

# 2025 Energy Code Significant Changes

Nonresidential, Single-Family, and Multifamily



California Building Officials (CALBO)

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California Energy Commission

October 2, 2025

This course is approved by The American Institute of Architects (AIA) for 6 Learning Units and International Code Council Preferred Provider Program (ICC PPP) for 0.6 Continuing Education Units.

- AIA: 6 LU | HSWs (Course Number - 14: 2025)
- ICC PPP in-person course: 0.6 CEUs (Course Number - 45739)
- ICC PPP online course: 0.6 CEUs (Course Number - 45740)

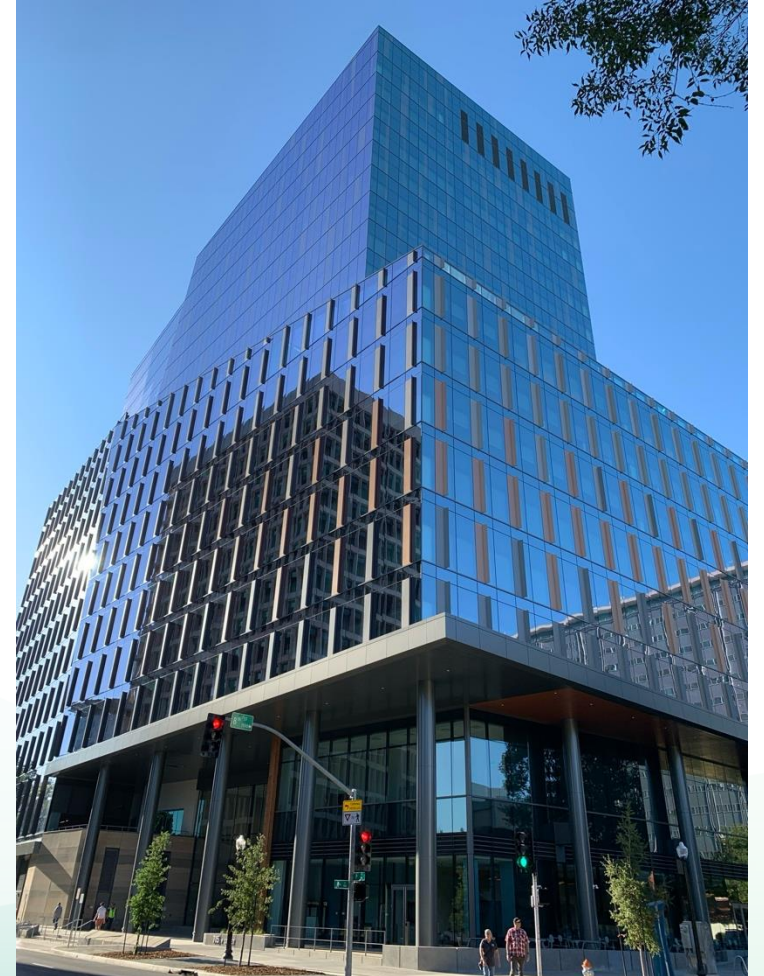
Course Schedule: 8:00 – 3:30pm (6 hours of instruction)

Certificate of Attendance: A certificate of attendance is emailed within 72 hours to each registrant who attends the entire course, no exceptions. Attendance is monitored at all times. For attendance questions, please contact the CALBO Office at 916-457-1103 or [info@calbo.org](mailto:info@calbo.org).



# Energy Commission Liaison

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# Agenda

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- 2025 Energy Code basics
- All building significant changes
- Nonresidential significant changes
- Single-family significant changes
- Multifamily significant changes
- Resources



# 2025 Energy Code Basics

# 2025 Energy Code Goals

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## State goals

- Contribute to GHG reduction
- Increase building energy efficiency cost-effectively

## 2025 Energy Code goals

- Increase heat pump baselines
- Promote demand flexibility, solar PV, and battery energy storage systems
- Improve covered process load efficiencies
- Focus on existing buildings and ADUs



# 2025 Energy Code Benefits by the Numbers

Energy cost savings: \$4.8B

Avoided GHG Emissions: 4.1M MT CO<sub>2e</sub>

Benefit to Cost Ratio: 7

Electricity Savings: 392 GWh/yr

Natural Gas Savings: 23 MM Therms/yr

Water Savings: 68+ MM gallons/yr

## Heat pumps:

Leads to installation of over 500k heat pumps over 3 years

## PV/Battery:

Saves on average 300 GWh/year; reduces power demand on average 0.88MW/year. Minimizes grid exports.

## Electric-ready:

Sets up owners of newly constructed commercial kitchens to use cleaner electric equipment when they are ready



# 2025 Energy Code Fact Sheet

CALIFORNIA ENERGY COMMISSION

## 2025 California Energy Code



## FACT SHEET

### The Energy Code Background

As California's primary energy policy and planning agency, the California Energy Commission (CEC) was mandated by the Warren-Alquist Act to update and adopt building standards that reduce wasteful, uneconomic, inefficient, or unnecessary energy consumption and reduce greenhouse gas (GHG) emissions. That's because homes and businesses use nearly 70 percent of California's electricity! They are also responsible for about 25 percent of the state's GHG emissions. Every three years, the CEC updates the Energy Code, which is published by the California Building Standards Commission as part of the California Building Standards Code

(itself, known as Title 24 of the California Code of Regulations). The CEC's efficiency standards for buildings and appliances together have saved Californians more than \$100 billion in avoided energy costs over the last 50 years. Thanks to efficiency measures, California — the U.S. state with the highest population and largest economy (almost \$3.9 trillion GDP in 2023) — has the second-lowest per capita energy use in both the residential and commercial sectors.<sup>1</sup>

### Meeting State Climate Goals Through Better Buildings for Californians

The Energy Code governs the energy-saving features of newly constructed buildings, building additions, and alterations to existing buildings. The proposed standards for 2025 are cost-effective and are estimated to provide over \$4 billion in statewide energy cost savings.

The 2025 updates strongly contribute to California's efforts to "decarbonize" its buildings: reducing their carbon emissions. The Energy Code reduces emissions by making buildings more energy efficient; encouraging the use of energy efficient heat pumps for space and water heating; using clean energy generated onsite by solar panels in combination with battery storage; and shifting times of energy use to avoid peak periods of the day when dirty and inefficient powerplants are supplying more power to the grid.

### The 2025 Energy Code Update Focuses on:

- Expanding the use of heat pumps for space conditioning and water heating in newly constructed single-family, multifamily, and select nonresidential buildings. The standards also allow for flexibility in taking alternative but equally efficient approaches.
  - For homes, use heat pumps for both space heating and water heating, expanding on the single heat pump baselines in the 2022 update.
  - For nonresidential building types, expanding on the single-zone heat pump baselines in the 2022 update.
  - For low-rise multifamily buildings with individual water heaters in dwelling units, use heat pump water heater baselines, expanding on the space heating heat pump baselines in the 2022 update.
- Encouraging electric-ready buildings to set up owners to use cleaner electric water heating and cooking when they are ready to invest in those technologies.
- Updating photovoltaic and battery energy storage system standards for low-rise and high-rise multifamily and nonresidential buildings to achieve cost effective installations in consideration of revised net billing and virtual net billing rules.
- Updating space conditioning system efficiency and control standards for homes and nonresidential buildings.
- Updating ventilation requirements in multifamily buildings to improve indoor air quality.

Reminder: The CEC does not mandate specific fuel types. California's Energy Code is founded on the principle of enabling building designers to use a range of options for complying with energy requirements.

<sup>1</sup> US Energy Information Administration

### Process and Timeline

The Energy Code measures are updated with extensive input from the public, many stakeholders, and experts who participate in the CEC's process. Over the course of each three-year cycle, CEC staff and technical consultants evaluate each measure. The standards must be technologically feasible and cost-effective over the life of the building. The measures are discussed in public workshops and in online comments before being revised. This year, the proposed standards are slated to go to a CEC business meeting for adoption in September of 2024. It will then go to the California Building Standards Commission for approval as part of California's Building Standards Code before the end of 2024.

After approval, there is a one-year period for the CEC to provide supporting information, training, and technical assistance that brings builders, code officials, and technicians up to speed on the updates before they take effect. Local building departments start enforcing the 2025 Energy Code on January 1, 2026. These measures not only save energy and reduce energy bills, but also help Californians breathe easier and be more comfortable where they live and work. They are a critically important tool for advancing the state's climate and energy goals.

### For more information on:

The current Energy Code updates, please go to [www.energy.ca.gov/2025EnergyCode](http://www.energy.ca.gov/2025EnergyCode)

Please direct media questions to [mediaoffice@energy.ca.gov](mailto:mediaoffice@energy.ca.gov)



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September 2024

## BY THE NUMBERS

### \$100 BILLION

avoided energy costs over the last 50 years from the CEC's efficiency standards for buildings and appliances

### 70%

 amount of California's electricity used by homes and businesses

### 25%

 amount of the state's total greenhouse gas (GHG) emissions that homes and businesses are responsible for

### \$4 BILLION

statewide energy cost savings expected from the proposed standards for 2025

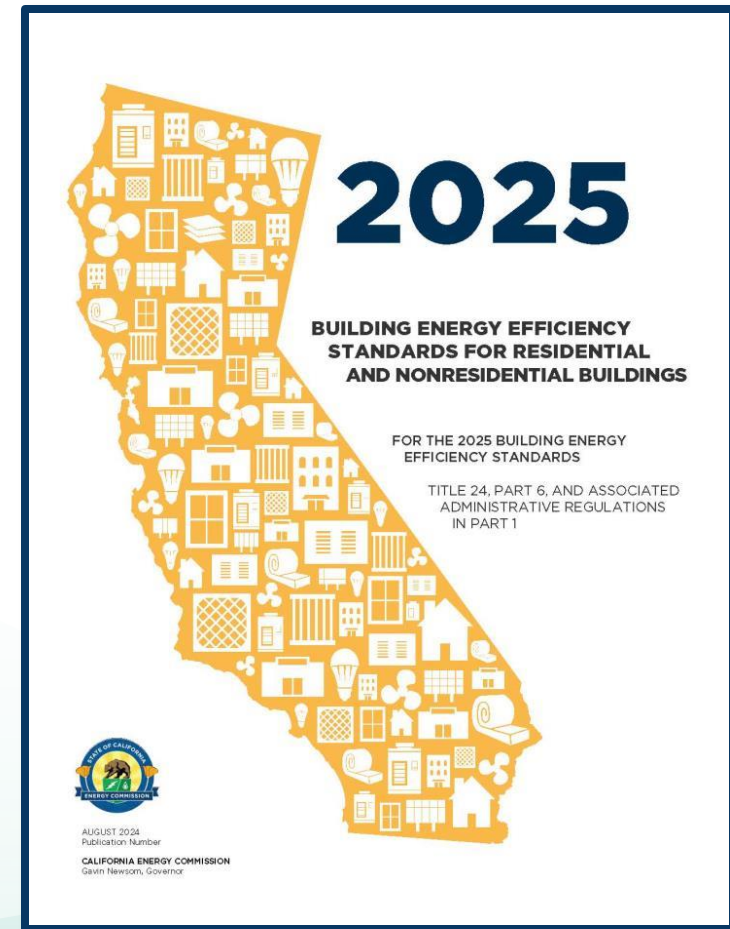
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# 2025 Energy Code

## Effective January 1, 2026

- Building permit applications submitted on or after effective date
- Must use 2025 tools
  - Software
  - Forms





# 2025 Energy Code Webpage

The screenshot shows the California Energy Commission website. The header includes the CA.gov logo, social media links, and navigation menus for About, Careers, Contact, Events, Newsroom, Resources, Translate, and Settings. The main navigation bar lists HOME, PROCEEDINGS, RULES AND REGULATIONS, PROGRAMS AND TOPICS, FUNDING, and DATA AND REPORTS. The breadcrumb trail reads: California Energy Commission > Programs and Topics > All Programs > Building Energy Efficiency Standards > 2025 Building Energy Efficiency Standards. The main content area features a large blue banner with the title "2025 Building Energy Efficiency Standards" and a paragraph: "The 2025 Energy Code expands the use of heat pumps in newly constructed residential buildings, encourages electric-readiness, strengthens ventilation standards, and more. Buildings whose permit applications are applied for on or after January 1, 2026, must comply with the 2025 Energy Code." To the right of this paragraph is a green sidebar titled "BUILDING ENERGY EFFICIENCY STANDARDS" containing links for "2025 Building Energy Efficiency Standards", "2022 Building Energy Efficiency Standards", "2019 Building Energy Efficiency Standards", "2028 Building Energy Efficiency Standards", "Energy Code Hotline Submission Form", "Energy Code Support Center", and "Workshops, Notices, and Documents". Below the sidebar is a yellow box titled "PROCEEDING INFORMATION" with links for "Docket Log (24-BSTD-01)" and "Submit e-Comment (24-BSTD-01)". At the bottom left, there are two book covers: "2025 Energy Code for Residential and Nonresidential Buildings" and "2025 Reference Appendices".

- Energy Code
- Reference Appendices
- Compliance Manuals
- Software
- Forms





# Energy Code Requirements

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## Mandatory requirements

- Minimum efficiency requirements must always be met.
- Can never trade off

## Prescriptive requirements

- Predefined efficiency requirements
- May supersede mandatory requirements
- Different requirements for newly constructed buildings, additions, and alterations



# Compliance Approaches

## Prescriptive approach

- Simple approach, no trade-offs
- Defines the standard building design
- Uses heat pump efficiency baselines

## Performance approach

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC-approved software
- Proposed building design meets or exceed standard building design





# 2025 Compliance Software

Performance approach must use approved compliance software versions

- Single-family
  - CBECC-Res 2025.1.0
- Nonresidential and multifamily
  - CBECC 2025.1.0



# Checkpoints 1-3

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# **2025 Energy Code All Buildings Significant Changes**



# Energy Code Compliance Program

## Formerly HERS

All buildings § 10-103.3

Updated for 2025

- Moves Home Energy Rating System (HERS) program to Title 24
- Renames to the Energy Code Compliance program
- Focuses on consumer protection
- Advances conflict of interest protections
- Strengthens quality assurance process
- Clarifies field verification and diagnostic testing (FV&DT) responsibilities



# Energy Code Compliance Program

## All buildings § 10-102

New for 2025

### Adds definitions

- Energy Code Compliance (ECC) Program - program for field verification and diagnostic testing for residential construction per Section 10-103.3 to verify newly constructed buildings, additions and alterations to existing buildings
- ECC-Provider - organization approved by Energy Commission to administer ECC program per Section 10-103.3
- ECC-Rater - person trained, tested, and certified by ECC-Provider to perform field verification and diagnostic testing for ECC program per Section 10-103.3
- ECC-Rater Company - organization certified by ECC-Provider to offer field verification and diagnostic testing services by ECC-Rater Company's ECC-Raters for ECC program per Section 10-103.3
- Exemplary ECC-Rater - ECC-Rater that has achieved the status of "Verified Exemplary" per Section 10-103.3(d)5B



# Performance Approach Summary of Changes

All buildings § 100.2, 150.1, 140.1, 170.1

Updated for 2025

## Performance energy budget

- Energy budget includes source energy and long-term system cost (LSC)
  - Compliance determined by applying mandatory and prescriptive requirements of standard design to proposed design building
- Updates long-term system cost (LSC) energy budget with two components
  - Efficiency LSC - includes space-conditioning, water heating, mechanical ventilation, self-utilization credit
  - Total LSC - includes efficiency LSC plus LSC energy from PV system, battery energy storage systems (BESS), demand flexibility, lighting and other plug loads
- Source energy is the total annual source energy



# Checkpoints 4-5

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# Water Heating Mandatory Requirements

All buildings § 110.3(c)7A-B

New for 2025

## Heat pump water heaters

- Backup heat required when
  - Inlet air unconditioned
  - Compressor cutoff temperature above winter median of extremes
    - JA2 Table 2-3
- Ventilation requirements
  - Installation space plus ventilation space minimum 100 ft<sup>3</sup> per kBtu/h or per manufacturer requirement, whichever is greater
  - Louvered/grilled permanent openings or doors with minimum net free area
  - When ducts used
    - R-6 insulation exhaust ducts and ducts crossing pressure boundaries
    - Air seal all connections and boundary crossings



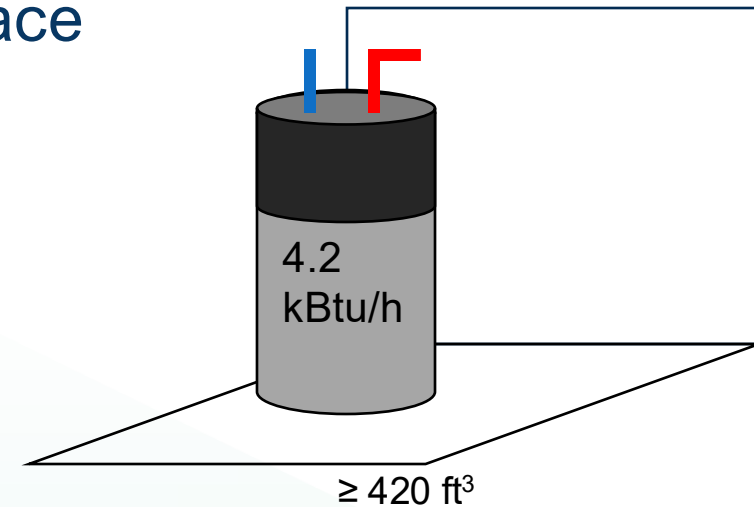
# Water Heating Mandatory Requirements

All buildings § 110.3(c)7B2

New for 2025

## Air-source heat pump water heaters

- Adds ventilation requirements either
  - Installation space plus ventilation space minimum 100 ft<sup>3</sup> per kBtu/h
  - Per manufacturer requirement
  - Whichever is greater



§110.3(c)7B2 installation space meets minimum ft<sup>3</sup>



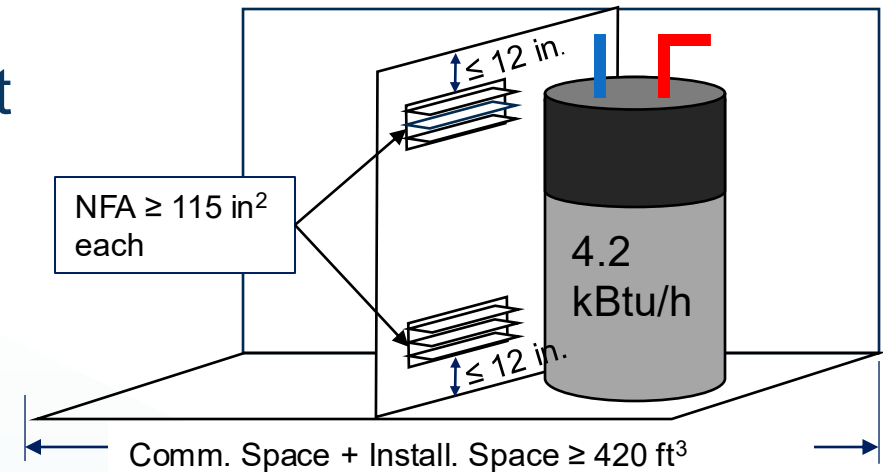
# Water Heating Mandatory Requirements

All buildings § 110.3(c)7B3

New for 2025

## Air-source heat pump water heaters

- Adds ventilation requirements
  - Louvered or grilled permanent openings or doors with minimum net free area



§110.3(c)7B3 using two equal louvered openings (or louvered door)



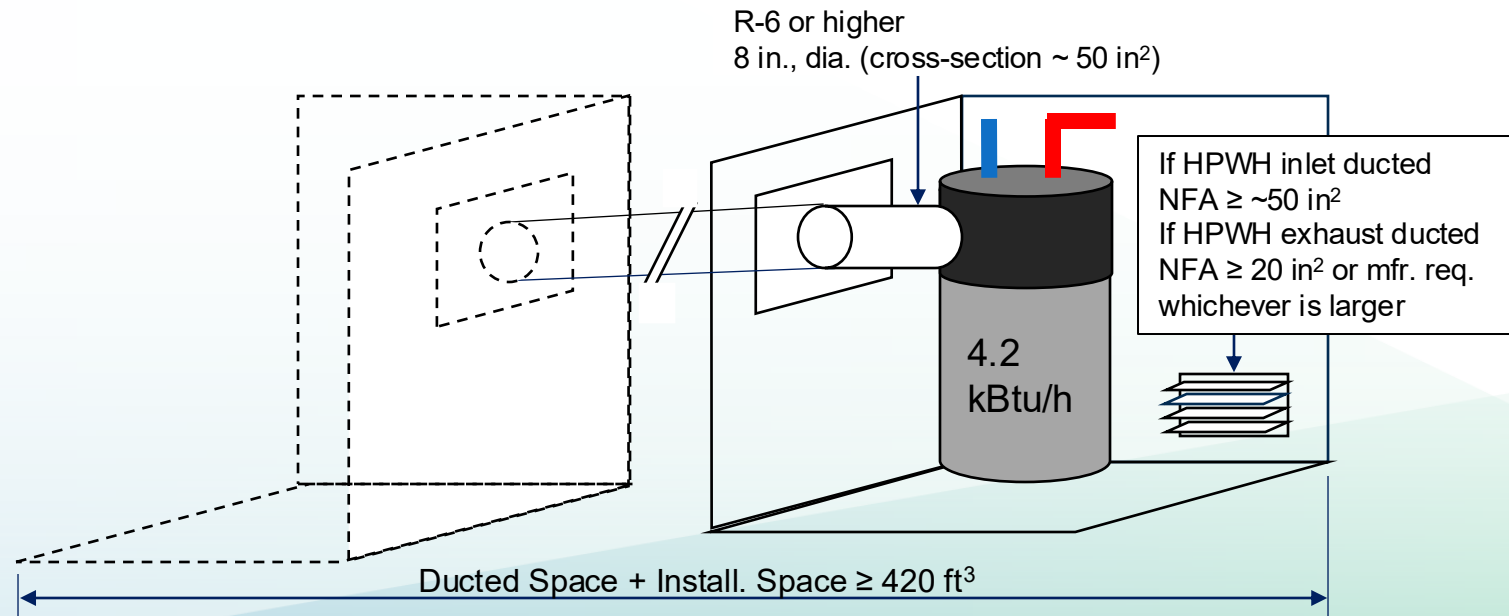
# Water Heating Mandatory Requirements

All buildings § 110.3(c)7B4

New for 2025

## Air-source heat pump water heaters

- Adds ventilation requirements
  - When ducts used
    - R-6 insulation exhaust ducts and ducts crossing pressure boundaries
    - Air seal all connections and boundary crossings





# Pool and Spa Heating Summary of Changes

All buildings § 110.4

Updated for 2025

## Pool and spa heating

- § 110.4(a)3 - Updates manufacturer certification to have energy efficiency rating on plate or card that is permanent, easily readable, weatherproof with instructions for energy-efficient heater operation
- § 110.4(a)4 removed
- § 110.4(b)1 – Adds Table 110.4-A for heating equipment standards
- § 110.4(b)2 – Updates minimum 18 inches of horizontal or vertical pipe between filter and heater
- § 110.4(b)3 – Adds outdoor heated pools/spas shall have a pool cover
- § 110.4(c) – Adds heater must be solar and/or heat pump (sized per JA16) or use 60% site-recovered or renewable energy
- § 110.4(d) – Adds controls for heat pump with supplementary heating to prevent supplementary heating when heat pump alone meets load



# Pool and Spa Heating Mandatory Requirements

All buildings § 110.4(a-b)

Updated for 2025

- Certification by manufacturers
- Relocates electric resistance heating into Section 110.4(c)
- Adds heating equipment selection per Table 110.4-A
- Modifies pipe requirement between filter and heater/connections to 18 inches of horizontal or vertical

*Table 110.4-A Heating Equipment Standards*

Heating Energy Source	Standard
Electric Resistance	UL 1261
Gas-fired	ANSI Z21.56/CSA 4.7a
Heat Pump	AHRI 1160 and one of the following: CSA C22.2 No. 236, UL 1995, or UL/CSA 60335-2-40
Solar	ICC/APSP 902/SRCC 400 for solar pool heaters, ICC 901/SRCC 100 for solar collectors



# Pool and Spa Heating Mandatory Requirements

All buildings § 110.4(c-d), JA16

New for 2025

## Heat source sizing

- Primary pool heater when new pool heater installed must be either
  - Solar swimming pool and/or spa heating system as main heating system
  - Heat pump pool heater as main heating system
  - Heating system that derives heating energy from on-site renewable or recovered energy
- Appendix JA16 criteria for pool and spa heat source sizing
  - Includes sizing method for heat pump pool heater
- Controls for heat pump with supplementary heating must prevent supplementary heating when heat pump alone meets load



# Pool and Spa Heating Mandatory Requirements

All buildings § 110.4(c)

New for 2025

## Exceptions

- Portable electric spas meeting Title 20
- Buildings with existing pool and spa heating systems and equipment
- Pool and spas heated by solar heating system
- Heating system for permanent spas in existing building
  - Gas available
  - Inadequate solar access



# Checkpoints 6-8

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# **2025 Energy Code Nonresidential Significant Changes**



# Nonresidential Defined

All buildings § 100.0, 100.1

Updated for 2025

## Nonresidential building

- All buildings in California Building Code (CBC) occupancies of group A, B, E, F, H, I, L, M, S, U
  - Adds L occupancy for laboratory
- Updates definition for healthcare facility
- Adds definitions for commercial kitchens
- Updates definitions for nonresidential building types
  - Events and exhibits, sports and recreation, warehouse
  - Functions areas for laboratories



# **2025 Envelope Changes Nonresidential**



# Envelope Summary

Nonresidential §§ 120.7, 140.3, 141.0

New for 2025

## Fenestration

- § 120.7(d) – adds mandatory U-factor 0.47 for vertical fenestration
- § 141.0(b)1E – adds mandatory requirements for vertical fenestration replacements over 150 ft<sup>2</sup> U-factor 0.58

## Vestibules

- § 120.7(e) – adds mandatory requirements for vestibules at public entrances that open into spaces 3,000 ft<sup>2</sup> or more for newly constructed occupancies types A, B, E, I, M

## Insulation

- 140.3(a) - updates prescriptive U-factors for roofs/ceilings and walls in Table 140.3-B



# Fenestration Mandatory Requirements

Nonresidential § 120.7(d)

New for 2025

## Exterior windows

- Vertical fenestration area-weighted average maximum U-factor 0.47
- Exception: Buildings meeting CBC Part 7, California Wildland-Urban Interface (WUI) Code, and located in Fire Hazard Severity Zones or WUI Fire Areas as designated by local enforcement agency



# Fenestration Vestibules Mandatory Requirements

Nonresidential § 120.7(e)

New for 2025

## Vestibules

- Public entrances for assembly, business, education, institutional, mercantile occupancies
- All doors opening into and out of vestibule equipped with self-closing devices
  - Interior and exterior doors should not be open at same time
  - Required on main entrance doors adjacent to revolving doors in building entrance
- If conditioned – heating system and air curtains with integral heating must have controls to shut off heating when outdoor air is above 45°F
  - Heating and cooling systems controlled by thermostat located in vestibule to limit heating to maximum 60°F and cooling to minimum 85°F





# Fenestration Vestibules Mandatory Requirements

## Nonresidential § 120.7(e)

New for 2025

### Vestibule exceptions

- Doors not intended to be used by public
- Doors opening directly from sleeping unit or dwelling unit
- Doors that open directly from space less than 3,000 square feet
- Revolving doors installed where public entrance to newly constructed building is required
- Doors primarily for vehicular movement or material handling and adjacent personnel doors
- Doors with air curtain velocity of at least 6.56 feet per second at floor per ANSI/AMCA 220
- Public entrances in buildings in climate zones 2 through 13
  - Less than four stories above grade and less than 10,000 square feet CFA
- Buildings with building plans submitted to local planning department prior to January 1, 2026



# Fenestration Alterations Mandatory Requirements

Nonresidential § 141.0(b)1E

New for 2025

## Replacing existing fenestration over 150 square feet

- Vertical windows
  - Maximum U-factor 0.58

## Additional fenestration over 50 square feet

- Vertical windows
  - Meet § 120.7(d) maximum U- factor 0.47





# Wall Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Tables 140.3-B

Updated for 2025

- Wall maximum U-factors for nonresidential buildings
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-B Wall Insulation Maximum U-Factors for Nonresidential Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Metal Building	<u>0.098</u>	<u>0.053</u>	<u>0.098</u>	<u>0.053</u>	<u>0.053</u>	<u>0.098</u>	<u>0.098</u>	<u>0.053</u>	<u>0.053</u>	<u>0.053</u>	<u>0.053</u>	<u>0.053</u>	<u>0.053</u>	<u>0.053</u>	<u>0.050</u>	<u>0.053</u>
Metal-framed	0.060	0.055	0.071	0.055	0.055	0.060	0.060	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
Mass Light <sup>1</sup>	<u>0.170</u>	<u>0.138</u>	<u>0.227</u>	<u>0.196</u>	<u>0.364</u>	<u>0.364</u>	<u>0.364</u>	<u>0.364</u>	<u>0.364</u>	<u>0.138</u>	<u>0.138</u>	<u>0.138</u>	<u>0.138</u>	<u>0.138</u>	<u>0.138</u>	<u>0.138</u>
Mass Heavy <sup>1</sup>	<u>0.211</u>	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	<u>0.160</u>	<u>0.211</u>	<u>0.184</u>	<u>0.160</u>	<u>0.160</u>	<u>0.153</u>
Wood-framed and Other	<u>0.078</u>	<u>0.053</u>	<u>0.102</u>	<u>0.053</u>	<u>0.095</u>	<u>0.102</u>	<u>0.102</u>	<u>0.095</u>	<u>0.053</u>	<u>0.053</u>	<u>0.042</u>	<u>0.053</u>	<u>0.053</u>	<u>0.053</u>	<u>0.038</u>	<u>0.053</u>



# Checkpoint 9

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# **2025 Solar PV and Battery Energy Storage System Changes Nonresidential**



# Solar PV and Battery Summary of Changes

## Nonresidential § 140.10

Updated for 2025

- § 140.10(a) - Updates PV sizing using solar access roof area (SARA) for steep and low slope roofs
  - Exception 5 – Updates for multitenant building tenant spaces < 2000 ft<sup>2</sup> with separate meter and HVAC to be excluded from PV calculation
- Tables 140.10-A and B – Adds building types
  - Events and exhibits, religious worship, sports and recreation
- Table 140.10-A - Increases PV capacity factors
  - Libraries in climate zones 2-16
  - Hotel/motel, medical office building/clinic, restaurants, retail, and grocery in all climate zones
- Equations 140.10-B to -D – updates PV sizing equations
- § 140.10(b), Table 140.10-B
  - Updates BESS capacity factors for all building types and climate zones
  - No requirements in climate zone 1 for schools and offices, financial institutions, unleased tenant space, and medical office buildings/clinics



# Solar Photovoltaic Prescriptive Requirements

## Nonresidential § 140.10(a)

Updated for 2025

- Newly constructed building types specified in Table 140.10-A
  - Newly installed PV system meets JA11
  - Mixed occupancy buildings where  $\geq 80\%$  of the floor area of the building serves one or more of these building types
- Minimum PV system capacity (kWdc) = whichever is smaller
  - Equation 140.10-A
  - Total of all available solar access roof areas (SARA)
    - SARA x 18 Watts per ft<sup>2</sup> for steep slope roofs
    - SARA x 14 Watts per ft<sup>2</sup> for low slope roofs
- Mixed occupancy buildings
  - Minimum rated PV system capacity
    - Apply Equation 140.10-A to CFA of each listed building type and sum capacities



# Solar Photovoltaic Prescriptive Requirements

## Nonresidential § 140.10(a)2

Updated for 2025

- SARA excludes roof area(s)
  - Less than 70% annual solar access
    - *Annual solar access* =  
$$\frac{[\textit{annual solar insolation, minus shading from obstructions}]}{[\textit{annual solar insolation if unshaded}]}$$
    - Shading from all obstructions counted in SARA calculations
  - Occupied per CBC § 503.1.4
  - Roof area otherwise unavailable
    - Other state building code requirements
    - Local building code requirements confirmed by Executive Director



# Solar Photovoltaic Prescriptive Requirements

Nonresidential § 140.10, Table 140.10-A

Updated for 2025

Table 140.10-A – PV Capacity Factors (*Watts per ft<sup>2</sup> of conditioned floor area*)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events & Exhibits	<u>3.48</u>	<u>4.28</u>	<u>3.66</u>	<u>4.32</u>	<u>3.77</u>	<u>4.05</u>	<u>4.28</u>	<u>4.83</u>	<u>4.63</u>	<u>4.80</u>	<u>5.04</u>	<u>4.44</u>	<u>4.95</u>	<u>4.36</u>	<u>5.48</u>	<u>3.38</u>
Library	0.39	<u>3.23</u>	<u>2.59</u>	<u>3.25</u>	<u>2.48</u>	<u>2.74</u>	<u>3.04</u>	<u>3.49</u>	<u>3.32</u>	<u>3.69</u>	<u>3.79</u>	<u>3.32</u>	<u>3.79</u>	<u>3.37</u>	<u>4.49</u>	<u>2.84</u>
Hotel/Motel	<u>1.69</u>	<u>1.90</u>	<u>1.66</u>	<u>1.97</u>	<u>1.69</u>	<u>1.87</u>	<u>1.94</u>	<u>2.22</u>	<u>2.09</u>	<u>2.20</u>	<u>2.30</u>	<u>2.05</u>	<u>2.30</u>	<u>2.02</u>	<u>2.72</u>	<u>1.73</u>
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	<u>2.59</u>	<u>3.13</u>	<u>2.59</u>	<u>3.13</u>	<u>2.59</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.13</u>	<u>3.80</u>	<u>2.59</u>
Restaurants	<u>8.55</u>	<u>9.32</u>	<u>8.16</u>	<u>9.65</u>	<u>8.21</u>	<u>8.73</u>	<u>9.11</u>	<u>10.18</u>	<u>9.75</u>	<u>10.28</u>	<u>10.85</u>	<u>9.73</u>	<u>10.69</u>	<u>9.73</u>	<u>12.25</u>	<u>8.47</u>
Retail, Grocery	<u>3.14</u>	<u>3.49</u>	<u>3.01</u>	<u>3.61</u>	<u>3.05</u>	<u>3.27</u>	<u>3.45</u>	<u>3.83</u>	<u>3.65</u>	<u>3.81</u>	<u>4.09</u>	<u>3.64</u>	<u>3.99</u>	<u>3.71</u>	<u>4.60</u>	<u>3.21</u>
School	1.27	1.63	1.27	1.63	1.27	1.63	<u>1.63</u>	<u>1.63</u>	<u>1.63</u>	<u>1.63</u>	<u>1.63</u>	<u>1.63</u>	<u>1.63</u>	1.63	2.46	1.27
Warehouse	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
Religious Worship	<u>4.25</u>	<u>4.65</u>	<u>3.49</u>	<u>4.52</u>	<u>3.72</u>	<u>4.29</u>	<u>4.64</u>	<u>5.89</u>	<u>5.30</u>	<u>5.67</u>	<u>5.89</u>	<u>4.99</u>	<u>5.78</u>	<u>4.63</u>	<u>7.57</u>	<u>3.90</u>
Sports & Recreation	<u>2.47</u>	<u>1.97</u>	<u>1.54</u>	<u>2.03</u>	<u>1.60</u>	<u>1.84</u>	<u>1.98</u>	<u>2.63</u>	<u>2.47</u>	<u>2.60</u>	<u>2.75</u>	<u>2.20</u>	<u>2.72</u>	<u>2.15</u>	<u>4.03</u>	<u>1.81</u>
Multifamily > 3 stories	1.82	2.21	1.82	2.21	1.82	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.77	1.82



# Solar Photovoltaic Prescriptive Requirements

## Nonresidential § 140.10(a)

Exceptions - No PV system if

- Total available SARA less than 3% of CFA
- Required PV system capacity less than 4 kWdc
- SARA less than 80 contiguous ft<sup>2</sup>
- AHJ determines PV system cannot meet ASCE 7-16, Chapter 7, Snow Loads



# Solar Photovoltaic Prescriptive Requirements

## Nonresidential § 140.10(a)

Updated for 2025

### Exception for multitenant buildings

- PV capacity to be calculated excluding tenant spaces
  - 2,000 ft<sup>2</sup> or less of condition floor space
  - Individual HVAC system
  - Individual utility meter
- Does not apply
  - CEC approved community solar program per § 10-115
  - Load-serving entity program compensates PV generation through virtual energy bill credits for occupants from netting of energy generation and consumption



# Battery Energy Storage System Prescriptive Requirements

## Nonresidential § 140.10(b)

Updated for 2025

- All buildings with PV system per § 140.10(a) must have battery energy storage system (BESS) meeting JA12
- Minimum rated energy capacity determined by
  - Equation 140.10-B
  - Equation 140.10-C if SARA was used
  - Mixed occupancy to determine total battery system capacity by applying minimum rated energy capacity to each listed building type and summing
- Minimum power capacity determined by Equation 140.10-D



# Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10(a), Equation 140.10-B, C

Updated for 2025

## Equation 140.10-B

$$kWh_{batt} = \frac{CFA \times B}{1000 \times C^{0.5}}$$

## Equation 140.10-C

$$kWh_{batt} = \frac{CFA \times B}{1000 \times C^{0.5}} \times \frac{kW_{PVdc, SARA}}{kW_{PVdc}}$$

- $kWh_{batt}$  = Min. Rated usable Energy Capacity (kWh)
- $kW_{PVdc}$  = Min. Rated PV System Capacity, Equation 140.10-A (kW)
- $kW_{PVdc, SARA}$  = Min. Rated PV System Capacity, SARA calculation (kW)
- $CFA$  = Conditioned floor area subject to § 140.10(a) (ft<sup>2</sup>)
- $B$  = BESS Capacity Factor, Table 140.10-B (Wh/ft<sup>2</sup>)
- $C$  = Rated single charge-discharge cycle AC-to-AC (round-trip) efficiency of BESS
  - Value < 1
  - From manufacturer specifications



# Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10(b), Equation 140.10-D

Updated for 2025

Equation 140.10-D for minimum power capacity

$$kW_{batt} = kWh_{batt}/4$$

- $kW_{batt}$  = Minimum rated power capacity of BESS (kWdc)
- $kWh_{batt}$  = Minimum rated usable energy capacity of BESS (kWh)



# Battery Energy Storage System Prescriptive Requirements

Nonresidential § 140.10, Table 140.10-B

Updated for 2025

Table 140.10-B – BESS Capacity Factors (Watt hour per ft<sup>2</sup> of conditioned floor area)

<b>Building Type</b>	<b>CZ 1</b>	<b>CZ 2</b>	<b>CZ 3</b>	<b>CZ 4</b>	<b>CZ 5</b>	<b>CZ 6</b>	<b>CZ 7</b>	<b>CZ 8</b>	<b>CZ 9</b>	<b>CZ 10</b>	<b>CZ 11</b>	<b>CZ 12</b>	<b>CZ 13</b>	<b>CZ 14</b>	<b>CZ 15</b>	<b>CZ 16</b>
Events & Exhibits	1.82	1.95	1.74	2.12	1.91	2.13	2.24	2.30	2.36	2.47	2.62	2.16	2.64	2.68	3.22	1.89
Library	0.37	7.17	5.97	6.75	5.64	6.08	6.19	7.13	7.18	7.56	7.17	6.93	6.88	6.81	7.93	6.40
Hotel/Motel	0.86	0.84	0.77	0.92	0.81	0.89	0.90	1.01	1.00	1.11	1.14	0.96	1.18	1.18	1.49	0.85
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	NR <sup>1</sup>	5.26	4.35	5.26	4.35	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	6.39	4.35
Restaurants	4.36	4.11	3.78	4.37	3.89	4.02	4.11	4.49	4.47	4.82	5.05	4.43	5.05	5.24	6.23	4.11
Retail, Grocery	1.89	1.82	2.70	1.82	1.72	1.80	1.76	1.92	1.97	2.05	2.22	1.95	2.16	2.29	2.66	1.91
School	NR <sup>1</sup>	3.05	2.38	3.05	2.38	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	4.60	2.38
Warehouse	0.37	0.41	0.37	0.41	0.37	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.54	0.37
Religious Worship	2.21	2.25	1.74	2.42	2.08	2.75	2.94	3.37	3.17	3.37	3.58	2.72	3.62	3.21	4.89	2.37
Sports & Recreation	1.26	0.98	0.76	1.14	0.86	1.20	1.23	1.57	1.53	1.65	1.83	1.27	1.86	1.57	3.02	1.13
Multifamily > 3 stories	1.88	2.27	1.88	2.27	1.88	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.85	1.88

Footnote to TABLE 140.10-B:

1. NR = Not Required



# Battery Energy Storage System Reference Joint Appendix

All buildings JA12.4

Updated for 2025

## Enforcement agency

- AHJ verifies
  - All Certificates of Installation valid
  - BESS model certified to CEC as qualified for credit
  - BESS commissioned and operational with approved control strategy
  - Control strategy and compliance cycling capacity must match Certificate of Compliance at install, commissioning, and final inspection



# Solar Equipment Lists

## Batteries

Updated for 2025

### List of batteries approved per JA12

#### Batteries

Manufacturers:

Model Names:

Search

Rows

[Download Excel file](#)

**Note #1:** The Battery List only includes electrochemical batteries.

**Note #2:** "JA12" references the 2022 or 2025 Building Energy Efficiency Standards' Reference Joint Appendix 12 (JA12). This appendix outlines requirements for field assembled battery energy storage systems to qualify for the compliance credit or the prescriptive requirements of the battery energy storage system as required. Y (2022) corresponds to batteries that comply with JA12 requirements of the energy code cycle 2022 and before, and Y (2025) corresponds to batteries that comply with JA12 requirements of the energy code cycle 2025 and before. For more information, see the [link](#).

**Note #3:** Maximum continuous discharge rate as stated by the manufacturer on the spec sheet.

Manufacturer	Model Name	Description	Nameplate Energy Capacity Rate (kW)	Max Continuous Discharge Rate(kW)	Declaration for JA12 Submitted
Yotta Energy, Inc.	SL-1000	675 W, 1 kWh lithium iron phosphate battery	1	0.675	Y (2022)
SolarEdge Technologies Ltd.	BAT-10K1P	5 kW, 9.7 kWh lithium ion battery system	9.7	5	Y (2022)
Jinko Solar Co., Ltd	JKR-B1950-A-US	17.28 kW, 19.2 kWh, lithium-ion battery	19.2	17.28	Y (2022)
Fortress Power LLC	eVaultMax	9.2 kW, 18.5 kWh, lithium iron phosphate battery	18.43	9.2	Y (2022)
Fortress Power LLC	eFlex 5.4	5 kW, 5.4 kWh, lithium iron phosphate battery	5	5.4	Y (2022)
Energizer Solar	PSUS4000H-7	20.16 kW, 27.82 kWh Lithium Ion (LFP) Battery Storage System	27.82	20.16	Y (2022)
Energizer Solar	PSUS4000H-6	17.28 kW, 23.85 kWh Lithium Ion (LFP) Battery Storage System	23.85	17.28	Y (2022)
Energizer Solar	PSUS4000H-5	14.4 kW, 19.87 kWh Lithium Ion (LFP) Battery Storage System	19.87	14.4	Y (2022)
Energizer Solar	PSUS4000H-4	11.52 kW, 15.90 kWh Lithium Ion (LFP) Battery Storage System	15.9	11.52	Y (2022)
Energizer Solar	PSUS4000H-3	8.64 kW, 11.92 kWh Lithium Ion (LFP) Battery Storage System	11.92	8.64	Y (2022)
Energizer Solar	PSUS4000H-2	5.76 kW, 7.95 kWh Lithium Ion (LFP) Battery Storage System	7.95	5.76	Y (2022)
BSL New Energy Technology Co., Ltd.	B-LFP48-100E	5.12 kW, 5.12 kWh lithium iron battery	5.12	5.12	Y (2022)
Zhuhai Ruixu Electronic Technology CO., LTD	Lithi2-16	10.24 kW, 16kWh, lithium iron phosphate battery	16	10.24	N
Zhuhai Ruixu Electronic Technology CO., LTD	RX-LFP48100-H	5.12 kW, 5.12kWh, lithium iron phosphate battery	5.12	5.12	N
Zhuhai Ruixu Electronic Technology CO., LTD	RX-LFP48100	5.12 kW, 5.12kWh, lithium iron phosphate battery	5.12	5.12	N
Xiamen Kehua Digital Energy Tech Co., Ltd	iStoragE BSL-S1	2.5 kW, 5 kWh lithium iron phosphate battery	5	2.5	N
Xiamen Hithium Energy Storage Technology Co., Ltd.	LC083502	418 kW, 836 kWh lithium iron phosphate battery	836	418	N
Xiamen Hithium Energy Storage Technology Co., Ltd.	SL00344U001L	172 kW, 344 kWh lithium iron phosphate battery	344	172	N
Xiamen Hithium Energy Storage Technology Co., Ltd.	CL00344U001L	172 kW, 344 kWh lithium iron phosphate battery	344	172	N
Xiamen Ampace Technology Limited	C-M51200ESA1	5.12 kW, 10 kWh lithium iron battery	10.03	5.12	N
Ulectric Technology Co., Ltd	Camel HSS-20	10 kW, 20 kWh, lithium ion battery	20	10	N
Ulectric Technology Co., Ltd	Camel HESS-15	10 kW, 15 kWh, lithium ion battery	15	10	N
Ulectric Technology Co., Ltd	Camel HESS-10	9 kW, 10 kWh, lithium ion battery	10	9	N
Ulectric Technology Co., Ltd	Camel HESS-5	5 kW, 5 kWh, lithium ion battery	5	5	N
TWS Technology (Anhui) Limited	ProeM-372-1h	372 kW, 372 kWh Lithium Iron Phosphate (LFP) Battery Storage System	372	372	N



# Solar Equipment Lists Energy Storage Systems

Updated for 2025

## List of Approved Energy Storage Systems

### Energy Storage Systems

Manufacturers:

Model Names:

Rows

[Download Excel file](#)

**Note #1:** The Energy Storage System List only includes battery energy storage systems.

**Note #2:** Energy storage systems on the list may incorporate a grid support inverter as a component. Grid support inverters are inverters that include advanced functionality and communication abilities and are commonly known as "smart inverters". Note that the equipment on the Energy Storage System List is capable of different levels of advanced functionality. It is important that you verify with the applicable utility, AHJ, or responsible entity whether specific equipment contains the level of functionality required by their "smart inverter" definition. Information about advanced inverter functionalities can be viewed by exporting the list.

**Note #3:** "JA12" references the 2022 or 2025 Building Energy Efficiency Standards' Reference Joint Appendix 12 (JA12). This appendix outlines requirements for integrated battery energy storage systems to qualify for the compliance credit or the prescriptive requirements of the battery energy storage system as required. Y (2022) corresponds to battery energy storage systems that comply with JA12 requirements of the energy code cycle 2022 and before, and Y (2025) corresponds to battery energy storage systems that comply with JA12 requirements of the energy code cycle 2025 and before. For more information, see the [link](#).

Manufacturer	Model Number	Description	PV DC Input Capability	Nameplate Energy Capacity (kWh)	Nameplate Power (kW)	Nominal Voltage (Vac)	Declaration for JA12 Submitted
Yotta Energy, Inc.	SL-1000/DPI-480	0.45 kW, 1 kWh, lithium iron phosphate energy storage system	Y	1	0.45	480	Y (2022)
Yotta Energy, Inc.	SL-1000/DPI-208	0.432 kW, 1 kWh, lithium iron phosphate energy storage system	Y	1	0.432	208	Y (2022)
Villara Energy Systems, LLC	VES20BC22S10P-S8K	8 kW, 11.5 kWh, LTO energy storage system	N	11.5	8	240	Y (2022)
Villara Energy Systems, LLC	VES20BC22S10P-S12K	8 kW, 11.5 kWh, LTO energy storage system	N	11.5	8	240	Y (2022)
Villara Energy Systems, LLC	VES20BC22S5P-S8K	8 kW, 5.75 kWh, LTO energy storage system	N	5.75	8	240	Y (2022)
Villara Energy Systems, LLC	VES20BC22S5P-S12K	8 kW, 5.75 kWh, LTO energy storage system	N	5.75	8	240	Y (2022)
Tesla Inc.	AC Powerwall 3012170-XX-Y	5 kW, 13.5 kWh, 240 Vac Lithium-Ion Energy Storage System, where xx are numbers and y is a letter; capable of PCS functionality	N	13.5	5	240	Y (2022)
Tesla Inc.	AC Powerwall 2012170-XX-Y	5 kW, 13.5 kWh, 240 Vac Lithium-Ion Energy Storage System, where xx are numbers and y is a letter; capable of PCS functionality	N	13.5	5	240	Y (2022)
Tesla Inc.	18S0000-XX-Y	7.6 kW, 13.5 kWh, 240 Vac split phase, Lithium-Ion Energy Storage System capable of PCS functionality; 9.6 kW off-grid. The PV inverter 1538000-XX-Y is a component of this system.	Y	13.5	7.6	240	Y (2022)
Tesla Inc.	1707000-XX-Y [7.6kW]	7.6 kW, 13.5 kWh, 240 Vac split phase, Lithium-Ion Energy Storage System (Powerwall 3), where XX are numbers and Y is a letter.	Y	13.5	7.6	240	Y (2022)
Tesla Inc.	1707000-XX-Y [5.75kW]	5.75 kW, 13.5 kWh, 240 Vac split phase, Lithium-Ion Energy Storage System (Powerwall 3), where XX are numbers and Y is a letter.	Y	13.5	5.75	240	Y (2022)
Tesla Inc.	1707000-XX-Y [11.5kW]	11.5 kW, 13.5 kWh, 240 Vac split phase, Lithium-Ion Energy Storage System (Powerwall 3), where XX are numbers and Y is a letter. Capable of PCS functionality.	Y	13.5	11.5	240	Y (2022)
Tesla Inc.	1707000-XX-Y [10kW]	10 kW, 13.5 kWh, 240 Vac split phase, Lithium-Ion Energy Storage System (Powerwall 3), where XX are numbers and Y is a letter.	Y	13.5	10	240	Y (2022)
SunPower	SV-BASE19.5-C	6kW, 19.5kWh, 240 Vac lithium iron phosphate energy storage system with PCS functionality	N	19.5	6	240	Y (2022)





# Checkpoints 10-12

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# **2025 Indoor Air Quality and Ventilation Changes Nonresidential**



# Ventilation and Indoor Air Quality Mandatory Requirements

Nonresidential § 120.1(c)1

Updated for 2025

## Air filtration

- Mechanical space-conditioning systems with ductwork more than 10 feet
- Mechanical supply-only ventilation systems and makeup air systems that provide outside air to an occupiable space
- Supply side of mechanical balanced ventilation systems, including
  - Heat recovery ventilation (HRV) systems
  - Energy recovery ventilation (ERV) systems
- Adds exception
  - Evaporative coolers



# Ventilation and Indoor Air Quality Mandatory Requirements

Nonresidential § 120.1(c)3

Updated for 2025

## Mechanical ventilation

- Outdoor ventilation rate determined by Equation 120.1-F

$$V_z = \text{the larger of } R_p \times P_z \text{ or } R_a \times A_z$$

- Where:
- $V_z$  = Required outdoor airflow rate (cfm)
- $R_p$  = 15 cubic feet per minute of outdoor airflow per person
  - $P_z$  = The expected number of occupants
- $R_a$  = The area-based minimum ventilation airflow rate in Table 120.1-A
- $A_z$  = The net occupiable floor area of the ventilation zone in square feet



# Ventilation and Indoor Air Quality Mandatory Requirements

## Nonresidential Table 120.1-B

Updated for 2025

- Adds categories for minimum exhaust rates to Table 120.1-B

*Table 120.1-B – Minimum Exhaust Rates [ASHRAE 62.1: Table 6.-25]*

Occupancy Category	Exhaust Rate cfm/unit	Exhaust Rate cfm/ft <sup>2</sup>	Air Class	Notes
Animal imaging(MRI/CT/PET)	-	<u>0.9</u>	3	-
Animal operating rooms	-	<u>3.00</u>	3	-
Animal postoperative recovery room	-	<u>1.5</u>	3	-
Animal preparation rooms	-	<u>1.5</u>	3	-
Animal procedure room	-	<u>2.25</u>	3	-
Animal surgery scrub	-	<u>1.50</u>	3	-
Large-animal holding room	-	<u>2.25</u>	3	-
Animal Necropsy	-	<u>2.25</u>	3	-
Small-animal-cage room (static cages)	-	<u>2.25</u>	3	-
Small-animal-cage room (ventilated cages)	-	<u>1.50</u>	3	-



# Ventilation and Indoor Air Quality Mandatory Requirements

## Nonresidential Table 120.1-C

Updated for 2025

- Updates Table 120.1-C to align with ASHRAE 62.1

*Table 120.1-C – Airstreams or Sources [ASHRAE 62.1:Table 5.16.16-3]*

Description	Air Class
Commercial kitchen grease hoods	4
Commercial kitchen hoods other than grease	3
Diazo printing equipment discharge	4
Hydraulic elevator machine room	2
Laboratory hoods	4
<u>Paint spray booths</u>	<u>4</u>
<u>Refrigerating machinery rooms</u>	<u>3</u>



# **2025 HVAC Changes Nonresidential**



# Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2(e)

Updated for 2025

## Open and closed-circuit cooling towers

- All cooling towers 150 tons or more must have conductivity controls
- Maximum achievable cycles of concentration per Table 110.2-A-1 and based on local water supply quality.
  - Documented on NRCC-MCH-E Table M
  - Signed by Professional Engineer (PE)
- Blowdown not allowed until one or more parameters reach maximum value in Table 110.2-A-1
- Conductivity controls and overflow alarm verified per NA 7.5.18



# Space-Conditioning Equipment Mandatory Requirements

All buildings Table 110.2-A-1

New for 2025

*Table 110.2-A-1 Recirculating Water Properties*

<u>Recirculating Water Parameters</u>	<u>Maximum Values</u>
<u>Conductivity (micro-siemens/cm)</u>	<u>2970 micro-siemens/cm</u>
<u>Total dissolved solids (ppm)</u>	<u>1845 ppm</u>
<u>Total alkalinity as CaCO<sub>3</sub> (ppm) excluding galvanized steel</u>	<u>540 ppm</u>
<u>Total alkalinity as CaCO<sub>3</sub> (ppm) galvanized steel (passivated)</u>	<u>450 ppm</u>
<u>Calcium hardness as CaCO<sub>3</sub> (ppm)</u>	<u>540 ppm</u>
<u>Chlorides as Cl (ppm)</u>	<u>270 ppm</u>
<u>Sulfates (ppm)</u>	<u>225 ppm</u>
<u>Silica (ppm)</u>	<u>135 ppm</u>
<u>Langelier saturation index (LSI)</u>	<u>2.5 (LSI)</u>



# Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2

Updated for 2025

## Removes Tables with federal minimum values

- Table 110.2-E – Packaged Terminal Air Conditioners and Packaged Terminal Heat Pumps Minimum Efficiency Requirements
- Table 110.2-I - Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters
- Table 110.2-J - Gas- and Oil-Fired Boilers, Minimum Efficiency Requirements
- Table 110.2-L - Floor-Mounted Air Conditioners and Condensing Units Serving Computer Rooms – Minimum Efficiency Requirements
- Table 110.2-M - Ceiling-Mounted Air Conditioners and Condensing Units Serving Computer Rooms – Minimum Efficiency Requirements



# Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2

New for 2025

## Adds Tables

- Table 110.2-J – Heat Pump and Heat Recovery Chiller Packages, Heat Pump, Heating Operation – Minimum Efficiency Requirements
- Table 110.2-K - Heat Pump and Heat Recovery Chiller Packages, Simultaneous Cooling and Heating, Heating Operation– Minimum Efficiency Requirements
- Table 110.2-L - Heat Pump and Heat Recovery Chiller Packages, Heat Recovery, Heating Operation– Minimum Efficiency Requirements



# Demand Management Mandatory Requirements

All buildings § 110.12(a)1

Updated for 2025

## Demand responsive controls

- When meeting demand management requirements, thermostats meet JA5 requirements, if no EMCS
- Spelled out communication protocols either
  - Must be certified as Open ADR 2.0a or b Virtual End Node (VEN)
  - Must be capable of responding to open ADR 2.0b VEN
  - Must be Open ADR 3.0 Virtual End Node



# Space-Conditioning System Controls Mandatory Requirements

Nonresidential § 120.2.(I)

New for 2025

## HVAC hot water temperature

- Hot water supply temperature no greater than 130°F in zones that use hot water for space heating



# Pipe Insulation Mandatory Requirements

## Nonresidential § 120.3(a)

Updated for 2025

- Pipe insulation required
  - Space cooling refrigerant suction, chilled water, and brine lines
  - Space heating refrigerant suction, steam, steam condensate, and hot water lines
  - Process heating refrigerant suction, steam, steam condensate, and hot water fluid distribution systems for heating a process unrelated to space conditioning
  - Process cooling refrigerant suction, chilled water, and brine fluid distribution systems for cooling unrelated to space conditioning
- Exception
  - No insulation required on refrigerant liquid line



# Pipe Insulation Mandatory Requirements

## Nonresidential § 120.3(c)

Updated for 2025

### Insulation thickness

- Insulation thickness levels specified in Table 120.3-A1 or A2
- If the conductivity is outside the range listed in Table 120.3-A1 or A2 calculation method from §120.3(c)2 must be used

$$T = PR \left[ \left( 1 + \frac{t}{PR} \right)^{\frac{K}{k}} - 1 \right]$$

T = insulation thickness

PR = actual outside radius

t = insulation thickness from Table 120.3-A1 or A2

K = conductivity of alternate material from Table 120.3-A1 or A2

k = lower value of the conductivity range from Table 120.3-A1 or A2



# Pipe Insulation Mandatory Requirements

Nonresidential § 120.3(c), Table 120.3-A1

Updated for 2025

- Table 120.3-A1 pipe insulation thickness for heating

*Table 120.3-A-1 Space Heating And Service Water Heating Systems (Steam, Steam Condensate, Refrigerant, Space Heating, Service Hot Water) And Process Heating System Pipe Insulation Thickness*

Fluid Operating Temperature Range (°F)	Insulation Conductivity (in Btu·in/h·ft <sup>2</sup> ·°F)	Insulation Mean Rating Temperature (°F)	Nominal Pipe Diameter < 1 inch	Nominal Pipe Diameter 1 to < 1.5 inches	Nominal Pipe Diameter 1.5 to < 4 inches	Nominal Pipe Diameter 4 to < 8 inches	Nominal Pipe Diameter 8 inches and larger
Above 350	0.32-0.34	250	4.5 inches	5.0 inches	5.0 inches	5.0 inches	5.0 inches
Above 350	0.32-0.34	250	R 37	R 41	R 37	R 27	R 23
251-350	0.29-0.32	200	3.0 inches	4.0 inches	4.5 inches	4.5 inches	4.5 inches
251-350	0.29-0.32	200	R 24	R 34	R 35	R 26	R 22
201-250	0.27-0.30	150	2.5 inches	2.5 inches	2.5 inches	3.0 inches	3.0 inches
201-250	0.27-0.30	150	R 21	R 20	R 17.5	R 17	R 14.5
141-200	0.25-0.29	125	1.5 inches	1.5 inches	2.0 inches	2.0 inches	2.0 inches
141-200	0.25-0.29	125	R 11.5	R 11	R 14	R 11	R 10
105-140	0.22-0.28	100	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
105-140	0.22-0.28	100	R 7.7	R 12.5	R 11	R 9	R 8



# Pipe Insulation Mandatory Requirements

Nonresidential § 120.3(c), Table 120.3-A2

Updated for 2025

- Table 120.3-A2 pipe insulation thickness for cooling

Table 120.3-A2 Space Cooling Systems (Chilled Water, Refrigerant And Brine) And Process Cooling System Pipe Insulation Thickness

Fluid Operating Temperature Range (°F)	Insulation Conductivity (in Btu·in/h·ft <sup>2</sup> ·°F)	Insulation Mean Rating Temperature (°F)	Nominal Pipe Diameter < 1 inch	Nominal Pipe Diameter 1 to < 1.5 inches	Nominal Pipe Diameter 1.5 to < 4 inches	Nominal Pipe Diameter 4 to < 8 inches	Nominal Pipe Diameter 8 inches and larger
Residential 40-60	0.21-0.27	75	0.75 inch	0.75 inch	1.0 inch	1.0 inch	1.0 inch
Residential 40-60	0.21-0.27	75	R 6	R 5	R 7	R 6	R 5
Nonresidential 40-60	0.21-0.27	75	0.5 inch	0.5 inch	1.0 inch	1.0 inch	1.0 inch
Nonresidential 40-60	0.21-0.27	75	R 3	R 3	R 7	R 6	R 5
Below 40	0.20-0.26	50	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
Below 40	0.20-0.26	50	R 8.5	R 14	R 12	R 10	R 9



# Pipe Insulation Mandatory Requirements

## Nonresidential § 120.3

Updated for 2025

### Exceptions

- Factory-installed piping within space-conditioning equipment certified under § 110.1 or § 110.2
- Piping with design operating temperature range between 60°F and 105°F
- Where heat gain or heat loss to or from piping without insulation will not increase building source energy use
- Piping that penetrates framing members not required to have pipe insulation for distance of framing penetration
  - Metal piping that penetrates metal framing must have grommets, plugs, wrapping, or other insulation to prevent contact with metal framing
- Fluid pumps, steam traps, blow-off valves, and piping within process equipment
- Valves, strainers, coil u-bends, air separators with at least 0.5 inches of insulation, and piping within process equipment



# Ducts and Plenums Mandatory Requirements

Nonresidential § 120.4(g)

Updated for 2025

## Duct sealing - either

- Leakage rate less than 6% of nominal air handler airflow rate for new ducts systems confirmed by acceptance testing
  - Does not serve healthcare facility
  - Provides conditioned air to an occupiable space for constant volume, single zone, and space conditioning system
  - Serves single zone less than 5,000 square feet of conditioned floor area
  - Ducts outdoors or unconditioned space combined surface area more than 25% of entire duct system
- Meet testing requirements per CMC §603.10.1



# Mechanical System Acceptance Mandatory Requirements

Nonresidential § 120.5(a-b)

Updated for 2025

Equipment/System	Reference Nonresidential Appendix
Outdoor air ventilation	NA7.5.1
Constant volume, single zone air conditioning and heat pump unit controls	NA7.5.2
Duct systems	NA7.5.3
Air economizers, <u>DOAS, HRV or ERV systems (added new exception)</u>	NA7.5.4
Demand control ventilation	NA7.5.5
Supply fan variable flow control	NA7.5.6
Hydronic system variable flow controls	NA7.5.7 & NA7.5.9
Boiler or Chiller with isolation controls	NA7.5.7



# Mechanical System Acceptance Mandatory Requirements

Nonresidential § 120.5(a-b)

Updated for 2025

<b>Equipment/System</b>	<b>Reference Nonresidential Appendix</b>
Hydronic systems with supply water temperature reset controls	NA7.5.8
Automatic demand shed controls	NA7.5.10
FDD for packaged DX units	NA7.5.11
Automatic FDD for air handling units	NA7.5.12
Distributed energy storage DX ac systems	NA7.5.13
Thermal Energy storage (TES)	NA7.5.14
Supply air temperature reset controls	NA7.5.15
Water-cooled chillers served by cooling towers with condenser water reset controls	NA7.5.16
Occupant sensing zone controls	NA7.5.17
<u>Conductivity controls and overflow alarms for open and closed cooling towers</u>	<u>NA 7.5.18</u>



# Checkpoints 13-15

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# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(a)3

New for 2025

### Sizing, equipment selection, and type

- Multi-zone space-conditioning system types
  - Space conditioning systems in office and school buildings not covered by § 140.4(a)2 must meet § 140.4(a)3
  - Exception
    - Buildings greater than 150,000 square feet or more than 5 habitable stories
    - School buildings in climate zones 6 and 7



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(a)3Ai-ii

New for 2025

## Multi-zone space-conditioning system types in offices and schools

- Space conditioning must meet one (i-v)
  - VRF heat pump system that incorporates refrigerant loop heat recovery
    - All zones ventilated by dedicated outdoor air system (DOAS)
    - Indoor fans must meet § 140.4(a)3D
    - DOAS must comply with § 140.4(a)3E
  - Four-pipe fan coil (FPFC) terminal units with DOAS providing ventilation to all zones
    - FPFC coils supplied by air to water heat pump (AWHP)
    - Indoor fans meet § 140.4(a)3D
    - DOAS meet § 140.4(a)3E



# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(a)3Aiiia

New for 2025

### Multi-zone space-conditioning system types in offices

- Space conditioning must meet one (i-v)
  - Space conditioning systems for office buildings in all climate zones must be variable air volume (VAV) system that utilizes heating supplied by hot water loop served by AWHP which meets § 140.4(a)3C and
  - For office buildings
    - Portion of perimeter zone terminal unit heating capacity utilizing parallel fan-powered boxes per § 140.4(a)3E must be 100% in climate zones 1-6, 16 and 25% in climate zones 7-15
    - Ventilation system in climate zones 1, 3, 5 must have heat recovery system per § 140.4(q)
    - Maximum allowed fan power in climate zones 3 and 5 must be 15% lower than specified in § 140.4(c)1



# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(a)3Aiiib

New for 2025

### Multi-zone space-conditioning system types in schools

- Space conditioning must meet one (i-v)
  - Space conditioning systems for schools in climate zones 2, 4, and 8-16 must be variable air volume (VAV) system which utilizes heating supplied by hot water loop served by AWHP that meets § 140.4(a)3C and
  - For school buildings
    - All perimeter zone terminal units meet § 140.4(a)3E
    - Ventilation system in climate zones 2, 4, and 11-16 have heat recovery system per § 140.4(q)
    - Maximum allowed fan power in climate zone 2 must be 15% lower than specified in § 140.4(c)1
    - Design leaving water temperature of heating loop no greater than 120°F in climate zone 2



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(a)3Aiv

New for 2025

## Multi-zone space-conditioning system types in offices and schools

- Space conditioning must meet one (i-v)
  - Space conditioning systems must be a dual fan dual duct (DFDD) system with hot and cold decks served by separate fan systems and
    - Economizer must be in cold deck when required by § 140.4(e)
    - Hot deck must supply 100% return air
      - Outdoor air may be supplied as required to supplement cold deck to maintain design minimum outdoor air rate
    - Hot deck heating must be heat pump
    - DFDD and terminal unit control sequence meet ASHRAE Guideline G36



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(a)3Av

New for 2025

## Multi-zone space-conditioning system types in offices and schools

- Space conditioning must meet one (i-v)
  - Space conditioning system determined by Executive Director to use no more energy than systems specified in § 140.4(a)3



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(a)3C

Updated for 2025

## Multi-zone space-conditioning system types

- Air to water heat pump (AWHP) space-heating hot water loop
  - AWHP used for space-heating hot water meeting § 140.4(a)3Aii, § 140.4(a)3Aiii, or § 140.4(a)3B
    - Efficiency per Table 110.2-J
    - If AWHP is used for space cooling
      - Heat recovery system meet § 140.4(s)
    - Supplemental heat be provided by electric resistance boiler with capacity of maximum 50% of design space-heating hot water loop heating capacity



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(a)3D

Updated for 2025

## Multi-zone space-conditioning system types

- Indoor fans meeting § 140.4(a)3Ai or ii
  - Maximum fan power of 0.35 Watts per cfm at design airflow
  - Minimum of three speeds
  - Turn off when there is no demand of cooling or heating in space



# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(a)3E

Updated for 2025

### Multi-zone space-conditioning system types

- DOAS meeting § 140.4(a)3Ai or § 140.4(a)3Aii
  - Meet § 140.4(p)
  - Equipped with heat recovery system meeting § 140.4(q)
  - Maximum fan power of 0.77 Watts per cfm at design airflow
- DOAS units that provide active heating or cooling meet either
  - For hydronic heating or cooling
    - DOAS heating coils must be hydronic heating coils utilizing AWHP space-heating hot water loop
    - DOAS cooling coils must be hydronic cooling coils utilizing space-cooling chilled water loop
  - Other heating or cooling must be heat pump
    - Electric resistance heating not allowed



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(h)5

Updated for 2025

## Cooling tower efficiency

- Axial fan, open-circuit cooling towers with capacity of 900 gpm or greater
  - Minimum efficiency per Table 140.4-H-2
- Exception
  - Replacement of existing cooling towers inside existing building or on existing roof

*Table 140.4-H-2 Minimum Efficiency For Propeller Or Axial Fan Open-circuit Cooling Towers (GPM/hp)*

<u>CZ 1</u>	<u>CZ 2</u>	<u>CZ 3</u>	<u>CZ 4</u>	<u>CZ 5</u>	<u>CZ 6</u>	<u>CZ 7</u>	<u>CZ 8</u>	<u>CZ 9</u>	<u>CZ 10</u>	<u>CZ 11</u>	<u>CZ 12</u>	<u>CZ 13</u>	<u>CZ 14</u>	<u>CZ 15</u>	<u>CZ 16</u>
<u>42.1</u>	<u>70</u>	<u>60</u>	<u>70</u>	<u>70</u>	<u>80</u>	<u>80</u>	<u>80</u>	<u>80</u>	<u>80</u>	<u>60</u>	<u>70</u>	<u>80</u>	<u>60</u>	<u>80</u>	<u>42.1</u>



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(r)

New for 2025

## DDC controller logic per ASHRAE Guideline 36

- HVAC systems with DDC controllers must use controller logic originating from a programming library based on sequences of operation from ASHRAE Guideline 36
  - All controllers capable of being field programmed
  - Entirety or all applicable portions of equipment control for configurations included in programming library
  - Programming library must be certified to Energy Commission as meeting Reference Joint Appendix JA18



# Space Conditioning Systems Prescriptive Requirements

Nonresidential § 140.4(r)

Updated for 2025

## DDC controller logic per ASHRAE Guideline 36

- Exceptions
  - Non-programmable (configurable-only) controllers for zone terminal units follow applicable ASHRAE Guideline 36 zone sequences per JA18 Table 18.3-1
    - Not subject to certification requirements
  - Logic from certified programming library modified to suit application-specific operation not included in Guideline 36 sequences
  - Systems serving healthcare facilities



# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(s)1A

Updated for 2025

### Simultaneous mechanical heat recovery either

- $CHL + 0.1 * CLL \geq 200$  tons and  $SWHCAP + HCAP \geq 2200$  kBtuh
- $CCAP \geq 300$  tons and  $SWHcap + 0.1 * HCAP \geq 700$  kBtuh
- Where
  - $CCAP$  = design capacity of all mechanical cooling systems
  - $CHL$  = coincident peak cooling load of all spaces with a design equipment power density  $> 5$  watts/ft<sup>2</sup> and a minimum outdoor airflow requirement  $< 0.5$  cfm/ft<sup>2</sup>, i.e., high load spaces
  - $CLL$  =  $CCAP - CHL$ . If the design includes capacity for future cooling systems, then assume 20% of future systems serve high load spaces
  - $SWHCAP$  = design capacity of all service water heating (SWH) systems, excluding systems expected to operate less than 5 hours per week, such as instant-hot water systems for emergency eyewash stations
  - $HCAP$  = design capacity of all space heating systems



# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(s)1B

Updated for 2025

### Mechanical heat recovery

- Heat recovery system must include heat recovery chiller, or other means, capable of transferring the lesser of the following from spaces in cooling to spaces in heating and/or to the service water heating (SWP) system
  - 25% of the peak heat rejection of the cooling system
  - 25% of (SWHCAP + HCAP)
  - Where
    - SWHCAP = design capacity of all service water heating (SWH) systems, excluding systems expected to operate less than 5 hours per week, such as instant-hot water systems for emergency eyewash stations
    - HCAP = design capacity of all space heating systems
- **Exceptions**
  - Laboratory buildings with exhaust air heat recovery systems per § 140.9(c)6
  - Buildings in climate zone 15 with SWHCAP < 600 kBtuh



# Space Conditioning Systems Prescriptive Requirements

## Nonresidential § 140.4(s)2

Updated for 2025

### Heat recovery for service water heating

- If required per § 140.4(s)1 to have simultaneous mechanical heat recovery and SWHCAP  $\geq 500$  kBtuh, heat recovery system must
  - Heat or preheat service hot water
  - Have capacity to transfer the smaller of
    - 30% of the peak heat rejection of the cooling system
    - 30% of SWHCAP
  - Where
    - SWHCAP = design capacity of all service water heating (SWH) systems, excluding systems expected to operate less than 5 hours per week, such as instant-hot water systems for emergency eyewash stations
- Exception to § 140.4(s)
  - Buildings with computer room heat recovery system or wastewater heat recovery system capable of providing not less than 25% of SWHCAP + HCAP



# Space Conditioning Systems Alterations Prescriptive Requirements

## Nonresidential § 141.0(b)2C

Updated for 2025

### New or replacement space-conditioning systems or components

- New systems or components except ducts meet § 140.4
  - Additional fan power allowances per Table 141.0-D
  - New or replacement single zone packaged rooftop systems with direct expansion cooling with rated cooling capacity less than 65,000 Btu/h either
    - Meet Table 141.0-E-1
    - Meet performance requirements of § 141.0(b)3
    - Exception: § 141.0(b)2Cii not applicable if alteration exceeds existing main service panel or service transformer capacity, electrical load calculation submitted by registered professional engineer per Article 220 of California Electrical Code





# Space Conditioning Systems Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2C

New for 2025

## Exceptions

- § 140.4(a)2 does not apply to new or replacement space conditioning systems or components
- § 140.4(a)3 does not apply to new or replacement space conditioning systems or components
- § 140.4(n) not applicable to newly installed or replacement space conditioning systems with existing operable wall or roof openings without interlock controls



# Space Conditioning Systems Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2C

New for 2025

## Exceptions

- Requirements for ASHRAE Guideline 36 in § 140.4(c)2Bii, § 140.4(d)2Av, § 140.4(e)2D, § 140.4(f)3, and § 140.4(r) do not apply to individual new or replacement components unless entire space conditioning-systems are new or replaced
- § 140.4(e) not applicable to
  - Systems not single package air-cooled commercial unitary air conditioner or heat pump with cooling capacity less than 54,000 Btu/h



# ATTCP Program - Mechanical

## ATTCP Program information

- California State Pipe Trades Council (CSPTC)
- National Energy Management Institute Committee (NEMIC)
- Refrigeration Service Engineers Society (RSES)





# Checkpoints 16-17

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# **2025 Covered Processes Changes Nonresidential**



# Covered Processes

## Summary Of Changes

Nonresidential §§ 120.3, 120.6, 140.9

Updated for 2025

- §120.3(a) – Adds mandatory pipe insulation for process heating and process cooling
- Table 120.3-A – Splits into Table 120.3-A1 and Table 120.3-A2 for mandatory pipe insulation thickness
- §120.6(a) – Adds mandatory efficiency requirements for fan-powered evaporators using volatile refrigerants
- §120.6(h) – Updates mandatory controlled environment horticulture to increase lighting efficiency
- §120.6(k) – Adds mandatory electric-ready for new commercial kitchens
- §140.9(c) – Adds prescriptive requirements for laboratory and factory exhaust systems



# Covered Processes

# Mandatory Requirements

## Nonresidential § 120.6(k)

New for 2025

### Electric-ready for new commercial kitchens

- Quick-service commercial kitchens and institutional commercial kitchens
  - Dedicated branch circuit wiring and outlet accessible to cookline appliances
    - Branch circuit conductors rated minimum 50 amps
    - Electrical service panel minimum capacity of 800 connected amps
  - Electrical service panel sized to accommodate either
    - Additional 208V or 240V 50-amp breaker
- Exceptions
  - Healthcare facilities
  - All-electric commercial kitchens



# Covered Processes

# Prescriptive Requirements

Nonresidential § 140.9(c)1

Updated for 2025

## Exhaust airflow reduction for laboratories

- Laboratory exhaust must be:
  - Able to reduce zone exhaust and makeup airflow per demand and occupancy as follows (whichever is larger):
    - Regulated min. occupied circulation rate documented to meet code, accreditation, or facility EH&S dept. requirements, or
    - Min. needed to maintain occupied pressurization.
    - User-defined airflow up to:
      - 1.0 cfm/ft<sup>2</sup> when occupant sensors detect occupants
      - 0.67 cfm/ft<sup>2</sup> within 20 minutes of no occupancy detected
  - Certified as meeting acceptance requirements per NA7.16



# Covered Processes Prescriptive Requirements

## Nonresidential § 140.9(c)3

Updated for 2025

### Exhaust fan power for labs and factories

- Fan exhaust systems over 10,000 cfm must meet ANSI discharge requirements
  - Fan power per §140.4(c)1A-B
  - Maximum fan power equals either
    - 0.85 W/cfm for systems with air treatment devices (e.g., filtration, scrubbers)
    - 0.65 W/cfm for all other exhaust fan systems
  - Exhaust system meets all
    - Sum of occupied minimum circulation rates less than 60% design airflow
    - Up to 1.3 W/cfm at full load
    - Variable speed controls to limit fan draw to 40% power at 60% design airflow
    - Maximum airflow equals larger of
      - Sum of exhaust airflows served by system
      - Minimum acceptable exhaust fan airflow meet either
        - Less than 60% of fan design airflow for simple turndown control system
        - Dynamically reset per wind speed and/or direction or contaminant concentration
    - Calculated outdoor contaminant concentrations meet federal, state, or local regulations
    - Certified to meet acceptance requirements per NA7.16



# Covered Processes Prescriptive Requirements

## Nonresidential § 140.9(c)5

New for 2025

### Reheat limitation for labs

- If over 20,000 cfm of lab exhaust serving multiple space conditioning zones in lab spaces, AHUs must not:
  - Mechanically cool AHU supply air below 80 °F
  - Heat AHU supply air over 50 °F
- Each zone must have heating and cooling capacity, to prevent cooling at AHU and zonal reheating
- Some exceptions may apply



# Covered Processes Prescriptive Requirements

## Nonresidential § 140.9(c)6

New for 2025

### Exhaust air heat recovery for labs

- Buildings with over 10,000 cfm of lab exhaust must include exhaust air heat recovery
  - Sensible energy recovery ratio minimum
    - 45% at heating design conditions
    - 25% at cooling design conditions
  - Heat recovered from at least 75% of all lab exhaust air volume
  - System includes
    - Run-around coil pump or other means to disable heat recovery
    - Bypass damper or other means to limit exhaust air pressure drop to 0.4 inch water gauge when heat recovery off
- Some exceptions may apply



# Checkpoints 18-19

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# **2025 Water Heating Changes Nonresidential**



# Water Heating Mandatory Requirements

All Buildings § 110.3(c)7

New for 2025

## Air source heat pump water heaters

- § 110.3(c)7A - Adds external or internal backup heat required when
  - Inlet air unconditioned
  - Compressor cutoff temperature > winter median of extremes (JA2 Table 2-3)
- § 110.3(c)7B - Adds ventilation requirements
  - Installation space plus ventilation space  $\geq 100 \text{ ft}^3$  per kBtu/h or per manufacturer requirement, whichever is greater
  - Louvered/grilled permanent openings or doors with minimum net free area
  - When ducts used
    - R-6 insulation exhaust ducts and ducts crossing pressure boundaries
    - Air seal all connections and boundary crossings



# Pipe Insulation Mandatory Requirements

Nonresidential § 120.3(c), Table 120.3-A1

Updated for 2025

- Table 120.3-A1 pipe insulation thickness for heating

*Table 120.3-A-1 Space Heating And Service Water Heating Systems (Steam, Steam Condensate, Refrigerant, Space Heating, Service Hot Water) And Process Heating System Pipe Insulation Thickness*

Fluid Operating Temperature Range (°F)	Insulation Conductivity (in Btu·in/h·ft <sup>2</sup> ·°F)	Insulation Mean Rating Temperature (°F)	Nominal Pipe Diameter < 1 inch	Nominal Pipe Diameter 1 to < 1.5 inches	Nominal Pipe Diameter 1.5 to < 4 inches	Nominal Pipe Diameter 4 to < 8 inches	Nominal Pipe Diameter 8 inches and larger
Above 350	0.32-0.34	250	4.5 inches	5.0 inches	5.0 inches	5.0 inches	5.0 inches
Above 350	0.32-0.34	250	R 37	R 41	R 37	R 27	R 23
251-350	0.29-0.32	200	3.0 inches	4.0 inches	4.5 inches	4.5 inches	4.5 inches
251-350	0.29-0.32	200	R 24	R 34	R 35	R 26	R 22
201-250	0.27-0.30	150	2.5 inches	2.5 inches	2.5 inches	3.0 inches	3.0 inches
201-250	0.27-0.30	150	R 21	R 20	R 17.5	R 17	R 14.5
141-200	0.25-0.29	125	1.5 inches	1.5 inches	2.0 inches	2.0 inches	2.0 inches
141-200	0.25-0.29	125	R 11.5	R 11	R 14	R 11	R 10
105-140	0.22-0.28	100	1.0 inch	1.5 inches	1.5 inches	1.5 inches	1.5 inches
105-140	0.22-0.28	100	R 7.7	R 12.5	R 11	R 9	R 8



# Pool and Spa Heating Summary of Changes

All buildings § 110.4

Updated for 2025

## Pool and spa heating

- § 110.4(a)3 – Updates manufacturer certification to have energy efficiency rating on plate or card that is permanent, easily readable, weatherproof with instructions for energy-efficient heater operation
- § 110.4(a)4 removed – allows electric resistance heating
- § 110.4(b)1 – Adds Table 110.4-A for heating equipment standards
- § 110.4(b)2 – Updates minimum 18 inches of horizontal or vertical pipe between filter and heater
- § 110.4(b)3 – Outdoor heated pools/spas shall have a pool cover
- § 110.4(c) – Heater must be solar and/or heat pump (sized per JA16) or use 60% site-recovered or renewable energy
- § 110.4(d) – Adds controls for heat pump with supplementary heating to prevent supplementary heating when heat pump alone meets load



# **2025 Lighting Changes Nonresidential**



# Lighting Summary of Changes

Nonresidential §§ 130.1, 130.2, 130.4, 140.6, 140.8

Updated for 2025

- §130.1(b) – Removes multilevel control uniformity Table 130.1-A
- §130.1(d) - Lowers trigger for mandatory daylighting controls to 75W; adds daylighting control exception for secondary sidelit daylight zones < 85W; updates linear luminaires controllable in up to 8-ft segments
- §130.2(c) – Updates exception from motion sensors for building façade, ornamental hardscape, and outdoor dining area lighting
- §130.4(a) – Adds mandatory acceptance testing for controlled environmental horticulture lighting
- §140.6 – Removes prescriptive tailored method; moves mounted and wall display lighting allowances to prescriptive area category method
- §140.8(b) – Removes most automatically compliant sign light sources; may use LED or neon



# Lighting Controls Mandatory Requirements

## Nonresidential §130.1(a-b)

Updated for 2025

- Clarifies manual controls must be in same space as controlled lighting, or located where lighting status visible
- Removes Table 130.1-A – all multilevel controls must provide and enable continuous dimming from 100% to 10%
  - Light sources with HID and induction lamps must have one control step between 30 and 70%



# Lighting Controls Mandatory Requirements

## Nonresidential §130.1(c)

Updated for 2025

- Occupant sensor delay maximum 20 minutes
- Exception 5 to §130.1(c)1 – Language clarified to exempt emergency lighting intended to function in emergency mode during power outages
- Removed exception for warehouse aisles and open areas to reduce lighting power by 40% (instead of 50%)
- Parking garage and loading/unloading areas requirements moved to Section 130.1(c)6E
  - Hotel/motel stairwell and corridors now meet Section 130.1(c)1C



# Daylighting Controls Mandatory Requirements

## Nonresidential § 130.1(d)

Updated for 2025

- Daylighting controls now required in skylit, primary, and secondary sidelit daylit zones with 75W or more of general lighting
  - Exception 3 to §130.1(d) now exempts secondary daylit zones with < 85W of general lighting, if primary daylit zones don't require daylighting controls
- General lighting luminaires over 8 feet to be controlled in segments up to 8 feet
  - If luminaire contains factory-assembled housing and light source as integral unit in segments over 8-feet, may be controlled according to daylit zone in which segment is mainly located



# Lighting Acceptance Testing Mandatory Requirements

Nonresidential § 130.4(a)

New for 2025

- Adds acceptance testing requirements for controlled environmental horticulture lighting meeting Section 120.6(h)5B



# Lighting Power Allowances Prescriptive Requirements

## Nonresidential § 140.6

Updated for 2025

- Removes Tailored Method
  - Some allowances for sales areas, bar/lounges, dining areas moved to Area Category Method
    - Wall and floor displays
    - Task lighting of certain mounting heights



# Sign Lighting Prescriptive Requirements

## Nonresidential § 140.8(b)

Updated for 2025

- Removes most automatically-compliant alternative light sources
  - Neon, cold cathode lamps
  - LEDs with power supply efficiency of 80%



# ATTCP Program - Lighting

## ATTCP Program information

- National Lighting Contractors Association of America (NLCAA)
- California Advanced Lighting Controls Training Program (CALCTP)



National Lighting Contractors  
Association of America



California Advanced Lighting  
Controls Training Program



# Checkpoint 20

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# **2025 Energy Code Single-Family Significant Changes**



# 2025 Envelope Changes Single-Family



# Envelope

## Summary of Changes

Single-family § 150.0(q), 150.1(c)

Updated for 2025

### Insulation

- §150.0(c) – Updates mandatory wall insulation
  - 2x4 walls U-factor 0.095 or R-15
  - 2x6 walls U-factor of 0.069 or R-21
- § 150.1(c)1A – Adds to prescriptive Option C - Table 150.1-A
  - Cathedral ceiling insulation R-38 all climate zones
  - Ceiling insulation for vented attic
    - R-38 climate zones 1, 8-16 (adds 8, 9, 10)
    - R-30 climate zones 2-7

### Fenestration

- § 150.0(q) – Updates mandatory U-factor 0.40 in all climate zones
- § 150.1(c)3 – Updates prescriptive U-factor 0.27 in climate zones 1-5, 11-14, 16
  - Adds exception for new dwelling units 500 square feet or less in climate zone 5 U-factor 0.30



# Envelope Definitions

## All buildings § 100.1

New for 2025

- Cathedral ceiling - exterior partition with ceiling applied directly to underside of roof framing members and structural roof sheathing applied directly to top of roof framing members/rafters, can be flat or sloped, vented or unvented
- Compartmentalization - when dwelling unit enclosure area is constructed to prevent air leakage, including all walls, ceilings, floors shared with exterior spaces or adjacent spaces, such as neighboring units, corridors, and elevator shafts



# Insulation Roof and Ceiling Mandatory Requirements

Single-family § 150.0(a)1

Updated for 2025

## Roof deck insulation

- Attics above conditioned space
- Climate zones 4 and 8-16
- Maximum U-factor 0.184
- Exceptions
  - Ducts and air handler located entirely in conditioned space
  - Air handler in unconditioned space with 12 feet or less of supply duct in unconditioned space or ductless
  - Buried duct systems per Section 150.1(b) and RA3.1.4.1



# Insulation Walls

## Mandatory Requirements

Single-family § 150.0(c)

Updated for 2025

### Wall insulation

- 2x4 walls assembly U-factor 0.095 or R-15
- 2x6 walls assembly U-factor of 0.069 or R-21
- Opaque non-framed assembly U-factor 0.102
- Masonry/mass walls must meet prescriptive requirements
  - Climate zones 1-15, above grade
    - Interior insulation – U-factor 0.077
    - Exterior insulation – U-factor 0.125
  - Climate zone 16, above grade
    - Interior insulation – U-factor 0.059
    - Exterior insulation – U-factor 0.077



# Insulation Roof and Ceiling Prescriptive Requirements

Single-family § 150.1(c)1A, Table 150.1-A

Updated for 2025

**Roof and ceiling insulation** - Option C per Table 150.1-A

- Cathedral ceiling insulation
  - R-38 all climate zones
- Ceiling insulation for vented attic
  - R-38 climate zones 1, 8-16
  - R-30 climate zones 2-7
- Meet § 150.1(c)9B with HERS verification of ducts in conditioned space
- Radiant barrier
  - Climate zones 2-15



# Fenestration Mandatory Requirements

Single-family § 150.0(q)

Updated for 2025

## Fenestration products

- Maximum weighted average U-factor 0.40
- All climate zones
- Exceptions to U-factor requirement
  - Fenestration area up to 10 square feet or 0.5% of conditioned floor area (CFA)
  - Greenhouse or garden windows up to 30 square feet of fenestration area
  - Buildings meeting CBC Part 7, California Wildland-Urban Interface (WUI) Code, and located in Fire Hazard Severity Zones or WUI Fire Areas as designated by local enforcement agency



# Fenestration Prescriptive Requirements

Single-family § 150.1(c)3, Table 150.1-A

Updated for 2025

**Windows, skylights, and glazed doors - Per Table 150.1-A**

- Maximum U-factor 0.27 in climate zones 1-5, 11-14, 16
- Maximum U-factor 0.30 in climate zones 6-10, 15
- Maximum SHGC 0.23 in climate zones 2, 4, 5-14
- Maximum SHGC 0.20 in climate zone 15
  - No SHGC requirement in climate zones 1, 3, 5, 16
- Total fenestration area 20% maximum
- West-facing fenestration area 5% maximum in climate zones 2, 4, 6-15



# Fenestration Prescriptive Requirements

## Single-family § 150.1(c)3

Updated for 2025

### Windows, skylights, and glazed doors - Exceptions

- New dwelling units 500 square feet or less in climate zone 5 maximum U-factor 0.30
- No U-factor or SHGC for up to 3 ft<sup>2</sup> in both glazed doors and tubular skylights
- Maximum U-factor of 0.40 and SHGC of 0.30 for up to 16 ft<sup>2</sup> of skylights
  - No SHGC in climate zones 1, 3, 5, 16
- Chromogenic glazing must have controls and cannot be combined in area-weighted average with non-chromogenic fenestration
- Unrated site-built may use default tables or NA6 up to 250 ft<sup>2</sup>
  - Note: defaults in Table 110.6-A do not meet mandatory U-factor



# Fenestration Prescriptive Requirements

## Single-family § 150.1(c)4

Updated for 2025

### Shading

- Meet either
  - Maximum SHGC per § 150.1(c)3A and Table 150.1-A
  - Install exterior operable shading louver or exterior shading device that meets required maximum SHGC
  - Combination of above to achieve same performance as § 150.1(c)3A
- South-facing glazing: overhangs installed so that south-facing glazing is fully shaded at solar noon on August 21 and substantially exposed to direct sunlight at solar noon on December 21
- Exterior shading devices must be permanently secured with attachments or fasteners that are not intended for removal
  - Exception: California Building Code (CBC) requires emergency egress or where compliance would conflict with health and safety regulations



# Fenestration Additions Prescriptive Requirements

## Single-family § 150.2(a)1A

Updated for 2025

- Additions greater than 700 square feet meet Table 150.1-A
  - New fenestration maximum SHGC 0.23 in climate zone 15



# Fenestration Alterations Prescriptive Requirements

Single-family § 150.2(b)1A, 150.2(b)1B

Updated for 2025

- Newly added fenestration meet Table 150.1-A
  - Exception 1: fenestration maximum SHGC 0.23 in climate zone 15
  - Exception 2: fenestration or skylight area up to 16 square feet
    - Not required to meet total fenestration area and west-facing fenestration area
- Replacement fenestration meet Table 150.1-A
  - Exception 1 - vertical fenestration up to 75 square feet
    - Maximum U-factor 0.40 in climate zones 1-16
    - Maximum SHGC 0.35 in climate zones 2, 4, and 6-15
  - Exception 2: skylights maximum U-factor 0.40 and maximum SHGC 0.30
  - Exception 3: vertical fenestration maximum SHGC 0.23 in climate zone 15



# Checkpoints 21-22

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# **2025 Solar PV and Battery Energy Storage System Ready Changes Single-Family**



# Solar PV and BESS

## Summary of Changes

Single-family §§ 150.1(c)14, 150.0(s)

Updated for 2025

### Solar PV

- §150.1(c)14 – Updates prescriptive PV sizing using solar access roof area (SARA) for steep and low slope roofs

### Battery energy storage system (BESS) ready

- §150.0(s) – Updates mandatory BESS-ready applies to newly constructed single-family buildings with dwelling unit electrical service over 125A
- §150.0(s) – Adds exception for buildings with BESS installed not required to meet §150.0(s)
- Updates to Reference Joint Appendix JA12



# Solar Photovoltaic Prescriptive Requirements

## Single-family § 150.1(c)14

Updated for 2025

- All newly constructed require newly installed PV system or modules meeting JA11
- Minimum PV capacity (kW<sub>PVdc</sub>) = whichever is smaller
  - Equation 150.1-C
  - Solar access roof area (SARA)
    - Steep slope roofs - SARA x 18 W/ft<sup>2</sup>
    - Low slope roofs - SARA x 14 W/ft<sup>2</sup>



# Solar Photovoltaic Prescriptive Requirements

## Single-family § 150.1(c)14B

Updated for 2025

- SARA excludes roof area(s)
  - Less than 70% annual solar access
    - *Annual solar access =*  
$$\frac{[\textit{annual solar insolation, minus shading from obstructions}]}{[\textit{annual solar insolation if unshaded}]}$$
    - Steep roofs – only shading from existing permanent external obstructions counted
    - Low-sloped roofs – shading from all obstructions counted
  - Occupied per CBC §503.1.4
  - Roof area otherwise unavailable due to either
    - Other state building code requirements
    - Local building code requirements confirmed by Executive Director.



# Battery Energy Storage System Prescriptive Requirements

## Single-family § 150.1(c)14

**Exception 5** - PV system size per Equation 150.1-C may be reduced by 25% if BESS installed

- Meet requirements in Reference Joint Appendix JA12
- Minimum cycling capacity of 7.5 kWh as defined in JA12

### JA12 Definitions

- Cycling Capacity – battery energy storage capacity (kWh) available for daily cycling
- Compliance Cycling Capacity – cycling capacity (kWh) of BESS commissioned during system installation, per Certificate of Compliance; ratio between compliance cycling capacity and usable capacity must be maintained for life of BESS
- Usable Capacity – battery storage capacity (kWh) that manufacturer allows for charging and discharging



# BESS Ready Mandatory Requirements

## Single-family § 150.0(s)

Updated for 2025

Newly constructed dwelling units where load serving entity provides electrical service over 125A must either

- BESS-ready interconnection equipment with back-up capacity 60A minimum and minimum 4 BESS-supplied branch circuits per § 150.0(s)2
- Dedicated raceway from main service to subpanel supplying branch circuits per § 150.1(s)2
  - Can supply branch circuits via main service panel before BESS is installed
  - Raceway trade size 1-inch minimum
  - Subpanel labeled “Subpanel shall include all backed-up load circuits”
- Exception: Buildings with BESS installed



# Checkpoint 23

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# 2025 HVAC Changes, Single-Family



# HVAC and IAQ Mandatory Summary of Changes

Single-family § 150.0(h, m, i, o)

Updated for 2025

## HVAC

- §150.0(h)1 – allows block load calculations for additions
- §150.0(h)5 – limits equipment selection, systems sized based on ACCA
- §150.0(h)6 – adds defrost requirements for heat pumps with defrost delay timer
- §150.0(h)7 – adds supplemental heating control requirements
- §150.0(h)8 – adds supplemental electric resistance heat sizing requirements
- §150.0(h)9 – adds thermostat requirements for variable or multi-speed systems
- §150.0(m)1B – new exception to allow less duct insulation in some unvented attics
- §150.0(m)13C – new exception from fan efficacy requirements for multispeed systems
- §150.0(i)2 – adds thermostat requirements for heat pumps with supplemental heating

## Indoor air quality

- §150.0(o)1Civ – Updates for balanced and supply-only ventilation to have accessible air filters, including HRV/ERVs



# Space-Conditioning Equipment Mandatory Requirements

All buildings § 110.2(b)

Updated for 2025

## Controls for heat pumps with supplementary heaters

- Meet requirements in Section 150.0(h)7 and Section 150.0(i)2
- Removes Exception 3



# Space-Conditioning Equipment Mandatory Requirements

Single-family §150.0(h)1

Updated for 2025

## Building cooling and heating load

- Heating and cooling loads determined using either
  - American Society of Heating Refrigerating and Air-Conditioning Engineers ([ASHRAE](#))
  - Sheet Metal and Air Conditioning Contractors' National Association ([SMACNA](#))
  - Air Conditioning Contractors of America ([ACCA](#))
- Exception: Block load - total load for all rooms combined served by central equipment may be used for sizing for additions



# Space-Conditioning Equipment Mandatory Requirements

Single-family §150.0(h)5

New for 2025

## System selection

- Equipment sizing and selection meet cooling and heating loads of Section 150.0(h)1-2
- System must be sized based on ACCA Manual S-2023
  - No limit on minimum cooling capacity
  - Furnaces heating capacity sized per ACCA Manual S-2023 Table N2.5
  - Heating pump heating capacity
    - Meet minimum requirements of the CBC not including supplementary heating
    - No limit on maximum heating capacity



# Space-Conditioning Equipment Mandatory Requirements

Single-family §150.0(h)6

New for 2025

## Defrost

- Defrost delay timer set not less than 90 minutes for heat pump with installer-adjustable defrost delay timer
- Installer certifies on CF2R that control configuration has been tested
- Exceptions
  - Dwelling units in climate zones 6 and 7
  - Dwelling units with conditioned floor area 500 ft<sup>2</sup> or less in climate zones 3, 5-10, 15



# Space-Conditioning Equipment Mandatory Requirements

Single-family §150.0(h)7

New for 2025

## Supplementary heating control configuration

- Heat pumps with supplementary heat including electric resistance heaters or gas furnace
  - Lock out supplementary heating when outdoor air above 35°F and meet thermostat requirements per Section 150.0(i)2
  - Controls may allow supplementary heat operation above 35°F only during defrost or emergency operation
- Installer certifies on CF2R that control configuration has been tested
- Exception to meet Option A or Option B
  - Climate zones 7 and 15
  - Conditioned floor area less than 500 ft<sup>2</sup> in all climate zones



# Space-Conditioning Equipment Mandatory Requirements

Single-family §150.0(h)8

New for 2025

## Sizing of electric resistance supplementary

- Capacity of electric resistance heat for heat pumps with electric resistance heat
  - Must exceed heat pump nominal cooling capacity
    - 95°F ambient conditions
    - Multiplied by 2.7 kW per ton
    - Rounded up to closest kW



# Space-Conditioning Equipment Mandatory Requirements

Single-family §150.0(h)9

New for 2025

## Capacity variation with third-party thermostat

- Variable or multi-speed systems
  - Capable of responding to heating and cooling loads by modulating systems compressor speed
  - Meet thermostat requirements per Section 150.0(i)2
  - Installer certifies on CF2R that control configuration has been tested



# Thermostats Mandatory Requirements

Single-family §150.0(i)2

New for 2025

## Thermostats for heat pumps with supplemental heating

- Receive and display outdoor air temperature from sensor or internet weather service
- Lock out supplementary heat when outdoor air above 35°F
  - Only allowed in defrost or emergency operations
- Indicate when supplementary heat or emergency heat in operation
- Installer certifies on CF2R that control configuration has been tested
- Exception
  - Room air conditioner heat pumps



# Ducts, Plenums and Fans Mandatory Requirements

## Single-family §150.0(m)1B

Updated for 2025

- Ducts insulated to R-6.0
  - Exception: Portions of duct system located in conditioned space below ceiling separating occupiable space from attic
    - Non-insulated portion of duct system located entirely inside thermal envelope
    - Locations that penetrate unconditioned space, draft stopped and air-sealed, connections in unconditioned space insulated to R-6.0
  - Exception: Minimum R-4.2 insulation for ducts in unvented attic
    - Attic has R-30 insulation between roof rafters in contact with roof deck
    - Gable ends meet wall insulation per Section 150.1(c)1B
    - Dwelling unit has whole building leakage rate of 3.0 ACH50
- No duct insulation when duct system located entirely in conditioned space with ECC verification per RA3.1.4.3.8
  - For dwelling units with attic, the duct system must be located below ceiling separating the occupiable space from the attic



# Ducts, Plenums and Fans Mandatory Requirements

Single-family § 150.0(m)13C

Updated for 2025

## Fan efficacy - systems supplying cooling with ducts

- All multi-zone systems
  - Airflow rate at least 350 cfm per ton of nominal cooling system
    - Systems with gas furnaces fan efficacy maximum 0.45 W/cfm
    - All other air handlers maximum 0.58 W/cfm
- Exception: Multispeed or variable speed compressor systems
  - Controls that vary fan speed to number of zones as certified by installer
    - May comply by operating system at maximum compressor capacity and system fan speed with all zones calling for conditioning



# Ventilation and Indoor Air Quality Mandatory Requirements

Single-family § 150.0(o)1C

Updated for 2025

## Amendments to ASHRAE 62.2

- Whole-dwelling unit mechanical ventilation for single-family dwellings
  - Mechanical ventilation per § 150.0(o)1Ci and iv
  - Detached dwelling units and attached dwelling units
    - Not sharing ceilings or floors with other dwelling units, occupiable spaces, public garages, or commercial spaces
    - May reduce mechanical ventilation rates per § 150.0(o)1Cii and iii
  - Vertically attached dwelling units
    - Not allowed to reduce minimum ventilation rates per § 150.0(o)1Cii and iii



# Ventilation and Indoor Air Quality Mandatory Requirements

Single-family § 150.0(o)1Civ

New for 2025

## Amendments to ASHRAE 62.2

- Balanced and supply-only ventilation systems
  - System air filters and HRV/ERV recovery cores accessible and located no more than 10 feet above walking surface inside specified space
  - Fans, motors, heat exchangers, filters, and recovery cores meet CMC § 304.0
  - Outdoor air intakes meet CMC § 402.4.1
  - Outdoor air intake accessible and not located more than 10 feet above walking surface
    - If located on roofs meet CMC § 304.3.1
- Some exceptions may apply



# Checkpoints 24-25

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# HVAC Prescriptive Requirements

## Summary of Changes

Single-family § 150.1(c)6, 9, 15

Updated for 2025

### HVAC

- § 150.1(c)6 - Updates prescriptive space heating heat pump in all climate zones; gas space heating only if using performance
- § 150.1(c)9 – updates duct systems and air handles to be entirely conditioned space and ECC-rater verified; below ceiling if not high performance attic per Option B in Table 150.1-A
- § 150.1(c)15 – Updates fault indicator display only for HRVs and ERVs with ECC-rater verification
- Table 150.1-A – Adds refrigerant charge verification for heat pumps in all climate zones with ECC-rater verification

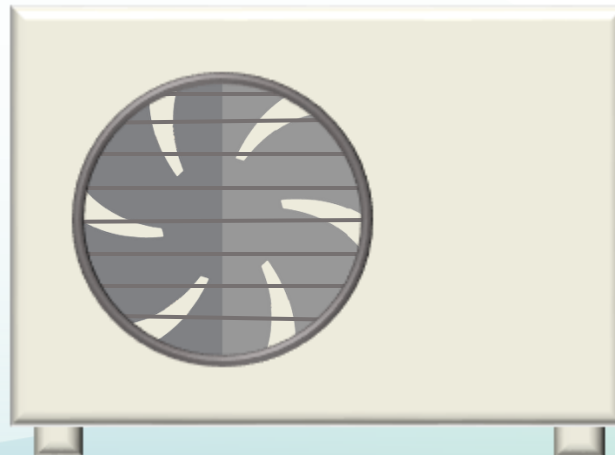


# Space-Conditioning Equipment Prescriptive Requirements

## Single-family § 150.1(c)6

Updated for 2025

- Heating system type
  - Installed per Table 150.1-A
  - All climate zones either
    - Heat pump for space conditioning system
    - Meet performance compliance requirements







# Space-Conditioning Equipment Prescriptive Requirements

Single-family § 150.1(c)15

Updated for 2025

## Ventilation system fault indicator display (FID)

- All HRV/ERV systems serving individual dwelling units
- ECC-rater verified per Reference Joint Appendix JA17





# HVAC Additions

## Summary of Changes

### Single-family § 150.2(a)

Updated for 2025

- §150.2(a)1E – Adds HVAC load calculations and system capacity requirements
- Adds Table 150.2-A for maximum heating capacity
- Adds Table 150.2-B for maximum cooling capacity
- Adds Table 150.2-C for maximum infiltration air changes per hour for load calculations



# HVAC Additions

## Prescriptive Requirements

Single-family § 150.2(a)1E

Updated for 2025

### Space-conditioning load calculations and system capacity

- Minimum capacity limits and supplemental heating requirements per section 150.0(h)
- Maximum capacity depends on calculated heating design load and cooling design load, type of space conditioning system, and duct sizing
  - No limit where airflow is field verified to be at least 350 cfm/ton
  - No field verification system capacities
    - Heating load per Table 150.2-A
    - Cooling load per Table 150.2-B
- Envelope leakage specified in load calculation no greater than values in Table 150.2-C



# HVAC Additions

## Prescriptive Requirements

### Single-family Table 150.2-A

New for 2025

TABLE 150.2-A Maximum Heating Capacity

<u>System Type</u>	<u>Maximum Heating Capacity for Heating Only Systems</u>	<u>Heat Pump Maximum Heating Capacity when HL is greater than CL</u>	<u>Heat Pump Maximum Heating Capacity when CL is greater than HL by less than 12 kBtuh</u>	<u>Heat Pump Maximum Heating Capacity when CL is greater than HL by 12 kBtuh or more</u>
<u>Single Speed System Capacity</u>	<u>HL + 6 kBtuh</u>	<u>No Maximum</u>	<u>HL + 12 kBtuh</u>	<u>No Maximum</u>
<u>Variable or Multi Speed System Maximum Capacity</u>	<u>HL + 6 kBtuh</u>	<u>No Maximum</u>	<u>HL + 12 kBtuh</u>	<u>No Maximum</u>
<u>Variable or Multi Speed System Capacity at Lowest Speed</u>	<u>80% of HL</u>	<u>80% of HL</u>	<u>No Maximum</u>	<u>No Maximum</u>



# HVAC Additions Prescriptive Requirements

## Single-family Table 150.2-B

New for 2025

*TABLE 150.2-B Maximum Cooling Capacity*

<u>System Type</u>	<u>Maximum Cooling Capacity for Cooling Only Systems</u>	<u>Heat Pump Maximum Cooling Capacity when HL is greater than CL</u>	<u>Heat Pump Maximum Cooling Capacity when CL is greater than HL by less than 12 kBtuh</u>	<u>Heat Pump Maximum Cooling Capacity when CL is greater than HL by 12 kBtuh or more</u>
<u>Single Speed System Capacity</u>	<u>CL + 6 kBtuh</u>	<u>No Maximum</u>	<u>CL + 6 kBtuh</u>	<u>CL + 6 kBtuh</u>
<u>Variable or Multi Speed System Maximum Capacity</u>	<u>CL + 6 kBtuh</u>	<u>No Maximum</u>	<u>CL + 6 kBtuh</u>	<u>CL + 6 kBtuh</u>
<u>Variable or Multi Speed System Capacity at Lowest Speed</u>	<u>80% of CL</u>	<u>No Maximum</u>	<u>80% of CL</u>	<u>80% of CL</u>

Footnote for Table 150.2-A and Table 150.2-B

HL and CL refer to the design heating load and design cooling load respectively.



# HVAC Additions Prescriptive Requirements

## Single-family Table 150.2-C

New for 2025

*TABLE 150.2-C Maximum Infiltration Air Changes Per Hour For Load Calculations*

<u>Floor Area of Conditioned Space</u>	<u>Single Story Heating</u>	<u>Single Story Cooling</u>	<u>Two Story Heating</u>	<u>Two Story Cooling</u>	<u>Townhouse or Condominium Heating</u>	<u>Townhouse or Condominium Cooling</u>
<u>ACH for ≤900 sqft</u>	<u>0.61</u>	<u>0.32</u>	<u>0.79</u>	<u>0.41</u>	<u>0.69</u>	<u>0.36</u>
<u>ACH for 901- 1500 sqft</u>	<u>0.45</u>	<u>0.23</u>	<u>0.80</u>	<u>0.30</u>	<u>0.50</u>	<u>0.27</u>
<u>ACH for 1501-2000 sqft</u>	<u>0.38</u>	<u>0.20</u>	<u>0.50</u>	<u>0.26</u>	<u>0.43</u>	<u>0.23</u>
<u>ACH for 2001-3000 sqft</u>	<u>0.32</u>	<u>0.16</u>	<u>0.41</u>	<u>0.21</u>	<u>0.36</u>	<u>0.19</u>
<u>ACH for ≥3001 sqft</u>	<u>0.28</u>	<u>0.15</u>	<u>0.37</u>	<u>0.19</u>	<u>0.32</u>	<u>0.17</u>
<u>CFM for one Fireplace</u>	<u>20</u>	<u>0</u>	<u>20</u>	<u>0</u>	<u>20</u>	<u>0</u>



# HVAC Alterations

## Summary of Changes

### Single-family § 150.2(b)

Updated for 2025

- § 150.2(b)1Fii – Clarifies air-cooled air conditioners in climate zones 2, 8-15 and all air source heat pumps must receive ECC verification
  - Minimum airflow
  - Refrigerant charge
    - Removed fault indicator display option



# Checkpoints 26-27

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# **2025 Water Heating, Pools and Spas Changes Single-Family**



# Water Heating Summary of Changes

Single-family §§ 150.0(n), 150.1(c)

Updated for 2025

## Water heaters

- §150.0(n)1A – Updates mandatory branch circuit requirement to 30A for HPWH electric-ready if installing gas
- §150.1(c)8 – Removes gas water heating exception from prescriptive, allowed in performance approach
- §150.2(a)1D – Water heaters in additions
  - Removes prescriptive options for gas and electric instantaneous water heaters



# Water Heating Mandatory Requirements

All buildings § 110.3(c)7A-B

New for 2025

## Air-source heat pump water heaters

- Requires backup heat when
  - Inlet air unconditioned
  - Compressor cutoff temperature over winter median of extremes
    - JA2 Table 2-3
- Ventilation requirements
  - Installation space plus ventilation space minimum 100 ft<sup>3</sup> per kBtu/h or per manufacturer requirement, whichever is greater
  - Louvered/grilled permanent openings or doors with minimum net free area
  - When ducts used
    - R-6 insulation exhaust ducts and ducts crossing pressure boundaries
    - Air seal all connections and boundary crossings



# Water Heating Mandatory Requirements

Single-family § 150.0(n)1A

Updated for 2025

**Electric-ready** - When gas water heating is installed

- Reserve space and install plumbing and electrical infrastructure for future HPWH
  - Dedicated receptacle connected to main panel via branch circuit
    - Updates to 30A branch circuit (instead of 10-gauge)



# Water Heating Prescriptive Requirements

Single-family § 150.1(c)8

Updated for 2025

- HPWH or solar water heating system in all climate zones
- Exceptions
  - Removes Exception 1 that allowed gas tankless water heaters in climate zones 3, 4, 13, and 14, with heat pump space conditioning
  - Allows all electric water heaters with point-of-use distribution per RA4.4.5 for new dwelling units up to 500 ft<sup>2</sup> CFA



# Heat Pump Water Heater Additions Prescriptive Requirements

Single-family § 150.2(a)1D

Updated for 2025

- Applies to additional water heaters
- Removes prescriptive options for gas tankless water heaters
- Allows all electric water heaters with point-of-use distribution in additions of up to 500 sqft
- Aligns prescriptive water heater requirements for additions with those for newly constructed building requirements



# Pool and Spa Heating Summary of Changes

All buildings § 110.4

Updated for 2025

## Pool and spa heating

- § 110.4(a)3 - Updates manufacturer certification to have energy efficiency rating on plate or card that is permanent, easily readable, weatherproof with instructions for energy-efficient heater operation
- § 110.4(a)4 - removes section
- § 110.4(b)1 – Adds Table 110.4-A for heating equipment standards
- § 110.4(b)2 – Updates minimum 18 inches of horizontal or vertical pipe between filter and heater
- § 110.4(b)3 – Adds outdoor heated pools/spas shall have a pool cover
- § 110.4(c) – Adds heater must be solar and/or heat pump (sized per JA16) or use 60% site-recovered or renewable energy
- § 110.4(d) – Adds controls for heat pump with supplementary heating to prevent supplementary heating when heat pump alone meets load



# Pool and Spa Equipment Mandatory Requirements

Single-family § 150.0(p)1

Updated for 2025

- Add references to dedicated-purpose pool pumps and replacement dedicated-purpose pump motors, and update references to applicable appliance standards
  - Pump sizing and flow rate for single-family buildings
  - Removes outdated references



# Checkpoints 28-29

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# 2025 Lighting Changes Single-Family



# Lighting Mandatory Requirements

## Summary of Changes

### Single-family §§ 150.0(k), JA8

Updated for 2025

- §150.0(k)1A – Removes Table 150.0-A, adds automatically high-efficacy light sources under Exception 4
  - All luminaires and light sources must meet JA8 requirements
- Reference Joint Appendix JA8
  - Removes luminous efficacy and CCT tests, except for LEDs, HIDs, and induction lamps
  - Removes ENERGY STAR specifications; updated reference for elevated temperature tests to federal procedures at higher ambient temperatures
  - Adds JA8.7, JA8.8 start time and noise test methods



# Dwelling Unit Lighting Mandatory Requirements

Single-family § 150.0(k)1-2

Updated for 2025

- All luminaires and light sources meet Reference Joint Appendix JA8
- Removes Table 150.0-A
  - Adds exceptions
    - Outdoor LEDs
    - Colored SSLs
    - HID light sources
    - Luminaires with hardwired high-frequency generators and induction lamps
- Exception from dimming controls
  - Lighting integral to kitchen range hoods and bathroom exhaust fans



# Dwelling Unit Lighting Mandatory Requirements

Single-family - Reference Joint Appendix JA8

Updated for 2025

- Removes luminous efficacy and CCT tests, except for LEDs, HIDs, and induction lamps
- Removes ENERGY STAR specifications
  - Updates reference for elevated temperature tests to federal procedures at higher ambient temperatures
- Adds JA8.7 and JA8.8 start time and noise test methods



# **2025 Energy Code Multifamily Significant Changes**



# 2025 Envelope Changes Multifamily



# Envelope

## Summary of Changes

### Multifamily § § 160.1, 170.2

Updated for 2025

#### Insulation

- § 160.1(b) - Updates mandatory wall insulation U-factors
  - Metal-framed U-factor 0.151
  - Wood-framed 2x4 U-factor 0.095
  - Wood-framed 2x6 U-factor 0.069

#### Roofing products

- Table 170.2-A - Updates prescriptive requirements
  - Option B: Steep-sloped roof aged solar reflectance(SR) 0.25 in climate zones 10, 11, 13, 15, aged SR 0.20 in climate zones 12, 14
  - Option D: Low-sloped roof aged solar reflectance 0.63 in climate zones 2, 4, 6-15
  - Option D: Low-sloped roof thermal emittance 0.75 in climate zones 2, 4, 6-15

#### Fenestration

- Table 170.2-A - Updates to U-factor varies by climate zone. Removes number of stories designation for U-factors, SHGC. VT applicable only to common areas



# Envelope Definitions

## All buildings § 100.1

New for 2025

- Cathedral ceiling - exterior partition with ceiling applied directly to underside of roof framing members and structural roof sheathing applied directly to top of roof framing members/rafters, can be flat or sloped, vented or unvented
- Compartmentalization - when dwelling unit enclosure area is constructed to prevent air leakage, including all walls, ceilings, floors shared with exterior spaces or adjacent spaces, such as neighboring units, corridors, and elevator shafts



# Fenestration Mandatory Requirements

## Multifamily § 160.1(e)

Updated for 2025

- Adds new exception
  - Buildings meeting CBC Part 7, California Wildland-Urban Interface (WUI) Code, and located in Fire Hazard Severity Zones or WUI Fire Areas as designated by local enforcement agency



# Fenestration Prescriptive Requirements

Multifamily § 170.2(a)3A, Table 170.2-A

Updated for 2025

- Exceptions for dwelling units
  - Removes number of habitable stories
  - No SHGC in climate zones 1, 3, 5, 16
  - No visual transmittance (VT) in all climate zones
- Table 170.2-A
  - Updates to U-factor varies by climate zone
  - Removes number of habitable stories
  - VT applicable only to common areas



# Fenestration Prescriptive Requirements

## Multifamily Table 170.2-A

Updated for 2025

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Curtain Wall/ Storefront <sup>7</sup> - 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
Curtain Wall/ Storefront <sup>7</sup> - Maximum RSHGC	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
Curtain Wall/ Storefront <sup>7</sup> - Minimum VT, <u>common use areas</u>	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
NAFS 2017 Performance Class AW <sup>5</sup> - 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
NAFS 2017 Performance Class AW <sup>5</sup> - Maximum RSHGC	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
NAFS 2017 Performance Class AW <sup>5</sup> - Minimum VT, <u>common use areas</u>	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
All Other Fenestration - Maximum U- factor	<u>0.28</u>	0.30	<u>0.28</u>	<u>0.28</u>	<u>0.28</u>	0.34	0.34	<u>0.30</u>	0.30	0.30	<u>0.28</u>	0.30	<u>0.28</u>	<u>0.28</u>	<u>0.28</u>	<u>0.28</u>
All Other Fenestration - Maximum RSHGC	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 Window to Floor Ratio	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Maximum Window to Wall Ratio	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Maximum Skylight Roof Ratio	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%



# Fenestration Alterations Prescriptive Requirements

Multifamily § 180.2(b)1Cii, Table 180.2-B

Updated for 2025

- Added vertical fenestration and skylights
  - Meet area requirements in 170.2(a)3
  - Meet U-factor, SHGC, VT in Table 180.2-B
  - Exception vertical fenestration up to 50 square feet
    - No area requirement, SHGC, or VT
- Table 180.2-B
  - Updates to U-factor varies by climate zone
  - Removes number of habitable stories
  - VT applicable only to common areas





# Fenestration Alterations Prescriptive Requirements

## Multifamily Table 180.2-B

Updated for 2025

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Skylights U-factor	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
Skylights SHGC	<u>NA</u>	0.25	<u>NA</u>	0.25	<u>NA</u>	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	<u>NA</u>
Skylights <u>Serving Common Areas</u> VT <sup>2</sup>	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49



# Wall Insulation Mandatory Requirements

## Multifamily § 160.1

Updated for 2025

Updates mandatory wall insulation area-weighted U-factors

- Metal building 0.113
- Metal-framed (includes demising) U-factor 0.151
- Wood-framed
  - 2x4 U-factor 0.095
  - 2x6 U-factor 0.069
  - Demising U-factor 0.099
- Other assemblies U-factor 0.102
- Light mass walls U-factor 0.440
- Heavy mass walls U-factor 0.690
- Spandrel panel and opaque curtain walls U-factor 0.280
- Bay or bow window roof and floors meet Table 170.2-A



# Floor Insulation Mandatory Requirements

## Multifamily § 160.1(g)

New for 2025

Adds mandatory slab edge insulation specifications

- Insulation material alone without facing water absorption rate 0.3% or less when tested per ASTM C272, Test Method A, 24-Hour-Immersion
- Water vapor permeance 2.0 perm/inch or less when tested per ASTM C272
- Concrete slab perimeter insulation protected from physical damage and ultraviolet light deterioration
- Heated slab insulation meets Section 110.8(g)



# Floor Insulation Prescriptive Requirements

## Multifamily § 170.2(a)5, Table 170.2-A

Updated for 2025

Updates slab perimeter insulation in climate zone 16

- Removes number of stories
- Adds F-factor equal or less than Table 170.2-A
- Minimum depth of concrete slab floor perimeter insulation
  - 16 inches or depth of building footing, whichever is less

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Floors/Soffits - Slab Perimeter <sup>2</sup>	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	F 0.58 R 7.0
Floors/Soffits – Wood Framed	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19	U 0.037 R19
Floors/Soffits - Raised Mass	U 0.092 R8.0	U 0.092 R8.0	U 0.269 R0	U 0.269 R0	U 0.269 R0	U 0.269 R0	U 0.269 R0	U 0.269 R0	U 0.269 R0	U 0.269 R0	U 0.092 R8.0	U 0.138 R4.0	U 0.092 R8.0	U 0.092 R8.0	U 0.138 R4.0	U 0.092 R8.0	
Floors/Soffits - Other	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	



# Roofing Products

## Prescriptive Requirements

Multifamily § 170.2(a)1, Table 170.2-A

Updated for 2025

### Roofing products

- Updates prescriptive requirements in Table 170.2-A
  - Option B: Steep-sloped roof
    - Aged solar reflectance 0.25 in climate zones 10-11, 13, 15
    - Aged solar reflectance 0.20 in climate zones 12, 14
    - Thermal emittance 0.75 in climate zones 10-15
    - Or SRI 23 in climate zones 10-11, 13, 15
    - Or SRI 16 in climate zones 12, 14
  - Option D: Low-sloped roof
    - Aged solar reflectance 0.63 in climate zones 2, 4, 6-15
    - Thermal emittance 0.75 in climate zones 2, 4, 6-15
    - Or SRI 75 in climate zones 2, 4, 6-15



# Roofing Products Prescriptive Requirements

## Multifamily Table 170.2-A

Updated for 2025

- Option B – roofs and ceilings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Option B <sup>9</sup> Below Roof Deck Insulation <sup>12</sup> (with air space)	NR	NR	NR	R19	NR	NR	NR	R19	R19	R13	R19	R19	R19	R19	R19	R13
Option B <sup>9</sup> Ceiling Insulation	R38	R38	R30	R38	R30	R30	R30	R38	R38	R38	R38	R38	R38	R38	R38	R38
Option B <sup>9</sup> Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
Option B <sup>9</sup> Low-Slope-Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
Option B <sup>9</sup> Low-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
Option B <sup>9</sup> Low-Sloped-Solar Reflectance Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	75	NR	75	NR
Option B <sup>9</sup> Steep-Sloped-Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	<u>0.25</u>	<u>0.25</u>	0.20	<u>0.25</u>	0.20	<u>0.25</u>	NR
Option B <sup>9</sup> Steep-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR
Option B <sup>9</sup> Steep-Sloped-Solar Reflectance Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	<u>23</u>	<u>23</u>	16	<u>23</u>	16	<u>23</u>	NR



# Roofing Products Prescriptive Requirements

## Multifamily Table 170.2-A

- Option C

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Option C <sup>10</sup> -Ceiling Insulation	R38	R30	R30	R30	R30	R30	R30	R30	R30	R30	R38	R38	R38	R38	R38	R38
Option C <sup>10</sup> -Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Option C <sup>10</sup> Low-Sloped-Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
Option C <sup>10</sup> Low-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
Option C <sup>10</sup> Low-Sloped-Solar Reflectance Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	75	NR	75	NR
Option C <sup>10</sup> Steep-Sloped-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
Option C <sup>10</sup> Steep-Sloped-Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR
Option C <sup>10</sup> Steep-Sloped-Solar Reflectance Index	NR	NR	NR	NR	NR	NR	NR	NR	NR	16	16	16	16	16	16	NR



# Roofing Products Prescriptive Requirements

## Multifamily Table 170.2 -A

Updated for 2025

- Option D

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Option D <sup>11</sup> -Metal Building 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
Option D <sup>11</sup> -Wood Framed and Other 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
Option D <sup>11</sup> Low-Sloped-Aged Solar Reflectance	NR	<u>0.63</u>	NR	<u>0.63</u>	NR	<u>0.63</u>	<u>0.63</u>	<u>0.63</u>	0.63	0.63	0.63	<u>0.63</u>	0.63	0.63	0.63	NR
Option D <sup>11</sup> Low-Sloped-Thermal Emittance	NR	<u>0.75</u>	NR	<u>0.75</u>	NR	<u>0.75</u>	<u>0.75</u>	<u>0.75</u>	0.75	0.75	0.75	<u>0.75</u>	0.75	0.75	0.75	NR
Option D <sup>11</sup> Low-Sloped-Solar Reflectance Index	NR	<u>75</u>	NR	<u>75</u>	NR	<u>75</u>	<u>75</u>	<u>75</u>	75	75	75	<u>75</u>	75	75	75	NR
Option D <sup>11</sup> Steep-Sloped-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
Option D <sup>11</sup> Steep-Sloped-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
Option D Steep-Sloped-Solar Reflectance Index	NR	16	16	16	16	16	16	16	16	16	16	16	16	16	16	NR



# Checkpoint 30

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# **2025 Indoor Air Quality and Ventilation Changes Multifamily**



# Ventilation and Indoor Air Quality Mandatory Requirements

Multifamily § 160.2(b)2Aivb

Updated for 2025

## Amendments to ASHRAE 62.2 for attached dwelling units

- Whole-dwelling unit mechanical ventilation for multifamily attached dwelling units
  - All dwelling units use same whole-dwelling ventilation system type
  - Balanced or supply ventilation
  - Compartmentalization testing
    - Field verified by ECC-Rater
    - Mechanical Acceptance Test Technician can do field verification for multifamily buildings with four or more habitable stories



# Ventilation and Indoor Air Quality Mandatory Requirements

Multifamily § 160.0(b)2Axi

New for 2025

## Amendments to ASHRAE 62.2 for attached dwelling units

- Adds requirements for balanced and supply-only ventilation systems
  - System air filters and HRV/ERV recovery cores must be accessible and located no more than 10 feet above walking surface inside a specified space
  - Fans, motors, heat exchangers, filters and recovery cores must meet CMC § 304.0



# Ventilation and Indoor Air Quality Mandatory Requirements

Multifamily § 160.2(b)2B

Updated for 2025

## Dwelling unit field verification and diagnostic testing

- Whole-dwelling unit ventilation airflow must be confirmed through field verification and diagnostic testing
  - RA3.7.4.1.1 or NA2.2.4.1.1 for supply and exhaust
  - RA3.7.4.1.2 or NA2.2.4.1.2 for balanced systems
- Vented range hoods installed for local mechanical exhaust must be confirmed through field verification and confirm the model is rated by HVI or AHAM
  - RA3.7.4.3 or NA2.2.4.1.4
- HRV and ERV system fan efficacy maximum 1.0 W/cfm confirmed through field verification
  - RA3.7.4.4 or NA2.2.4.1.5
- Mechanical Acceptance Test Technician can do field verification for multifamily buildings with four or more habitable stories



# Ventilation and Indoor Air Quality Mandatory Requirements

Multifamily § 160.2(b)2C

Updated for 2025

## Central ventilation system field verification for attached dwelling units

- Ventilation ducts which serves multiple dwelling units and provides continuous airflows or airflow to provide balanced ventilation
  - Duct sealing requirements of California Mechanical Code § 603.10
  - Leakage maximum 6% of rooftop fan or central fan design airflow rate confirmed by field verification per NA7.18.3
    - Test pressure 25 Pa (0.1 inch) for six or fewer dwelling units
    - Test pressure 50 Pa (0.2 inch) for more than six dwelling units
- Exception
  - Buildings in climate zone 6 with no more than three habitable stories



# Ventilation and Indoor Air Quality Mandatory Requirements

Multifamily § 160.2(c)3

Updated for 2025

## Mechanical ventilation for common use areas

- Outdoor ventilation rate determined by Equation 160.2-H:

$$V_z = \underline{\text{the larger of } R_p \times P_z \text{ or } R_a \times A_z}$$

- Where:
- $V_z$  = Required outdoor airflow rate (cfm)
- $R_p$  = 15 cubic feet per minute of outdoor airflow per person
  - $P_z$  = The expected number of occupants
- $R_a$  = The area-based minimum ventilation airflow rate in Table 160.2-B;
- $A_z$  = The net occupiable floor area of the ventilation zone in square feet.



# Checkpoint 31

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# 2025 HVAC Changes Multifamily



# Space-Conditioning Equipment Mandatory Requirements

Multifamily § 160.3(b)1

Updated for 2025

## Building cooling and heating load for dwelling units

- Heating and cooling loads acceptable methods
  - American Society of Heating, Refrigerating and Air-Conditioning Engineers ([ASHRAE](#))
  - Sheet Metal and Air Conditioning Contractors' National Association ([SMACNA](#))
  - Air Conditioning Contractors of America ([ACCA](#))
- Exception: Block Load, the total load for all rooms combined that are served by central equipment, may be used for the purpose of system sizing for additions.



# Space-Conditioning Equipment Mandatory Requirements

Multifamily § 160.3(b)7

New for 2025

## Defrost for dwelling units

- Defrost delay timer set minimum 90 minutes for heat pump with installer-adjustable defrost delay timer
- Installers certify on Certificate of Installation that control configuration has been tested
- Exception
  - Dwelling units in climate zone 1, 6-10, 15, 16



# Space-Conditioning Equipment Mandatory Requirements

Multifamily § 160.3(b)8

New for 2025

## Capacity variation with third-party thermostat for dwelling units

- Variable or multi-speed systems
  - Capable of responding to heating and cooling loads by modulating systems compressor speed
  - Installers certify on Certificate of Installation that control configuration has been tested



# Space-Conditioning Systems Prescriptive Requirements

## Multifamily § 170.2(c)3Biva-b

Updated for 2025

### Space conditioning systems for dwelling units

- Balanced ventilation system
  - Climate zones 1,2, 4,11-14 and 16 must be ERV or HRV
  - Minimum sensible recovery efficiency 67%
  - Fan efficacy less than 0.6W/cfm
  - Verified per RA3.7.4.4 (3 habitable stories or less)
  - Verified per NA2.2.4.1.5 (4 habitable stories or more)
- Balanced ventilation system serving multiple units with 4 or more habitable stories
  - Climate zones 1,2, 4,11-14 and 16 must be ERV or HRV
  - Minimum sensible recovery efficiency 67%
  - Fan power requirements per § 170.2(c)4A
  - Recovery bypass or control to directly economize with ventilation air based on outside temperature limits in Table 170.2-G
  - Verified per NA7.18.4



# Space-Conditioning Systems Prescriptive Requirements

Multifamily § 170.2(c)3Bv

Updated for 2025

## Space conditioning systems for dwelling units

- Balanced ventilation system – 3 or fewer habitable stories
  - Climate zones 5 -10 and 15 with heat pump and without ERV or HRV
    - Fan efficacy maximum 0.4W/cfm



# Space-Conditioning Systems Prescriptive Requirements

Multifamily § 170.2(c)3Bvi

New for 2025

## Space conditioning systems for dwelling units

- All HRV/ERV systems
  - Fault indicator display (FID)
  - Manufacturer certified per JA17.4
  - FID certification verified by ECC-Rater



# Space-Conditioning Systems Prescriptive Requirements

Multifamily § 170.2(c)4Fv

Updated for 2025

## Cooling tower efficiency for common use areas

- Axial fan, open-circuit cooling towers with capacity of 900 gpm or greater
  - Minimum rated efficiency based on Table 170.2-I
- Exception
  - Replacement of existing cooling towers inside an existing building or on an existing roof

Table 170.2-I MINIMUM EFFICIENCY FOR PROPELLER OR AXIAL FAN OPEN-CIRCUIT COOLING TOWERS (GPM/hp)

<u>CZ 1</u>	<u>CZ 2</u>	<u>CZ 3</u>	<u>CZ 4</u>	<u>CZ 5</u>	<u>CZ 6</u>	<u>CZ 7</u>	<u>CZ 8</u>	<u>CZ 9</u>	<u>CZ 10</u>	<u>CZ 11</u>	<u>CZ 12</u>	<u>CZ 13</u>	<u>CZ 14</u>	<u>CZ 15</u>	<u>CZ 16</u>
<u>42.1</u>	<u>70</u>	<u>60</u>	<u>70</u>	<u>70</u>	<u>80</u>	<u>80</u>	<u>80</u>	<u>80</u>	<u>80</u>	<u>60</u>	<u>70</u>	<u>80</u>	<u>60</u>	<u>80</u>	<u>42.1</u>



# Space-Conditioning Systems Prescriptive Requirements

## Multifamily § 170.2(c)4N

Updated for 2025

### Dedicate outdoor air systems (DOAS) for common use areas

- DOAS unit fan system input power below 1kW
  - Maximum total combined fan power 1.0 W/cfm
- DOAS fan power greater than 1kW meet § 140.4(c)
- DOAS supply air
  - Delivered directly to occupied space or at outlet of any terminal heating or cooling coils
  - Shut off any equipment fans, pumps, and terminal unit fans when no need for heat or cooling
  - Exception: Active chilled beam systems
- Ventilation fans minimum of three speeds to facilitate system balancing
- System cannot use heat recovery or heating to warm supply air above 60°F when majority of zones require cooling



# HVAC Additions

# Prescriptive Requirements

## Multifamily § 180.1(a)2A-B

Updated for 2025

### Mechanical ventilation for indoor air quality

- Whole-Dwelling Unit Mechanical Ventilation
  - No § 160.2(b)2Aiv requirements for additions 1,000 ft<sup>2</sup> or less
  - No § 160.2(b)2Av requirements for Junior ADUs that are additions to an existing building
  - Additions that increase conditioned floor area by more than 1,000 ft<sup>2</sup> must meet § 160.2(b)2Aiv and § 160.2(b)2Av requirements.
    - Ventilation system must be supply, balanced or the existing ventilation type

### Local mechanical exhaust

- Additions to existing buildings shall comply with all applicable requirements specified in § 160.2(b)2Avi and § 160.2(b)2B.

### Field verification requirements

- 3 habitable stories or less per Residential Appendices
- 3 or more habitable stories per Nonresidential Appendices NA1 and NA2
- Exception: Dwelling unit air leakage test is not required for additions



# HVAC Alterations

## Prescriptive Requirement

### Multifamily §180.2(b)2Bii

Updated for 2025

#### Altered duct systems for common use areas - either

- Entirely new or complete replacement duct system with at least 75% new duct material
  - Up to 25% may be reused parts from existing system
  - Leak tested per section 160.2(c)2H
    - If leakage test is not possible - all accessible leaks sealed and verified by visual inspection and smoke test by mechanical acceptance test technician
- Extended ducts to existing duct system sealed maximum 15% of nominal air handler airflow confirmed by acceptance testing per NA7.5.3
  - Combined new system
    - Provides conditioned air to occupiable space for constant volume, single-zone, space-conditioning system
    - Serves less than 5,000 sq ft of conditioned floor area
    - Combined surface area of ducts in specific areas is not less than 25% of total surface area of entire duct system



# **2025 Water Heating, Pools and Spas Changes Multifamily**



# Water Heating Summary of Changes

## Multifamily § 160.4, 170.2

Updated for 2025

- § 160.4(e) – Adds mandatory piping insulation requirements, including continuous insulation, pipe supports must be on outside of insulation, insulation required for hot water plumbing appurtenances
- § 170.2(d)1 – Changes prescriptive options for dwellings with individual water heaters
  - Removes gas tankless water heaters (low-rise multifamily buildings only)
  - Adds 120V HPWH
- § 170.2(d)2A – Updates central HPWH may meet NEEA Advanced Water Heater Specification for Commercial HPWH Tier 2; main HPWH must prescriptively be single-pass
- § 170.2(d)2C – All hot water pipes must meet CA Plumbing Code Appendix M
- § 170.2(d)2D – Moves central systems recirculation system with thermostatic master mixing valve on each supply and return loop, except buildings up to 8 dwellings
- § 170.2(d)2E – Pipe insulation must be ECC-rated per RA3.6.3



# Water Heating Mandatory Requirements

All buildings § 110.3(c)7A-B

New for 2025

## Air-source heat pump water heaters

- Requires backup heat when
  - Inlet air unconditioned
  - Compressor cutoff temperature over winter median of extremes
    - JA2 Table 2-3
- Ventilation requirements
  - Installation space plus ventilation space minimum 100 ft<sup>3</sup> per kBtu/h or per manufacturer requirement, whichever is greater
  - Louvered/grilled permanent openings or doors with minimum net free area
  - When ducts used
    - R-6 insulation exhaust ducts and ducts crossing pressure boundaries
    - Air seal all connections and boundary crossings



# Water Heating Electric Ready Mandatory Requirements

Multifamily § 160.9(e)1-3

New for 2025

## Individual gas or propane water heater serving dwelling unit

- Dedicated 125V, 20A receptacle connected to panel via 120/240V 3-conductor minimum 30A branch circuit, within 3 feet of water heater
  - Both ends of unused conductor labeled “Spare” and electrically isolated
  - Reserved single pole circuit breaker space in panel next to circuit breaker for branch circuit, labeled “Future 240V Use”
- Condensate drain up to 2 inches higher than base of installed gas or propane water heater, allows natural draining without pump
- Plans designate space at least 39x39x96 inches for future location of HPWH



# Water Heating Electric Ready Mandatory Requirements

## Multifamily § 160.9(e)4

New for 2025

### Future HPWH Ventilation for individual dwelling units – meet one

- Minimum volume 700 ft<sup>3</sup>
- Vent to indoor communicating space in same pressure boundary, total combined volume connected 700 ft<sup>3</sup> or more, meet one
  - Doors with fixed single-layer flat louvers, total net free area (NFA) minimum 250 in<sup>2</sup>
  - Two equal permanent openings, total NFA minimum 250 in<sup>2</sup> located within 12 inches from enclosure top and bottom
  - Two 8-inch ducts to communicating space
- Vent to outdoors, meet one
  - Doors with fixed single-layer flat louvers, total NFA minimum 250 in<sup>2</sup>
  - Two equal permanent openings, total NFA minimum 250 in<sup>2</sup> located within 12 inches from enclosure top and bottom
  - Two 8-inch capped ducts, ducts crossing pressure boundary insulated to R-6 or higher, ducts, connections, and penetrations sealed



# Water Heating Electric Ready Mandatory Requirements

Multifamily § 160.9(f)1-2

New for 2025

## Central gas or propane serving multiple dwelling units

- Input capacity = sum of input gas or propane capacity of all water heating devices associated with each gas or propane system
- Reserved space
  - Include clearances for service and air flow
  - Meet either
    - Required volume for system meeting total building hot water demand as calculated and documented by responsible person
    - JA15.2.1 for heat pump, and JA15.2.2 for tank(s)



# Water Heating Electric Ready Mandatory Requirements

Multifamily § 160.9(f)3

New for 2025

## Central gas or propane serving multiple dwelling units

- Ventilation provided either
  - Reserved space for HPWH located outside
  - Reserved pathway for ducting from reserved heat pump location to suitable outdoor location
    - Envelope penetrations for louvers and ducts planned and identified for future use, sized per either
      - For HPWH system that meets calculated total building hot water demand as documented by responsible person
      - Per JA15.2.3



# Water Heating Electric Ready Mandatory Requirements

Multifamily § 160.9(f)4

New for 2025

## Central gas or propane serving multiple dwelling units

- Condensate drainage
  - Plumbing either
    - Approved receptacle sized per CA Plumbing Code within 3 feet of reserved heat pump location
    - Piping within 3 feet of reserved heat pump location to approved discharge location, sized per CA Plumbing Code
  - Sizing either
    - Drainage sized for HPWH that meets total building hot water demand as calculated and documented by responsible person
    - Piping sized per JA15.2.4



# Water Heating Electric Ready Mandatory Requirements

Multifamily § 160.9(f)5

New for 2025

## Central gas or propane serving multiple dwelling units

- Electrical
  - Physical space reserved on bus of main switchboard, or distribution board, to serve future HPWH, including heat pump and temperature maintenance tanks
  - Reserved space able to provide adequate power to future heat pump and temperature maintenance tanks per either
    - System meeting total building hot water demand as calculated and documented by responsible person
    - JA15.2.5



# Central Heat Pump Water Heater Joint Reference Appendix

## JA15 Qualification Requirements

Updated for 2025

	<b>Gas Water Heater &lt; 200k Btu/h</b>	<b>Gas Water Heater ≥ 200k Btu/h</b>
Heat Pump Reserved Space	2.0 sqft per 10k Btu/h; ≥ 48 inches linear	3.6 sqft per 10k Btu/h; ≥ 84 inches linear
Storage Tank Reserved Space	4.4 sqft per 10k Btu/h	3.1 sqft per 10k Btu/h
Ventilation	70 CFM per 10k Btu/h; total external static pressure drop of ducts and louvers ≤ 0.17 in-H <sub>2</sub> O when HPWH installed	420 CFM per 10k Btu/h; total external static pressure drop of ducts and louvers ≤ 0.17 in-H <sub>2</sub> O when HPWH installed
Condensate Drainage	0.2t refrigeration capacity per 10k Btu/h	0.7t refrigeration capacity per 10k Btu/h
Electrical	0.1 kVA per 10k Btu/h; 1.0 kVA per 10k Btu/h for temp. maintenance tank	1.1 kVA per 10k Btu/h; 0.6 kVA per 10k Btu/h for temp. maintenance tank



# Water Heater Prescriptive Requirements

## Multifamily § 170.2(d)1

Updated for 2025

### Individual heat pump water heaters

- HPWH prescriptive baseline for individual dwelling units in low-rise multifamily
  - Removes option for gas tankless water heaters
- Exceptions
  - Allows gas tankless water heaters for high-rise multifamily
  - 120V HPWH instead of 240V allowed for dwellings with 1 bedroom or less



# Water Heating Prescriptive Requirements

Multifamily § 170.2(d)2A

Updated for 2025

## Central water heating systems

- Updates prescriptive requirements for central HPWHs
  - Main HPHW must be single-pass
  - Removes primary storage tank plumbing configuration requirement to allow design flexibility
  - Relocates recirculation requirement to § 170.2(d)2D
- Adds new alternative option for NEEA Advanced Water Heater Specification for commercial HPWH Tier 2 or higher



# Water Heating Prescriptive Requirements

Multifamily § 170.2(d)2C-E

Updated for 2025

## Central water heating systems

- Hot water distribution piping sized per California Plumbing Code, Appendix M
- Thermostatic master mixing valves per RA4.4.19
  - Exception: buildings with up to 8 dwelling units
- ECC rating for hot water piping insulation and plumbing appurtenances per RA3.6.3



# Pool and Spa Heating Summary of Changes

All buildings § 110.4

Updated for 2025

## Pool and spa heating

- § 110.4(a)3 – Updates manufacturer certification to have energy efficiency rating on plate or card that is permanent, easily readable, weatherproof with instructions for energy-efficient heater operation
- § 110.4(a)4 removed – allows electric resistance heating
- § 110.4(b)1 – Adds Table 110.4-A for heating equipment standards
- § 110.4(b)2 – Updates minimum 18 inches of horizontal or vertical pipe between filter and heater
- § 110.4(b)3 – Outdoor heated pools and spas have pool cover
- § 110.4(c) – Heater must be solar and/or heat pump (sized per JA16) or use 60% site-recovered or renewable energy
- § 110.4(d) – Adds controls for heat pump with supplementary heating to prevent supplementary heating when heat pump alone meets load



# Checkpoints 32-34

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# 2025 Electric-Ready Changes Multifamily



# Electric Ready Mandatory Requirements

## Multifamily § 160.9(a)

Updated for 2025

- Building electrical system must be sized to meet future electric requirements per § 160.9(b-f)
- Main service conduit, electrical system to point specified in each subsection and any on-site distribution transformers must have sufficient capacity to supply full rated amperage at each electric-ready appliance per California Electrical Code
  - Replaces requirements under § 160.9(d)2A



# Electric Ready Mandatory Requirements

## Multifamily § 160.9(d)2

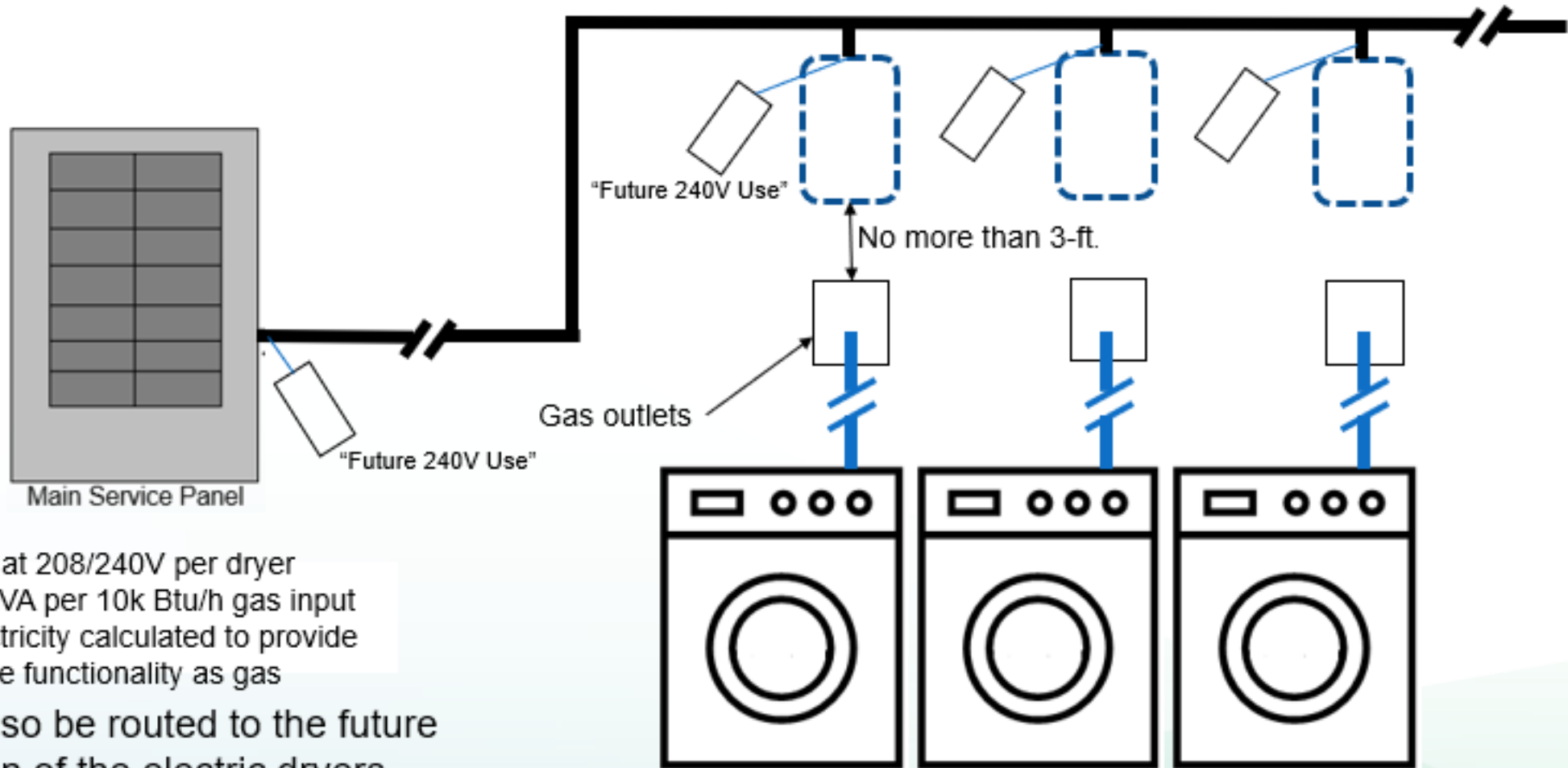
Updated for 2025

### Dryer locations with gas or propane plumbing in common use areas

- Conductors/raceway between main panel and location up to 3-feet from each gas outlet, or location designated for future electric dryers
  - Both ends of conductors/raceway labelled “Future 240V Use”
  - Removed provisions regarding conductor sizing
  - Capacity meet one
    - 24A at 208/240V per dryer
    - 2.6 kVA per 10k Btu/h of rated gas input/pipe capacity
    - Electricity to provide same functionality as gas equipment, calculated and documented by responsible person



# §160.9(d)2 Example



- 24A at 208/240V per dryer
- 2.6kVA per 10k Btu/h gas input
- Electricity calculated to provide same functionality as gas

Can also be routed to the future location of the electric dryers



# **2025 Lighting Changes Multifamily**



# Lighting Summary of Changes

## Multifamily §§ 160.5, 170.2, JA8

Updated for 2025

- §160.5(a)1 – Removes Table 160.5-A , moves automatically high-efficacy light sources under Exception 4, All luminaires and light sources must now meet JA8 requirements
- §160.5(b)4B – Removes uniformity requirements under Table 160.5-B
- §160.5(b)4D – Reduces trigger for daylighting controls to 75W; adds daylighting control exception for secondary sidelit daylight zones < 85W; updates linear luminaires controllable in up to 8-ft segments
- §160.5(c)2C – Updates building façade, ornamental hardscape, and outdoor dining area lighting exempt from motion sensors
- §170.2(e) – Removes prescriptive tailored method; moves mounted and wall display lighting allowances to area category method; removes most automatically compliant sign light sources
- Reference appendices JA8
  - Removes luminous efficacy and CCT tests, except for LEDs, HIDs, and induction lamps
  - Removes ENERGY STAR specifications; references elevated temperature tests federal procedures at higher ambient temperatures
  - Adds JA8.7, JA8.8 – Start time and noise test methods



# Dwelling Unit Lighting Mandatory Requirements

## Multifamily § 160.5(a)

Updated for 2025

- Removes Table 160.5-A - all luminaires and light sources must now meet Reference Joint Appendix JA8
  - Exceptions
    - Outdoor LEDs
    - Colored SSLs
    - HID light sources
    - Luminaires with hardwired high-frequency generators and induction lamps
- Lighting integral to kitchen range hoods and bathroom exhaust fans exempt from dimming controls



# Lighting Controls Mandatory Requirements

Multifamily § 160.5(b)4A-B

Updated for 2025

## Common use areas manual and multilevel controls

- Manual controls located in same space as controlled lighting, or such that lighting status visible
- Removes Table 160.5-B
  - All multilevel controls provide and enable continuous dimming from 100 to 10%
  - Light sources with HID and induction lamps have one control step between 30 and 70%



# Lighting Controls Mandatory Requirements

## Multifamily § 160.5(b)4C

Updated for 2025

### Common use areas shutoff controls

- Occupant sensor delay maximum 20 minutes
  - Exception: emergency lighting intended to function in emergency mode during power outages
- Auto holiday shutoff not required in restaurants, nor where occupant sensors installed
- Parking garage and loading/unloading areas requirements relocated to § 160.5(b)4Cvic



# Lighting Controls

## Mandatory Requirements

Multifamily § 160.5(b)4D

Updated for 2025

### Common use areas daylighting controls

- Daylighting controls in skylit, primary, and secondary sidelit daylight zones with 75W or more of general lighting
  - Exception: secondary daylight zones < 85W of general lighting, if primary daylight zones do not require daylighting controls
- General lighting luminaires over 8-feet controlled in segments up to 8-feet
  - If luminaire contains factory-assembled housing and light source as integral unit in segments over 8-feet, may be controlled by daylight zone where segment is mainly located
- Manual controls able to turn off/down lights to levels set by daylighting controls



# Lighting Power Allowances Prescriptive Requirements

Multifamily § 170.2(e)

Updated for 2025

## Common use areas

- Removes Tailored Method
  - Some allowances for sales areas, bar/lounges, dining areas moved to Area Category Method:
    - Wall and floor displays
    - Task lighting of certain mounting heights



# Sign Lighting Prescriptive Requirements

## Multifamily § 170.2(e)7

Updated for 2025

- Removes most automatically-compliant alternative light sources
  - Neon, cold cathode lamps
  - LEDs with power supply efficiency of 80%



# Checkpoint 35

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# Resources





# Energy Code Support Center



<https://www.energy.ca.gov/energy-code-support-center>

## Energy Code FAQs

Expand All

- Where are the compliance documents (forms)?
- How can I get a copy of the Energy Code, Reference Appendices, Manuals?
- Who do I contact for compliance modeling software questions?
- Where do I find my climate zone?
- How do I participate in the upcoming Energy Code rulemaking?
- What local ordinances are approved?
- Are there any regulatory advisories?
- Is there help with finding incentives, rebates, and financing?
- Where do I report an issue with a contractor or business professional?
- Where can I ask an Energy Code question that is not answered here or on a specific project?

## Information, Training, and Resources

Expand All

- Training classes, Energy Code overviews, and the Blueprint newsletter +
- Solar PV systems, solar-ready, and electric-ready +
- Battery, energy storage systems (ESS), and ESS-ready +
- Heating, ventilation, and air conditioning (HVAC) mechanical systems +
- Water heating systems +
- Lighting systems (indoor, outdoor, signs) +
- Envelope components (window, roof, insulation, etc.) +
- Electrical power distribution +
- Building commissioning +
- Covered processes +
- HERS raters +
- Acceptance test technicians (ATTs) +

- **FAQs**
- **Handouts**
  - Fact sheets
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- **Tools**
  - Checklists
  - Blueprint newsletter
- **Training**
  - Presentations
  - Videos
- **Links**
  - Internal resources
  - External resources



# 2025 Energy Code What's New Summaries



**2025 Single-Family**

*NOTE: Single-family residential buildings subject to the Energy Code. Review the respective sections for more information.*

Space Conditioning, Water Heating, and Plumbing Systems	
§ 110.0-110.3	<b>Certification.</b> Heating, ventilation, air conditioning, and hot water equipment must be certified by the manufacturer to the California Energy Code.
§ 110.2(a)	<b>HVAC Efficiency.</b> Equipment must meet the minimum efficiency requirements specified in Table 110.2(a).
§ 110.2(b)	<b>Controls for Heat Pumps with Supplemental Heating.</b> Heat pumps with supplemental heating must have controls that meet the requirements specified in § 150.0(h)7 and § 150.0(h)8.
§ 110.2(c)	<b>Thermostats.</b> All heating or cooling equipment must have a thermostat that meets the requirements specified in § 150.0(h)7 and § 150.0(h)8.
§ 110.3(c)3	<b>Insulation.</b> Unfired service water heater surface heat loss rating.
§ 110.3(c)6	<b>Isolation Valves.</b> Instantaneous water heaters must have isolation valves on both the inlet and outlet piping.
§ 110.3(c)7	<b>Backup Heat and Ventilation.</b> Air-distributed, unconditioned, unless compressor or pump water heater installation space is less than 10 cubic feet, must have backup heat and ventilation.
§ 110.5	<b>Pilot Lights.</b> Continuously burning pilot lights are prohibited, except for appliances without electrical controls.
§ 150.0(h)1	<b>Building Cooling and Heating Load.</b> Equipment Volume, Applications Volume, or the ACCA Manual J must be used to determine the cooling and heating load.
§ 150.0(h)3A	<b>Clearances.</b> Air conditioner and heat pump clearances must meet the manufacturer's instructions.
§ 150.0(h)3B	<b>Liquid Line Drier.</b> Air conditioners and heat pumps must have a liquid line drier.
§ 150.0(h)5	<b>System Selection.</b> Equipment size must be based on ACCA Manual S-2023 with heating capacity must meet minimum requirements.
§ 150.0(h)6	<b>Defrost.</b> Installer-adjustable defrost controls are required.
§ 150.0(h)7	<b>Supplementary Heating Control.</b> Heating equipment must have a control that prevents the heating equipment from operating when the outdoor air temperature is below the supplementary heating setpoint.
§ 150.0(h)8	<b>Sizing of Electric Resistance Supplemental Heating.</b> Supplemental heating must not exceed the heat pump capacity rounded up to the closest kW.
§ 150.0(h)9	<b>Capacity Variation with Third-party Heating.</b> Heating equipment must be capable of responding to the capacity variation of a third-party heating system.
§ 150.0(i)	<b>Thermostat.</b> All heating or cooling equipment must have a thermostat that meets the requirements specified in § 150.0(h)7 and § 150.0(h)8.
§ 150.0(j)1	<b>Water Piping, Solar Water-heating Piping.</b> Solar water-heating piping must be insulated as specified.
§ 150.0(j)2	<b>Insulation Protection.</b> Piping insulation must be protected from damage by wind, as required by §120.3(b). Insulation covering chilled water piping by a Class I or II vapor retarder. Piping must be protected from damage by wind, as required by §120.3(b).
§ 150.0(k)1	<b>Gas or Propane Water Heating Systems.</b> Gas and propane water heating systems must be installed in a designated space at least 2' x 2' x 2' high, with the top of the water heater at least 2' higher than the base of the water heater.
§ 150.0(k)2	<b>Solar Water Heating Systems.</b> Solar water heating systems must be installed in accordance with the requirements of the Solar Water Heating Systems, Solar Certification Corporation (SRCC), the R&T, or by a listing agency that is approved by the California Energy Code.
Ducts and Fans	
§ 110.0(d)3	<b>Ducts.</b> Insulation installed on an exterior duct must be installed by a contractor who installs the insulation, and the insulation must meet the requirements of the California Energy Code.
§ 150.0(m)1	<b>CMC Compliance.</b> All air-distribution duct construction must meet the requirements of the California Energy Code, R-6.0 or higher. Ducts located entirely in unconditioned spaces must require insulation, in dwelling units. Connections of metal ducts and inner core of flexible ducts must be mechanically fastened. Openings must be sealed with mastic, tape, or other duct-closure system that meets applicable UL requirements, or aerosol sealant that meets UL 723. The combination of mastic and either mesh or tape must be used to seal openings greater than 1/4", if mastic or tape is used. Building cavities, air handler support



## California Energy Commission 2025 Building Energy Efficiency Standards What's New for Multifamily Buildings

### Solar PV and Battery Energy Storage Systems

- Updates PV sizing using total solar access roof area (SARA), SARA multiplied by 18 for steep-sloped roofs, and by 14 for low-sloped roofs; Exception 2 increases minimum PV system size to 4kW for low-rise multifamily; increases PV capacity factors in Table 170.2-U for some buildings/climate; Exception 5 applies to areas with no PV compensation through virtual energy bill credits. Section 170.2(f-g)
- Adds building types in Table 170.2-U and Table 170.2-V: events and exhibits, religious worship, sports and recreation. Section 170.2(g-h)
- Updates Equations 170.2-E, F, & G; revises Table 170.2-V BESS capacity factors for all building types and Climate Zones. Section 170.2(h)

### HVAC

- Multifamily dwelling units must have balanced or supply ventilation system, with compartmentalization verified by ECC-Rater. Section 160.2(b)2Aivb
- Adds mandatory requirements for balanced and supply-only ventilation to have accessible air filters, including HRV/ERVs for attached dwelling units. Section 160.2(b)2AXi
- Adds exception in Climate Zone 6 for central ventilation system duct sealing requirements for dwelling units. Section 160.2(b)2C
- Updates mandatory requirements for dwelling units: exception for block loads in determining system size for addition; outdoor design conditions may be selected using ASHRAE Handbook, Fundamental Volume, or ACCA Manual J; defrost requirements for heat pumps with defrost delay timer; thermostat requirements for variable or multi-speed systems. Section 160.3(b)
- Adds mandatory acceptance testing requirements for DOAS and HRV/ERV systems, with some exceptions. Section 160.3(d)1D
- Updates prescriptive requirements: balanced systems with HRV/ERV for dwelling units in Climate Zones 1, 2, 4, 11-14, 16; all HRVs and ERVs for dwelling units to have fault indicator display (FID) with ECC-rater verification. Section 170.2(c)3B
- Updates prescriptive requirement for cooling tower to have minimum rated efficiency per Table 170.2-I. Section 170.2(c)4Fv
- Revises prescriptive requirements for dedicated outdoor air systems (DOAS). Section 170.2(c)4N
- Adds exception for dwelling unit air leakage test for additions. Section 180.1(a)2

### Lighting

- Updates mandatory requirements for dwelling units: all installed luminaires and light sources to meet IA8 criteria; removes Table 160.5-A and references; f. Section 160.5(a)1A
- Updates lighting integral to kitchen range hoods and bathroom exhaust fans do not require dimming controls. Section 160.5(a)2F
- Updates mandatory common area lighting requirements:
  - Manual controls to be located such that controlled lighting or status can be seen when operating controls. Section 160.5(b)4A
  - Multilevel controls must provide and enable continuous dimming from 100 to 10% or lower; removes Table 160.5-B; Exception 3 allows HID and induction luminaires to have one control step between 30-70%. Section 160.5(b)4B
  - Occupant sensing controls must have no more than 20-minute time delay; Exception 4 only applies to emergency lighting intended to function only when normal power is absent. Section 160.5(b)4C
  - Lighting in restaurants does not require automatic holiday shut-off feature with automatic time-switch controls. Section 160.5(b)4Civ
  - Occupancy sensing control zones for offices greater than 250 square feet must be shown on plans. Section 160.5(b)4Cvi
  - Automatic daylighting controls in skylit and sidelit daylight zones with 75 watts or greater of general lighting or greater; luminaires longer than 8 feet must be controlled in segments up to 8 feet; Exception 3 exempts secondary sidelit daylight zones with less than 85W of general lighting from daylight responsive controls, if primary sidelit daylight zones do not require daylight responsive controls. Section 160.5(b)4D

## Energy Code Support Center Overview webpage

- [2025 What's new Single-Family](#)
- [2025 What's New Multifamily](#)
- [2025 What's New Nonresidential](#)
- [2025 Single-family Mandatory Requirements Summary](#)



# Energy Code Hotline

## Energy Code Hotline Submission Form

Please submit your Energy Code questions through the Energy Code Inquiry Submission Form.

### Contact and General Information

What is your name? ⓘ \*

What is your email address? ⓘ \*

What is your question about? ⓘ \*

What is your role? ⓘ

### Building and Project Information

What is the building type? ⓘ \*

What is project type/scope of the building? ⓘ \*

Is the building conditioned (heating and/or cooling) or unconditioned (no heating or cooling)? ⓘ \*

Please list the climate zone of the project. Alternatively, please enter the address of the project. ⓘ \*

- Monday through Friday
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- Call
  - 800-772-3300 in CA
  - 916-654-5106 outside CA
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# Blueprint Newsletter

- [Energy Code quarterly newsletter](#)
- Updates
- Clarifications
- Frequently asked questions



Issue 146 | April - June 2024

## BLUEPRINT

CALIFORNIA ENERGY COMMISSION  
EFFICIENCY DIVISION

### In This Issue

- Nonresidential and Multifamily Water Chiller Packages
- Updated Lighting Videos
- New Training Presentations
- Online Fact Sheets Updated
- Energy Code Support Center
- ASHRAE Resources
- Q&A
  - Nonresidential Chiller Alterations
  - Nonresidential Electric Resistance Heating
  - Solar PV for Campus Projects
  - Multifamily Lighting
  - Unpermitted ADUs

For additional help with the Energy Code, see Energy Code Ace's [online offerings](#) of trainings, tools, and resources.



### Nonresidential and Multifamily Water Chiller Packages

The 2022 Energy Code lists efficiency requirements for water chiller packages in **Table 110.2-D**. This table separates equipment by type and size. Equipment type is categorized as water or air-cooled, which refers to the method used for cooling the refrigerant in the condenser. Per the prescriptive requirements in **Section 140.4(j)** and **Section 170.2(c)4G**, chillers must meet the efficiency requirements shown in the Path B Efficiency column.

The exceptions are:

- Chillers with an electrical service greater than 600 volts
- Chillers attached to a heat recovery system with a design heat recovery capacity greater than 40% of the design chiller cooling capacity
- Chillers used to charge thermal energy storage systems where the charging temperature is less than 40 degrees Fahrenheit
- In a building with more than three chillers, only three chillers are required to meet path B efficiencies

In addition, the Energy Code provides a prescriptive requirement for chilled water plants in **Section 140.4(j)** and **Section 170.2(c)4H**. No more than 300 tons of cooling for a chilled water plant can be provided by air-cooled chillers when using the prescriptive compliance approach. The exceptions are:

- Where the water quality of the building site fails to meet the manufacturer's specifications for the use of water-cooled chillers
- Chillers that are used to charge a thermal energy storage system with a design temperature of less than 40 degrees Fahrenheit
- Nonresidential systems serving healthcare facilities.

New or replacement space-conditioning systems or components, including water chillers, must meet the prescriptive requirements that are applicable to the system or component being altered or replaced. For example, the maximum 300-ton air-cooled chiller requirement in **Section 140.4(j)** and **Section 170.2(c)4H** only applies to HVAC alterations when additional cooling tower tonnage is added to

1



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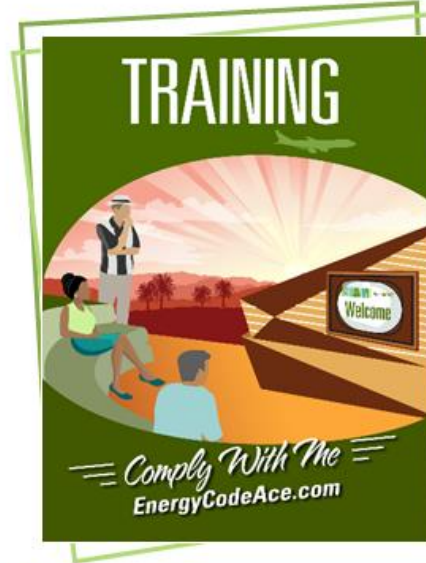
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# Energy Code Ace



## Tools help automate tasks:

- ✦ Energy Code Product Finder
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- ✦ Image Ace
- ✦ Navigator Ace
- ✦ Nonres. Indoor Lighting Wheel
- ✦ Q&Ace
- ✦ Reference Ace
- ✦ Timeline Ace
- ✦ Virtual Compliance Assistant

## Training is activity based and delivered in a variety of formats:

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## Resources provide quick, useful guidance:

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BayREN helps the Bay Area's local governments reduce energy and water use for a more resilient and sustainable future.

We support local governments by:

- » Offering assistance to develop and adopt local energy policies and building codes
- » Providing training and resources for implementation and enforcement of the California Energy Code and local reach codes
- » Organizing quarterly Bay Area Regional Forums on a variety of energy and emission reduction topics
- » Helping local governments and special districts with energy efficiency and decarbonization of their buildings
- » Providing water utilities with a turnkey water efficiency program to help your customers save water and money



### Local Government Resources

YOUR COUNTY LEAD

BUILDING AND ENERGY TOOLS

PUBLIC BUILDINGS ASSISTANCE

CODE COMPLIANCE

ENERGY POLICIES & REACH CODES

CONTACT CODES AND STANDARDS

Create a Website Account Manage notification subscriptions, save form progress and more.

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PROGRAMS

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Public Sector Program



Workforce Education & Training Program



Codes & Standards Program

## INLAND REGIONAL ENERGY NETWORK

The Inland Regional Energy Network (I-REN) connects local governments, the workforce, and other stakeholders to a wide range of energy efficiency resources.

Latest News



Contact Us



CONTRACTORS & INDUSTRY

MULTIFAMILY PROPERTIES

FOR RESIDENTS



3C-REN (Tri-County Regional Energy Network) reduces energy use in our region's buildings for a more affordable, healthy, resilient and sustainable community.

### CURRENT PROGRAMS



HOME ENERGY SAVINGS

Save energy and improve your property

Start Saving Today!



BUILDING PERFORMANCE TRAINING

Develop your skills in building performance

Find a Course



ENERGY CODE CONNECT

Personalized coaching and events to simplify the energy code

See Title 24 Services



Public Agencies

Residential

Financing

WE&T

About SoCalREN

## Public Agencies

Helping cities, counties, water agencies, school districts, special districts, community colleges, universities, and state and federal government facilities lead their communities towards a sustainable clean energy future.

Register now and join us!

### Program Information



Learn about the SoCalREN Public Agency Programs, including who is participating and how your agency can get started.

### Services



Discover a wide variety of no-cost services offered to enrolled agencies, from technical support to staff guidance.

### Resources



Explore online resources, tools, and ideas to help implement energy efficiency improvements.

### Eligibility & Enrollment



Find out if your agency is eligible to enroll, and complete our online interest form to get started.





**Thank you**