



# Decoding What's New: *Let's Talk 2019 Title 4 Part 6*



WELCOME!

## Low-Rise Residential



HELPING YOU PLAY YOUR CARDS RIGHT



# Recording For Future Use

 *Decoding* \* Attics and Walls™

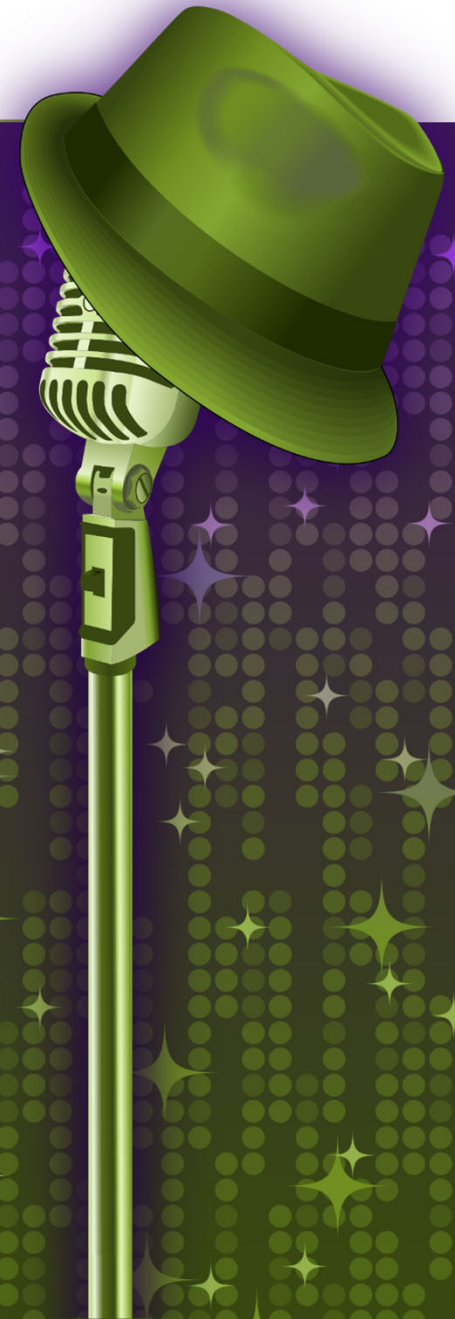
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This session is  
being recorded.

Last Decoding Talk...

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Let's Talk Residential Rebuilding





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Tools ♠ Training ♠ Resources  
to help you decode Title 24, Part 6 and Title 20



This program is funded by California utility customers and administered by Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E®), Southern California Edison Company (SCE), and Southern California Gas Company (SoCalGas®) under the auspices of the California Public Utilities Commission.





# Who Are We?

---



Gina Rodda  
Gabel Energy  
[gina@gabelenergy.com](mailto:gina@gabelenergy.com)



BUILDING ENERGY ANALYSIS +  
ENERGY CODE COMPLIANCE

## Host: Gina Rodda

Gina Rodda, our host for the Decoding Talk series, is a Certified Energy Analyst (CEA) through CABEC, and LEED Accredited Professional (AP).

She is involved in providing residential and non-residential energy calculations for a variety of building types throughout California; an instructor of full day trainings; subject matter expert supporting future code development; aids the improvement to tools and resources supporting energy compliance through the private utility programs and the Energy Commission.

Gina has been in the energy modeling field since 1991.





# Who Are We?

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Martyn C. Dodd  
Energy Soft

## Co-Host: Martyn Dodd

Having written software used in California for Title 24 energy code compliance since 1984, Mr. Dodd is principal of EnergySoft, a Bay Area company that specializes in performance-based energy analysis for Title 24 and LEED.

Mr. Dodd has been involved in the California standards development process for the past four decades and has consulted on the Title 24 rules and procedures extensively in that time.

Mr. Dodd has taught over 2,000 training classes throughout North America on energy modeling and code compliance and has developed training curriculums for over 100 different classes related to building energy efficiency.





## Decoding What's New

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- ✦ Review the major changes associated with Title 24 Part 6 2019 code cycle;
- ✦ Review the design, modeling, installation and enforcement challenges associated with these changes;
- ✦ Provide our opinions on when and how these new measures will affect compliance.





Why?



HELPING YOU PLAY YOUR CARDS RIGHT



# Handouts



2019 Title 24, Part 6

## Low-Rise Residential What's Changed in 2019

This fact sheet is intended to help industry professionals understand changes made to the 2016 Title 24, Part 6 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2019 Energy Code for the low-rise residential building occupancy by building feature.

**For More Information**  
California Energy Commission  
Information & Services

### Legend

Background colors of 2016 Energy Code

No Change or are considered and typically

Revised for 2019

New for 2019

### Key Definitions

1. **Multifamily:** family, duplex, above grade, a the Energy Code (§§150.0, 150.1, 150.2)

a. Multifamily are address Code (§§150.0, 150.1, 150.2)

b. Multifamily grade are at the Energy Code

2. **Healthcare Facilities:** Occupancies I-1 and I-2 are now covered by the requirements of the Energy Code with this 2019 code cycle. There are many exceptions, so see the section devoted to Exceptions for Healthcare Facilities. Occupancy I-3 and I-4 are still not subject to the requirements of Title 24, Part 6.



2019 Title 24, Part 6

## Nonresidential, High-Rise Residential, Hotel/Motel What's Changed in 2019

This fact sheet is intended to help industry professionals understand changes made to the 2016 Title 24, Part 6 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2019 Energy Code for nonresidential, high-rise residential and hotel/motel building occupancy types. It is presented in tabular form and divided by building feature (e.g., envelope and lighting). Each building feature section includes explanatory notes on all applicable Title 24, Part 6 sections, but not the actual language of the 2019 Energy Code. Notes on Title 24, Part 1 sections are also included, as applicable. The left-hand column serves to note the Title 24 sub-sections and to highlight related key comments.

There is a similar fact sheet covering changes for the low-rise residential occupancy type.

### Legend

Background colors are used to indicate the degree of change to the 2016 Energy Code.

No Change or Minor Change for 2019 - "Minor Changes" are considered non-substantive changes to code language and typically no further clarification is provided.

Revised for 2019

New for 2019

### Key Definitions

1. **Multifamily:** Occupancies R-1 and R-2 (R-3 includes single family, duplexes and townhomes 3-habitat stories or less above grade, and is subject to the single-family requirements of the Energy Code).

a. Multifamily buildings 3-habitat stories or less above grade are addressed in the residential requirements of the Energy Code (§§150.0, 150.1, 150.2)

b. Multifamily buildings 4-habitat stories or more above grade are addressed in the nonresidential requirements of the Energy Code (§§130-141)

2. **Healthcare Facilities:** Occupancies I-1 and I-2 are now covered by the requirements of the Energy Code with this 2019 code cycle. There are many exceptions, so see the section devoted to Exceptions for Healthcare Facilities. Occupancy I-3 and I-4 are still not subject to the requirements of Title 24, Part 6.

**For More Information**  
California Energy Commission  
Information & Services

- 2019 Title 24, Part 6 Document (December 2018); [www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf](http://www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf)
- Draft 2019 Energy Code - October 4 & 5, 2017; Staff Workshop on the Draft 2019 Building Energy Standards ("marked up" for easier viewing of changes); [www.energy.ca.gov/title24/2019standards/premaking/documents/2017-10-0405\\_workshop/2017-10-0405\\_documents.php](http://www.energy.ca.gov/title24/2019standards/premaking/documents/2017-10-0405_workshop/2017-10-0405_documents.php)
- Energy Code Hotline: 1-800-772-3300 (Free) or [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)
- Online Resource Center: [energy.ca.gov/title24/orc/](http://energy.ca.gov/title24/orc/)
  - The Energy Commission's main web portal for Energy Code, including information, documents and historical information

- Energy Code Ace Tools, Training and Resources Updated for the 2019 Code - Coming Soon! Register with [EnergyCodeAce.com](http://EnergyCodeAce.com) and select a role in My Profile to receive emails when they are published!

- Training
  - Title 24: Where We're Headed with the 2019 Standards
  - 2019 Title 24, Part 6: Where We're Headed With the Nonresidential Standards

- Energy Code Ace Tools, Training and Resources Updated for the 2019 Code - Coming Soon! Register with [EnergyCodeAce.com](http://EnergyCodeAce.com) and select a role in My Profile to receive emails when they are published!

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What's Changed in 2019 - Nonresidential, High-Rise Residential, Hotel/Motel

Page 1 of 23



Let's Talk 2019 Title 24, Part 6

## 2019 Overview of Nonresidential / High-Rise Multifamily / Hotel & Motel Occupancies

Application	Building Feature	Brief Description	Code §	1	2	3
Scope	Occu I-1, I-2					
Demand Response	All					
Envelope	Fenest					
	Effic					
	F					
	Fan S					
	Air F					
Mechanical	Vent					

Application	Building Feature	Brief Description	Code §	1	2	3
Performance Method	EDR Score	New compliance metric for new single-family homes, new low-rise townhomes & multifamily buildings. Building efficiency must show compliance with no tradeoffs from PV systems	150.1(b)1			X
PV + Flexibility	PV	New single-family homes, new low-rise townhomes & multifamily buildings to meet PV kW requirements of Table 150.1-C (exceptions may apply)	150.1(c)14		X	X
	Battery	Can be used to reduce PV kW or trade with building efficiency features, depending on kW size, for new single-family homes, new low-rise townhomes & multifamily buildings	150.1(c)14		X	X
	Prescriptive Tables	There is a separate table for single family versus low-rise multifamily	150.1		X	
	Roof	Above roof deck insulation option removed as prescriptive feature (can still use with performance approach). Below roof deck insulation R-value increased to R-19 and associated with roofing material installed with air gap (i.e. tile roofing) for prescriptive compliance (all other must use performance approach)	150.1(c)1			X
	Roof: Additions	Roof insulation R-value increased to R-30 CZ 2-10, and R-38 in CZ 1&11-16	150.2(c)5		X	
	Walls	Framed. Mandatory min. for 2 x 6 walls increased to R-20	150.0(c)	X		
	Walls: Additions	Framed. Prescriptive U-factor for single family CZ 1-5, 8-16 reduced to 0.048	150.1(c)1B		X	
	Walls: Additions	Above Grade Mass. Mandatory U-factor based on prescriptive measure	150.0(c)5	X		
	Fenestration	Extended 2 x 6 framed walls increased to R-21	150.0(c)5		X	
	Fenestration	Prescriptive U-factor reduced to 0.30 and SHGC reduced to 0.23 for CZ 2, 4, 6-15	150.1(c)3A			X
	Fenestration	Door considered fenestration (using rough opening) when ≥25% glass	150.1(c)5	X		
	Solid Doors	NFRC rated U-factor of 0.20 or less except for door in home to the garage	150.1(c)5			X
	Quality Insulation Installation (QII)	HERS verification now a prescriptive requirement for new single-family homes, low-rise multifamily, and additions >700 ft² (multifamily in CZ 7 exempt)	150.1(c)1E			X
	Filter	MERV-13 2" (exceptions allowed for 1" meeting Equation 150.0-A) for new ducted >10 ft² of ducting) systems or complete replacement (indoor, outdoor ducting) systems verified by HERS rater	150.0(m)	X		
	IAQ Ventilation Rate	Increased CFM requirements per Equation 150.0-B	150.0(o)		X	
	ADU IAQ requirement	All new accessory dwelling units must meet IAQ requirements including HERS verification	150.0(o)		X	
	Gas FAU + AC	HERS verification reduced to 0.45 W/CFM for gas furnaces manufactured as of July 3, 2019 for system including AC	150.0(m)13	X		

Decoding 2019 Whats Changed Handout v2

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# Title 24: CA Building Code

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- ◆ Part 1: Administrative
- ◆ Part 2: ICC Changes
- ◆ Part 2.5: Residential Buildings
- ◆ Part 3: Electrical Code
- ◆ Part 4: Mechanical Code
- ◆ Part 5: Plumbing Code
- ◆ **Part 6: ENERGY CODE**
- ◆ Part 8: Historic Building
- ◆ Part 9: Fire Code
- ◆ Part 10: Existing Buildings
- ◆ Part 11: Environmental Code



# Which Code Year Applies? Permit pulled...

Jan. 2017- Dec. 2019


Jan. 2020- Dec. 2022

**2016**

**BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS**

FOR THE 2016 BUILDING ENERGY EFFICIENCY STANDARDS

TITLE 24, PART 6, AND ASSOCIATED ADMINISTRATIVE REGULATIONS IN PART 1.




JUNE 2015  
CEC-400-2015-037-CMF  
CALIFORNIA ENERGY COMMISSION  
Edmund G. Brown Jr., Governor

**2019**

**BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS**

FOR THE 2019 BUILDING ENERGY EFFICIENCY STANDARDS

TITLE 24, PART 6, AND ASSOCIATED ADMINISTRATIVE REGULATIONS IN PART 1.



DECEMBER 2018  
CEC-400-2018-020-CMF  
CALIFORNIA ENERGY COMMISSION  
Edmund G. Brown Jr., Governor





# Where to get the Energy Standards

- Compliance Forms +
- Energy Videos +
- Trainings and Upcoming Events +
- Exhibitor Booth Handouts +

### ENERGY STANDARDS AND FORMS



**2019 Building Energy Efficiency Standards**  
The 2019 Building Energy Efficiency Standards take effect January 1, 2020. Find compliance manuals, forms, software, and supporting content.

**2016 Building Energy Efficiency Standards**  
The 2016 Building Energy Efficiency Standards were effective January 1, 2017. Find compliance manuals, forms, software, and supporting content.



**Past Building Energy Efficiency Standards**  
Historical archive of past standards (2013 and prior).

## 2019 Building Energy Efficiency Standards

The 2019 Building Energy Efficiency Standards replace the 2016 Energy Standards for new construction of, and additions and alterations to, residential and nonresidential buildings. Buildings permitted on or after January 1, 2020, must comply with the 2019 Standards. The California Energy Commission updates the standards every three years.

Expand All

- 2019 Building Energy Efficiency Standards and Compliance Manuals +
- 2019 Compliance Forms +
- 2019 Compliance Software and Alternative Calculation Method (ACM) Manuals +
- 2019 Building Energy Efficiency Standards Rulemaking Documents +
- Fact Sheet +
- Frequently Asked Questions +

**BUILDING ENERGY EFFICIENCY STANDARDS - TITLE 24**

- 2022 Building Energy Efficiency Standards
- 2019 Building Energy Efficiency Standards**
- 2016 Building Energy Efficiency Standards
- Online Resource Center
- Past Building Energy Efficiency Standards

**CONTACT**

[Building Energy Efficiency Standards - Title 24](#)

Toll-free in California: 800-772-3300  
Outside California: 916-654-5106

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## Blueprint Newsletter

Blueprint is the California Energy Commission's quarterly e-newsletter that delves into the Building Energy Efficiency Standards and provides examples of projects. The newsletter provides updates, answers to frequently asked questions, clarifications to requirements, announcements, and educational resources and training.

[Expand All](#)

**Compiled Blueprints** +

**Issue 126, April - June 2019** +

**Issue 125, January - March 2019** +

**Issue 124, October—December 2018** +

**Issue 123, April - September 2018** +

**Issue 122, January - March 2018** +

**Issue 121, October - December 2017** +

**Issue 120, July - September 2017** +

**Issue 119, April - June 2017** +

**Issue 118, January - March 2017** +

**Issue 117, November - December 2016** +

### RESOURCES AND TRAINING MATERIALS



#### Overview

Look for informational resources that cover multiple building components in a single document for residential and nonresidential buildings.



#### Commissioning

Mandatory commissioning requirements for nonresidential buildings.



#### Covered Processes

Mandatory and prescriptive covered processes requirements for nonresidential buildings.



#### Electrical Power Distribution

Mandatory electrical power distribution requirements for nonresidential buildings.



#### Envelope

Mandatory and prescriptive envelope requirements for residential and nonresidential buildings.



#### HVAC

Mandatory and prescriptive HVAC requirements for residential and nonresidential buildings.

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## Mandatory Measures



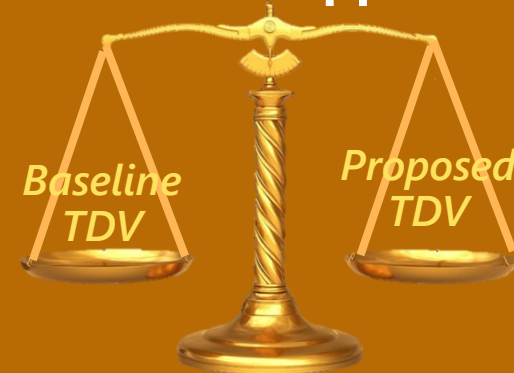
- *Cannot be traded via the Performance Approach*
- *Not typically documented within Certificate of Compliance (CF1R)*

Two Ways to Comply with the Standards

### Prescriptive Approach

Single Family: Table 150.1-A  
Multifamily: Table 150.1-B

### Performance Approach



*Proposed TDV equal or better than baseline TDV*

**Compliance Documentation**

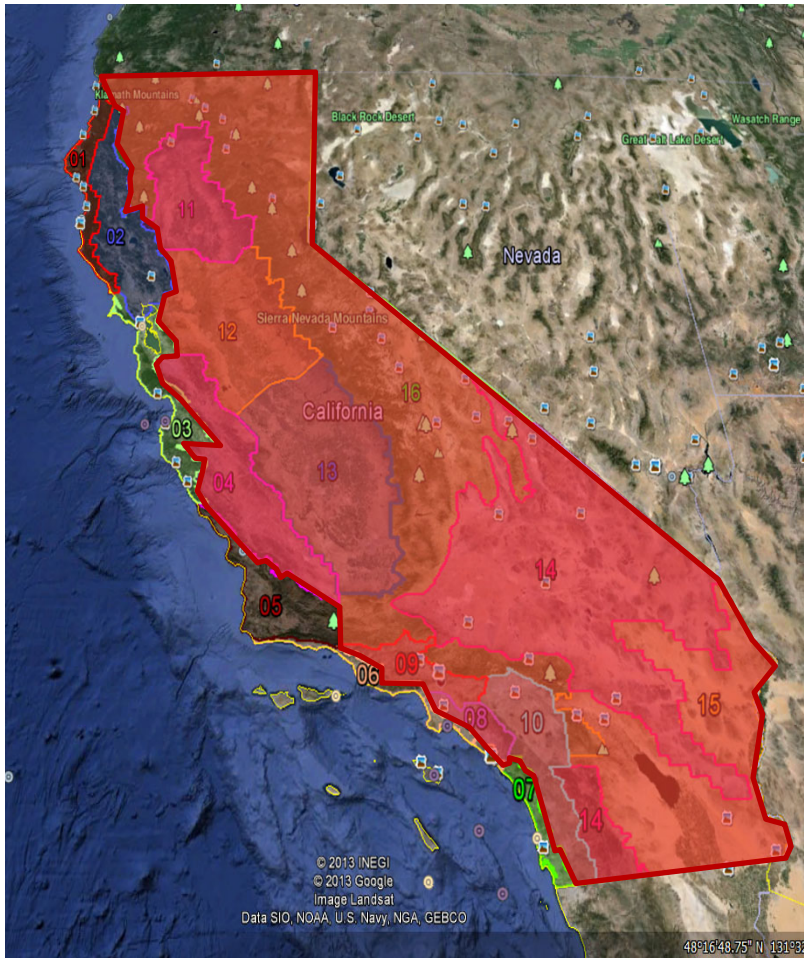




# Climate Zones



## Hot/Cold Climate Zones



## Mild Climate Zones





# Performance: Building Energy Efficiency Ratings



## For Low-rise Residential Construction



Energy Code	New Construction	Additions	Alterations
2016	TDV	TDV	TDV
2019	<b>EDR</b> * <b>NEW</b>	TDV	TDV

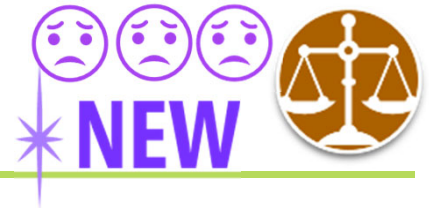
### Energy Design Rating (EDR):

Page 2 of CF1R-PRF-01-E

ENERGY DESIGN RATING				
	Energy Design Ratings		Compliance Margins	
	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)
Standard Design	53.8	21.5		
Proposed Design	53.4	21.1	0.4	0.4
<b>RESULT<sup>3</sup>: COMPLIES</b>				



# Energy Design Rating Index Score



EDR index scores help compare any project to another project

A score of **"100"** represents the energy consumption of the building if built according to the specs of the **2006 IECC** (International Energy Conservation Code)

A score of **"0"** represents a building that has zero net energy consumption

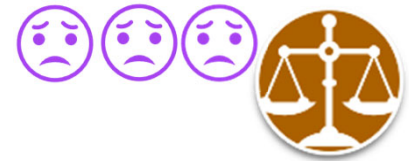


The Proposed Design's overall TDV energy usage (called **"Total EDR"**) is found along this range. The **lower** the EDR index score, the better.

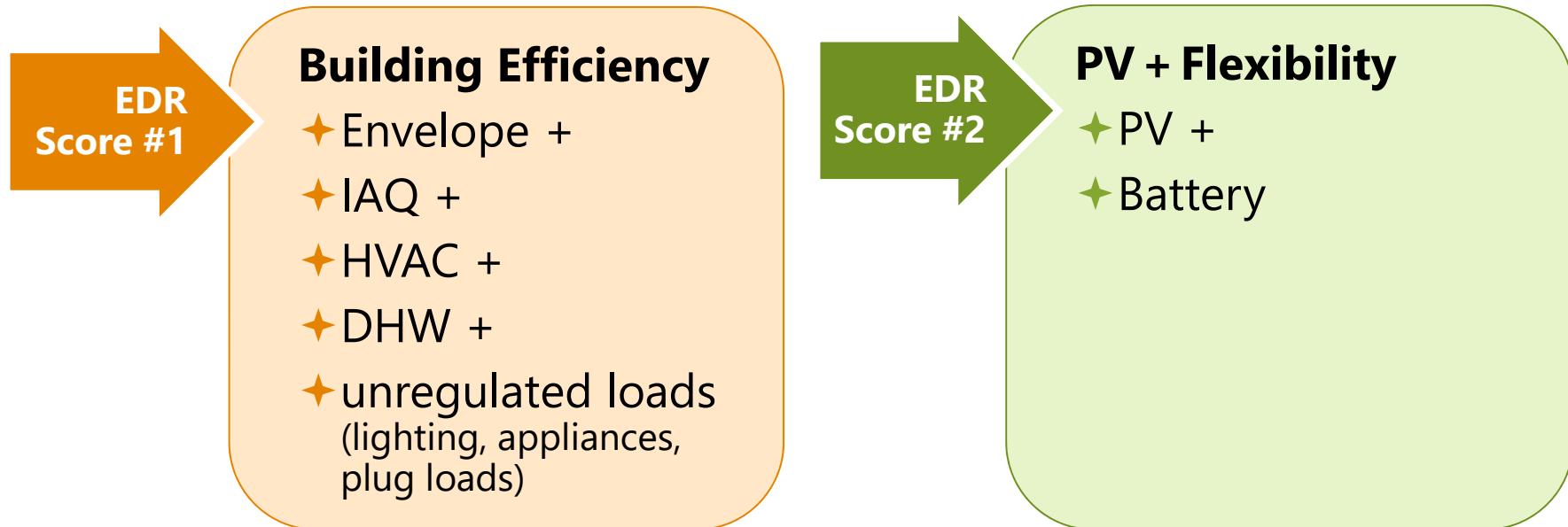




# EDR as a Compliance Metric



The building's energy use is measured via two EDR scores:



The building complies when 2 conditions are met:

1. Proposed EDR  $\leq$  Standard EDR for **Building Efficiency** ✓

**AND**

2. **Building Efficiency EDR** - **PV + Flexibility EDR** = **Total EDR** ✓

"Total EDR" represents the overall TDV energy usage as a score  score that shows overall compliance



# Finding EDR, PV & Battery on the CF1R

CF1R Page 2



## CERTIFICATE OF COMPLIANCE

Project Name: Walker Residence

Calculation Description: Title 24 Analysis

Calculation Date/Time: 2019-07-24T17:49:21-07:00

Input File Name: Walker Residence 2019 GR v1.ribd19

CF1R-PRF-01E

(Page 2 of 11)

EDR Table



ENERGY DESIGN RATING				
	Energy Design Ratings		Compliance Margins	
	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)
Standard Design	51.5	25.9		
Proposed Design	48.2	18.3	3.3	7.6
<b>RESULT: <sup>3</sup> COMPLIES</b>				
<sup>1</sup> Efficiency measures include improvements like a better building envelope and more efficient equipment <sup>2</sup> Total EDR includes efficiency, photovoltaics and batteries <sup>3</sup> Building complies when all efficiency and total margins are greater than or equal to zero				
<ul style="list-style-type: none"> <li>Standard Design PV Capacity: 2.54 kW</li> <li>PV kWh output exceeds proposed electric use by 2.3% which may violate NEM rules. Contact your utility.</li> </ul>				

Building Energy Use Summary Table



ENERGY USE SUMMARY				
Energy Use (kTDV/ft <sup>2</sup> -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	8.8	7.99	0.81	9.2
Space Cooling	26.45	21.43	5.02	19
IAQ Ventilation	2.94	2.94	0	0
Water Heating	16.91	14.58	2.33	13.8
Self Utilization Credit	n/a	0	0	n/a
<b>Compliance Energy Total</b>	<b>55.1</b>	<b>46.94</b>	<b>8.16</b>	<b>14.8</b>

PV Table



REQUIRED PV SYSTEMS										
01	02	03	04	05	06	07	08	09	10	11
DC System Size (kWdc)	Exception	Module Type	Array Type	Power Electronics	CFI	Azimuth (deg)	Tilt Input	Array Angle (deg)	Tilt: (x in 12)	Inverter Eff. (%)
3	NA	Standard	Fixed (open rack)	none	true	n/a	n/a	n/a	n/a	96

# CF1R-PRF evolving



Let's Talk



HELPING YOU PLAY YOUR CARDS RIGHT







# Challenges

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- ✦ Challenge A:
  - ✦ Envelope



- ✦ Challenge B:
  - ✦ Mechanical



- ✦ Challenge C:
  - ✦ Lighting

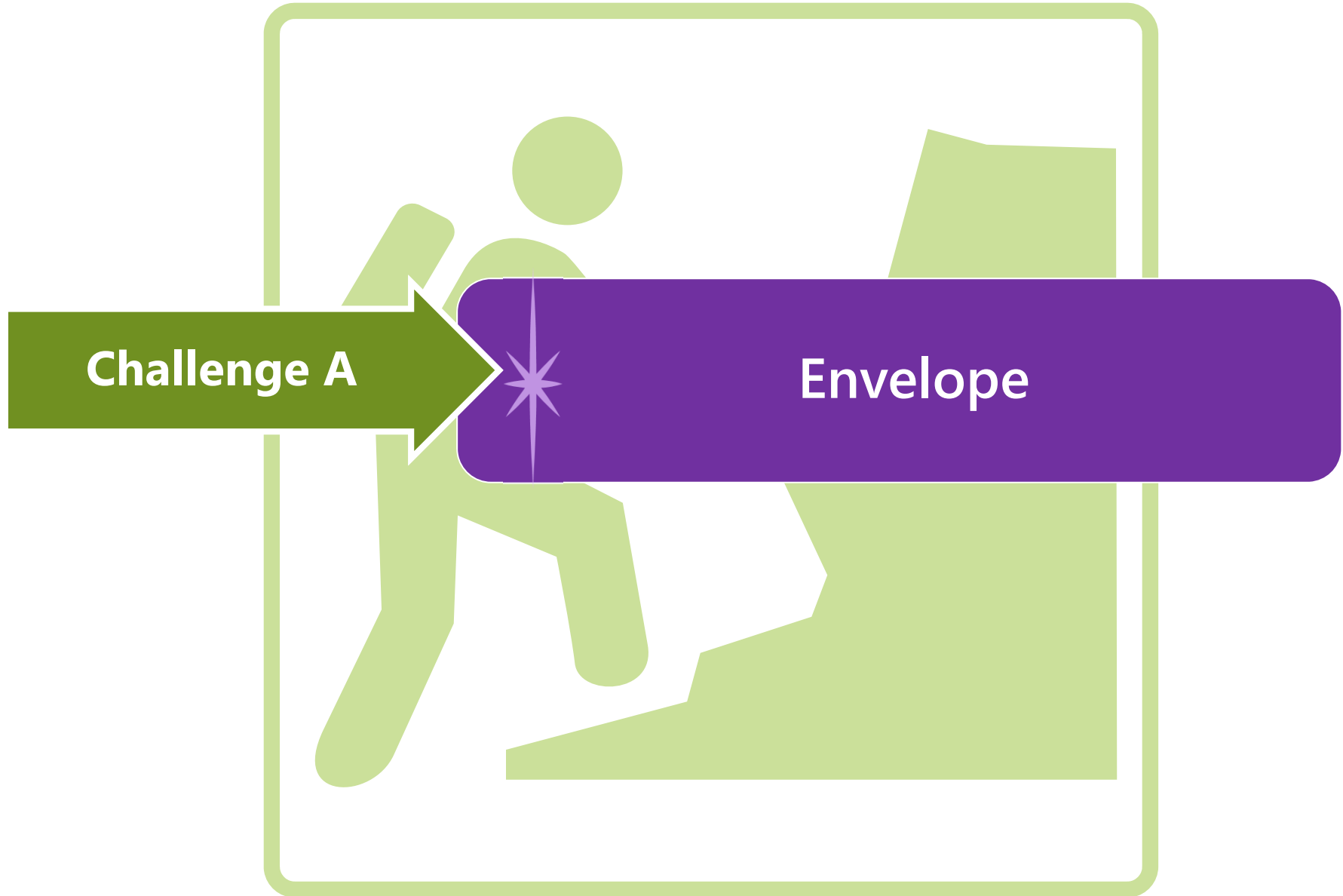


- ✦ Challenge D:
  - ✦ PV + Flexibility



# Challenge A

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# Table 150.1-A: Single-Family Prescriptive Requirements



Table 150.1-A

2019 Building Energy Efficiency Standards Page 287

TABLE 150.1-A COMPONENT PACKAGE – Single Family Standard Building Design

Single Family		Climate Zone																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Building Envelope	Roofs/Ceilings	Option B (meets §150.1(c)(9A))	Building Envelope Insulation															
		Below Roof Deck Insulation <sup>1,2</sup> (With Air Space)	NR		R.19	NR	NR	NR	R.19	R.19	R.19	R.19	R.19	R.19	R.19	R.19	R.19	R.19
		Ceiling Insulation	R.38	R.30	R.38	R.30	R.30	R.30	R.38	R.38	R.38	R.38	R.38	R.38	R.38	R.38	R.38	R.38
		Radiant Barrier	NR	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets §150.1(c)(9B))																
		Ceiling Insulation	R.38	R.30	R.30	R.30	R.30	R.30	R.30	R.30	R.30	R.38	R.38	R.38	R.38	R.38	R.38	R.38
	Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	
	Walls	Above Grade	Frame <sup>3</sup>	U 0.048	U 0.048	U 0.048	U 0.048	U 0.065	U 0.065	U 0.065	U 0.065	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048
			Mass Wall Interior <sup>4,5</sup>	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.059 R.17
		Below Grade	Below Grade Interior <sup>6</sup>	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.077 R.13	U 0.067 R.15
Below Grade Exterior <sup>8</sup>			U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.200 R.5.0	U 0.100 R.10	U 0.100 R.10	U 0.053 R.19	

SECTION 150.1 – PERFORMANCE AND PREScriptive COMPLIANCE APPROACHES FOR LOW-RISE RESIDENTIAL BUILDINGS

Single-family

2019 Building Energy Efficiency Standards Page 287

TABLE 150.1-A COMPONENT PACKAGE – Single Family Standard Building Design

Single Family	Climate Zone															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Also note guidance by climate zone





# Table 150.1-B: Multifamily Prescriptive Requirements

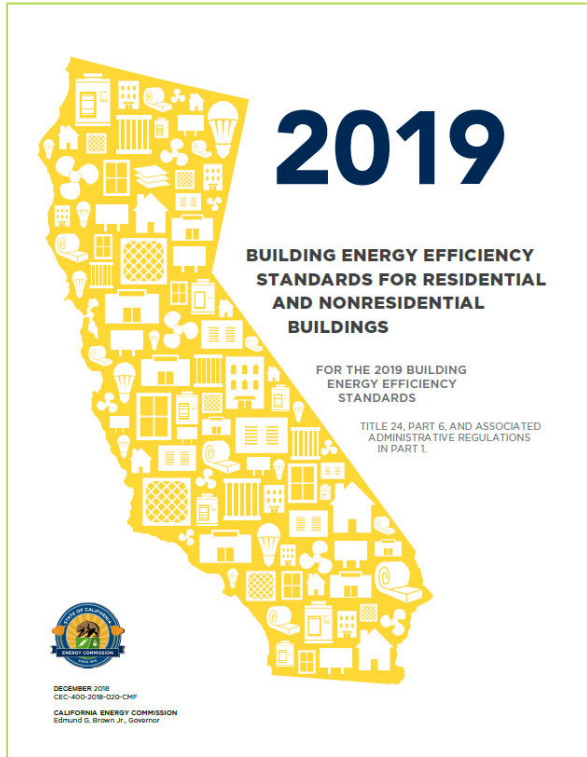


Table 150.1-B

2019 Building Energy Efficiency Standards Page 291

TABLE 150.1-B COMPONENT PACKAGE – Multifamily Standard Building Design

Multifamily		Climate Zone																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
Building Envelope Insulation		Building Envelope Insulation																		
		Roofs/Ceilings	Option B (meets §90.1(c)(9))	Below Roof Deck Insulation <sup>1,2</sup> (With Air Space)	NR	NR	R19	NR	NR	NR	R19	R19	R13	R19	R19	R19	R19	R19	R13	
				Ceiling Insulation	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Option C (meets §90.1(c)(9B))	Radiant Barrier	NR	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
				Ceiling Insulation	R38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
		Walls	Above Grade	Framed <sup>3</sup>	U 0.051	U 0.051	U 0.051	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	
				Mass Wall Interior <sup>4,5</sup>	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
				Mass Wall Exterior <sup>5</sup>	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0
			Below Grade <sup>6</sup>	Below Grade Interior	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.067 R 15
				Below Grade Exterior	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19

SECTION 150.1 – PERFORMANCE AND PREScriptive COMPLIANCE APPROACHES FOR LOW-RISE RESIDENTIAL BUILDINGS

Lists similar requirements as single-family table, but with some different values.

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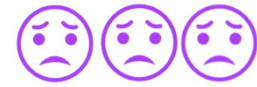
TABLE 150.1-B COMPONENT PACKAGE – Multifamily Standard Building Design

Multifamily	Climate Zone															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16





# High Performance Attics (HPA)

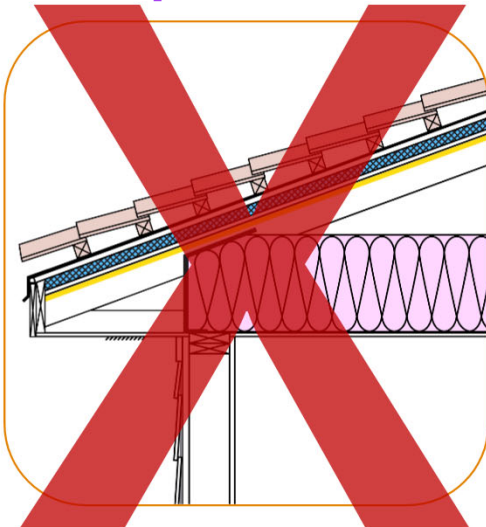


§150.1(c)1



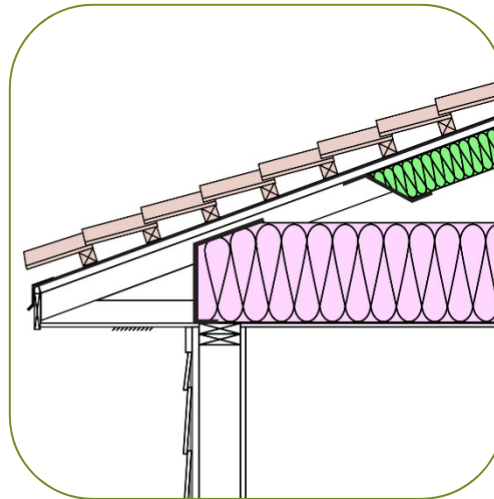
## 2019 Energy Code Allows 2 Prescriptive Options

### Option A



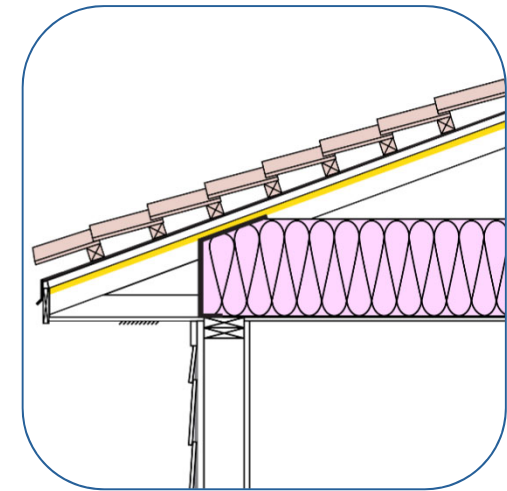
continuous insulation **at** or **above**  
roof deck  
**AND**  
ceiling insulation between  
attic and conditioned space

### Option B



insulation **below** roof deck  
(**between** framing) with roofing  
installed **with air-space** (i.e. tile)  
**AND**  
ceiling insulation between  
attic and conditioned space

### Option C



Ducts and air handler  
in conditioned space;  
**ONLY NEEDS**  
ceiling insulation between  
attic and conditioned space

**HPA Applies to Climate Zones 4, 8-16**



# HPA by Climate Zone: Single-Family (2019)



## Option B (below roof deck; air space between roofing material and roof deck)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Insulation Below-Roof Deck (with Air Space)	NR	NR	NR	<b>R-19</b>	NR	NR	NR	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>	<b>R-19</b>
Ceiling Insulation	R-38	R-38	R-30	R-38	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38
Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR

## Option C (ducts & air handler in conditioned space)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ceiling Insulation	R-38	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38
Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

### **Excerpt of Energy Code Table 150.1-A**

Updated values for 2019 appear in **bold black**

(R-13 changed to R-19)



# HPA by Climate Zone: Multifamily (2019)



## Option B (below roof deck; air space between roofing material and roof deck)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Insulation Below-Roof Deck (with Air Space)	NR	NR	NR	R-19	NR	NR	NR	R-19	R-19	R-13	R-19	R-19	R-19	R-19	R-19	R-13
Ceiling Insulation	R-38	R-38	R-30	R-38	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38
Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR

## Option C (ducts & air handler in conditioned space)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ceiling Insulation	R-38	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38
Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

### Excerpt of Energy Code Table 150.1-B

Largely mirrors 2019 single-family values for HPA, but requires R-13 for Option B, CZ 10 & 16 (in red)







# Framed Wall



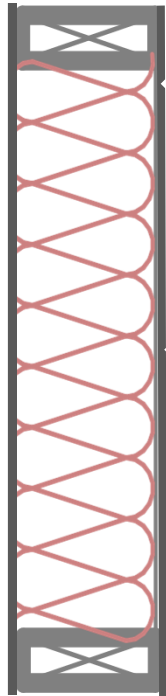
§150.0(c)



§150.1(c)1B



## Mandatory Minimum



2 x 4 = U-factor of 0.102 (R-13)

2 x 6 = U-factor of 0.071 (R-20) *(was R-19)*

## Prescriptive: CZ 6-7

U-factor: 0.065 (2 x 4 with R-15 + R-4)

## Prescriptive: All Other CZ's

Single Family: U-factor: 0.048 *(was 0.051)*

- 2 x 6 with R-21 *(was R-19)* + R-5 (1") or
- 2 x 6 with R-19 + R-7 (1-1/2") *(was 1")* or
- 2 x 4 with R-15 *(was R-13)* + R-10 (2") or
- Whatever can meet the 0.048 U-factor

Multifamily: U-factor: 0.051 *(no change)*



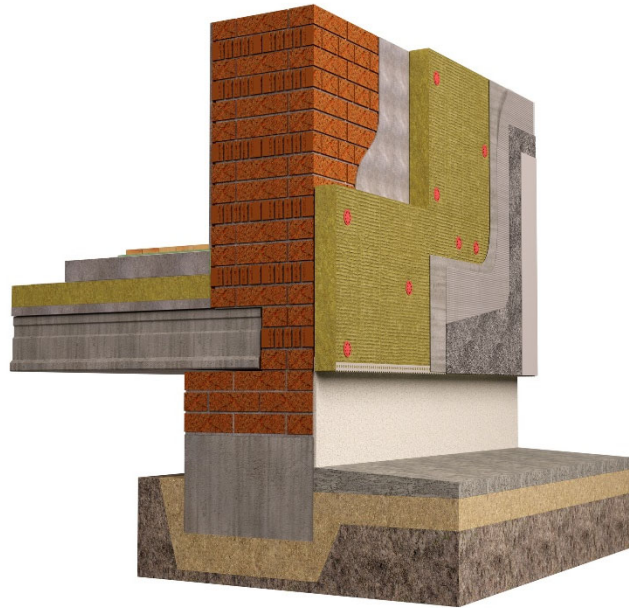
# Above Grade Mass Walls



§150.0(c)5






*(was prescriptive)*



- ★ Per Prescriptive requirements of Table 150.1-A or B, which offers two options for compliance:
  - ✧ Interior insulation:
    - CZ 1-15 U-factor = 0.077
      - R-13 Continuous insulation with no framing *(was U = 0.070)*
    - CZ 16 U = 0.059 (R-17)
  - ✧ Exterior insulation:
    - CZ1-15 U-factor = 0.125
      - R-8 Continuous insulation with no framing
    - CZ 16 U = 0.077 (R-13) *(was U = 0.070)*
- ★ Mass wall defined as a density >45 lbs/cu ft



# Fenestration & Doors

§150.1(c)3A   



- ✦ Maximum U-Factor = 0.30 (*was 0.32*)
- ✦ Maximum SHGC = 0.23 (*was 0.25*)
- ✧ No requirement in Zones 1,3,5 &16 (*CZ 16 is a new exception*)
  - Zone 16 is now treated like the other heating climate zones, not like the cooling climate zones (encourages passive design)



# Opaque Doors



§150.1(c)5



- ★ Subject to a maximum NFRC rated U-Factor requirement of 0.20 (*new*)
  - ✧ Basically an R-5 insulated door.
- ★ Same in all Climate Zones
- ★ Includes doors to outside and to unconditioned spaces
  - ✧ Does not apply to doors from house to garage.
- ★ Doors with 25% or more glass now treated as fenestration (windows). (*was 50%*)





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# HERS Measures



HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
<b>Envelope</b>			
Quality insulation installation (QII)*		X	
Building envelope sealing			X
HERS verified pre-existing conditions			X
Spray Polyurethane Foam (SPF) QII: When R-values better than default (default=open cell @ 3.6 per inch / closed cell @ 5.8 per inch)			X

**\*QII:** Projects that do not perform QII will see a **compliance penalty** in Performance results.



# Quality Insulation Installation



§150.1(c)1E



- ✦ **Quality Insulation Installation (QII)** is now a **Prescriptive requirement** for:
  - ✧ Res Low-rise New Construction **NEW**
  - ✧ Res Low-rise Additions > 700 ft<sup>2</sup>
  - ✧ Exception: Climate Zone 7 multifamily (Coastal San Diego)
- ✦ Requires HERS testing at various phases
- ✦ Will set the baseline for Standard Design under the Performance Approach
  - ✧ If not done, the chances of getting the project to comply by other measures is significantly difficult



# Example Project

## Not Including QII

- ✦ CZ 12 (Stockton)
  - ✧ **2016: -10.7%** TDV
    - *Not using a high performance wall meeting prescriptive requirements*
  - ✧ **2019: -19.7%** TDV
  
- ✦ CZ 3 (San Francisco)
  - ✧ **2016: -12.3%** TDV
  - ✧ **2019: -15.8%** TDV

## Including QII

HERS Measures

Date of Rating:

Quality Insulation Installation

- ✦ CZ 12 (Stockton)
  - ✧ **2016: +0.8%** TDV (+11.5 TDV)
  - ✧ **2019: -8.4%** TDV (+11.3 TDV)
  
- ✦ CZ 3 (San Francisco)
  - ✧ **2016: +4.9%** TDV (+17.2 TDV)
  - ✧ **2019: -4.1%** TDV (+11.7 TDV)





# HERS Rater's Involvement with QII

§150.1(c)1E



Preliminary meeting with **HERS Rater** to **review design**

1

• Building Permit

2

• Site/Foundation



**Air sealing** visually verified by **HERS Rater** **before** insulation

3

• Rough Install



**All insulation** visually verified by **HERS Rater** **before** covering

4

• Insulation Installation



5

• Finishes

Forms reviewed by **Building Inspector**

6

• Final Occupancy Permit





## QII Takeaways by Role

### Energy Consultants

- ✦ **Communication of required QII** is key
- ✦ If the builder doesn't do QII, the project will have a slim chance of complying via other measures



### Designer

- ✦ **Incorporate QII requirements** (notes and details) into the plans



### Plans Examiner

- ✦ As a best practice, ensure the QII requirement is **indicated on the plans**



### Installer

- ✦ Ensure the air sealing and insulation is **installed per QII** requirements



### HERS Rater

- ✦ Typically **at least 3 QII inspections**: air sealing, insulation behind bath enclosures/stairwells, and after insulation goes in (before drywall)



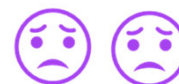
### Building Inspector

- ✦ Ensure HERS verification is completed and documented **prior to issuing a notice to proceed** for project





# Attics: Additions



§150.2(c)5



## Additions Over 700 ft<sup>2</sup>

- ★ Quality Insulation Installation (QII) is a Prescriptive requirement in 2019 Energy Code

**NEW**



	HPA Option B	HPA Option C
<b>Roof Deck Insulation</b>	<b>Below roof deck insulation applies to CZ 4, 8-16:</b> R-19 (with air space between roofing material and roof deck)	<b>None required in all CZs</b> (This approach requires ducts in conditioned space)
<b>Ceiling Insulation</b>	R-38 (CZ 1-2, 4, 8-16) R-30 (CZ 3,5-7)	R-38 (CZ 1, 11-16) R-30 (CZ 2-10)
<b>Duct Location</b>	Attic allowed	Conditioned Space

## Additions 700 ft<sup>2</sup> or Less

- ★ No QII required

- ★ Insulation:

**NEW**

- ✧ R-38 roof & ceiling insulation (CZ 1 & 11-16)

- ✧ R-30 roof & ceiling insulation (CZ 2-10)

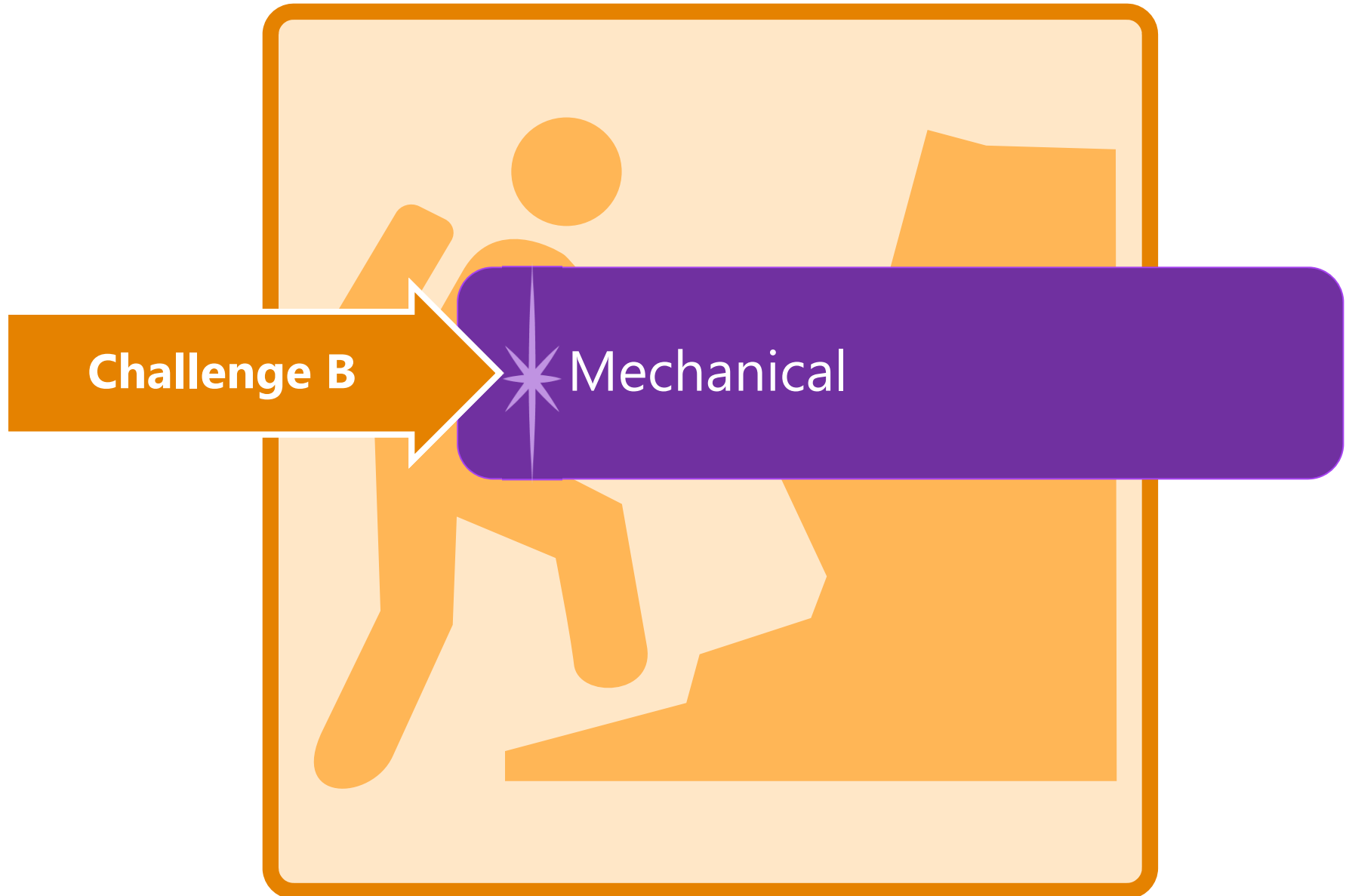
- ✧ Rafter roofs can be R-22 (exception to the Prescriptive addition roof and ceiling insulation requirement)

- ★ Radiant Barrier: Required in CZ 2-15 for vented attics



# Challenge B

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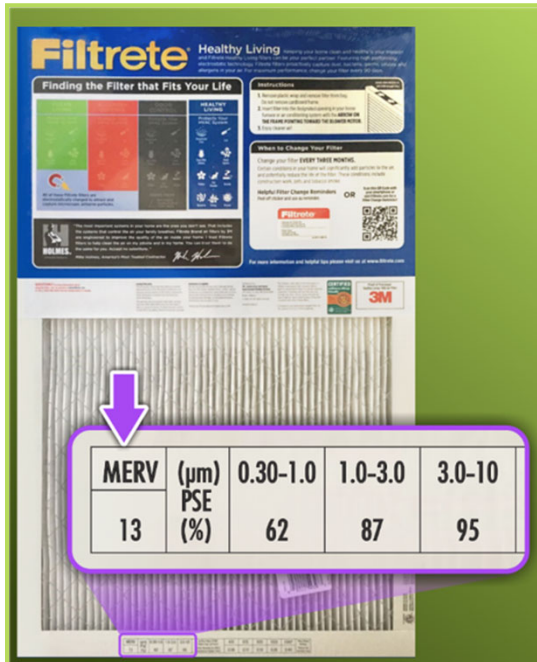






## New Construction & Alterations

- ★ **Two new exceptions** in 2019 Energy Code for R-4.2 duct insulation requirements allow the following to be uninsulated:
  - ✧ Ducts in support platforms and wall cavities
  - ✧ Ducts that are completely exposed to the conditioned space
- ★ **Minimum 2" MERV-13 Filter** 😞😞😞😞😞
  - ✧ 1" filter is allowed if sized according to Equation 150.0-A
  - ✧ Filter not required if 10 feet or less of ductwork



## Alterations 😞😞😞

- ★ HERS duct testing (6% or smoke test) to be performed for Altered system components (regardless of new duct length) when any of the following are **located in garage**:
  - ✧ Altered/New ducts
  - ✧ Air-handling unit
  - ✧ Cooling or heating coils
  - ✧ Plenums



# Single-family IAQ Fans

§150.0(o)



**Applies to**  
**Additions > 1,000 ft<sup>2</sup>**  
**AND when a new**  
**dwelling unit is added**  
**to an existing**  
**Residential building**  
**(i.e. ADU) \*NEW**

**2019 Energy Code requires use of an updated formula to determine the minimum ventilation rate:**

★ **Total Required Ventilation Rate (Equation 150.0-B)**

- ✦  **$Q_{tot} = 0.03 \times A_{floor} + 7.5 \times (N_{br} + 1)$** 
  - $Q_{tot}$  = Total required ventilation rate, cfm
  - $A_{floor}$  = Dwelling-unit floor area, ft<sup>2</sup>
  - $N_{br}$  = Number of bedrooms (not to be less than 1)

**Example:** 2,000 ft<sup>2</sup>, 3-bedroom home

- ✦ Using the 2019 formula:  
 $Q_{tot} = 0.03 \times A_{floor} + 7.5 \times (N_{br} + 1)$   
 $Q_{tot} = 0.03 \times 2,000 + 7.5 \times (3 + 1)$   
 **$Q_{tot} = 90 \text{ cfm}$**
- ✦ Using the 2016 formula, the same home requires 50 cfm

So, the 2019 rate is **almost double** that of 2016.



## Range Hoods \*NEW

§150.0(o)2B



Range hoods (single family and low-rise multifamily) must be **HERS inspected** in the field to verify **HVI certified** for:

- ✦ Minimum ventilation airflow rate per ASHRAE 62.2 (**100 cfm for typical kitchen layouts**)
- ✦ Maximum sound ratings per ASHRAE 62.2 (**3.0 sones**)

Other airflow options are provided in ASHRAE 62.2 for continuous ventilation



# Fan Performance



§150.0(m)13B



## ✦ Gas Furnace & AC:

- ✦ Fan wattage must be HERS tested on forced air system with cooling to be no more than 0.45 W/cfm. *(was 0.58 w/cfm)*

*This is possible when using furnaces dictated by Federal guidelines that goes into play July 2019 setting max. efficacy limits for residential furnace fans, otherwise known as a Fan Efficacy Rating (FER).*

- EXCEPTION: Gas furnaces allowed to meet 0.58 w/cfm if manufactured before July 3, 2019.

- ✦ Other air handlers such as heat pumps and fan coils can still be 0.58 W/cfm

- ✦ Small Duct High Velocity Forced Air Systems must test at 250 cfm per ton and no more than 0.54 W/cfm by HERS rater. *(new)*



# Domestic Hot Water (DHW)

§150.1(c)8A



- ✦ Any number of gas or propane tankless water heaters (*used to be just one*)
- ✦ If one large gas or propane water heater (>55 gallons/ $\leq$ 75,000 BTUH) is desired per dwelling unit, then: (*new*)
  - ✦ Fenestration with weighted U-Factor of 0.24 or less AND:
    - Compact hot water distribution HERS verified OR
    - A drain water heat recovery system HERS verified

OR





# Domestic Hot Water (DHW) *New*

§150.1(c)8A



- ✦ One heat pump water heater *IN GARAGE or CONDITIONED SPACE AND*
  - ✧ HERS verified Compact hot water distribution and a drain water heat recovery system OR
  - ✧ Add additional PV capacity:
    - CZ 2-15: increase PV size by 0.3 kW
    - CZ 1&16 increase PV size by 1.1 kW OR
- ✦ One Tier III NEEA rated (or higher) heat pump water heater with storage tank in garage or conditioned space:
  - ✧ If located in CZ 1&16: must increase the PV size by 0.3 kW



# Replacement Water Heaters



§150.2(b)1H



- ✦ A replacement water heater can be one of the following:
  - ✦ Natural Gas or Propane unit (tank or tankless)
  - ✦ Consumer (not commercial) Electric Resistance unit allowed if no gas is at the water heater location (*used to be "to the home"*)
  - ✦ Heat Pump in CZ 1-15 (CZ 16 not allowed) (*new*)
    - One heat pump water heater (tank located indoors) and on incompressible rigid insulated surface (R-10 or more) AND has a "communication interface" **OR**
    - One heat pump water heater (tank located indoors) NEEA Tier III rated (or higher)



# Multifamily Specific



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# Low-rise Multifamily IAQ \*NEW



§150.0(o)1E-F



2019 Energy Code allows these **three methods** for providing IAQ for low-rise multifamily dwellings using individual systems for each unit

## Exhaust Only Ventilation (Continuous)

- ✦ Creates infiltration due to negative pressure in home
- ✦ Could potentially pull in deadly carbon monoxide as well as other air contaminants

**Not great**

## Supply Only Ventilation (Continuous)

- ✦ Creates exfiltration due to positive pressure in home
- ✦ In contrast to exhaust only, at least incoming air is filtered

**Better**

## Balanced System Ventilation

- ✦ Creates neither positive nor negative pressure (no infiltration)
- ✦ Separate, balanced fans exhaust indoor air and bring in outdoor air in equal amounts

**Best**



# Low-rise Multifamily IAQ Testing



§150.0(o)1E



Exhaust Only and Supply Only Ventilation methods will require HERS blower door test

## HERS verified blower door test requires:

- ✦ No more than 0.3 cubic ft per minute at 50 Pa (0.2" water) per ft<sup>2</sup> leakage based on dwelling unit's envelope surface area
- ✦ Ventilation rates based on **Equation 150.0-B** (ASHRAE 62.2)
- ✦ HERS field verification & diagnostic testing in accordance with Reference Residential Appendix **RA3.7.4.1**





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# HERS Measures



HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
<b>Plumbing (DHW)</b>			
Pipe insulation			X
Verified design (parallel piping, compact design, point of use, <b>drain water heat recovery</b> and multifamily recirculation loop/controls)			X
<b>HVAC Ducting</b>			
Duct sealing (maximum leakage)*	X		
Duct design (reduced surface area, high insulation, and duct location)			X
Ducts in conditioned space (<12 ft outside, low leakage)			X

# HERS Measures (cont)

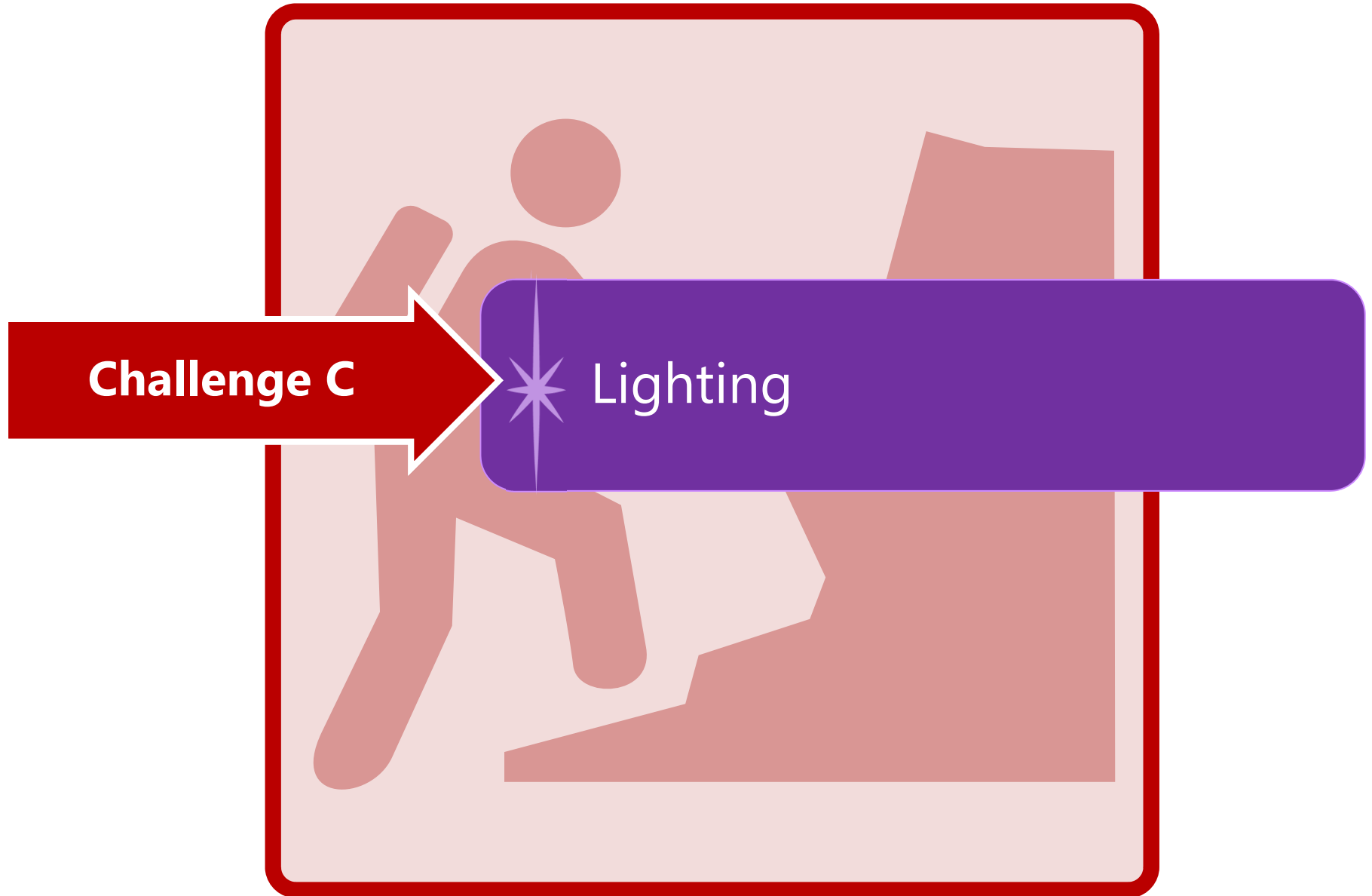


HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
<b>Mechanical</b>			
IAQ Ventilation: Whole building indoor air quality (IAQ) fan (continuous or intermittent), kitchen range hood, air filter device	X		
Ventilation Cooling: Whole house fan, central fan ventilation cooling system (CFVCS)			X
Refrigerant charge or charge indicator display		<b>CZ 2, 8-15</b>	<b>CZ 1, 3-7, 16</b>
Low leakage air handlers			X
Cooling air flow and air handler fan watt draw <b>OR</b> Verified return duct design	X		
High Efficiency Equipment: SEER, EER, HSPF			X
Rated Heat Pump Capacity ☹️☹️☹️☹️			X
Zonal control			X
Evaporatively cooled condensers			X



# Challenge C

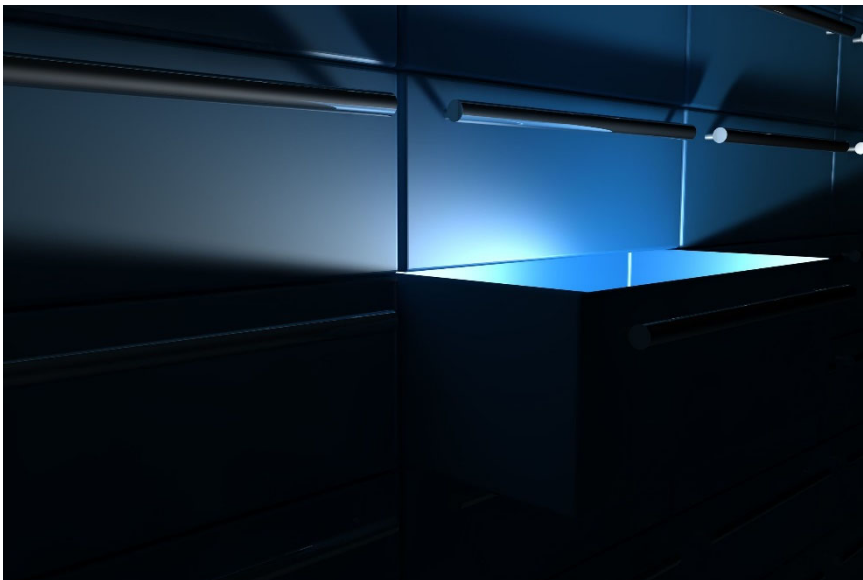
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# Luminaire Requirements

§150.0(k)



- ★ Night Lights, Step Lights and Path Lights require a **vacancy sensor and be JA8 certified** if >5 watts or >150 lumens *(new)*
- ★ Light sources internal to drawers, cabinetry or linen closets require a **vacancy sensor and be JA8 certified** if >5 watts or >150 lumens unless they are equipped with controls that automatically turn the lighting off when closed. *(new)*





# Controls

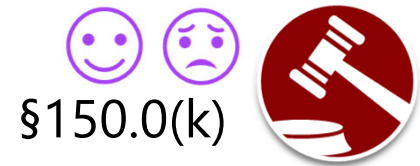
§150.0(k)



- ✦ Bathrooms, Garages, Laundry Rooms & Utility Rooms:
  - ✧ At least one luminaire controlled by either:
    - A Vacancy Sensor OR
    - An Occupancy Sensor (must be configured in Vacancy Sensor mode for final inspection) *(new)*



# JA8-2019 Specification



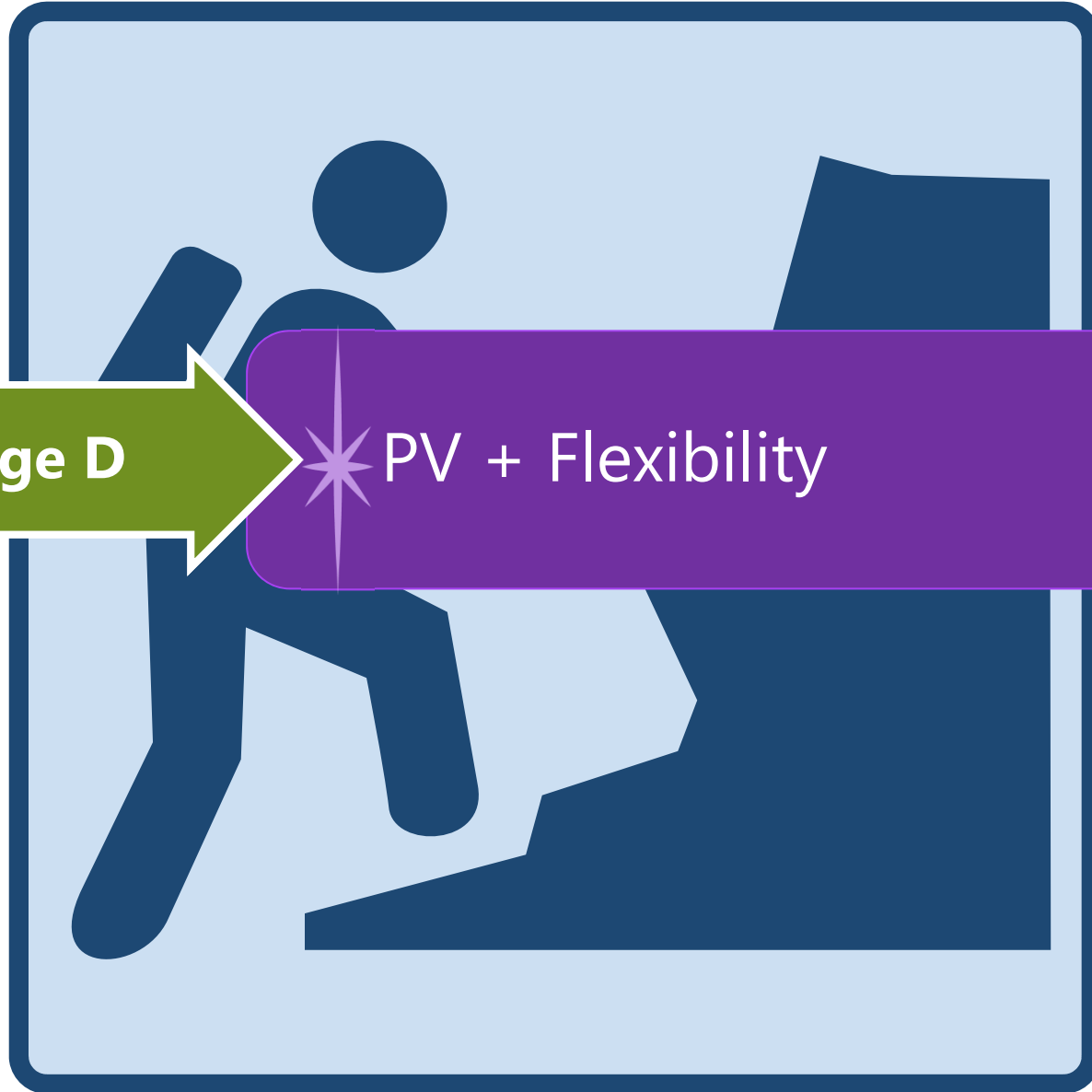
Metric	Performance Requirements
Efficacy	≥45 lpw (when tested at full light output)
Power Factor	≥0.9 (when tested at full light output)
Start Time	≤ 0.5 seconds
CCT	≤4000K for all light sources All other sources (e.g. lamps with base types commonly used by incandescent products) must be capable of providing a CCT ≤3000K
CRI	≥90 for all products other than Title 20 lamps (Note: for color-changing products, this measurement must be taken when operating at a compliant CCT value.) ≥82 for Title 20 lamps
Duv	Within 0.0033 of the black body locus (this is approximately 4 MacAdam steps) (Note: for color changing products, this measurement must be taken when operating at a compliant CCT value)
R9	≥50 for all products other than Title 20 lamps (Note: for color-changing products, this measurement must be taken when operating at a compliant CCT value)
Lumen Maintenance	Corresponds to an L70 of 15,000 (≥86.7% maintenance after 6,000 hours or 93.1 percent if reporting interim data)
Rated Life	≥10,000 hours
Early Failure	≥90% of units operational 6,000 hour test
Dimmability	Must be dimmable down to 10% of full light output. Forward phase cut LEDs must meet NEMA SSL7A.
Flicker	<30%, at frequencies <200 Hz at 20% light output; per Joint Appendix JA10
Audible Noise	≤24 dBA at 1 meter, tested at full light output and 20% light output

**JA8-2016**  
**will also be allowed**



# Challenge D

---



**Challenge D**

**PV + Flexibility**



# High-Level View of Solar Topics in 2019

## Solar Photovoltaic §150.1(c)14

### ◆ **Prescriptive Requirement** in 2019 \*NEW



- ◆ 2016 Solar PV credit is eliminated
- ◆ PV system sizing based on conditioned floor area (CFA), number of dwellings, & climate zone
- ◆ Has exceptions (only 1 eliminates the requirement; the rest reduce sizing)
- ◆ Applies to Low-rise Res New Construction

## Community Solar §10-115

### ◆ **Prescriptive & Performance Option** in 2019 \*NEW

- ◆ Stringent reqs & Energy Commission approval
- ◆ Allows common shared solar PV and/or battery storage, but must directly benefit building
- ◆ Suffices the Residential solar PV requirements





# Community Shared Solar PV and/or Battery Storage Systems

**NEW**  
§10-115



- ✦ Allows a common shared solar and/or battery system to be used to offset solar requirements from **§150.1(b)1**.
- ✦ Requires approval from the California Energy Commission

## Requirements:

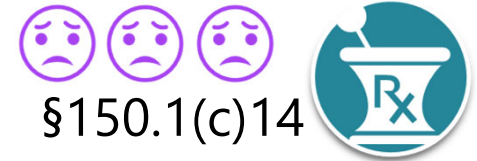
- ✦ Must be **operational before final permit** signed off on building
- ✦ Must provide **equivalent or better** performance than what is specified for building
- ✦ Must provide benefit to the building for **20 years** minimum
- ✦ **Cannot transfer benefit** to another building







# Solar Photovoltaic (PV)



§150.1(c)14

**Table 150.1-C: CFA & Dwelling Adjustment Factors**

Climate Zone	A: CFA	B: Dwelling Units
1	0.793	1.27
2	0.621	1.22
3	0.628	1.12
4	0.586	1.21
5	0.585	1.06
6	0.594	1.23
7	0.572	1.15
8	0.586	1.37
9	0.631	1.36
10	0.627	1.41
11	0.836	1.44
12	0.613	1.40
13	0.894	1.51
14	0.741	1.26
15	1.56	1.47
16	0.59	1.22

★ A PV system is now **Prescriptively required** for all single-family and low-rise multifamily buildings.

★ Systems must meet:

- ✧ Minimum qualification requirements as specified in **Reference Joint Appendix JA11**
- ✧ Annual electrical output  $\geq$  the dwelling's annual electrical usage as determined by **Equation 150.1-C:**

$$kW_{PV} = \frac{CFA \times A}{1000} + (ND_{well} \times B)$$

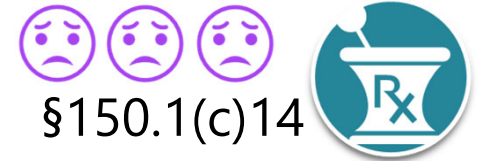
**Where:**  $kW_{PV}$  = kWdc size of the PV system  
 CFA = Conditioned floor area  
 NDwell = Number of dwelling units  
 A = Adjustment factor from **Table 150.1-C**  
 B = Dwelling adjustment factor from **Table 150.1-C**

### Examples:

- ✧ 2,000 ft<sup>2</sup> home in LA (CZ 9) → 2.62 kW system
- ✧ 30-unit 21,000 ft<sup>2</sup> apartment building (not including common areas) in Oakland (CZ 3) → 46.8 kW system



# PV Triggers



§150.1(c)14



*For single-family homes, the PV system must be installed before final inspection.*



## ✦ When effective annual solar access >70%:

$$\text{Solar Access} = \frac{\text{Solar Insolation Including Shading}}{\text{Solar Insolation without Shading}}$$

## ✦ Solar access must be verified:

- *Installer* to demonstrate shading condition compliance of installed PV via CF2R using either:
  - Solar Assessment Tool approved by the Energy Commission (and used per the manufacturer's instructions)
    - i.e. An Aerial satellite, drone or digital image.
    - No tools have been approved as of July 2019.



# 2019 PV Exceptions


§150.1(c)14



**This is the only exception that removes Solar PV requirement; all others simply reduce PV sizing**

If roof facing between E (90) and WNW (300)\* gets >70% Sun

**#1:** If that area(s) is <80 ft<sup>2</sup> of contiguous area then:

 No PV Required and use Solar Ready requirements

If the area(s) are ≥80 ft<sup>2</sup> then:


**#2: Building in CZ 15**  
PV = Min. 1.5 W/ft<sup>2</sup> of conditioned floor area

**#3: 2 habitable stories**  
PV = Min. 1 W/ft<sup>2</sup> of conditioned floor area

**#4: 3 habitable stories**  
PV = Min. 0.8 W/ft<sup>2</sup> of conditioned floor area

**#5**  
Planning Approval prior to 1/1/2020, when Solar Ready area between 80-200 ft<sup>2</sup>, then:

Smaller of either required PV (per **Table 150.1-C**) or effective annual solar access

 **#6**  
If building installing battery min. capacity of 7.5 kWh then:

PV from Equation 150.1-C can be reduced by 25%



\*If not within this orientation, Performance Approach to be used based on actual orientation. If CA Flexible Installation (CFI) used in Performance Approach, additional requirements apply.





# Next Steps



HELPING YOU PLAY YOUR CARDS RIGHT






# Compliance Software

## 2019 Performance Software

Residential Buildings, 2019 Standards			
Program Name	Approved versions usable for permit	Contact Information	Additional Information
CBECC-Res	<p>CBECC-Res 2019.1.0 was approved 5/15/2019 for demonstrating performance compliance with the residential provisions of the 2019 California Building Energy Efficiency Standards (effective date 1/1/20). Permit applications made on or after January 1, 2020 must use CBECC-Res 2019.1.0. <a href="#">Download CBECC-Res 2019.1.0 setup (.exe file)</a>.</p> <p>Please review the resolutions for details of the public domain Compliance Software and associated Compliance Manager (CM).</p> <p><a href="#">All CBECC-Res 2019 resolutions can be found here</a></p>	<p>California Energy Commission Building Standards Office 1516 9th Street, MS 37 Sacramento, CA 95814 ATTN: Dee Anne Ross 916-654-6560 <a href="mailto:deeanne.ross@energy.ca.gov">deeanne.ross@energy.ca.gov</a></p>	<p><a href="#">Quick Start Guide</a></p> <p><a href="#">What's New and Different</a></p> <p><a href="#">FAQs</a></p> <p><a href="#">User Manual</a></p> <p>See the <a href="#">CBECC-Res Website</a> for:</p> <ul style="list-style-type: none"><li>» <a href="#">Software Archive</a></li><li>» <a href="#">ACM Tests</a></li><li>» <a href="#">Reference Documents</a></li></ul> <p>Support: <a href="mailto:cbec.res@energy.ca.gov">cbec.res@energy.ca.gov</a></p>




*Software updated every 6 months, and October 2019 is the next time we may see an update, and maybe approval for Energy Pro.*

## 2019 Overview of Low-Rise Residential

Application	Building Feature	Brief Description	Code §	 1	 2	 3
<b>Performance Method</b>	<b>EDR Score</b>	New compliance metric for new single-family homes, new low-rise townhomes & multifamily buildings. Building efficiency must show compliance with no tradeoffs from PV systems	150.1(b)1			<b>X</b>
<b>PV + Flexibility</b>	<b>PV</b>	New single-family homes, new low-rise townhomes & multifamily buildings to meet PV kW requirements of Table 150.1-C (exceptions may apply)	150.1(c)14		<b>X</b>	<b>X</b>
	<b>Battery</b>	Can be used to reduce PV kW or trade with building efficiency features, depending on kWh size, for new single-family homes, new low-rise townhomes & multifamily buildings	150.1(c)14		<b>X</b>	<b>X</b>
<b>Envelope</b>	<b>Prescriptive Tables</b>	There is a separate table for single family versus low-rise multifamily	150.1		<b>X</b>	
	<b>Roof</b>	Above roof deck insulation option removed as prescriptive feature (can still use with performance approach). Below roof deck insulation R-value increased to R-19 and associated with roofing material installed with air gap (i.e. tile roofing) for prescriptive compliance (all other must use performance approach)	150.1(c)1		<b>X</b>	
	<b>Roof: Additions</b>	Roof insulation R-value increased to R-30 CZ 2-10, and R-38 in CZ 1&11-16	150.2(c)5		<b>X</b>	
	<b>Walls</b>	Framed: Mandatory min. for 2 x 6 walls increased to R-20	150.0(c)	<b>X</b>		
		Framed: Prescriptive U-factor for single family CZ 1-5, 8-16 reduced to 0.048	150.1(c)1B		<b>X</b>	
		Above Grade Mass: Mandatory U-factor based on prescriptive measures	150.0(c)5	<b>X</b>		
	<b>Walls: Additions</b>	Extended 2 x 6 framed walls increased to R-21	150.0(c)5		<b>X</b>	
	<b>Fenestration</b>	Prescriptive U-factor reduced to 0.30 and SHGC reduced to 0.23 for CZ 2,4,6-15	150.1(c)3A		<b>X</b>	
		Door considered fenestration (using rough opening) when ≥25% glass	150.1(c)5	<b>X</b>		
	<b>Solid Doors</b>	NFRC rated U-factor of 0.20 or less except for door in home to the garage	150.1(c)5		<b>X</b>	
<b>Quality Insulation Installation (QII)</b>	HERS verification now a prescriptive requirement for new single-family homes, low-rise multifamily, and additions >700 ft² (multifamily in CZ 7 exempt)	150.1(c)1E		<b>X</b>		
<b>Mechanical</b>	<b>Filter</b>	MERV-13 2" (exceptions allowed for 1" meeting Equation 150.0-A) for new ducted (>10 ft² of ducting) systems or complete replacement (indoor, outdoor ducting) systems verified by HERS rater	150.0(m)	<b>X</b>		
	<b>IAQ Ventilation Rate</b>	Increased CFM requirements per Equation 150.0-B	150.0(o)	<b>X</b>		
	<b>ADU IAQ requirement</b>	All new accessory dwelling units must meet IAQ requirements including HERS verification	150.0(o)	<b>X</b>		
	<b>Gas FAU + AC</b>	HERS verification reduced to 0.45 W/CFM for gas furnaces manufactured as of July 3, 2019 for system including AC	150.0(m)13	<b>X</b>		



## 2019 Overview of Low-Rise Residential

Application	Building Feature	Brief Description	Code §	 1	 2	 3	
<b>Mechanical (cont.)</b>	<b>Small Duct High Velocity Forced Air Systems</b>	Reduced HERS airflow verification requirements at 250 CFM per ton and 0.54 W/CFM	150.0(m)13	<b>X</b>			
	<b>Kitchen Range Hood</b>	HVI certification required for 100 CFM airflow and 3.0 sone sound rating verified by HERS rater	150.0(o)2B	<b>X</b>			
	<b>Whole House Fan</b>	Now verified by HERS rater	Table RA2.1	<b>X</b>			
	<b>Heat Pumps</b>	HSPF and rated heat pump heating capacity to be verified by HERS rater	Table RA2.1			<b>X</b>	
	<b>Multifamily IAQ</b>	Balanced ventilation, or continuous supply or exhaust ventilation which will require HERS blower door compartmentalized testing of envelope infiltration rate	150.0(o)1E	<b>X</b>			
	<b>Alterations: HERS Duct Testing</b>	New 6% leakage requirement for HVAC alterations that include HVAC features located in the garage	150.2(b)1D 150.2(b)1E	<b>X</b>			
<b>Domestic Hot Water (DHW)</b>	<b># of Gas Tankless Systems</b>	No limit on # of units	150.1(c)8A		<b>X</b>		
	<b>Gas Tank Systems</b>	One ≤75,000 BTUH allowed in addition to fenestration improvement and HERS verified DHW design measure(s)	150.1(c)8A		<b>X</b>		
	<b>Heat Pump Tank System</b>	One NEEA 3 system allowed in garage or conditioned space in CZ 2-15. Other requirements required for CZ 1 & 16 and for non NEEA 3 systems.	150.1(c)8A		<b>X</b>		
	<b>Drain Water Heat Recovery</b>	If utilized, HERS verification required	Table RA2.1		<b>X</b>	<b>X</b>	
	<b>Alterations</b>		New allowance for heat pump DHW in CZ 1-15	150.2(b)1H		<b>X</b>	
			New allowance for electric resistance tank DHW when natural gas not available at DHW location.	120.2(b)1H		<b>X</b>	
<b>Lighting</b>	<b>Night, Step &amp; Path Lights</b>	Be JA8 certified, and be controlled with vacancy sensor, if over 5 watts or 150 lumens	150.0(k)	<b>X</b>			
	<b>Drawer, Cabinet &amp; Linen Closet Lighting</b>	Be JA8 certified, and be controlled with vacancy sensor, if over 5 watts or 150 lumens. Automatic shut-off controls required.	150.0(k)	<b>X</b>			
	<b>Occupancy Sensors</b>	Now allowed if they are programmed to function like vacancy sensor for final inspection	150.0(k)	<b>X</b>			
	<b>JA8</b>	JA8-2019 or JA8-2016 will be allowed to be installed to meet JA8 requirements	150.0(k)	<b>X</b>			

1. Mandatory: Cannot be traded away
2. Prescriptive: Sets baseline for performance & prescriptive approach
3. Performance: Allows for greater flexibility in performance approach

This fact sheet is intended to help industry professionals understand changes made to the 2016 Title 24, Part 6 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2019 Energy Code for the low-rise residential building occupancy type. It is presented in tabular form and divided by building feature (e.g., envelope and lighting). Each building feature section includes explanatory notes on all applicable Title 24, Part 6 sections, but not the actual language of the 2019 Energy Code. Notes on Title 24, Part 1 sections are also included, as applicable. The left-hand column serves to note the Title 24 sub-sections and to highlight related key comments.

There is a similar [Energy Code Ace fact sheet](#) covering changes for the nonresidential, high-rise residential and hotel/motel occupancy type.

### Legend

Background colors are used to indicate the degree of change to the 2016 Energy Code.

No Change or Minor Change for 2019 - "Minor Changes" are considered non-substantive changes to code language and typically no further clarification is provided.

Revised for 2019

New for 2019

### Key Definitions

1. **Multifamily:** Occupancies R-1 and R-2 (R-3 includes single family, duplexes and townhomes 3-habitable stories or less above grade, and is subject to the single-family requirements of the Energy Code):
  - a. Multifamily buildings 3-habitable stories or less above grade are addressed in the **residential** requirements of the Energy Code (§§150.0, 150.1, 150.2)
  - b. Multifamily buildings 4-habitable stories or more above grade are addressed in the **nonresidential** requirements of the Energy Code (§§130-141)

## For More Information

### California Energy Commission Information & Services

- 2019 Title 24, Part 6 Document (December 2018):  
[www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf](http://www.energy.ca.gov/2018publications/CEC-400-2018-020/CEC-400-2018-020-CMF.pdf)
- Draft 2019 Energy Code - October 4 & 5, 2017: Staff Workshop on the Draft 2019 Building Energy Standards ("marked up" for easier viewing of changes):  
[www.energy.ca.gov/title24/2019standards/prerulemaking/documents/2017-10-0405\\_workshop/2017-10-0405\\_documents.php](http://www.energy.ca.gov/title24/2019standards/prerulemaking/documents/2017-10-0405_workshop/2017-10-0405_documents.php)
- Energy Code Hotline: 1-800-772-3300 (Free) or [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)
- Online Resource Center:  
[energy.ca.gov/title24/orc/](http://energy.ca.gov/title24/orc/)
  - The Energy Commission's main web portal for Energy Code, including information, documents and historical information

### Energy Code Ace Information & Services





- Reference Ace™ – Easily navigate Title 24, Part 6 documents using search and hyperlinks
  - [2019 Energy Code](#)
  - [2016 Energy Code](#)
- Training
  - [Title 24: Where We're Headed with the 2019 Standards](#)
  - [2019 Title 24, Part 6: Where We're Headed With the Residential Standards](#)
- Energy Code Ace Tools, Training and Resources Updated for the 2019 Code - Coming Soon! Register with [EnergyCodeAce.com](http://EnergyCodeAce.com) and select a role in My Profile to receive emails when they are published!

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# MECHANICAL – SINGLE FAMILY

Color background indicates:  NO CHANGE/MINOR CHANGE  REVISED  NEW FOR 2019

Building Application	 <b>Mandatory</b>		 <b>Prescriptive</b>	 <b>Performance</b>	 <b>Additions Alterations</b>
	All Occupancy Subchapters 1-2, 4 (§§100.0-110.11)	Residential Occupancy Subchapter 7 (§150.0)	Subchapter 8 (§150.1)	Subchapter 8 (§150.1)	Subchapter 9 (§150.2)
General	§§100.0, 100.1-2, 110.0 110.1	§150.0			
HVAC (conditioned)	§§110.2, 110.5	§§150.0(h)-(j), 150.0(m), 150.0(o)	§§150.1(a), 150.1(c)	§§150.1(a), 150.1(b)	§§150.2(a), 150.2(b)
Water Heating	§110.3	§§150.0(j), 150.0(n)			
Pool & Spa Systems	§110.4	§150.0(p)	N/A	N/A	§§150.2(a), 150.2(b)

**T24 Section & Notes**



**Mandatory – Change Summaries**

**Title 24, Part 1, Section 10-106 – LOCALLY ADOPTED ENERGY STANDARDS**

10-106	Clarification that cost-effectiveness studies submitted as part of applications from public agencies for the adoption of local energy codes must first be made available for public review within the jurisdiction of the public entity, then the Energy Commission must confirm that the cost-effectiveness study demonstrates that the proposed new local code will use less energy than what is permitted by Title 24, Part 6. Only then may it be filed with the Energy Commission.
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**Title 24, Part 6, Section 100.0 – SCOPE**

100.0(a)	Redundant language removed to simplify the description of buildings regulated by Title 24, Part 6. The definition of “conditioned space” already uses the terms mechanical cooling, mechanical heating and wood heating (the form of non-mechanical heating).
100.0(h)	Clarification that if manufactured equipment, a product or a device is NOT specified in Title 24, Part 6, it will be found in Title 20, Sections 1601-1609.

**Title 24, Part 6, Section 100.1 – DEFINITIONS**

Updates to various references to resources and standards other than the Energy Code (e.g., revisions to list newer applicable versions or editions).

**ENERGY BUDGET** is the maximum energy consumption, based on Time Dependent Valuation (TDV) energy, that a proposed building, or portion of a building, can be designed to consume, calculated using Commission-approved compliance software as specified by the Alternative Calculation Method Approval Manual. The Energy Budget for newly constructed, low-rise residential buildings is expressed in terms of the Energy Design Rating.

**ENERGY DESIGN RATING (EDR)** is a way to express the energy consumption of a building as a rating score index where a score of 100 represents the energy consumption of the building built to the specifications of the Residential Energy Services (RESNET) reference home characterization of the 2006 International Energy Conservation Code (IECC) with Title 24, Part 6 modeling assumptions, and a score of 0 (zero) represents a building that has zero net energy consumption. The EDR is calculated using Commission-approved compliance software as specified by the Alternative Calculation Method Approval Manual.

**ENERGY DESIGN RATING, ENERGY EFFICIENCY** is an Energy Design Rating based on the TDV energy consumption of a building that results from the building's energy efficiency characteristics, calculated using Commission-approved compliance software as specified by the Alternative Calculation Methods Approval Manual.

**ENERGY DESIGN RATING, SOLAR ELECTRIC GENERATION AND DEMAND FLEXIBILITY** is the reduction in TDV energy consumption of a building expressed in terms of an Energy Design Rating reduction that results from the combination of the building's solar electric generation system and demand flexibility measures.

**ENERGY DESIGN RATING, TOTAL** is the total Energy Design Rating for the building that is determined by subtracting the Solar Electric Generation System and Demand Flexibility Energy Design Rating from the Energy Efficiency Energy Design Rating.


**HABITABLE SPACE** is space in a building for living, sleeping, eating or cooking, excluding bathrooms, toilets, hallways, storage areas, closets, or utility rooms and similar areas. (See also OCCUPIABLE SPACE.)

	<b>HABITABLE STORY</b> is a story that contains habitable space and that has at least 50% of its volume above grade.
Revised to clarify source energy and how that applies to Energy Code triggers.	<b>MECHANICAL COOLING</b> is lowering the temperature within a space using refrigerant compressors or absorbers, desiccant dehumidifiers, or other systems that require energy to directly condition the space (language regarding energy from depletable sources has been removed). In nonresidential, high-rise residential, and hotel/motel buildings, cooling of a space by direct or indirect evaporation of water alone is not considered mechanical cooling. <b>MECHANICAL HEATING</b> is raising the temperature within a space using electric resistance heaters, fossil fuel burners, heat pumps, or other systems that require energy to directly condition the space. (Language regarding energy from depletable sources has been removed.)
	<b>NATURAL GAS AVAILABILITY:</b> For newly constructed buildings, natural gas is available if a gas service line can be connected to the site without a gas main extension. For addition and alteration, natural gas is available if a gas service line is connected to the existing building.
Definition for multifamily ventilation changes.	<b>VENTILATION SYSTEM, BALANCED</b> is a mechanical device intended to remove air from buildings, and simultaneously replace it with outdoor air. <b>VENTILATION SYSTEM, CENTRAL FAN INTEGRATED (CFI)</b> is a central fan forced air space conditioning system is also designed to bring outdoor air into buildings, causing indoor air to flow out of the building through ventilation relief outlets or normal leakage paths through the building envelope. <b>VENTILATION SYSTEM, ENERGY RECOVERY (ERV)</b> is a mechanical device intended to remove air from buildings, simultaneously replace it with outdoor air and, in the process, transfer heat from the warmer to the colder of the simultaneous airflows, and transfer moisture from the most humid to least humid of the simultaneous airflows. <b>VENTILATION SYSTEM, EXHAUST</b> is a mechanical device intended to remove air from buildings, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope. <b>VENTILATION SYSTEM, HEAT RECOVERY (HRV)</b> is a mechanical device intended to remove air from buildings, simultaneously replace it with outdoor air and, in the process, transfer heat from the warmer to the colder of the simultaneous airflows. <b>VENTILATION SYSTEM, SUPPLY</b> is a mechanical device intended to bring outdoor air into buildings, causing indoor air to flow out of the building through ventilation relief outlets or normal leakage paths through the building envelope.
<b>Title 24, Part 6, Section 110.2 – SPACE CONDITIONING EQUIPMENT</b>	
Revised efficiency requirements for some Mechanical equipment covered by Title 24, Part 6.	Tables 110.2 A-D: Minor Changes.
	Table 110.2-E: Revised Efficiencies.
	Table 110.2-F: Minor Changes.
	Table 110.2-G: Revised Efficiencies.
	Table 110.2-H: Revised Efficiencies.
	Table 110.2-I: Revised Efficiencies.
	Table 110.2-J: Minor Changes. Table 110.2-K: Minor Changes.
<b>Title 24, Part 6, Section 110.3 – SERVICE WATER-HEATING SYSTEMS AND EQUIPMENT</b>	
	No changes affecting residential occupancies.
<b>Title 24, Part 6, Section 110.4 – POOL AND SPA SYSTEMS AND EQUIPMENT</b>	
	No Change.
<b>Title 24, Part 6, Section 110.5 – NATURAL GAS CENTRAL FURNACES, COOKING EQUIPMENT, AND POOL SPA HEATERS, AND FIREPLACES</b>	
	Pilot Lights Prohibited: Indoor and outdoor fireplaces have been added.
<b>Title 24, Part 6, Section 150.0 – LOW-RISE RESIDENTIAL BUILDINGS – MANDATORY FEATURES AND DEVICES</b>	
150.0(e)	<b>Installation of Fireplaces, Decorative Gas Appliances and Gas Logs:</b> Added language referencing Section 110.5 and Title 24, Part 11, Section 4.503. EXCEPTION allowing for continuous pilot lights in any situation removed.
150.0(h)	<b>Space-Conditioning Equipment:</b> No Change.
150.0(i)	<b>Thermostats:</b> Clarifies that all heating and cooling systems not controlled by a central energy management control system must have a setback thermostat.

150.0(j)	<p><b>Insulation for Piping and Tanks</b></p> <p>1. <b>Storage Tank Insulation:</b> No Change.</p>
Aligning with CA Plumbing Code Section 609.11, with some differences.	<p>2. <b>Water Piping, Solar Water-heating System Piping, and Space Conditioning System Line Insulation Thickness and Conductivity:</b></p> <p>A. Pipe insulation to follow CA plumbing Code Section 609.11.</p>
	<p><b>2016 CA Plumbing Code:</b></p> <p><i>Section 609.11 Pipe Insulation: Insulation of domestic hot water piping shall be in accordance with Section 609.11.1 and Section 609.11.2.</i></p> <p><i>Section 609.11.1 Insulation Requirements: Domestic hot water piping shall be insulated.</i></p> <p><i>Section 609.11.2 Pipe Insulation Wall Thickness: Hot water pipe insulation shall have a minimum wall thickness of not less than the diameter of the pipe for a pipe up to 2 inches (50 mm) in diameter. Insulation wall thickness shall be not less than 2 inches (51 mm) for a pipe of 2 inches (50 mm) or more in diameter.</i></p> <p><b>EXCEPTIONS:</b></p> <p>(1) Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration.</p> <p>(2) Hot water piping between the fixture control valve or supply stop and the fixture or appliance shall not be required to be insulated.</p>
	<p>Except min. insulation thickness to be 1" or min. insulation R-value of 7.7 for the following:</p> <ul style="list-style-type: none"> <li>i. The first 5' (1.5 meters) of hot water and cold water pipes from the storage tank.</li> <li>ii. All hot water piping with a nominal diameter <math>\geq 3/4"</math> (19 millimeter) and <math>&lt; 1"</math>.</li> <li>iii. All hot water piping with a nominal diameter <math>&lt; 3/4"</math> that is: <ul style="list-style-type: none"> <li>a. Associated with a domestic hot water recirculation system;</li> <li>b. From the heating source to the kitchen fixtures;</li> <li>c. From the heating source to a storage tank or between storage tanks; or</li> <li>d. Buried below grade.</li> </ul> </li> </ul> <p>B. Pipe for space conditioning systems, solar water-heating system collector loop, and distribution piping for steam and hydronic heating system, shall meet the requirements of Section 120.3(c).</p> <p>EXCEPTION 4 revised so that piping surrounded by min. 1" of wall insulation, 2" crawlspace insulation and/or 4" attic insulation is exempt.</p> <p>C. Insulation Protection: Must meet the requirements of Section 120.3(b).</p>
150.0(m)	<p><b>Air-Distribution and Ventilation System Ducts, Plenums and Fans</b></p> <p>1. <b>CMC Compliance</b></p> <p>Two new EXCEPTIONS to duct insulation.</p> <ul style="list-style-type: none"> <li>A. Visually confirmed to be in wall cavities that are in conditioned space (within the thermal envelope) and visually confirmed that when those ducts transition to unconditioned space, the transition is to be air-sealed and insulated with R-6.</li> <li>B. When ducts are exposed in directly conditioned space.</li> </ul>
	<p>2-9. No Change.</p>
	<p>10. <b>Porous Inner Core Flex Duct:</b> Must have a non-porous layer or air barrier between the inner core and outer vapor barrier.</p>
	<p>11. <b>Duct System Sealing and Leakage Testing:</b> No Change.</p>
Changes to air filtration requirements.  These are very similar to the nonresidential ventilation requirements.	<p>12. <b>Air Filtration</b></p> <p>Evaporative coolers are exempt.</p> <p>A. Air Filters are required when:</p> <p>Mechanical space conditioning systems that use forced air ducts to supply air to an occupiable space through ductwork exceeding 10' (3 meters) in length: Must comply with the requirements of Sections 150.0(m)12B-E.</p> <ul style="list-style-type: none"> <li>• Mechanical supply-only ventilation systems that provide outside air to an occupiable space: Must comply with the requirements of Sections 150.0(m)12B-D.</li> <li>• The supply side of mechanical balanced ventilation systems that provide outside air to an occupiable space: Must comply with the requirements of Sections 150.0(m)12B-D.</li> <li>• EXCEPTION: Heat recovery ventilation system and energy recovery ventilation system filter location may be downstream of thermal conditioned system IF ancillary filtration is located upstream.</li> </ul>

	<p>B. <b>System Design and Installation</b></p> <ul style="list-style-type: none"> <li>i. All outdoor and recirculated air must be filtered before passing through thermal conditioning unit. EXCEPTION for heat recovery and energy recovery ventilators.</li> <li>ii. System designed to meet pressure drop requirements.</li> <li>iii. Filter must be readily accessible to system owner.</li> <li>iv. Filters must have clearly visible permanent labels stating design airflow rate and max. clean-filter pressure drop.</li> </ul> <p>C. <b>Air Filter Efficiency:</b> MERV 13.</p>
<p>EQUATION 150.0-A</p> $A_{face} = Q_{filter} / V_{face}$	<p>D. <b>Air Filter Pressure Drop:</b> Design must accommodate clean-filter pressure drop with design airflow rate determined with filters meeting either:</p> <ul style="list-style-type: none"> <li>i. Nominal 2" filter OR</li> <li>ii. Nominal 1" if sized according to Equation 150.0-A (max. face velocity of 150 ft/min clean-filter pressure drop per max. 25 PA (0.1" water) OR</li> <li>iii. If a supply-only ventilation system, max. clean-filter pressure drop determined by system design.</li> </ul>
	<p>iv. Systems including cooling using EXCEPTION 1 Sections 150.0(m)13B and D for single zone central and small duct high velocity forced air systems using Table 150.0-B or 150.0-C (return duct sizing): Clean-filter pressure drop must meet applicable requirements in those tables.</p> <p>E. <b>Air Filter Product Labeling:</b> Labels provided by manufacturer must include efficiency and pressure drop ratings for space conditioning systems.</p>
	<p>13. <b>Space Conditioning System Airflow Rate and Fan Efficacy</b></p> <p>A. <b>Static Pressure Probe:</b> No Change.</p>
	<p>B. <b>Single Zone Central Forced Air Systems:</b> HERS-verified air-handler fan efficacy changing from 0.58 W/CFM to 0.45 W/CFM for gas furnace AHUs.</p>
<p>New fan efficiency requirements for gas furnaces manufactured as of July 3, 2019.</p>	<p>This aligns with Federal guidelines that become effective July 2019. U.S. DOE issued a final ruling under 10 CFR Parts 429 and 430 setting max. efficacy limits for residential furnace fans, otherwise known as a Fan Efficacy Rating (FER). Compliance with the DOE standard is required after July 3, 2019. A review of discussion in the Federal Register covering this ruling revealed that it would induce furnace manufacturers to use more efficient brushless permanent magnet motors in all products. New EXCEPTION for gas furnaces allowed to meet 0.58 W/CFM if manufactured before July 3, 2019.</p>
	<p>All other AHU types to remain at 0.58 W/CFM.</p> <p>C. <b>Zonally Controlled Central Forced Air Systems:</b> See Above.</p>
	<p>D. <b>Small Duct High Velocity Forced Air Systems:</b> HERS-verified airflow 250 CFM per ton, fan efficacy of ≤ 0.62 W/CFM.</p>
150.0(n)	<p><b>Water Heating System</b></p>
Future heat pump option.	<p>1A. Electrical panel must include a dedicated 125 volt, 20 amp electrical receptacle with a 120/240 volt 3 conductor, 10 AWG copper branch circuit within 3' of the water heater and accessible to it. AND both ends of the unused conductor must be labeled "spare" and be electrically isolated. AND must have a reserve single-pole circuit breaker space near this circuit breaker labeled "Future 240V Use."</p>
150.0(o)	<p><b>Requirements for Ventilation and Indoor Air Quality</b></p>
150.0(o)1	<p>Must meet the requirements of 2016 ASHRAE 62.2, clarified as applying to these building types: Single family and townhomes (not attached to public garages or commercial spaces).</p> <p>A-D. Amendments to ASHRAE 62.2: All dwelling units must meet the requirements of ASHRAE 62.2 except as modified in Section 150.0(o)1. E-F. See the <a href="#">Multifamily Specific</a> section of this What's Changed fact sheet for applicable revised language.</p>
	<p>G. Kitchen Range Hoods: HERS-verified min. ventilation airflow per ASHRAE 62.2, Section 5 and max. sound rating per ASHRAE 62.2, Section 7.2 (3 sones at one or more airflow settings ≥ 100 CFM).</p>
	<p>H. Compliance with ASHRAE 62.2 Section 6.5.2 (Space Conditioning System Ducts) is not required.</p>
	<p>I. Manual ventilation switches must be labeled with the following or similar text: "This switch controls the indoor air quality ventilation for the home. Leave it on unless the outdoor air quality is very poor."</p>









150.0(o)1-2	<b>Kitchen Hood Requirements: 2016 ASHRAE 62.2, Tables 5.1 and 5.2</b>		
	<b>Ventilation Control Type</b>	<b>Application</b>	<b>Airflow</b>
	Demand-Controlled Local Ventilation Exhaust Airflow Rates	Enclosed Kitchen: permanent openings to interior adjacent spaces do not exceed a total of 60 ft <sup>2</sup>	<ul style="list-style-type: none"> <li>Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s)</li> <li>Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ach</li> </ul>
		Non-enclosed Kitchen	<ul style="list-style-type: none"> <li>Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s)</li> <li>Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s)</li> </ul>
Continuous Local Ventilation Exhaust Airflow Rates	Enclosed Kitchen	5 air changes per hour, based on kitchen volume	
150.0(p)	<b>Pool Systems and Equipment Installation:</b> No Change.		
<b>T24 Section &amp; Notes</b>	 <b>Prescriptive – Change Summaries</b>		
<b>Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES</b>			
150.1(a)	<b>Basic Requirements:</b> Minor Changes.		
150.1(b)	<b>Performance Standards</b>		
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	<p>1. <b>Newly Constructed Buildings:</b> EDR will be the measurement of compliance based on two components:                  #1 EDR - #2 EDR = Total EDR</p> <ul style="list-style-type: none"> <li>Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR.</li> <li>Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR.</li> </ul> <p>EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).</p>		
	<p>2. <b>Additions and Alterations to Existing Buildings:</b> Measurement for compliance will continue to use TDV energy and not EDR.</p> <p>3. <b>Compliance Demonstration Requirements for Performance Standards</b></p> <p>A. <b>Certificate of Compliance and Application for a Building Permit:</b> Documentation for newly constructed buildings must demonstrate that the building efficiency proposed EDR meets or exceeds the standard EDR AND that the PV + Flexibility EDR meets or exceeds the standard EDR.</p> <p>B. <b>Field Verification:</b> If HERS verification is required, it must be documented per Title 24, Part 1, Section 10-103. HERS verifications that may be applicable:</p> <ul style="list-style-type: none"> <li>i. SEER rating better than what is required prescriptively being used for compliance (No Change).</li> <li>ii. EER rating better than standard design EER being used for compliance.</li> <li>iii. Low-leakage air handler being used for compliance (No Change).</li> <li>iv. HSPF rating better than what is required prescriptively being used for compliance.</li> <li>v. Heat pump-rated heating capacity values at 47°F and 17°F (when NOT using the default values provided by compliance software) being used for compliance.</li> <li>vi. Whole House Fan ventilation airflow and fan efficacy being used for compliance.</li> <li>vii. Central Fan Ventilation Cooling System being used for compliance. (No Change.)</li> <li>viii. Building Enclosure Air Leakage being used for compliance. (No Change.)</li> <li>ix. Quality Insulation Installation (QII) being used for compliance. (No Change.)</li> </ul>		
150.1(c)	<b>Prescriptive Standards/Component Package</b>		
	6. <b>Heating System Type:</b> No Change.		
	7. <b>Space Heating and Space Cooling:</b> Provisions added for small duct high velocity systems. Otherwise only minor changes.		
	8. <b>Domestic Water-Heating Systems</b>		
	A. For systems serving individual dwelling units: Use one of the following:		
	i. One or more gas/propane instantaneous water heater input of 200,000 BTUH or less with NO storage tank		
	ii. OR One gas/propane ≤ 55 gal. storage water heater of ≤ 75,000 BTUH AND		
New provisions for electric DHW.	fenestration weighted U-factor = 0.24 or less AND <ul style="list-style-type: none"> <li>HERS-verified compact hot water distribution system OR</li> <li>HERS-verified drain water heat recovery system.</li> </ul>		

<p>New provisions for electric DHW.</p>	<p>iii. OR One gas/propane &gt; 55 gal. storage water heater of ≤ 75,000 BTUH</p> <p>iv. OR One heat pump water heater located in garage or conditioned space AND</p> <ul style="list-style-type: none"> <li>• HERS-verified compact hot water distribution system AND HERS-verified drain water heat recovery system OR</li> <li>• In CZ 2-15: PV system sized 0.3 kWdc larger than required in Section 150.1(c)14 OR</li> <li>• In CZ1 and 16: PV system sized 1.1 kWdc larger than required in Section 150.1(c)14</li> </ul> <p>v. OR one NEEA Tier 3 or higher heat pump water heater located in garage or conditioned space. CZ 1 and 16 will ALSO need:</p> <ul style="list-style-type: none"> <li>• PV system sized 0.3 kWdc larger than required in Section 150.1(c)14 OR</li> <li>• HERS-verified compact hot water distribution system</li> </ul>
	<p>B. See the <a href="#">Multifamily Specific</a> section of this What's Changed fact sheet for revised multifamily requirements.</p> <p>9. <b>Space Conditioning Distribution Systems:</b> No Change.</p> <p>10. <b>Central Fan Integrated Ventilation Systems:</b> If central FAU fans used to provide whole house ventilation airflow, then HERS-verified airflow rate and fan efficacy as follows:</p>
<p>WHF used in single-family homes must be certified to the MAEDbS.</p>	<p>Gas furnace AHU: 0.45 W/CFM. New EXCEPTION for gas furnaces allowed to meet 0.58W/CFM if manufactured before July 3, 2019.</p> <p>All other AHU: 0.58 W/CFM.</p> <p>12. <b>Ventilation Cooling:</b> If whole house fans are used in single-family homes in CZ 8-14, they must be certified to the Energy Commission's Modernized Appliance Efficiency Database System (MAEDbS) to have an airflow of ≥ 1.5 CFM/ft<sup>2</sup> of CFA, with with 1 ft<sup>2</sup> of attic vent area for each 750 CFM of the whole house fan airflow CFM (or per manufacturer's instructions or if directly vented to outside). Homeowner must be provided with a 1-page instruction sheet on how to use.</p>
	<p>13. <b>HVAC System Bypass Ducts:</b> No Change.</p>
<p><b>Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS</b></p>	
<p>150.2(a)</p>	<p><b>Additions</b></p> <p>1. <b>Prescriptive Approach</b></p> <p>C. <b>Mechanical Ventilation for Indoor Air Quality:</b> If an addition is a new dwelling unit, it must meet all the requirements including mechanical ventilation airflow, no matter the size of the addition.</p> <p>D. <b>Water Heater:</b> System must meet the requirements of Section 150.1(c)8.</p> <p>2. <b>Performance Approach</b></p> <p>C. <b>Mechanical Ventilation for Indoor Air Quality:</b> If an addition is a new dwelling unit, it must meet all the requirements including mechanical ventilation airflow, no matter the size of the addition.</p>
<p>150.2(b)</p>	<p><b>Alterations</b></p> <p>1. <b>Prescriptive Approach</b></p> <p>C. <b>Entirely New or Complete Replacement Space-Conditioning Systems:</b> New allowance for heat pump heating systems when gas/propane is available.</p> <p>D. <b>Altered Duct Systems - Duct Sealing:</b> New provision by which any altered duct, AHU, heating/cooling coils or plenums located in garages must meet the new requirement of Section 150.2(b)1Diic. Otherwise only minor changes.</p> <p>ii.c. <b>Altered Ducts and Duct System Components in Garage Spaces:</b> To meet HERS requirements of 6% or less leakage OR everything possible as verified by visible verification and smoke test.</p> <p>E. <b>Altered Space-Conditioning System - Duct Sealing:</b> New provision by which any altered duct, AHU, heating/cooling coils or plenums located in garages must meet the new requirement of Section 150.2(b)1Diic. Otherwise only minor changes.</p> <p>F. <b>Altered Space-Conditioning System - Mechanical Cooling:</b> Provisions added for small duct high velocity systems. Otherwise only minor changes.</p> <p>G. <b>Altered Space-Conditioning System:</b> New allowance for heat pump heating systems when gas/propane available.</p> <p>H. <b>Water-Heating System:</b> Minor changes AND new allowances for heat pump and electric water heater alterations:</p> <p>iii.b. Heat pump water heater in CZ 1-15 allowed if storage tank NOT outdoors AND placed on rigid surface with R-value = R-10 AND a demand response interface (Section 110.12(a)). OR</p> <p>iii.c. Heat pump water heater in CZ 1-15 that is NEEA Tier 3 or higher and NOT located outdoors.</p> <p>iii.d. Electric resistance allowed if no natural gas is located where the existing water heater is being altered.</p>

# ENVELOPE – SINGLE FAMILY

Color background indicates:  NO CHANGE/MINOR CHANGE  REVISED  NEW FOR 2019


Building Application	 <b>Mandatory</b>		 <b>Prescriptive</b>	 <b>Performance</b>	 <b>Additions Alterations</b>
	All Occupancy Subchapters 1-2, 4 (§§100.0-110.11)	Residential Occupancy Subchapter 7 (§150.0)	Subchapter 8 (§150.1)	Subchapter 8 (§150.1)	Subchapter 9 (§150.2)
General	§§100.0, 100.1-2, 110.0 110.1	§§150.0	§§150.1(a), 150.1(c)	§§150.1(a), 150.1(b)	§§150.2(a), 150.2(b)
Envelope (conditioned)	§§110.6, 110.7, 110.8	§§150.0(a)-(e), 150.0(g), 150.0(q)			
<b>T-24 Section &amp; Notes</b>	 <b>Mandatory – Change Summaries</b>				
<b>Title 24, Part 1, Section 10-110 – CERTIFICATION AND LABELING OF FENESTRATION PRODUCT AND EXTERIOR DOOR U-FACTORS, SOLAR HEAT GAIN COEFFICIENTS, VISIBLE TRANSMITTANCE AND AIR LEAKAGE</b>					
Exterior doors have been added throughout this Section to support the solid door changes for residential buildings.					
<b>Title 24, Part 6, Section 100.1 – DEFINITIONS</b>					
	Updates to various references to resources and standards other than the Energy Code (e.g., revisions to list newer applicable versions or editions). <b>ENERGY BUDGET</b> is the maximum energy consumption, based on Time Dependent Valuation (TDV) energy, that a proposed building, or portion of a building, can be designed to consume, calculated using Commission-approved compliance software as specified by the Alternative Calculation Method Approval Manual. The Energy Budget for newly constructed, low-rise residential buildings is expressed in terms of the Energy Design Rating.				
Definitions added to support the new requirements for new homes.	<b>ENERGY DESIGN RATING (EDR)</b> is a way to express the energy consumption of a building as a rating score index where a score of 100 represents the energy consumption of the building built to the specifications of the Residential Energy Services (RESNET) reference home characterization of the 2006 International Energy Conservation Code (IECC) with Title 24, Part 6 modeling assumptions, and a score of 0 (zero) represents a building that has zero net energy consumption. The EDR is calculated using Commission-approved compliance software as specified by the Alternative Calculation Method Approval Manual. <b>ENERGY DESIGN RATING, ENERGY EFFICIENCY</b> is an Energy Design Rating based on the TDV energy consumption of a building that results from the building's energy efficiency characteristics, calculated using Commission-approved compliance software as specified by the Alternative Calculation Methods Approval Manual. <b>ENERGY DESIGN RATING, SOLAR ELECTRIC GENERATION AND DEMAND FLEXIBILITY</b> is the reduction in TDV energy consumption of a building expressed in terms of an Energy Design Rating reduction that results from the combination of the building's solar electric generation system and demand flexibility measures. <b>ENERGY DESIGN RATING, TOTAL</b> is the total Energy Design Rating for the building that is determined by subtracting the Solar Electric Generation System and Demand Flexibility Energy Design Rating from the Energy Efficiency Energy Design Rating.				
To support door requirements.	<b>GLAZED DOOR</b> is an exterior door having a glazed area of 25% or greater of the area of the door. Glazed doors shall meet fenestration product requirements. See: Door. <b>HABITABLE SPACE</b> is space in a building for living, sleeping, eating or cooking, excluding bathrooms, toilets, hallways, storage areas, closets, or utility rooms and similar areas. (See also OCCUPIABLE SPACE.) <b>HABITABLE STORY</b> is a story that contains habitable space and that has at least 50% of its volume above grade. <b>ROOF, LOW-SLOPED</b> is a roof that has a ratio of rise to run < 2:12 (9.5° from the horizontal). <b>ROOF, STEEP-SLOPED</b> is a roof that has a ratio of rise to run ≥ 2:12 (9.5° from the horizontal).				
<b>Title 24, Part 6, Section 150.0 – MANDATORY FEATURES AND DEVICES</b>					
150.0(a)	<b>Ceiling and Rafter Roof Insulation:</b> No Change.				
150.0(b)	<b>Loose-fill Insulation:</b> No Change.				
150.0(c)	<b>Wall Insulation</b> <ul style="list-style-type: none"> <li>Wood-framed walls: 2 x 4 = U-factor 0.102 (R-13); 2 x 6 = U-factor 0.071 (R-20)</li> <li>Non-framed walls: U-factor = 0.102</li> <li>Mass (masonry) walls: Must meet Prescriptive requirements, there are no Mandatory requirements.</li> </ul>				





150.0(d)	<b>Raised-floor Insulation:</b> Wood-framed U-factor = 0.037 (R-19). Clarified for use with wood-framed assembly.
150.0(f)	<b>Slab Edge Insulation:</b> No Change.
150.0(g)	<b>Vapor Retarder:</b> No Change.
150.0(q)	<b>Fenestration Products:</b> No Change.
<b>T-24 Section &amp; Notes</b>	 <b>Prescriptive – Change Summaries</b>
<b>Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES</b>	
150.1(a)	<b>Basic Requirements</b> Minor Changes.
150.1(b)	<b>Performance Standards</b>
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	<ol style="list-style-type: none"> <li><b>Newly Constructed Buildings:</b> EDR will be the measurement of compliance based on two components:  <math>\#1 \text{ EDR} - \#2 \text{ EDR} = \text{Total EDR}</math> <ul style="list-style-type: none"> <li>Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR.</li> <li>Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR.</li> </ul>                     EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).                 </li> <li><b>Additions and Alterations to Existing Buildings:</b> Measurement for compliance will use TDV energy and not EDR.</li> <li><b>Compliance Demonstration Requirements for Performance Standards</b> <ol style="list-style-type: none"> <li><b>Certificate of Compliance and Application for a Building Permit:</b> Documentation for newly constructed buildings must demonstrate that the building efficiency proposed EDR meets or exceeds the standard EDR AND that the PV + Flexibility EDR meets or exceeds the standard EDR.</li> <li><b>Field Verification:</b> If HERS verification is required, it must be documented per Title 24, Part 1, Section 10-103. HERS verifications that may be applicable:                             <ol style="list-style-type: none"> <li>Building Enclosure Air Leakage being used for compliance.</li> <li>Quality Insulation Installation (QII) being used for compliance.</li> </ol> </li> </ol> </li> </ol>
150.1(c) Insulation requirements for roof and walls have been changed in Table 150.1-A.	<b>Prescriptive Standards/Component Package</b> <ol style="list-style-type: none"> <li><b>Insulation</b> <ol style="list-style-type: none"> <li><b>Roof and Ceiling Insulation:</b> Must meet applicable sections of Table 150.1-A or 150.1-B using either Option B, which has insulation between roof rafters AND on ceiling between ventilated attic and conditioned space, or Option C, which has insulation on ceiling between ventilated attic and conditioned space and ducts/air handler within directly conditioned space. Option A (above/at roof deck insulation) has been removed as a Prescriptive option.                             <ul style="list-style-type: none"> <li>Single Family:                                     <ul style="list-style-type: none"> <li>Option B (airspace option only) now requires R-19 (was R-18) below roof deck in applicable CZ. Ceiling insulation R-values/CZ have not changed.</li> <li>Option C: No Change.</li> </ul> </li> </ul> </li> <li><b>Walls:</b> Exterior framed walls, mass walls (below or above grade), and non-framed walls (that are not mass to meet framed wall requirements) must meet applicable sections of Table 150.1-A or 150.1-B.                             <ul style="list-style-type: none"> <li>Single Family:                                     <ul style="list-style-type: none"> <li><u>Wood Framed</u> <ul style="list-style-type: none"> <li>CZ 1-5 and 8-16: U-factor = 0.048 (was 0.051) (e.g., 2 x 6 24" OC wood-framed wall with R-21 and R-6 (1-1/2" rigid insulation outside framing).</li> <li>CZ 6-7: No Change.</li> </ul> </li> <li><u>Mass with interior insulation</u> <ul style="list-style-type: none"> <li>CZ 1-15: Above grade and below grade: U-factor = 0.077 (e.g., R-13 insulation with wood framing) (was 0.070 representing continuous R-13 not interrupted by framing).</li> <li>CZ 16: Above grade: No Change. Below grade: U-factor = 0.067 (was 0.066); R-15.</li> </ul> </li> <li><u>Mass with exterior insulation</u> <ul style="list-style-type: none"> <li>CZ 1-15: Above grade and below grade: No Change.</li> <li>CZ 16: Above grade: U-factor = 0.077 (was 0.070); Below grade: No Change.</li> </ul> </li> </ul> </li> </ul> </li> <li><b>Raised Floors:</b> No change for single family or multifamily.</li> <li><b>Slab Floors:</b> No change for single family or multifamily.</li> <li><b>QII:</b> Required in all CZ for single family.</li> </ol> </li> <li><b>Radiant Barrier:</b> No change for single family or multifamily.</li> </ol>

CZ 16 does not have SHGC requirements or west-facing limitations.	<p>3. <b>Fenestration:</b> For both single family and multifamily:</p> <ul style="list-style-type: none"> <li>• Glass door glazing <math>\geq 25\%</math> of door area now considered fenestration (was 50%).</li> <li>• U-factor: 0.30 (was 0.032).</li> <li>• Solar Heat Gain Coefficient (SHGC) Requirements: CZ 2, 4, 6-15: Yes; CZ 1, 3, 5, 16: No.</li> <li>• Max. total area: No Change.</li> <li>• Max. min. west facing: CZ 16 no longer has a west facing limitations, otherwise no change.</li> </ul>
	4. <b>Shading:</b> No Change.
	5. <b>Exterior Opaque Doors:</b> Doors (less than 25% glazing is considered opaque): NFRC-rated U-factor $\leq 0.20$ . EXCEPTION for swinging doors between garage and house that are required to be fire rated.
	11. <b>Roofing Products:</b> No change for single family or multifamily.
<b>Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS</b>	
150.2(a)	<p><b>Additions</b></p> <p>1. <b>Prescriptive Approach</b></p> <p>A. Additions of Any Size</p> <ul style="list-style-type: none"> <li>i. Extended Walls: 2 x 4 must use R-15 and 2 x 6 must use R-21.</li> <li>ii. Fenestration: No Change.</li> <li>iii. Additions of any size that are using existing walls (newly conditioned) in which the siding is not being removed or replaced: 2 x 4 must use R-15 and 2 x 6 must use R-21.</li> <li>iv. QII is required for additions <math>&gt; 700</math> ft<sup>2</sup> BUT if converting existing unconditioned space, then existing window/door headers and air barrier (not being removed or replaced) do not need to meet QII requirements.</li> </ul> <p>B. Additions <math>\leq 700</math> ft<sup>2</sup></p> <ul style="list-style-type: none"> <li>i. Attic ceiling insulation: CZ 1, 11-16 = R-38; CZ 2-10 = R-30. EXCEPTION for enclosed rafter ceiling if meeting requirements of Section 150.0 (U-factor = 0.043; R-22 with U-factor = 0.054; R-19, exception for existing 2 x 6 rafters).</li> <li>ii. Radiant Barrier: Required in CZ 2-15.</li> <li>iii. Extended Walls: 2 x 4 must use R-15 and 2 x 6 must use R-21.</li> <li>iv. Fenestration: No Change.</li> <li>v. QII: Not required.</li> <li>vi. Using existing walls (newly conditioned) without removing or replacing siding: 2 x 4 must use R-15 and 2 x 6 must use R-21.</li> </ul>
150.2(b)	<p><b>Alterations</b></p> <p>1. <b>Prescriptive Approach</b></p> <ul style="list-style-type: none"> <li>B. Replacement Fenestration: Clarification that glass replaced in existing frame is considered a repair AS LONG as the performance is at least equal to prior existing.</li> <li>I. Roofs: Replacing <b>or ADDING a new surface layer</b> to 50% or more of the roof area, otherwise no change.</li> </ul>

# SOLAR READY/PV/BATTERY STORAGE – SINGLE FAMILY

Color background indicates:  NO CHANGE/MINOR CHANGE  REVISED  NEW FOR 2019

 **ALL OCCUPANCIES:**  
Article 1 of Title 24, Part 1 (Sections 10-101 through 10-114)

Low-Rise Residential Occupancy: Building Application	 <b>Mandatory</b>		 <b>Prescriptive</b>	 <b>Performance</b>	 <b>Additions Alterations</b>
	All Occupancy Subchapters 1-2, 4 (§§100.0-110.11)	Reference Joint Appendix (JA)	Subchapter 8 (§150.1)	Subchapter 8 (§150.1)	Subchapter 9 (§150.2)
PV (conditioned)	§§100.0, 100.1-2	JA11	§150.1(a)14	§§150.1(a), 150.1(b)	N/A
Solar Ready Buildings	§§110.10, 150.0(r)	N/A	N/A	N/A	N/A
Battery	§100.1	JA12	N/A	§150.1(b)	N/A

**T24 Section & Notes**



**Mandatory – Change Summaries**

**Title 24, Part 1, Section 10-109 – COMPLIANCE SOFTWARE, ALTERNATIVE COMPONENT PACKAGES, EXCEPTIONAL METHODS, DATA REGISTRIES AND RELATED EXTERNAL DIGITAL DATA SOURCES SOFTWARE, ALTERNATIVE RESIDENTIAL FIELD VERIFICATION PROTOCOLS AND ELECTRONIC DOCUMENT REPOSITORIES, AND PHOTOVOLTAIC SYSTEM REQUIREMENT DETERMINATIONS**


10-109(i)	<b>Data Registries and Related External Digital Data Sources, And Electronic Document Repositories:</b> Provisions added to include external digital data sources to the registry procedures.
10-109(k)	<b>Photovoltaic System Requirement Determinations:</b> The Commission may, upon written application or its own motion, determine that the photovoltaic requirements in Section 150.1(c)14 shall not apply, if the Commission finds that the implementation of public agency rules regarding utility system costs and revenue requirements, compensation for customer-owned generation, or interconnection fees, causes the Commission's cost-effectiveness conclusions, made pursuant to Public Resources Code 25402(b)(3), to not hold for buildings. Applications shall include full information regarding the differences between public agency rules and Energy Commission cost-effectiveness determinations, including all information requested by the Commission to enable full review of the application. Applications shall also include specific recommended limitations to the scope of the determination that is requested, and specific eligibility criteria to determine what buildings would qualify for the determination. Applications from public agencies shall be submitted to the Energy Commission only after public review within the jurisdiction of the public entity or service area of the utility.


**Title 24, Part 1, Section 10-115 – COMMUNITY SHARED SOLAR ELECTRIC GENERATION SYSTEM OR COMMUNITY SHARED BATTERY STORAGE SYSTEM COMPLIANCE OPTION FOR ONSITE SOLAR ELECTRIC GENERATION OR BATTERY STORAGE REQUIREMENTS**

10-115(a)	<b>Community Shared Solar Electric Generation System or Battery Storage System Offset:</b> A community system can be used to meet the "Solar Electric Generation and Demand Flexibility Design Rating" required per Title 24, Part 6, Section 150.1(b) only if the system has been approved by the Energy Commission. <ol style="list-style-type: none"> <li>Enforcement Agency: Community system must be installed and available for inspection at the time the building permit in which they are using a community system to meet compliance is being finalized.</li> <li>Energy Performance: Community system must be able to provide the energy performance promised by the compliance paperwork.</li> <li>Dedicated Building Energy Savings Benefits: Community system energy savings promised via the compliance paperwork must be in the form of actual reduction of energy consumption OR utility energy reduction credits of energy consumption OR payments to the building equal to energy bill reductions (energy bill reduction energy savings used to be greater than the shared/added cost of the community system).</li> <li>Durability: Community system used for compliance must be designed to be installed for at least 20 years.</li> <li>Additionality: The energy savings used for compliance of one building cannot be used for any other reason.</li> <li>Accountability and Recordkeeping: Each building that uses a community shared system must be provided access to records for the 20 years of installation and these records must be made available to all parties who rely on these systems for compliance (i.e., builders, owners, enforcement agencies and Energy Commission).</li> </ol>
10-115(b)	<b>Application for Commission Approval:</b> Any entity may apply to the Energy Commission for approval for a community system and must meet the min. requirements of Section 10-115.
10-115(c)	<b>Commission Approval:</b> Energy Commission to determine approval solely based on what is submitted for approval.







Title 24, Part 6, Section 100.1 – DEFINITIONS	
	Updates to various references to resources and standards other than the Energy Code (e.g., revisions to list newer applicable versions or editions).
Definitions added to support the new requirements for new homes.	<p><b>BATTERY SYSTEM, STATIONARY STORAGE</b> is a rechargeable energy storage system consisting of electrochemical storage batteries, battery chargers, controls, and associated electrical equipment designed to provide electrical power to a building. The system is typically used to provide standby or emergency power, and uninterruptible power supply, load shedding, load sharing or similar capabilities.</p> <p><b>DEMAND FLEXIBILITY MEASURE</b> is a measure that reduces TDV energy consumption using communication and control technology to shift electricity use across hours of the day to decrease energy use onpeak or increase energy use offpeak, including but not limited to battery storage, or HVAC or water heating load shifting.</p>
	<p><b>ENERGY BUDGET</b> is the maximum energy consumption, based on Time Dependent Valuation (TDV) energy, that a proposed building, or portion of a building, can be designed to consume, calculated using Commission-approved compliance software as specified by the Alternative Calculation Method Approval Manual. The Energy Budget for newly constructed, low-rise residential buildings is expressed in terms of the Energy Design Rating.</p>
Definitions added to support the new requirements for new homes.	<p><b>ENERGY DESIGN RATING (EDR)</b> is a way to express the energy consumption of a building as a rating score index where a score of 100 represents the energy consumption of the building built to the specifications of the Residential Energy Services (RESNET) reference home characterization of the 2006 International Energy Conservation Code (IECC) with Title 24, Part 6 modeling assumptions, and a score of 0 (zero) represents a building that has zero net energy consumption. The EDR is calculated using Commission-approved compliance software as specified by the Alternative Calculation Method Approval Manual.</p> <p><b>ENERGY DESIGN RATING, ENERGY EFFICIENCY</b> is an Energy Design Rating based on the TDV energy consumption of a building that results from the building's energy efficiency characteristics, calculated using Commission-approved compliance software as specified by the Alternative Calculation Methods Approval Manual.</p> <p><b>ENERGY DESIGN RATING, SOLAR ELECTRIC GENERATION AND DEMAND FLEXIBILITY</b> is the reduction in TDV energy consumption of a building expressed in terms of an Energy Design Rating reduction that results from the combination of the building's solar electric generation system and demand flexibility measures.</p> <p><b>ENERGY DESIGN RATING, TOTAL</b> is the total Energy Design Rating for the building that is determined by subtracting the Solar Electric Generation System and Demand Flexibility Energy Design Rating from the Energy Efficiency Energy Design Rating.</p> <p><b>SOLAR ELECTRIC GENERATION SYSTEM</b> or <b>PHOTOVOLTAIC SYSTEM</b> is the complete set of all components for converting sunlight into electricity through the photovoltaic process, including the array of panels, inverter(s) and the balance of system components required to enable the system to effectively deliver power to reduce a building's consumption of electricity from the utility grid.</p>
Title 24, Part 6, Sections 150.0(r) and 110.10 – SOLAR READY BUILDINGS	
150.0(r)/110.10	<b>Solar Ready Buildings:</b> Must meet the requirements of Section 110.10 applicable to the building project. Changes for 2019 for those applicable to single family are outlined below.
110.10(a)	<p><b>Solar Ready Buildings:</b></p> <ol style="list-style-type: none"> <li>Single family homes in subdivisions of 10 or more homes approved as of July 1, 2014 or later that do not have a PV (photovoltaic) system meeting the requirements of Section 150.1(c)14.</li> <li>Low-rise Multifamily buildings that do not have a PV (photovoltaic) system meeting the requirements of Section 150.1.</li> </ol>
110.10(b)	<p><b>Solar Zone</b></p> <ol style="list-style-type: none"> <li><b>Minimum Solar Zone Area</b> <ol style="list-style-type: none"> <li>Single Family: For those homes in which PV is not installed per Section 150.1(c)14, to have 250 ft<sup>2</sup> on roof or overhang of the home.</li> </ol> <p>EXCEPTION 1-2: No Change.</p> <p>EXCEPTION 3: Any home in a Wildland-Urban Interface Fire Area (WUI) can reduce solar zone area to 150 ft<sup>2</sup> if whole house fan (ventilation cooling) used in home and is no longer limited to certain climate zones.</p> <p>EXCEPTION 4: Buildings with solar zone area that is at least 50% of the potential solar zone area.</p> <p>Potential Solar Zone:</p> <ul style="list-style-type: none"> <li>Low-sloped Roof: Roof area where annual solar access is ≥70%.</li> <li>Steep-sloped Roof: Roof area oriented 90°-300° of true north in which the annual solar access is ≥70%.</li> </ul> <p>EXCEPTION 5: Solar zone of ≤150 ft<sup>2</sup> allowed if all thermostats meet the demand response control requirements of Section 110.12(a) and are capable of receiving / responding prior to final occupancy permit.</p> <p>EXCEPTION 6: Solar zone areas not required if:</p> <p>All thermostats meet the demand response control requirements of Section 110.12(a) and are capable of receiving / responding prior to final occupancy permit, AND one of the following:</p> <ul style="list-style-type: none"> <li>ENERGY STAR® dishwasher and either ENERGY STAR refrigerator OR whole house fan OR</li> <li>SAE J1772 Level 2 EVSE/EV charge with 40 amperes or more</li> </ul> </li> <li><b>Azimuth:</b> Steep sloped roof shall design solar zones on roofs oriented 90°-300° of true north.</li> </ol>
	<ol style="list-style-type: none"> <li><b>Shading:</b> No Change.</li> <li><b>Structural Design Loads on Construction Documents:</b> No Change.</li> </ol>

110.10(c)	<b>Interconnection Pathways:</b> 1. Drawings to indicate “reserved” location for future inverters/metering equipment/pathway for conduit between solar zone and electrical service AND 2. Drawings to indicate “reserved” pathway for plumbing between solar zone and water heater.
110.10(d)	<b>Documentation:</b> No Change.
110.10(e)	<b>Main Electrical Service Panel:</b> Min. busbar rating of 200 amps and “reserved” space for future double pole circuit breaker labeled “For Future Solar Electric.”
<b>T-24 Section &amp; Notes</b>	 <b>Prescriptive – Change Summaries</b>
<b>Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES</b>	
150.1(a)	<b>Basic Requirements:</b> Minor Changes.
150.1(b)	<b>Performance Standards</b>
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	1. <b>Newly Constructed Buildings:</b> EDR will be the measurement of compliance based on two components: #1 EDR - #2 EDR = Total EDR <ul style="list-style-type: none"> <li>• Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR.</li> <li>• Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR.</li> </ul> EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).
	2. <b>Additions and Alterations to Existing Buildings:</b> Measurement for compliance will continue to use TDV energy and not EDR. 3. <b>Compliance Demonstration Requirements for Performance Standards</b> A. <b>Certificate of Compliance and Application for a Building Permit:</b> Documentation for newly constructed buildings must demonstrate that the building efficiency proposed EDR meets or exceeds the standard EDR AND that the PV + Flexibility EDR meets or exceeds the standard EDR.
150.1(c)  Equation 150.1-C Annual PV Electric Output $kW_{PV} = (CFA \times A) / 1000 + (NDwell \times B)$ using Table 150.1-C CFA and Dwelling Adjustment Factors	<b>Prescriptive Standards/Component Package</b> 14. Photovoltaic Requirements: PV system size must meet the minimum qualification requirements per Reference Joint Appendix JA11 determined by Equation 150.1-C. Many Prescriptive exceptions to reduce PV, only EXCEPTION 1 will exempt it completely. Performance method provides more flexibility. EXCEPTION 1: PV not required if less than 80 contiguous ft <sup>2</sup> of roof is within the effective annual solar access because of existing natural or manmade barriers (not part of building). Effective annual access is defined $\geq 70\%$ annual solar access of unshaded PV array on an annual basis. EXCEPTION 2: CZ 15: The smallest PV size to accommodate effective annual solar access OR per Equation 150.1-C (cannot be less than 1.5 watt DC per ft <sup>2</sup> of conditioned floor area). EXCEPTION 3: Two habitable story buildings can use PV size to accommodate effective annual solar access OR per Equation 150.1-C (cannot be less than 1.0 watt DC per ft <sup>2</sup> of conditioned floor area). EXCEPTION 4: Three habitable story buildings (or more if single family) can use PV size to accommodate effective annual solar access OR per Equation 150.1-C (cannot be less than 0.8 watt DC per ft <sup>2</sup> of conditioned floor area). EXCEPTION 5: If unit plan approved by Planning Department BEFORE January 1, 2020 AND available solar ready area is only 80-200 ft <sup>2</sup> , use the smallest of either the PV size to accommodate effective annual solar access OR Equation 150.1-C. EXCEPTION 6: If battery storage system is min. capacity 7.5 kWh and meets the criteria of Reference Joint Appendix JA12, THEN PV size from Equation 150.1-C may be reduced by 25%.
<b>Title 24, Part 6, Reference Joint Appendix JA11 – QUALIFICATION REQUIREMENTS FOR PHOTOVOLTAIC SYSTEM</b>	
JA11.1	<b>Purpose and Scope:</b> Requirements for PV using either Prescriptive and Performance method.
JA11.2	<b>System Orientation</b> a. Prescriptive: PV system (including all modules) $\leq 2:12$ (or $10^\circ$ ) with azimuth range $90^\circ$ - $300^\circ$ of true north. b. Performance: If PV array does not meet Prescriptive requirements, the actual orientation must be input into Performance software. – CA Flexible Installation (CFI): If used in a performance calculation, PV system must be installed with an azimuth range $150^\circ$ - $270^\circ$ of true north and all modules matching tilt of roof pitch of $\leq 7:12$ .
JA11.3	<b>Shading:</b> Use one of the following methods: a. Min. Shading Criterion OR b. PV Array Geometries Performance Input using the Performance method.

JA11.4	<b>Solar Access Verification:</b> Installer to demonstrate shading condition compliance of installed PV system via CF2R (Certificate of Installation) using one of the following methods: a. Solar Assessment Tool approved by the Energy Commission and used per the manufacturer's instructions with measurements $\leq 40'$ apart, either before PV is installed (but roof deck clearly marked with future PV location) or after PV is installed. b. Alternative Method: An aerial satellite, drone or digital image (using CF2R) or other Energy Commission-approved method.
JA11.5	<b>System Monitoring Requirements:</b> Remote Monitoring Capability (web or mobile) must provide dwelling occupants specific information regarding the PV system.
JA11.6	<b>Interconnection Requirements:</b> Inverters must meet UL1741 including supplement A. PV system must comply with Rule 21 per CPUC.
JA11.7	<b>Certificates and Availability:</b> CF2R required to be provided by Installer at time of building inspection.
JA11.8	<b>Enforcement Agency:</b> Must confirm the registered CF2R provided is accurate to installation.
<b>T-24 Section &amp; Notes</b>	 <b>Performance – Change Summaries</b>
<b>RESIDENTIAL ALTERNATIVE CALCULATION METHOD (ACM) REFERENCE MANUAL</b>	
Res ACM	Performance method allows for battery storage flexibility to reduce PV size requirements by 25% per Reference Joint Appendix JA12 and additionally allows trade-offs against building efficiency.
<b>REFERENCE JOINT APPENDIX JA12 – QUALIFICATION REQUIREMENTS FOR BATTERY STORAGE SYSTEM</b>	
JA12.1	<b>Purpose and Scope:</b> Requirements for battery storage using the Performance method when in combination with PV system.
JA12.2	<b>Qualification Requirements</b> Must be certified by Energy Commission: a. Safety Requirements: Per UL1973/9540/1741, including supplement A b. Minimum Performance Requirements <ul style="list-style-type: none"> <li>• Capacity of <math>\geq 5\text{kWh}</math></li> <li>• AC-AC single charge/discharge cycle with <math>\geq 80\%</math> efficiency</li> <li>• Warranty of energy retention of 70% nameplate capacity after 4,000 cycles, OR 10 year warranty</li> </ul> c. Control Requirements <ul style="list-style-type: none"> <li>• Can be remotely programmed for charge/discharge periods; AND</li> <li>• During discharge period the excess capacity (after the dwelling unit electrical load is met) must be able to respond to demand response signal and discharge into grid; AND</li> <li>• Use one of the following control strategies except during a power interruption (and then it must be able to revert back to control strategy) AND be able to be remotely changed to another control type: <ol style="list-style-type: none"> <li>1. Basic Control: Charge from on-site PV system when PV production greater than dwelling unit electrical load demand; discharge when PV production less than dwelling unit electrical load demand OR</li> <li>2. Time-of-Use (TOU) Control: Charge from on-site PV system and be able to discharge to grid during highest price TOU hours for at least three separate seasonal schedules OR</li> <li>3. Advanced Demand Response Control: Meet Basic OR TOU Control, AND be able to charge and discharge from demand response signals.</li> <li>4. Alternative Control Approved by Energy Commission. Allow for future controls types not known at this time.</li> </ol> </li> </ul> d. System Checks: At least twice: Within 10 calendar days of onset of summer and winter TOU schedule.
JA12.3	<b>Interconnection and Net Energy Metering Requirements:</b> System to comply with Rule 21 and Net Energy Metering (NEM) rules per CPUC. <b>Enforcement Agency:</b> To confirm the registered CF2R provided is accurate to installation and meeting control strategy specified in CF1R-PRF-01-E.
<b>Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS</b>	
150.2(a)	<b>Additions:</b> PV not required.

# LIGHTING – SINGLE FAMILY & MULTIFAMILY DWELLING UNITS

Color background indicates:  NO CHANGE/MINOR CHANGE  REVISED  NEW FOR 2019

Building Application	 <b>Mandatory</b>		 <b>Prescriptive</b> Subchapter 8 (\$150.1)	 <b>Performance</b> Subchapter 8 (\$150.1)	 <b>Additions Alterations</b> Subchapter 9 (\$150.2)
	All Occupancy Subchapters 1-2, 4 (§§100.0-110.11) & 130.0	Residential Occupancy Subchapter 7 (\$150.0)			
General	§§100.0, 100.1-2, 110.0 110.1	\$150.0			
Indoor Lighting (cond, uncond. & parking garages)	§§110.9, 130.0	\$150.0(k)	§§150.1(a), 150.1(c)	§§150.1(a), 150.1(b)	§§150.2(a), 150.2(b)
Outdoor Lighting	§§110.9, 130.0	\$150.0(k)			

**T-24 Section & Notes**  **Mandatory – Change Summaries**

**Title 24, Part 6, Section 150.0 – MANDATORY FEATURES AND DEVICES**






150.0(k)	<b>Residential Lighting</b> 1. <b>Luminaire Requirements</b>
	A-D. Minor Changes.
Clean up of Table 150.0-A	E. Step lights and path lights have been added to the night light requirements that exempt them from Table 150.0-A IF they are 5 watts or less and no more than 150 lumens
	F-H. Minor Changes.
	I. Light Sources in Drawers, Cabinets, and Linen Closets: Exempt from Table 150.0-A IF they are ≤5W AND ≤150 lumens AND use auto shut-off controls when location is closed.
	2. <b>Interior Lighting Switching Devices and Controls</b> A-C. Language added to allow ceiling fans with integrated lighting to be controlled with remote control. Otherwise only minor changes.
	D-H. Minor Changes.
	I. Bathroom, Garage, Laundry Room and Utility Room Controls: At least one fixture controlled with vacancy sensor OR occupancy sensor provided the occupancy sensor that is initially programmed like a vacancy sensor (manual-on operation).
	J. No Change.
	K. Undercabinet Lighting: Controlled so that the ceiling lighting and the undercabinet lighting are switched separately from each other.
	3. <b>Residential Outdoor Lighting</b> a. Single-family Residential Buildings: Minor changes.
	4. <b>Internally Illuminated Address Signs:</b> Minor Changes.

**Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS**

150.2(b)	<b>Alterations</b> 1. <b>Prescriptive Approach</b> J. <b>Lighting:</b> Clarification that existing recessed cans do NOT have to be replaced but DO need to use Reference Joint Appendix JA8-compliant trim kit or JA8-E lamp.
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# MULTIFAMILY SPECIFIC

Color background indicates:  NO CHANGE/MINOR CHANGE  REVISED  NEW FOR 2019

Building Application	 <b>Mandatory</b>		 <b>Prescriptive</b>	 <b>Performance</b>	 <b>Additions Alterations</b>
	All Occupancy Subchapters 1-2, 4 (§§100.0-110.11) & 130.0)	Residential Occupancy Subchapter 7 (§150.0)	Subchapter 8 (§150.1)	Subchapter 8 (§150.1)	Subchapter 9 (§150.2)
Envelope (conditioned)	§§110.6, 110.7, 110.8	§§150.0(a)-(e), 150.0(g), 150.0(q)	§§150.1(a), 150.1(c)	§§150.1(a), 150.1(b)	§§150.2(a), 150.2(b)
HVAC (conditioned)	§§110.2, 110.5	§§150.0(h)-(j), 150.0(m), 150.0(o)			
Water Heating	§110.3	§§150.0(j), 150.0(n)			
Solar Ready Buildings	§§110.10, 150.0(r)	N/A	N/A	N/A	N/A
<b>T24 Section &amp; Notes</b>	 <b>Mandatory – Change Summaries</b>				
<b>Title 24, Part 6, Sections 150.0(r) and 110.10 – SOLAR READY BUILDINGS</b>					
150.0(r)	<b>Solar Ready Buildings:</b> Must meet the requirements of Section 110.10 applicable to the building project.				
110.10(a)	<b>Low-rise Multifamily, including Mixed-Use Occupancy Buildings:</b> No Change.				
110.10(b)	<p><b>Solar Zone:</b> Solar zones areas cannot be less than:</p> <p>1. <b>Minimum Solar Zone Area</b></p> <ul style="list-style-type: none"> <li>Roof area ≤ 10,000 ft<sup>2</sup>: No Change.</li> <li>Roof area &gt; 10,000 ft<sup>2</sup>: No Change.</li> </ul> <p>B. <b>Low-Rise Multifamily:</b></p> <p>EXCEPTIONS 1-2: Minor Changes.</p> <p>EXCEPTION 3: Buildings with solar zone area that is at least 50% of the potential solar zone area. Potential Solar Zone:</p> <ul style="list-style-type: none"> <li>Low-sloped Roof: Roof area where annual solar access is ≥ 70%.</li> <li>Steep-sloped Roof: Roof area oriented 90°-300° of true north in which the annual solar access is ≥ 70%.</li> </ul> <p>EXCEPTION 4 (Multifamily only): No solar ready requirements will apply if all dwelling unit thermostats meet the demand response control requirements of Section 110.12(a) and are capable of receiving / responding prior to final occupancy permit, AND either meet Title 24, Part 11 A4.106.8.2 for EV charging spaces OR one of the following:</p> <ol style="list-style-type: none"> <li>ENERGY STAR® dishwasher and either ENERGY STAR refrigerator OR a whole house fan (using electronically commutated motor) OR</li> <li>Demand response home automation system (per Section 110.12(a)) controlling appliances and lighting OR</li> <li>CA Plumbing Code greywater system to be used for irrigation system OR</li> <li>CA Plumbing Code rainwater catchment system using 65% of roof rainwater.</li> </ol> <p>EXCEPTION 5: Roof used for parking, automobile hardscape or heliport. (No Change.)</p> <p>2. <b>Azimuth:</b> Steep sloped roof shall design solar zones on roofs oriented 90°-300° of true north.</p> <p>3. <b>Shading:</b> No Change.</p> <p>4. <b>Structural Design Loads on Construction Documents:</b> No Change.</p>				
110.10(c)	<p><b>Interconnection Pathways</b></p> <ol style="list-style-type: none"> <li>Drawings must indicate “reserved” location for future inverters/metering equipment/pathway for conduit between solar zone and electrical service AND</li> <li>Central water heating systems must have drawings indicate “reserved” pathway for plumbing between solar zone and water heater.</li> </ol>				
110.10(d)	<b>Documentation:</b> No Change.				

110.10(e)	<b>Main Electrical Service Panel:</b> Min. busbar rating of 200 amps and “reserved” space for future double pole circuit breaker labeled “For Future Solar Electric.”											
<b>Title 24, Part 6, Section 150.0 – MANDATORY FEATURES AND DEVICES</b>												
150.0(k)	<b>Residential Lighting: See Lighting section in this What’s Changed fact sheet for dwelling unit lighting requirements.</b> <b>3. Residential Outdoor Lighting</b>											
	B. Low-rise residential buildings with four or more dwelling units AND eight or less parking spots/carports: Trigger clarified as only including four or more dwelling units. Otherwise only minor changes.											
	C. Low-rise residential buildings with four or more dwelling units AND more than eight parking spots/carports: Minor Changes.											
	5. <b>Residential Garages for Eight or More Vehicles:</b> No Change.											
	6. <b>Interior Common Areas of Low-rise Multifamily Residential Buildings:</b> Minor Changes.											
150.0(o)	<b>Requirements for Ventilation and Indoor Air Quality</b>											
	E. Multifamily attached must use Equation 150.0-B AND i. Balanced ventilation system OR ii. Continuous supply/exhaust ventilation system WITH HERS-verified envelope leakage (0.30 CFM at 50 Pa (0.2” water) per ft <sup>2</sup> or less)											
	F. Multifamily building central ventilation systems must be balanced per Equation 150.0-B, oversized no more than 20% using system balancing such as constant air regulation devices, orifice plates and variable speed central fans.											
	G. Kitchen range hoods: HERS-verified min. ventilation airflow per ASHRAE 62.2 Section 5 and max. sound rating per ASHRAE 62.2 Section 7.2 (3 sones at one or more airflow settings ≥100 CFM.)											
Aligning with ASHRAE 62.2	<b>Kitchen Hood Requirements: 2016 ASHRAE 62.2, Tables 5.1 and 5.2</b>											
Equation 150.0-B $Q_{tot} = 0.03A_{floor} + 7.5(N_{br} + 1)$	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Ventilation Control Type</th> <th style="width: 33%;">Application</th> <th style="width: 33%;">Airflow</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Demand-Controlled Local Ventilation Exhaust Airflow Rates</td> <td>Enclosed Kitchen: permanent openings to interior adjacent spaces do not exceed a total of 60 ft<sup>2</sup></td> <td> <ul style="list-style-type: none"> <li>Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s)</li> <li>Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ach</li> </ul> </td> </tr> <tr> <td>Non-enclosed Kitchen</td> <td> <ul style="list-style-type: none"> <li>Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s)</li> <li>Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s)</li> </ul> </td> </tr> <tr> <td>Continuous Local Ventilation Exhaust Airflow Rates</td> <td>Enclosed Kitchen</td> <td>5 air changes per hour, based on kitchen volume</td> </tr> </tbody> </table>	Ventilation Control Type	Application	Airflow	Demand-Controlled Local Ventilation Exhaust Airflow Rates	Enclosed Kitchen: permanent openings to interior adjacent spaces do not exceed a total of 60 ft <sup>2</sup>	<ul style="list-style-type: none"> <li>Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s)</li> <li>Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ach</li> </ul>	Non-enclosed Kitchen	<ul style="list-style-type: none"> <li>Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s)</li> <li>Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s)</li> </ul>	Continuous Local Ventilation Exhaust Airflow Rates	Enclosed Kitchen	5 air changes per hour, based on kitchen volume
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150.0(n)	<b>Domestic Water-Heating Systems</b> 2. For systems serving multiple dwelling units: Minor changes only except:											
	Solar thermal water heating system per Reference Residential Appendix RA4 with min. solar fraction: i. CZ 1-9 = 0.20 solar fraction; CZ 10-16 = 0.35 solar fraction OR ii. HERS-verified drain water heat recovery system can reduce solar fraction in CZ 1-9 = 0.15; in CZ 10-16 = 0.30.											
<b>T-24 Section &amp; Notes</b>	<b>Prescriptive – Change Summaries</b>											
<b>Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES</b>												
150.1(a)	<b>Basic Requirements:</b> Minor Changes.											
150.1(b)	<b>Performance Standards</b>											
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	1. <b>Newly Constructed Buildings:</b> EDR will be the measurement of compliance based on two components: #1 EDR - #2 EDR = Total EDR <ul style="list-style-type: none"> <li>Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR.</li> <li>Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR.</li> </ul> EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).											
	1. <b>Additions and Alterations to Existing Buildings:</b> Measurement for compliance will use TDV energy and not EDR.											



<p>150.1(c) Insulation requirements for roof and walls have been changed.</p> <p>New Table 150.1-B Multifamily Standard Building Design</p>	<p><b>Prescriptive Standards/Component Package</b></p> <p><b>1. Insulation</b></p> <p>A. <b>Roof and Ceiling Insulation:</b> Must meet applicable sections of Table 150.1-A or 150.1-B using either Option B, which has insulation between roof rafters AND on ceiling between ventilated attic and conditioned space, or Option C, which has insulation on ceiling between ventilated attic and conditioned space and ducts/air handler within directly conditioned space. Option A (above/at roof deck insulation) has been removed as a Prescriptive option.</p> <ul style="list-style-type: none"> <li>New Table 150.1-B. Requirements are similar, EXCEPT CZ 10 and 16 are allowed R-13 for below-roof insulation. CZ 4, 8, 9 and 11-15 must use R-19.</li> </ul> <p>B. <b>Walls:</b> Exterior framed walls, mass walls (below or above grade), and unframed walls (that are not mass to meet framed wall requirements) must meet applicable sections of Table 150.1-A or 150.1-B.</p>
	<ul style="list-style-type: none"> <li>Multifamily: <ul style="list-style-type: none"> <li><u>Wood Framed: No Change.</u> <ul style="list-style-type: none"> <li>CZ 1-5 and 8-16: U-factor = 0.051 (i.e., 2 x 6 16" and R-4) (1" rigid insulation outside framing).</li> <li>CZ 6-7: U-factor = 0.065 (i.e., 2 x 4 16" and R-4) (1" rigid insulation outside framing).</li> </ul> </li> <li><u>Mass with interior insulation: Same as single family:</u> <ul style="list-style-type: none"> <li>CZ 1-15: Above and below grade: U-factor = 0.077 (i.e., R-13 insulation with wood framing) (was 0.070 which can only be done using R-13 without framing interrupted).</li> <li>CZ 16: Above grade: No Change. Below grade: U-factor = 0.067 (was 0.066); R-15.</li> </ul> </li> <li><u>Mass with exterior insulation: Same as single family:</u> <ul style="list-style-type: none"> <li>CZ 1-15: Above and below grade: No Change.</li> <li>CZ 16: Above grade: U-factor = 0.077 (i.e., R-13 insulation with wood framing) (was 0.070 which can only be done using R-13 without framing interruption). Below grade: No Change.</li> </ul> </li> </ul> </li> </ul>
	<p>C. <b>Raised Floors:</b> No change for single family or multifamily.</p> <p>D. <b>Slab Floors:</b> No change for single family or multifamily.</p> <p>E. <b>Quality Insulation Installation (QII):</b> Not required in CZ 7, but required in all others.</p>
<p>CZ 16 does not have SHGC requirements or west-facing limitations.</p>	<p>2. <b>Radiant Barrier:</b> No change for single family or multifamily.</p> <p>3. Fenestration: For both single family and multifamily:</p> <ul style="list-style-type: none"> <li>Glass door glazing 25% or more of door area (was 50%).</li> <li>U-factor: 0.30 (was 0.032).</li> <li>Solar Heat Gain Coefficient (SHGC) Requirements: CZ 2, 4, 6-15: Yes; CZ 1, 3, 5, 16: No.</li> <li>Max. total area: No Change.</li> <li>Max. min. west facing: CZ 16 no longer has a west facing limitations, otherwise no change.</li> </ul>
	<p>4. <b>Shading:</b> No Change.</p> <p>5. <b>Exterior Opaque Doors:</b> Doors (less than 25% glazing is considered opaque): NFRC-rated U-factor <math>\leq 0.20</math>. EXCEPTION for swinging doors between garage and house that are required to be fire rated.</p>
	<p>8. <b>Domestic Water-Heating Systems:</b></p> <p>A. See Mechanical section in this What's Changed fact sheet for single-family requirements.</p> <p>B. Central water-heating for multifamily dwelling units:</p> <ol style="list-style-type: none"> <li>Equipment: Minor Changes.</li> <li>Recirculation systems: Minor Changes.</li> <li>Solar Water-Heating System: <ol style="list-style-type: none"> <li>CZ 1-9 = 0.20 solar fraction; CZ 10-16 = 0.35 solar fraction OR</li> <li>HERS-verified drain water heat recovery system can reduce solar fraction in CZ 1-9 = 0.15; in CZ 10-16 = 0.30.</li> </ol> </li> </ol>
	<p>11. <b>Roofing Products:</b> No change for single family or multifamily.</p>



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