy Code cycles, the requirements for multifamily buildings with three or fewer habitable stories were grouped together with single-family residences and duplexes in the category of “low-rise residential,” while multifamily buildings with four or more habitable stories were considered “high-rise residential,” and their Energy Code requirements were part of the nonresidential standards. The 2022 Energy Code still has some distinctions between multifamily buildings with three or fewer stories versus four or more stories, but the new Energy Code structure makes it easier to find all multifamily requirements.

2022 Energy Code sections that apply to multifamily buildings are listed in Table 1.

	Subchapter	Requirements
	<b>Subchapter 2</b>	<p><b>All Occupancies: Mandatory Requirements for the Manufacture, Construction and Installation of Systems, Equipment and Building Components</b></p> <p><a href="#">§§110.0-110.10</a>: Mandatory measures that may apply to all occupancy types depending on the equipment types and systems proposed</p> <p>The structure of Subchapter 2 of the Energy Code remains essentially the same as in past code cycles.</p>
	<b>Subchapter 10</b>	<p><b>Multifamily Buildings: Mandatory Requirements</b></p> <p><a href="#">§§160.0-160.9</a>: Mandatory requirements for dwelling units and common use areas in multifamily buildings</p> <p><a href="#">§160.0</a> General</p> <p><a href="#">§160.1</a> Mandatory Requirements for Building Envelopes</p> <p><a href="#">§160.2</a> Mandatory Requirements for Ventilation and Indoor Air Quality</p> <p><a href="#">§160.3</a> Mandatory Requirements for Space Conditioning Systems in Multifamily Buildings</p> <p><a href="#">§160.4</a> Mandatory Requirements for Water Heating Systems</p> <p><a href="#">§160.5</a> Mandatory Lighting Requirements for Indoor and Outdoor Spaces</p> <p><a href="#">§160.6</a> Mandatory Requirements for Electric Power Distribution System</p> <p><a href="#">§160.7</a> Mandatory Requirements for Covered Process (Elevators, Pools and Spas)</p> <p><a href="#">§160.8</a> Mandatory Requirements for Solar Ready Buildings</p> <p><a href="#">§160.9</a> Mandatory Requirements for Electric Ready Buildings</p>
	<b>Subchapter 11</b>	<p><b>Multifamily Buildings: Performance and Prescriptive Compliance Approaches</b></p> <p><a href="#">§170.0</a> General</p> <p><a href="#">§170.1</a> Performance Approach</p> <p><a href="#">§170.2</a> Prescriptive Approach</p>
	<b>Subchapter 12</b>	<p><b>Multifamily Buildings: Additions, Alterations and Repairs to Existing Multifamily Buildings</b></p> <p><a href="#">§180.0</a> General</p> <p><a href="#">§180.1</a> Additions</p> <p><a href="#">§180.2</a> Alterations</p> <p><a href="#">§180.3</a> Repairs</p> <p><a href="#">§180.4</a> Whole Building</p>

**Table 1.** 2022 Energy Code Sections Applicable to Multifamily Buildings



# Performance Highlights

## Time Dependent Valuation and Source Energy Compliance

### New Construction

#### [§170.1](#)



#### Performance Requirements

In the 2019 Energy Code, new multifamily buildings of three or fewer habitable stories showed compliance with the Performance Method based on Energy Design Rating (EDR), while new multifamily buildings with four or more habitable stories showed Performance compliance based on only Time Dependent Valuation (TDV) energy use per ft<sup>2</sup>.

In the 2022 Energy Code, Performance Method compliance metrics for all new multifamily buildings are changing to a combination of TDV Energy and Source Energy. New multifamily buildings need to meet both the TDV and Source Energy budgets separately from each other.

The 2022 Source Energy metric is new for all multifamily buildings, and it was added to support decarbonization and electrification policy goals.

### Performance and Verification

#### [§170.1](#)



#### Performance Requirements

The 2022 Energy Code modifies the building features that trigger verification for all multifamily building types when modeled for Performance compliance credit. Many of these or very similar ones were already required for 2019 low-rise residential buildings, including multifamily, but not for 2019 high-rise residential buildings. This is an example of how some 2022 multifamily requirements started as high-rise or low-rise residential requirements from the 2019 Energy Code.

## Source Energy

Source energy represents the underlying fuel sources such as coal, natural gas or solar used to power building systems and equipment. Source energy includes transmission, delivery and production losses.

When generating electricity, fuel sources have very different carbon footprints. In the 2022 Energy Code, the California Energy Commission is working to encourage low-carbon energy sources like solar power rather than high-carbon fuel sources like coal or natural gas.



# Envelope Highlights

## Envelope Prescriptive Requirements: New Construction

### Attic Roof and Ceiling

[§170.2\(a\), Table 170.2-A](#)



#### Prescriptive Requirements

2022 Energy Code Prescriptive Options B and C roof and ceiling requirements for attic roof assemblies are the same as the 2019 Energy Code Prescriptive requirements for multifamily buildings of three stories or fewer. For 2022, those requirements are extended to all multifamily buildings including those with four stories or more.

Table 2, adapted from Table 170.2-A, focuses on the Option B High Performance Attic roof assembly in the outline of Prescriptive multifamily requirements by Climate Zone. Option B includes minimum requirements for both below roof deck insulation and ceiling insulation. Note that Prescriptive HVAC system requirement [§170.2\(c\)3Biii](#) states that air handlers and ducts are only allowed in ventilated attics that meet Option B.

Building Feature	Measurement	Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Below Roof Deck Insulation</b>	R-value	NR	NR	NR	R-19	NR	NR	NR	R-19	R-19	R-13	R-19	R-19	R-19	R-19	R-19	R-13
<b>Ceiling Insulation</b>	R-value	R-38	R-38	R-30	R-38	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38
<b>Radiant Barrier</b>	Installation	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
<b>Low- sloped Roof</b>	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
	Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
	Solar Reflectance Index (SRI)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	75	NR	75	NR
<b>Steep- sloped Roof</b>	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
	Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR
	Solar Reflectance Index (SRI)	NR	NR	NR	NR	NR	NR	NR	NR	NR	16	16	16	16	16	16	NR

**Table 2.** Roof/Ceiling Option B – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A

*(continued)*



## Envelope Prescriptive Requirements: New Construction (continued)

### Attic Roof and Ceiling (continued)

Table 3, excerpted from [Table 170.2-A](#), shows requirements for the Option C Attic. Unlike Option B, Option C requires ceiling insulation but no below roof deck insulation. Prescriptive Option C must be used for HVAC systems meeting Prescriptive §170.2(c)3Biib for ducts and air handlers in conditioned space.

Building Feature	Measurement	Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Ceiling Insulation</b>	R-value	R-38	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38
<b>Radiant Barrier</b>	Installation	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
<b>Low- sloped Roof</b>	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
	Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
	Solar Reflectance Index (SRI)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	75	NR	75	NR
<b>Steep- sloped Roof</b>	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
	Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR
	Solar Reflectance Index (SRI)	NR	NR	NR	NR	NR	NR	NR	NR	NR	16	16	16	16	16	16	NR

**Table 3.** Roof/Ceiling Option C – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A



## Envelope Prescriptive Requirements: New Construction (continued)

### Non-attic Roof

#### [§170.2\(a\), Table 170.2-A](#)



#### Prescriptive Requirements

By contrast, 2022 Prescriptive Option D non-attic roof assemblies, often referred to as rafter roofs, follow all the 2019 Prescriptive roof and ceiling requirements for multifamily buildings with four or more stories. In this case, 2019 four story or more requirements are extended to include three story or less multifamily building requirements in the 2022 Energy Code. The only 2022 changes to the 2019 Energy Code values are non-attic low-sloped roof aged solar reflectance changing to 0.63 and solar reflectance index (SRI) changing to 75 in Climate Zones 9, 10, 11, 13, 14 and 15.

See Table 4, adapted from Table 170.2-A, which focuses on Option C Non-attic Roofs in the outline of Prescriptive multifamily requirements by Climate Zone.

Building Feature	Measurement	Climate Zone																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<b>Metal Building</b>	U-factor	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
<b>Wood-framed and Other</b>	U-factor	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
<b>Low- sloped Roof</b>	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	0.63	0.63	0.63	NR	0.63	0.63	0.63	NR	
	Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	NR	0.75	0.75	0.75	NR	
	Solar Reflectance Index (SRI)	NR	NR	NR	NR	NR	NR	NR	NR	75	75	75	NR	75	75	75	NR	
<b>Steep- sloped Roof</b>	Aged Solar Reflectance	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR	
	Thermal Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR	
	Solar Reflectance Index (SRI)	NR	16	16	16	16	16	16	16	16	16	16	16	16	16	16	NR	

**Table 4.** Roof/Ceiling Option D – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A



## Envelope Prescriptive Requirements: New Construction (continued)

### Exterior Floors

§170.2(a), Table 170.2-A



#### Prescriptive Requirements

2022 Energy Code Prescriptive insulation requirements for multifamily exterior floors including slab on grade, wood-framed and raised mass construction are the same as the 2019 Energy Code Prescriptive requirements for multifamily buildings of three stories or fewer. Table 5 shows that Prescriptive slab on grade perimeter insulation is only required in Climate Zone 16 and only for multifamily buildings of three stories or fewer. Uninsulated slab on grade is allowed for multifamily buildings of four stories or more in all Climate Zones. Note that heated slab on grade floors must meet the mandatory insulation requirements in §110.8(g). Prescriptive options for all other floor types cover all multifamily buildings. Wood-framed and raised mass floors must either meet a maximum assembly U-factor or exceed a minimum insulation R-value depending on Climate Zone.

“Other” exterior floors as shown in Table 5 include any floor types that are not slab on grade, wood-framed or raised mass. “Other” exterior floors show Prescriptive compliance by meeting a maximum assembly U-factor also based on Climate Zone. The “other” Prescriptive values come to the 2022 Energy Code from 2019 Energy Code nonresidential Table 140.3-B.

Building Feature	Measurement	Climate Zone																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<b>Slab Perimeter ≤ 3 Habitable Stories</b>	U-factor	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.58
	R-value																	R-7.0
<b>Wood-framed</b>	U-factor	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037
	R-value	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19	R-19
<b>Raised Mass</b>	U-factor	0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.138	0.092	0.092	0.138	0.092	0.092
	R-value	R-8.0	R-8.0	R-0	R-0	R-0	R-0	R-0	R-0	R-0	R-0	R-8.0	R-4.0	R-8.0	R-8.0	R-4.0	R-8.0	R-8.0
<b>Other</b>		0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039	0.039

**Table 5.** Floors/Soffits – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A





## Envelope Prescriptive Requirements: New Construction (continued)

### Exterior Walls

[§170.2\(a\), Table 170.2-A](#)



#### Prescriptive Requirements

2022 Energy Code Prescriptive insulation requirements for exterior walls are all new except for “mass light” (i.e., light mass walls) which are the same as 2019 Energy Code above and below grade interior mass walls for multifamily of three stories or fewer. 2022 Prescriptive wall insulation requirements vary by wall type and Climate Zone, and also by fire rating for framed walls. Exterior walls as shown in Table 6 comply prescriptively by meeting a maximum assembly U factor. Note that there are different U-factor requirements for framed walls (wood, metal and others) depending on whether their fire rating is less than or equal to one hour or greater than one hour. 2022 Prescriptive wall insulation requirements apply to all multifamily buildings regardless of the number of habitable stories.

### Quality Insulation Installation

[§170.2\(a\), Table 170.2-A](#)



#### Prescriptive Requirements

The 2022 Energy Code continues the 2019 Prescriptive Quality Insulation Installation (QII) HERS verification requirements for multifamily buildings of three habitable stories or fewer except for buildings in Climate Zone 7. The 2022 Energy Code does not require QII for multifamily buildings over three stories.

Building Feature	Measurement	Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Metal Building: Any Fire Rating</b>	U-factor	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.057	0.057	0.057	0.057	0.057
<b>Framed (Wood, Metal) and Other: &gt; 1hr Fire Rating</b>	U-factor	0.059	0.059	0.059	0.059	0.059	0.065	0.065	0.059	0.059	0.059	0.051	0.059	0.059	0.051	0.051	0.051
<b>Framed (Wood, Metal) and Other: ≤ 1hr Fire Rating</b>	U-factor	0.051	0.051	0.051	0.051	0.051	0.065	0.065	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051
<b>Mass Light (Heat Capacity ≥ 7 Btu/°F - ft² and &lt; 15 Btu/°F - ft²)</b>	U-factor	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.059
	R-value	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-13	R-17
<b>Mass Heavy (Heat Capacity ≥ 15 Btu/°F - ft²)</b>	U-factor	0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160

**Table 6.** Walls – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A with footnote from Table 140.3-C



## Envelope Prescriptive Requirements: New Construction (continued)

### Fenestration (Windows, Glazed Doors and Skylights)

§170.2(a), Table 170.2-A



#### Prescriptive Requirements

The 2022 Energy Code has new multifamily Prescriptive requirements for fenestration including maximum U-factor, maximum relative solar heat gain coefficient (RSHGC) and minimum visible transmittance (VT). The 2022 Energy Code also introduces a new way to calculate the Prescriptive maximum vertical fenestration area for multifamily dwelling units and common areas.

Table 7 lists fenestration performance values for three different product types:

- ✦ Curtain wall and storefront
- ✦ NAFS 2017 Performance Class AW (architectural windows)
- ✦ All other fenestration, including skylights

Each of those types includes requirements for each Climate Zone for:

- ✦ Maximum U-factor
- ✦ Maximum RSHGC, three or fewer habitable stories
- ✦ Maximum RSHGC, four or more habitable stories

§170.2(a)3Aiii details how to calculate the contribution of overhang shading in the RSHGC for vertical fenestration.

Building Feature	Measurement	Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Curtain Wall/ Storefront</b>	Maximum U-factor	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.38
	Maximum RSHGC: ≤ 3 habitable stories	NR	0.26	NR	0.26	NR	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.26	NR
	Maximum RSHGC: ≥ 4 habitable stories	0.35	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.26	0.25
	Minimum VT: ≥ 4 habitable stories	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
<b>NAFS 2017 Performance Class AW</b>	Maximum U-factor	0.38	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.38
	Maximum RSHGC: ≤ 3 habitable stories	NR	0.24	NR	0.24	NR	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	NR
	Maximum RSHGC: ≥ 4 habitable stories	0.35	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	Minimum VT: ≥ 4 habitable stories	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
<b>All Other Fenestration</b>	Maximum U-factor	0.30	0.30	0.30	0.30	0.30	0.30	0.34	0.34	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	Maximum RSHGC: ≤ 3 habitable stories	NR	0.23	NR	0.23	NR	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	NR
	Maximum RSHGC: ≥ 4 habitable stories	0.35	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23

**RSHGC** = relative solar heat gain coefficient; **VT** = visible transmittance.

**Table 7.** Fenestration Performance – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A



## Envelope Prescriptive Requirements: New Construction *(continued)*

### Fenestration (Windows, Glazed Doors and Skylights) *(continued)*

Curtain wall and storefront, and NAFS 2017 Performance Class AW also require:

- ◊ Minimum VT, four or more habitable stories

The 2022 Energy Code Prescriptive Method to calculate vertical fenestration area for multifamily dwelling units and common areas combines the Prescriptive low-rise and high-rise residential vertical fenestration area allowance strategies from the 2019 Energy Code. The 2022 Prescriptive maximum vertical fenestration area is calculated as the smaller of the following:

- ◊ Maximum 20% window to conditioned floor area
- ◊ Maximum 40% window to gross exterior wall area

Note that demising walls are not part of the gross exterior wall area used to determine Prescriptive maximum vertical fenestration area, and windows and glass doors in demising walls are not included when calculating total proposed vertical fenestration area.

Table 8, adapted from [Table 170.2-A](#), focuses on fenestration window-to-wall and window-to-floor ratios in the outline of Prescriptive multifamily requirements by Climate Zone.

Table 8 also shows the 2022 Prescriptive maximum skylight-roof ratio of 5% for all multifamily buildings in all Climate Zones. This is the same as the 2019 Energy Code Prescriptive high-rise residential requirement, but it is new for multifamily buildings of three habitable stories or less. The 2022 Prescriptive maximum skylight area is calculated as:

- ◊ Maximum 5% skylight to gross exterior roof area

Measurement	Climate Zone															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Maximum Window-to-Floor Ratio</b>	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
<b>Maximum Window-to-Wall Ratio</b>	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
<b>Maximum Skylight-Roof Ratio</b>	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

**Table 8.** Fenestration Area – Envelope Component Package – Multifamily Building Standard Design – Excerpt from Table 170.2-A



### NAFS 2017 Performance Class Architectural Window (AW)

The NAFS 2017 Performance Class AW requirements are for products certified to meet the North American Fenestration Standard/Specification for an Architectural Window (AW). AW performance grade windows are designed to withstand high wind loads or other physical loads, and they are usually installed in high-rise or mid-rise buildings. U-factor, relative solar heat gain coefficient (RSHGC) and visible transmittance (VT) values for AW performance grade and the other multifamily fenestration types still must be determined through National Fenestration Rating Council (NFRC) rating or other methods defined in Energy Code [§110.6](#).



## Envelope Prescriptive Requirements: New Construction *(continued)*

### Opaque Exterior Doors [§170.2\(a\), Table 170.2-A](#)



#### Prescriptive Requirements

The 2022 Energy Code Prescriptive multifamily requirements for opaque exterior doors are a mixture of 2019 Energy Code low-rise and high-rise residential door requirements. 2022 Prescriptive maximum U factors for opaque exterior doors are divided by type and Climate Zone (CZ):

- ◇ Dwelling unit entry doors:  
All CZ: U-factor ≤ 0.20
- ◇ Common use area non-swinging entry doors:  
CZ 1, 16: U-factor ≤ 0.50  
CZ 2-15: U-factor ≤ 1.45
- ◇ Common use area swinging entry doors:  
All CZ: U-factor ≤ 0.70

Table 9, adapted from Table 170.2-A, focuses on exterior doors in the outline of Prescriptive multifamily requirements by Climate Zone.

Building Feature	Measurement	Climate Zone															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Dwelling Unit Entry</b>	Maximum U-factor	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
<b>Common Use Area Entry Non-swinging</b>	Maximum U-factor	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
<b>Common Use Area Entry Swinging</b>	Maximum U-factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70

**Table 9.** Exterior Doors – Envelope Component Package – Multifamily Standard Building Design – Excerpt from Table 170.2-A

## Envelope Prescriptive Requirements: Additions and Alterations:

### Additions [§180.1](#)



#### Prescriptive Requirements

2022 Energy Code Prescriptive envelope requirements for multifamily dwelling unit and common use area additions match the low-rise residential requirements in 2019 Energy Code [§150.2\(a\)](#). All multifamily dwelling unit and common use area additions have the same requirements for 2022.

### Alterations [§180.2](#)



#### Prescriptive Requirements

The 2022 Energy Code includes some new Prescriptive ceiling insulation and reroofing requirements for multifamily Alterations. Altered vented attics in CZ 1-4 and 8-16 require at least R-49 new ceiling insulation or must meet an area-weighted U-factor ≤ 0.020, unless the building is in CZ 1, 3, 4 or 9 and has existing R-19 ceiling insulation.

There are new 2022 Prescriptive reroofing requirements for steep- and low-sloped roofs:

- ◇ Steep sloped roofs in CZ 4 and 8-15 now require aged solar reflectance of 0.20 or more.
- ◇ Low sloped roofs in CZ 2, 4 and 6-15 now require aged solar reflectance of 0.63 or more. The area of the low-sloped roof recover or replacement in CZ 1, 2, 4 and 8-16 must also meet new R-14 continuous insulation requirements or a maximum U-factor of 0.039.



# Mechanical System Highlights

## Mechanical Mandatory Requirements: New Construction

### Kitchen Range Hood

[§160.2\(b\)2Aivc2](#)



#### Mandatory Requirements

Multifamily dwelling units have new kitchen range hood ventilation airflow or capture efficiency (CE) requirements based on the dwelling unit floor area and whether the range is powered by natural gas or electricity (see Table 10). Airflow and CE requirements are higher for kitchen hoods over natural-gas-powered stoves versus electric.

### Balanced Ventilation with Heat or Energy Recovery Ventilation

[§§160.2\(b\)2Aivb1](#) and [160.2\(b\)2Biii](#)



#### Mandatory Requirements

There are new fan efficacy and verification requirements for balanced ventilation systems with heat recovery ventilation (HRV) or energy recovery ventilation (ERV). Systems that serve a single dwelling unit require a fan efficacy  $\leq 1$  W/CFM (§160.2(b)2Aivb1). New HERS verification requirements apply when these systems are installed (§160.2(b)2Biii).

Dwelling Unit Floor Area (Ft <sup>2</sup> )	Hood Over Electric Range	Hood Over Natural Gas Range
> 1500	50% CE or 110 cfm	70% or 180 cfm
> 1000 - 1500	50% CE or 110 cfm	80% or 250 cfm
750 - 1000	55% CE or 130 cfm	85% or 280 cfm
< 750	65% CE or 160 cfm	85% or 280 cfm

**Table 10.** Kitchen Range Hood Airflow Rates (CFM) and ASTM E3087 Capture Efficiency (CE) Ratings According to Dwelling Unit Floor Area and Kitchen Range Fuel Type – Copied from Table 160.2-G



**Figure 1.** Kitchen Hood - ECA Training: 2022 Title 24, Part 6 Essentials – Residential Standards: What's New



## Mechanical Mandatory Requirements: New Construction *(continued)*

### Central Ventilation System Duct Sealing

[§160.2\(b\)2C](#)



#### Mandatory Requirements

The 2022 Energy Code adds new duct sealing and verification requirements for central ventilation system ducts that serve multiple dwelling units and deliver required ventilation using either continuous airflows or airflows providing balanced ventilation.

### HERS Verification Exceptions

[§§160.3\(b\)5K-L](#)



#### Mandatory Requirements

The 2022 Energy Code changes who is allowed to verify duct sealing and leakage testing (160.3(b)5K) and system airflow rate and fan efficacy (160.3(b)5L) for multifamily buildings depending on the number of habitable stories. HERS raters must still verify those HERS measures when they apply to multifamily buildings of three stories or fewer as under the 2019 Energy Code, but the 2022 Energy Code allows installing contractors to verify those HERS measures for multifamily buildings of four stories or more.

### Service Water Heating Pipe Insulation

[§160.4\(f\), Table 160.4-A](#)



#### Mandatory Requirements

2022 Energy Code Table 160.4-A lists new pipe insulation requirements for multifamily service hot water systems operating between 105 and 140°F. Water heating systems operating over 140°F use the applicable pipe insulation requirements from Table 120.3-A.

See Table 11 copied from Table 160.4-A Pipe Insulation Thickness.

Fluid Operating Temperature Range (°F)	Insulation Conductivity			Nominal Pipe Diameter (in inches)				
	Conductivity (in Btu-in/h-ft <sup>2</sup> -°F)	Mean Rating Temperature (°F)		< 1	1 to < 1.5	1.5 to < 4	4 to < 8	8 and larger
<b>Multifamily Domestic Hot Water Systems</b>				<b>Minimum Pipe Insulation Required (Thickness in inches or R-value)</b>				
105-140 <sup>1</sup>	0.22-0.28	100	Inches	1.0	1.5	2.0	2.0	2.0
			R-value	R 7.7	R 12.5	R 16	R 12.5	R 11

<sup>1</sup> Multifamily and hotel/motel domestic hot water systems with water temperature above 140°F must use the row in Table 120.3-A for the applicable water temperature.

**Table 11.** Pipe Insulation Thickness – Multifamily Domestic Hot Water – Adapted from Table 160.4-A



## Mechanical Prescriptive Requirements: New Construction

### [§170.2\(c\)](#)

#### Space-conditioning System Types for Dwelling Units Only

##### [§170.2\(c\)3A](#)



#### Prescriptive Requirements

The 2022 Energy Code identifies Prescriptive space-conditioning system types for multifamily dwelling units depending on Climate Zone (CZ) and the number of habitable stories in the building overall. These requirements do not apply to multifamily common use areas.

Space-conditioning requirements for multifamily dwelling units in buildings of three stories or fewer:

- ◇ In CZ 1-15: Heat pump systems
- ◇ In CZ 16: Furnace plus air conditioner systems
- ◇ In all CZ: Balanced ventilation systems serving these dwelling units must meet applicable ERV or HRV requirements in [§170.2\(c\)3Biv](#)

Space-conditioning requirements for multifamily dwelling units in buildings of four stories or more:

- ◇ In CZ 2-15: Heat pump systems
- ◇ In CZ 1 and 16: Dual-fuel heat pump systems

#### Balanced Ventilation System Requirements for Dwelling Units Only

##### [§170.2\(c\)3Biv](#)



#### Prescriptive Requirements

§170.2(c)3Biv lists new Prescriptive requirements for balanced ventilation systems that provide Mandatory minimum ventilation levels for multifamily dwelling units. There are some differences based on CZ and the number of habitable stories in the building overall.

Balanced ventilation system requirements for multifamily dwelling units in buildings of three stories or fewer:

- ◇ In CZ 1, 2, 11-16: Balanced ventilation systems serving individual dwelling units must include an energy recovery ventilator (ERV) or heat recovery ventilator (HRV) with sensible recovery efficiency  $\geq 67\%$  rated at 32°F and fan efficacy  $\leq 0.6$  W/CFM. These measures must be HERS verified.
- ◇ In CZ 4-10: In dwelling units with heat pump space conditioning, balanced ventilation systems that do not include ERV or HRV systems must have fan efficacy  $\leq 0.4$  W/CFM.

Balanced ventilation system requirements for multifamily dwelling units in buildings of four stories or more:

- ◇ In CZ 1, 2, 11-16: Balanced ventilation systems serving individual dwelling units must include an ERV or HRV with sensible recovery efficiency  $\geq 67\%$  rated at 32°F and fan efficacy  $\leq 0.6$  W/CFM. These measures must be field verified per 2022 Energy Code Reference [Appendix NA2.2.4.1.5](#).
- ◇ In CZ 1, 2, 11-16: Balanced ventilation systems serving multiple dwelling units must include an ERV or HRV with sensible recovery efficiency or effectiveness  $\geq 67\%$  rated at 32°F and fan efficacy per common use area fan requirements of [§170.2\(c\)4A](#). These systems also require recovery bypass or control to directly economize with ventilation air based on outdoor air temperature limits per [Table 170.2-G](#). These measures must be field verified per 2022 Energy Code Reference [Appendix NA7.18.4](#).



## Mechanical Prescriptive Requirements: New Construction (*continued*)

### Prescriptive Multifamily Common Use Area Fan Systems, Economizers and Dedicated Outdoor Air Systems §170.2(c)4

#### Prescriptive Requirements

2022 Energy Code [§170.2\(c\)4](#) includes some new requirements for space conditioning fan systems, air economizers and dedicated outdoor air systems (DOAS) serving multifamily common use areas.

### Fan Systems for Common Use Areas Only §170.2(c)4A

#### Prescriptive Requirements

Fan power budget requirements for common use areas apply to each fan system with at least one fan or fan array with electrical input  $\geq 1$  kW. Each fan component is assigned a fan power allowance which varies by system type, CFM, floors served and elevation (see [Tables 170.2-B](#) and [C](#)).

See Table 12, adapted from Table 170.2-B Supply Fan Power Allowances.

### Economizers for Common Use Areas §170.2(c)4C

#### Prescriptive Requirements

Air handlers with design total cooling capacity over 33,000 Btuh require air-side economizers. There are exceptions for issues like contaminated outside air or other situations where introducing outdoor air may actually increase TDV energy use, plus several other conditions. Note that the 2022 Energy Code air economizer trigger of 33,000 Btuh is 21,000 Btuh lower than the 54,000 Btuh cooling capacity threshold for air-side economizers in the 2019 Energy Code for nonresidential and high-rise residential buildings.

Airflow	Multi-Zone VAV Systems $\leq 5,000$ CFM	Multi-Zone VAV Systems $> 5,000$ and $\leq 10,000$ CFM	Multi-Zone VAV Systems $> 10,000$ CFM	All Other Fan Systems $\leq 5,000$ CFM	All Other Fan Systems $> 5,000$ and $\leq 10,000$ CFM	All Other Fan Systems $> 10,000$ CFM
<b>Supply System Base Allowance for AHU Serving Spaces <math>\leq 6</math> Floors Away</b>	0.395	0.453	0.413	0.232	0.256	0.236
<b>Supply System Base Allowance for AHU Serving Spaces <math>&gt; 6</math> Floors Away</b>	0.508	0.548	0.501	0.349	0.356	0.325
<b>MERV 13 to MERV 16 Filter Upstream of Thermal Conditioning Equipment (two times the clean filter pressure drop)</b>	0.136	0.114	0.105	0.139	0.120	0.107
<b>MERV 13 to MERV 16 Final Filter Downstream of Thermal Conditioning Equipment (two times the clean filter pressure drop)</b>	0.225	0.188	0.176	0.231	0.197	0.177

**AHU** = air handling unit; **VAV** = variable air volume.

**Table 12.** Supply Fan Power Allowances (W/CFM) - Adapted from Table 170.2-B





## Mechanical Prescriptive Requirements: New Construction (*continued*)

### Dedicated Outdoor Air Systems (DOAS) for Common Use Areas

#### [§170.2\(c\)4N](#)



#### Prescriptive Requirements

Dedicated outdoor air system (DOAS) requirements apply when HVAC systems use a DOAS to condition, temper or filter 100% outdoor air separate from space conditioning systems serving the same space or spaces. The Prescriptive 2022 Energy Code requires each space served by a DOAS to have one of three configurations per §170.2(c)4Ni, and there are many other new requirements based on DOAS configuration, fan system components, supply air design and other features of the DOAS plus separate HVAC system overall.

### Water-heating System Requirements for Dwelling Units

#### [§170.2\(d\)](#)



#### Prescriptive Requirements

The 2022 Energy Code has new multifamily Prescriptive requirements for individual water-heating systems serving a single dwelling unit and for central water-heating systems serving multiple dwelling units. There are no Prescriptive requirements for water heaters serving multifamily common use areas, but those systems must still meet applicable Mandatory Measures.



**Figure 2.** Domestic Water Heaters: Heat Pump (left) and Gas Instantaneous Tankless (right)

### Individual Systems

#### [§170.2\(d\)1](#)



#### Prescriptive Requirements

There are three Prescriptive options overall, plus some extra requirements for heat pump water heaters in Climate Zones 1 and 16:

- ◇ One 240-volt heat pump water heater, plus compact distribution in CZ 1 and 16 and drain heat recovery in CZ 16
- ◇ One NEEA Tier 3 heat pump water heater, plus additional drain heat recovery in CZ 16
- ◇ One gas or propane instantaneous tankless water heater with  $\leq 200,000$  Btuh input



## Mechanical Prescriptive Requirements: New Construction (*continued*)

### Central Systems

#### [§170.2\(d\)2-3](#)



#### Prescriptive Requirements

There are two new Prescriptive options for central water-heating systems serving multiple dwelling units, a heat pump system and a gas or propane plus solar thermal system. Both system types require a recirculation system when serving more than eight dwelling units:

#### ◇ Central Heat Pump Water Heating

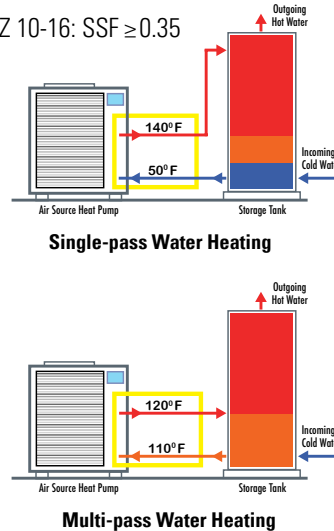
One Prescriptive option is a heat pump water-heating system meeting the design requirements of §§170.2(d)2A-H:

- Hot water return from recirculation loop must connect to a recirculation loop tank and not to primary heat pump water heater inlet or primary thermal storage tanks
- Electric-powered recirculation loop tank if auxiliary heat needed, and recirculation loop heater capable of multi-pass water heater operation
- For single-pass primary heat pump water heater, primary thermal storage tanks (if multiple) piped in series
- For multi-pass primary heat pump water heater, primary thermal storage tanks (if multiple) piped in parallel
- Primary storage tank setpoint  $\geq 135^{\circ}\text{F}$
- Recirculation loop tank setpoint at least  $10^{\circ}\text{F}$  lower than primary storage tank setpoint
- Minimum heat pump water heater compressor cut-off temperature  $\leq 40^{\circ}\text{F}$
- A recirculation system when serving more than eight dwelling units
- System operating conditions documented per 2022 Energy Code Reference [Joint Appendix JA14.4](#)

#### ◇ Central Gas or Propane Water Heating plus Solar Thermal

The second Prescriptive option is a natural gas or propane water-heating system plus solar thermal meeting the requirements of [§§170.2\(d\)3A-C](#):

- For Climate Zone (CZ) 1 through 9: Total input rating  $\geq 1,000,000$  Btuh and thermal efficiency  $\geq 90\%$
- A recirculation system when serving more than eight dwelling units
- A solar water heating system with solar savings fraction (SSF) per Climate Zone (CZ):
  - \* CZ 1-9:  $\text{SSF} \geq 0.20$
  - \* CZ 10-16:  $\text{SSF} \geq 0.35$



**Figure 3.** Single-pass versus Multi-pass Heat Pump Water Heaters

## Mechanical Prescriptive Requirements: Additions and Alterations

#### [§§180.1\(a\)3](#) and [180.2\(b\)3](#)

### Duct Testing for New Ducting Added to Existing System

#### Exception 5 to [§180.1](#), and Exception 1 to [§180.2\(b\)2Aii](#)



#### Prescriptive Requirements

When any length of new ducting is added to an existing system, it triggers HERS duct testing requirements. HERS Raters must provide testing and verification for multifamily buildings of three stories or fewer. However, installing contractors are allowed to provide testing and certification for multifamily buildings of four stories or more.

### New or Altered Ventilation System

#### [§180.2\(b\)5](#)



#### Prescriptive Requirements

New or altered ventilation systems for dwelling units need to meet [§160.2\(b\)2](#) ventilation requirements for new multifamily buildings with allowances associated with code requirements applicable to previous building permit.

# Lighting and Electrical Distribution Highlights

## Mandatory and Prescriptive Lighting Requirements

### Dwelling Unit Indoor and Outdoor Lighting §160.5(a)



#### Mandatory Requirements

The 2022 Energy Code multifamily dwelling unit requirements for indoor lighting and for outdoor lighting controlled from inside of dwelling units are all Mandatory Measures that have been updated from those for 2019 Energy Code low-rise residential lighting. The updated multifamily dwelling unit lighting requirements in the 2022 Energy Code are the same as the updated single-family building lighting requirements, except with different section and table numbering.

One important change to the lighting requirements for dwelling units is that there is a new version of 2019 Energy Code Table 150.0-A, now called [Table 160.5-A](#) Classification of Dwelling Unit High Luminous Efficacy Light Sources, shown here as Table 13. Both indoor and outdoor multifamily dwelling unit lighting must meet the requirements of Table 160.5-A, except for integrated device lighting, navigation lighting and cabinet lighting. Another interesting change for the 2022 Energy Code is that screw-based luminaires are now limited to [JA8](#) lamps rather than allowing all the lamp types in Table 160.5-A.

Light Sources <u>Not</u> Required to Comply with JA8	Light Sources Required to Comply with JA8
<p>Light sources in this column, other than those installed in ceiling recessed downlight luminaires, are classified as high luminous efficacy and <i>are not required</i> to comply with Reference <a href="#">Joint Appendix JA8</a>.</p>	<p>Light sources in this column <i>are required</i> to comply with Reference <a href="#">Joint Appendix JA8</a> and must be certified and marked as required by JA8.</p>
<ol style="list-style-type: none"> <li>1. LED light sources installed outdoors</li> <li>2. Inseparable solid state lighting (SSL) luminaires containing colored light sources that are installed to provide decorative lighting</li> <li>3. Pin-based linear fluorescent or compact fluorescent light sources using electronic ballasts</li> <li>4. High-intensity discharge (HID) light sources including pulse start metal halide and high-pressure sodium light sources</li> <li>5. Luminaires with hardwired high frequency generator and induction lamp</li> <li>6. Ceiling fan light kits subject to federal appliance regulations</li> </ol>	<ol style="list-style-type: none"> <li>7. All light sources installed in ceiling-recessed downlight luminaires: Note that ceiling-recessed downlight luminaires must not have screw-base sockets regardless of lamp type as specified in §160.5(a)1C</li> <li>8. Any light source not otherwise listed in this table</li> </ol>

**Table 13.** Classification of Dwelling Unit High Luminous Efficacy Light Sources - Adapted from Table 160.5-A



## Mandatory and Prescriptive Lighting Requirements *(continued)*

### Common Use Area Indoor Lighting §§160.5(b) and 170.2(e)1-4



#### Mandatory Requirements



#### Prescriptive Requirements

2022 Energy Code multifamily common use area indoor lighting requirements are very similar to both 2019 and 2022 Energy Code indoor lighting power allowances and controls for nonresidential buildings.



**Figure 4.** Dwelling Unit Outdoor Light

## Mandatory and Prescriptive Outdoor Lighting Requirements

### Outdoor Lighting for Building Overall §§160.5(c) and 170.2(e)6



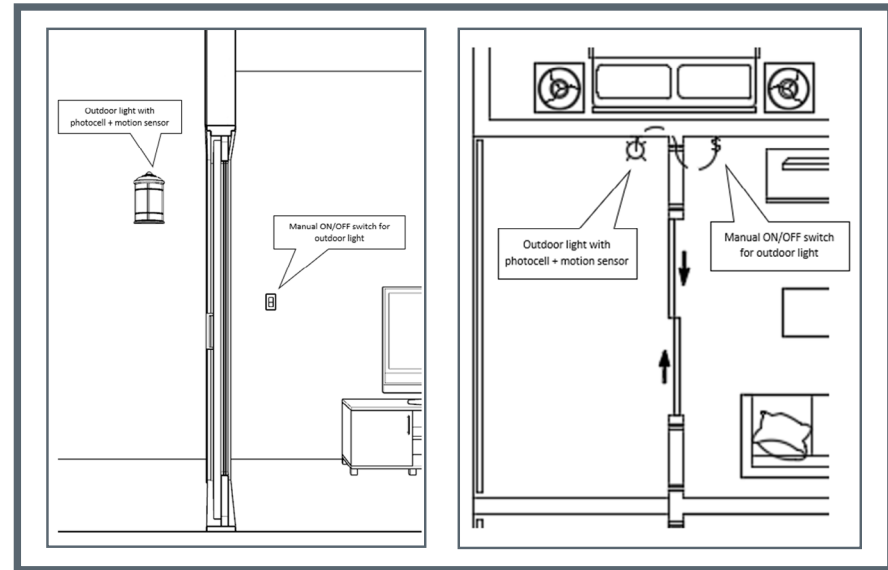
#### Mandatory Requirements



#### Prescriptive Requirements

For the 2022 Energy Code, any building that includes a multifamily occupancy must comply with the multifamily outdoor lighting requirements using outdoor Lighting Zone 2 (LZ2) based on [Table 10-114-A](#). The basic method to calculate multifamily site outdoor lighting is similar to that used for nonresidential buildings, but it does not include a linear wattage allowance, and there are separate multifamily outdoor lighting allowance tables.

Note that any lighting controlled from within a dwelling unit must meet the multifamily dwelling unit outdoor lighting requirements.



**Figure 5.** Mid-Rise Multifamily Case Study: Dwelling Unit Balcony Light with Controls

## Mandatory Electrical Distribution Requirements

### Electrical Distribution §160.6



#### Mandatory Requirements

Common use areas must meet the same electrical distribution requirements as nonresidential. This includes the new 2022 Energy Code demand-responsive controlled receptacles if demand-responsive controls are required for indoor lighting. See [§§160.6\(e\)](#) and [110.12\(e\)](#).

# Photovoltaic and Battery Storage System Highlights

## Prescriptive Photovoltaic Requirements

### Prescriptive Photovoltaic Requirements

#### §§170.2(f)-(g)



#### Prescriptive Requirements

The 2022 Energy Code slightly updates the 2019 Prescriptive solar photovoltaic (PV) requirements for multifamily buildings with three habitable stories or fewer and adds new Prescriptive solar PV requirements to multifamily buildings with four habitable stories or more. Part of calculating the 2022 prescriptively required kW<sub>dc</sub> capacity of solar electricity for all multifamily buildings is determining how much roof area receives enough sunlight for PV systems to work. The 2022 Energy Code clarifies how to do that with the new solar access roof area (SARA) definitions for multifamily buildings depending on number of habitable stories.

### Solar Access Roof Area

#### §§170.2(f)-(g)



#### Prescriptive Requirements

The solar access roof area (SARA) includes all of the building's roof area with at least 70% solar access and that is structurally capable of supporting a PV system per California Building Code (CBC) §1511.2. This includes the roofs of garages and other newly built structures on-site.

There are some differences between SARA calculations for multifamily buildings that are four stories or more versus three stories or fewer. See Table 14 for roof areas not included in the SARA.

Other SARA exceptions include:

- ◇ Roof areas occupied per California Building Code §503.1.4
- ◇ Roof areas not available due to compliance with other building codes if confirmed by the Executive Director of the CEC

The 2022 Energy Code requires solar access to be verified using a certified solar assessment tool per Reference [Joint Appendix SJA11.4](#).

### Photovoltaic Requirements for Multifamily Buildings with Three Stories or Less

#### §170.2(f)



#### Prescriptive Requirements

The 2022 PV requirements for multifamily buildings with three habitable stories or fewer are the same as those under the 2019 Energy Code for all low-rise residential buildings, except that they have been moved to §170.2(f), changing table and equation names. Also, the SARA rules update some previous solar access requirements, and there are two new exceptions - one if the enforcement authority determines that the PV system cannot meet ASCE 7-16 Snow Loads and another if the Prescriptively required size is less than 1.8 kW. Other multifamily PV exceptions in the 2022 Energy Code for buildings with three stories or fewer remain the same as those for 2019.

These PV systems must meet the minimum qualifications in Reference [Joint Appendix JA11](#), and the minimum required PV kW for three story or less multifamily is the smaller of that calculated using [Equation 170.2-C](#) or the maximum PV system size that can be installed in the building's SARA.

#### Equation 170.2-C Annual Photovoltaic Electrical Output: kW<sub>PV</sub> = (CFA × A)/1000 + (N<sub>DU</sub> × B)

kW<sub>PV</sub> = kW<sub>dc</sub> size of the PV system

CFA = Conditioned floor area

N<sub>DU</sub> = Number of dwelling units

A = CFA adjustment factor from [Table 170.2-T](#)

B = Dwelling unit adjustment factor from Table 170.2-T

Habitable Stories	Low-sloped roofs	Steep-sloped roofs
<b>Multifamily Buildings ≤ 3 Stories</b>	SARA for low-sloped roofs can be reduced by shading from both: <ul style="list-style-type: none"> <li>◇ Existing external permanent structures or natural features</li> <li>◇ Components of the building design itself</li> </ul>	SARA for steep-sloped roofs can be reduced by shading from only: <ul style="list-style-type: none"> <li>◇ Existing external permanent structures or natural features, but not components of the building design itself</li> </ul>
<b>Multifamily Buildings ≥ 4 Stories</b>	SARA for all roofs, regardless of slope, can be reduced by shading from both: <ul style="list-style-type: none"> <li>✦ Existing external permanent structures or natural features</li> <li>✦ Components of the building design itself</li> </ul>	
<p><b>SARA</b> = solar access roof area; <b>low-sloped</b> = rise-to-run ratio of &lt; 2:12 (lower than 9.5 degrees); <b>steep-sloped</b> = rise-to-run ratio ≥ 2:12 (9.5 degrees or more).</p>		

**Table 14.** Multifamily Building Roof Areas not Included in the Solar Access Roof Area



## Prescriptive Photovoltaic Requirements (continued)

### Photovoltaic Requirements for Multifamily Buildings with Four Stories or More

#### §170.2(g)



#### Prescriptive Requirements

Solar PV was not required for multifamily buildings with more than three habitable stories under the 2019 Energy Code, so the 2022 Prescriptive PV requirements for them are all new. These PV systems must meet the minimum qualifications in Reference [Joint Appendix JA11](#). The minimum required PV kW for multifamily over three stories is the smaller of:

- ✦ The kW<sub>PVdc</sub> calculated using [Equation 170.2-D](#), or
- ✦ The building's total Solar Access Roof Area (SARA) times 14 W/ft<sup>2</sup>

#### Equation 170.2-D Photovoltaic Direct Current Size

$$kW_{PVdc} = (CFA \times A) / 1000$$

- kW<sub>PVdc</sub> = Size of the PV system in kW
- CFA = Conditioned floor area in ft<sup>2</sup>
- A = PV capacity factor specified in Table 170.2-U for the building type in W/ft<sup>2</sup>

Multifamily buildings more than three habitable stories often have a combination of multifamily dwelling units and common areas, plus other nonresidential occupancy types, so the PV calculations for them take that into account.

Table 15 lists PV capacity factors by Climate Zone for “high-rise multifamily” plus selected nonresidential occupancies. The “high-rise multifamily” category includes both dwelling units and common use areas for multifamily buildings with four or more stories. If a project has 80% or more of one of the occupancies in Table 15, then use Factor A for that occupancy in Equation 170.2-D. If a building has multiple occupancies from Table 15 that in total, but not separately, are 80% or more of the total area, then do separate Equation 170.2-D calculations for each separate occupancy area and add them together.

Possible exceptions to 170.2(g) for multifamily with four stories or more:

1. Total SARA less than 3% of conditioned floor area
2. Required PV size less than 4 kWdc
3. SARA less than 80 ft<sup>2</sup> contiguous area
4. Enforcement authority determines PV system cannot meet ASCE 7-16, Snow Loads
5. Multi-tenant buildings where load serving entity does not provide either Virtual Net Metering (VNEM) or community solar program

## Calculating Photovoltaic Requirements

### Example 1: One Occupancy of 80% or More

If a four story, 10,000 ft<sup>2</sup> building in Climate Zone 4 has at least 8,000 ft<sup>2</sup> (80%) of multifamily dwelling units plus common use area, then calculate kW<sub>PVdc</sub> from Equation 170.2-D for the full 10,000 ft<sup>2</sup> conditioned floor area using Factor A=2.21 W/ft<sup>2</sup> for high-rise multifamily:

$$\text{Total: } (10,000 \text{ ft}^2 \times 2.21 \text{ W/ft}^2) / 1,000 = 22.10 \text{ kW}_{PVdc}$$

### Example 2: Two Occupancies at 40% Each

Assume another four story, 10,000 ft<sup>2</sup> building in Climate Zone 4 has 4,000 ft<sup>2</sup> (40%) of multifamily dwelling units plus common area, 4,000 ft<sup>2</sup> (40%) of offices and 2,000 ft<sup>2</sup> (20%) of laboratories or some other occupancy not in Table 170.2-U (Table 15 below). In that case, calculate kW<sub>PVdc</sub> using Factor A values for high-rise multifamily (2.21 W/ft<sup>2</sup>) and office (3.13 W/ft<sup>2</sup>) with their actual conditioned floor areas and add them together for the total:

$$\begin{aligned} \text{Multifamily: } & (4,000 \text{ ft}^2 \times 2.21 \text{ W/ft}^2) / 1000 = 8.84 \text{ kW}_{PVdc} \\ \text{Office: } & (4,000 \text{ ft}^2 \times 3.13 \text{ W/ft}^2) / 1000 = 12.52 \text{ kW}_{PVdc} \\ \text{Total: } & 8.84 \text{ kW} + 12.52 \text{ kW} = 21.36 \text{ kW}_{PVdc} \end{aligned}$$

Building Type	Factor A - Minimum Photovoltaic Capacity (W/ft <sup>2</sup> of conditioned floor area)		
	Climate Zones 1, 3, 5, 16	Climate Zones 2, 4, 6-14	Climate Zone 15
Grocery	2.62	2.91	3.53
High-rise Multifamily	1.82	2.21	2.77
Office, Financial Institutions, Unleased Tenant Space	2.59	3.13	3.80
Retail	2.62	2.91	3.53
School	1.27	1.63	2.46
Warehouse	0.39	0.44	0.58
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.39	0.44	0.58

Table 15. Photovoltaic Capacity Factors – Factor A – Copied from Table 170.2-U



## Battery Storage Requirements

### Prescriptive Battery Storage Requirements for Multifamily Buildings with Four Stories or More §170.2(h)



#### Prescriptive Requirement

As another new Prescriptive requirement for the 2022 Energy Code, battery storage systems must be installed for multifamily buildings with four habitable stories or more that require PV systems per [§170.2\(g\)](#). These battery storage systems must meet the minimum qualifications in Reference [Joint Appendix JA12](#), and their minimum rated energy capacity and rated power capacity are calculated using [Equations 170.2-E](#) and [170.2-F](#). Table 16 lists battery storage capacity factors by Climate Zone for “high-rise multifamily” plus selected nonresidential occupancies. The “high-rise multifamily” category includes both dwelling units and common use areas for multifamily buildings with four or more stories.

If the required PV system size ( $kW_{PVdc}$ ) was based on just one occupancy type, then select Battery Energy Capacity Factor B and Battery Power Capacity Factor C from Table 16 for that occupancy. If the required  $kW_{PVdc}$  was based on more than one occupancy type, then calculate separate  $kWh_{batt}$  and  $kW_{batt}$  values using Factors B and C for each occupancy.

Note that Equation 170.2-E also asks for Factor D, the rated single charge-discharge cycle AC to AC (round trip) efficiency of the battery storage system. Reference [Joint Appendix section JA12.2.2.1\(b\)](#) requires this efficiency to be 80% or more for Prescriptive compliance.

Partial list of exceptions to §170.2(h) battery storage for four story or more multifamily buildings includes:

1. Installed PV system size less than 15% of Equation 170.2-D
2. Required battery system less than 10 kWh rated capacity

Note that there are no Prescriptive battery storage requirements for multifamily buildings with three stories or fewer, although a Performance method battery storage compliance credit is available.

### Battery Storage Capacity

#### Equation 170.2-E: $kWh_{batt} = kW_{PVdc} \times B / D^{0.5}$

$kWh_{batt}$  = Rated Usable Energy Capacity of the battery storage system in kWh

$kW_{PVdc}$  = PV system capacity required by §170.2(g) in  $kW_{dc}$

B = Battery energy capacity factor specified in Table 170.2-V for the building type

D = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the battery storage system

#### Equation 170.2-F: $kW_{batt} = kW_{PVdc} \times C$

$kW_{batt}$  = Rated Power Capacity of the battery storage system in  $kW_{dc}$

$kW_{PVdc}$  = PV system capacity required by §170.2(g) in  $kW_{dc}$

C = Battery power capacity factor specified in Table 170.2-V for the building type

Storage-to-PV Ratio	Factor B – Energy Capacity Wh/W	Factor C – Energy Capacity Wh/W
<b>Grocery</b>	1.03	0.26
<b>High-rise Multifamily</b>	1.03	0.26
<b>Office, Financial Institutions, Unleased Tenant Space</b>	1.68	0.42
<b>Retail</b>	1.03	0.26
<b>School</b>	1.87	0.46
<b>Warehouse</b>	0.93	0.23
<b>Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater</b>	0.93	0.23

**Table 16.** Battery Storage Capacity Factors – Factors B and C – Copied from [Table 170.2-V](#)

## Electric-ready Requirements

### Electric-ready Requirements

#### §160.9



#### Mandatory Requirements

California has an overall goal to reduce carbon emissions by switching to equipment powered by renewably sourced electricity, but the 2022 Energy Code still allows natural gas as the fuel source for furnaces, cooktops and clothes dryers in new multifamily buildings. The 2022 Energy Code introduces Mandatory electric-ready requirements to make it easier to change from natural gas to electricity for future equipment.

The new electric-ready requirements apply to gas furnaces, cooktops and clothes dryers installed in dwelling units and gas clothes dryers installed in multifamily common areas, such as shared laundry rooms. It is substantially easier and less expensive to install the electric infrastructure needed for potential future electric heat pump space heaters, electric cooktops and electric clothes dryers during initial construction, rather than having to retrofit an existing electrical system.

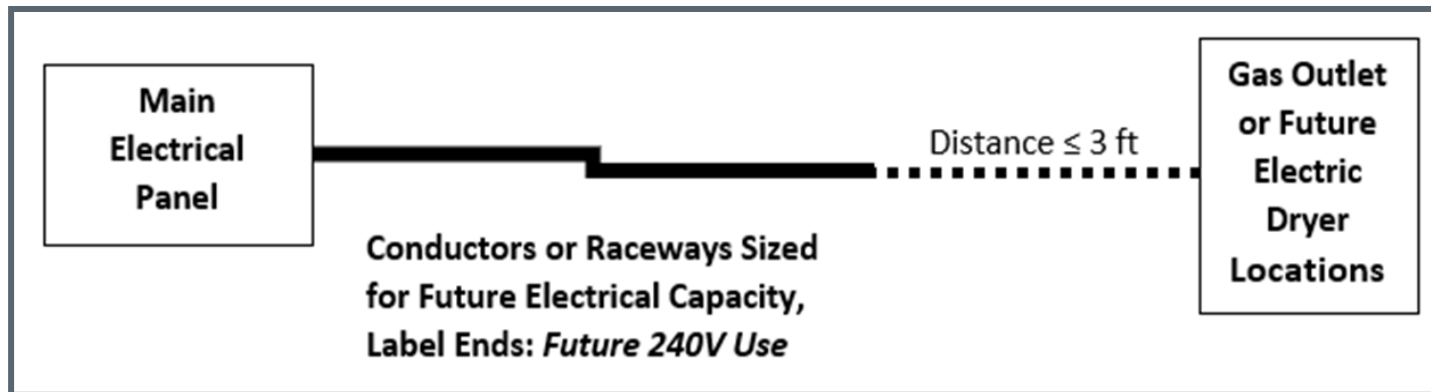
There are similar electric-ready requirements for future electric heat pump space heating, electric cooktops and electric clothes dryers in multifamily dwelling units. They all require the following:

- ◇ A dedicated, 240-volt branch circuit with specific minimum amp ratings (30 amps for heat pumps and clothes dryers, 50 amps for cooktops) added within three feet of the installed gas equipment and labeled “240V Ready”
- ◇ A reserved space in the main electrical service panel labeled “For Future 240V Use”

The electric-ready requirements for common areas are geared toward central laundry rooms with multiple clothes dryers. The requirements include:

- ◇ Conductors or raceways sized for future electrical capacity running from the main electrical panel to within three feet of each gas outlet or future electric dryer location
- ◇ Conductor or raceway capacity per [§160.9\(c\)2](#): 24 amps at 208/240 volts per clothes dryer, 2.6 kVA for each 10 kBtu/h rated gas input or gas pipe capacity, or an electric power calculated and documented by the responsible person to provide equivalent functionality of the gas-powered equipment
- ◇ Both ends of the conductors or raceways labeled “Future 240V Use”

Note that new multifamily buildings that install electric heat pumps, cooktops or clothes dryers instead of gas-fired equipment automatically meet the applicable electric-ready requirements.



**Figure 6.** Electric Clothes Dryer Ready Diagram for a Central Laundry Room





## For More Information

### CALIFORNIA ENERGY COMMISSION

[www.energy.ca.gov](http://www.energy.ca.gov)

Learn more about the California Energy Commission (CEC) and its programs on its website.

#### 2022 Building Energy Efficiency Standards

[bit.ly/CEC-2022-Standards](http://bit.ly/CEC-2022-Standards)

Explore the main CEC web portal for the 2022 Energy Code, including information, documents and historical information.

#### 2022 Building Energy Efficiency Standards Summary

[bit.ly/CEC-2022-Summary](http://bit.ly/CEC-2022-Summary)

View or download this visual summary of the Energy Code's purpose, current changes and impact.

#### Energy Code Hotline

Call: 1-800-772-3300 (Free)

Email: [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)

#### Online Resource Center

[bit.ly/CEC-ORC](http://bit.ly/CEC-ORC)

Use these online resources developed for building and enforcement communities to learn more about the Energy Code.



[www.energycodeace.com](http://www.energycodeace.com)

Stop by this online "one-stop-shop" for no-cost tools, training and resources designed to help you comply with California's Title 4, Part 6 and Title 20.



Tools

[www.energycodeace.com/tools](http://www.energycodeace.com/tools)

Explore this suite of interactive tools to understand the compliance process, required forms, installation techniques and energy efficiency regulations in California.

#### Reference Ace

[www.energycodeace.com/content/reference-ace-2022-tool](http://www.energycodeace.com/content/reference-ace-2022-tool)

Navigate the Title 24, Part 6 Energy Code using an index, keyword search and hyperlinked text.

#### Q&Ace

[www.energycodeace.com/QAndAce](http://www.energycodeace.com/QAndAce)

Search our online knowledge base or submit your question to Energy Code Ace experts.



Training

[www.energycodeace.com/training](http://www.energycodeace.com/training)

On-demand, live in-person and online training alternatives are tailored to a variety of industry professionals and address key measures.

Of Special Interest:

- ◇ 2022 Title 24, Part 6 Essentials – Residential Standards: What's New

[bit.ly/ECA-training-2022-res-whats-new](http://bit.ly/ECA-training-2022-res-whats-new)



Resources

[www.energycodeace.com/resources](http://www.energycodeace.com/resources)

Downloadable materials provide practical and concise guidance on how and when to comply with California's building and appliance energy efficiency standards.

Of Special Interest:

#### Fact Sheets

- ◇ Multifamily Buildings: What's Changed in 2022?

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