

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
- 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
- Energy Code Hotline: 1-800-772-3300 (Free) or Title24@energy.ca.gov
- Online Resource Center:
energy.ca.gov/title24/orc/
 - The Energy Commission's main web portal for Energy 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 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	 Mandatory		 Prescriptive	 Performance	 Additions Alterations
	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.)

	HABITABLE STORY 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.	MECHANICAL COOLING 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. MECHANICAL HEATING 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.)
	NATURAL GAS AVAILABILITY: 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.	VENTILATION SYSTEM, BALANCED is a mechanical device intended to remove air from buildings, and simultaneously replace it with outdoor air. VENTILATION SYSTEM, CENTRAL FAN INTEGRATED (CFI) 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. VENTILATION SYSTEM, ENERGY RECOVERY (ERV) 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. VENTILATION SYSTEM, EXHAUST 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. VENTILATION SYSTEM, HEAT RECOVERY (HRV) 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. VENTILATION SYSTEM, SUPPLY 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.
Title 24, Part 6, Section 110.2 – SPACE CONDITIONING EQUIPMENT	
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.
Title 24, Part 6, Section 110.3 – SERVICE WATER-HEATING SYSTEMS AND EQUIPMENT	
	No changes affecting residential occupancies.
Title 24, Part 6, Section 110.4 – POOL AND SPA SYSTEMS AND EQUIPMENT	
	No Change.
Title 24, Part 6, Section 110.5 – NATURAL GAS CENTRAL FURNACES, COOKING EQUIPMENT, AND POOL SPA HEATERS, AND FIREPLACES	
	Pilot Lights Prohibited: Indoor and outdoor fireplaces have been added.
Title 24, Part 6, Section 150.0 – LOW-RISE RESIDENTIAL BUILDINGS – MANDATORY FEATURES AND DEVICES	
150.0(e)	Installation of Fireplaces, Decorative Gas Appliances and Gas Logs: 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)	Space-Conditioning Equipment: No Change.
150.0(i)	Thermostats: Clarifies that all heating and cooling systems not controlled by a central energy management control system must have a setback thermostat.

<p>150.0(j)</p> <p>Aligning with CA Plumbing Code Section 609.11, with some differences.</p>	<p>Insulation for Piping and Tanks</p> <p>1. Storage Tank Insulation: No Change.</p> <p>2. Water Piping, Solar Water-heating System Piping, and Space Conditioning System Line Insulation Thickness and Conductivity:</p> <p>A. Pipe insulation to follow CA plumbing Code Section 609.11.</p> <p>2016 CA Plumbing Code:</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>EXCEPTIONS:</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> <ol style="list-style-type: none"> The first 5' (1.5 meters) of hot water and cold water pipes from the storage tank. All hot water piping with a nominal diameter $\geq 3/4"$ (19 millimeter) and $< 1"$. All hot water piping with a nominal diameter $< 3/4"$ that is: <ol style="list-style-type: none"> Associated with a domestic hot water recirculation system; From the heating source to the kitchen fixtures; From the heating source to a storage tank or between storage tanks; or Buried below grade. <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>
<p>150.0(m)</p>	<p>Air-Distribution and Ventilation System Ducts, Plenums and Fans</p> <p>1. CMC Compliance</p> <p>Two new EXCEPTIONS to duct insulation.</p> <ol style="list-style-type: none"> 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. When ducts are exposed in directly conditioned space. <p>2-9. No Change.</p> <p>10. Porous Inner Core Flex Duct: Must have a non-porous layer or air barrier between the inner core and outer vapor barrier.</p> <p>11. Duct System Sealing and Leakage Testing: No Change.</p>
<p>Changes to air filtration requirements.</p> <p>These are very similar to the nonresidential ventilation requirements.</p>	<p>12. Air Filtration</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"> 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. 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. 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.






	<p>B. System Design and Installation</p> <ul style="list-style-type: none"> i. All outdoor and recirculated air must be filtered before passing through thermal conditioning unit. EXCEPTION for heat recovery and energy recovery ventilators. ii. System designed to meet pressure drop requirements. iii. Filter must be readily accessible to system owner. iv. Filters must have clearly visible permanent labels stating design airflow rate and max. clean-filter pressure drop. <p>C. Air Filter Efficiency: MERV 13.</p>
<p>EQUATION 150.0-A</p> $A_{\text{face}} = Q_{\text{filter}} / V_{\text{face}}$	<p>D. Air Filter Pressure Drop: Design must accommodate clean-filter pressure drop with design airflow rate determined with filters meeting either:</p> <ul style="list-style-type: none"> i. Nominal 2" filter OR 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 iii. If a supply-only ventilation system, max. clean-filter pressure drop determined by system design.
	<ul style="list-style-type: none"> 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>E. Air Filter Product Labeling: Labels provided by manufacturer must include efficiency and pressure drop ratings for space conditioning systems.</p>
	<p>13. Space Conditioning System Airflow Rate and Fan Efficacy</p> <p>A. Static Pressure Probe: No Change.</p>
	<p>B. Single Zone Central Forced Air Systems: 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. Zonally Controlled Central Forced Air Systems: See Above.</p>
	<p>D. Small Duct High Velocity Forced Air Systems: HERS-verified airflow 250 CFM per ton, fan efficacy of ≤ 0.62 W/CFM.</p>
<p>150.0(n)</p>	<p>Water Heating System</p>
<p>Future heat pump option.</p>	<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>
<p>150.0(o)</p>	<p>Requirements for Ventilation and Indoor Air Quality</p>
<p>150.0(o)1</p>	<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 Multifamily Specific 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	Kitchen Hood Requirements: 2016 ASHRAE 62.2, Tables 5.1 and 5.2		
	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 ²	<ul style="list-style-type: none"> Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s) Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ach
		Non-enclosed Kitchen	<ul style="list-style-type: none"> Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s) Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s)
Continuous Local Ventilation Exhaust Airflow Rates	Enclosed Kitchen	5 air changes per hour, based on kitchen volume	
150.0(p)	Pool Systems and Equipment Installation: No Change.		
T24 Section & Notes	 Prescriptive – Change Summaries		
Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES			
150.1(a)	Basic Requirements: Minor Changes.		
150.1(b)	Performance Standards		
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	<p>1. Newly Constructed Buildings: EDR will be the measurement of compliance based on two components: $\#1 \text{ EDR} - \#2 \text{ EDR} = \text{Total EDR}$</p> <ul style="list-style-type: none"> Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR. Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR. <p>EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).</p>		
	2. Additions and Alterations to Existing Buildings: Measurement for compliance will continue to use TDV energy and not EDR.		
	3. Compliance Demonstration Requirements for Performance Standards		
	A. Certificate of Compliance and Application for a Building Permit: 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.		
	B. Field Verification: If HERS verification is required, it must be documented per Title 24, Part 1, Section 10-103. HERS verifications that may be applicable:		
	i. SEER rating better than what is required prescriptively being used for compliance (No Change).		
	ii. EER rating better than standard design EER being used for compliance.		
	iii. Low-leakage air handler being used for compliance (No Change).		
	iv. HSPF rating better than what is required prescriptively being used for compliance.		
	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.		
	vi. Whole House Fan ventilation airflow and fan efficacy being used for compliance.		
	vii. Central Fan Ventilation Cooling System being used for compliance. (No Change.)		
	viii. Building Enclosure Air Leakage being used for compliance. (No Change.)		
	ix. Quality Insulation Installation (QII) being used for compliance. (No Change.)		
150.1(c)	Prescriptive Standards/Component Package		
	6. Heating System Type: No Change.		
	7. Space Heating and Space Cooling: Provisions added for small duct high velocity systems. Otherwise only minor changes.		
	8. Domestic Water-Heating Systems		
	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"> HERS-verified compact hot water distribution system OR HERS-verified drain water heat recovery system. 		

<p>New provisions for electric DHW.</p>	<p>iii. OR One gas/propane > 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"> • HERS-verified compact hot water distribution system AND HERS-verified drain water heat recovery system OR • In CZ 2-15: PV system sized 0.3 kWdc larger than required in Section 150.1(c)14 OR • In CZ1 and 16: PV system sized 1.1 kWdc larger than required in Section 150.1(c)14 <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"> • PV system sized 0.3 kWdc larger than required in Section 150.1(c)14 OR • HERS-verified compact hot water distribution system
	<p>B. See the Multifamily Specific section of this What's Changed fact sheet for revised multifamily requirements.</p> <p>9. Space Conditioning Distribution Systems: No Change.</p> <p>10. Central Fan Integrated Ventilation Systems: 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. Ventilation Cooling: 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/ft² of CFA, with with 1 ft² 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. HVAC System Bypass Ducts: No Change.</p>
<p>Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS</p>	
<p>150.2(a)</p>	<p>Additions</p> <p>1. Prescriptive Approach</p> <p>C. Mechanical Ventilation for Indoor Air Quality: 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. Water Heater: System must meet the requirements of Section 150.1(c)8.</p> <p>2. Performance Approach</p> <p>C. Mechanical Ventilation for Indoor Air Quality: 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>Alterations</p> <p>1. Prescriptive Approach</p> <p>C. Entirely New or Complete Replacement Space-Conditioning Systems: New allowance for heat pump heating systems when gas/propane is available.</p> <p>D. Altered Duct Systems - Duct Sealing: 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. Altered Ducts and Duct System Components in Garage Spaces: To meet HERS requirements of 6% or less leakage OR everything possible as verified by visible verification and smoke test.</p> <p>E. Altered Space-Conditioning System - Duct Sealing: 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. Altered Space-Conditioning System - Mechanical Cooling: Provisions added for small duct high velocity systems. Otherwise only minor changes.</p> <p>G. Altered Space-Conditioning System: New allowance for heat pump heating systems when gas/propane available.</p> <p>H. Water-Heating System: 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	 Mandatory		 Prescriptive	 Performance	 Additions Alterations
	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)			
T-24 Section & Notes	 Mandatory – Change Summaries				
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					
Exterior doors have been added throughout this Section to support the solid door changes for residential buildings.					
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.				
Definitions added to support the new requirements for new homes.	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.				
To support door requirements.	GLAZED DOOR 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. 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.) HABITABLE STORY is a story that contains habitable space and that has at least 50% of its volume above grade. ROOF, LOW-SLOPED is a roof that has a ratio of rise to run < 2:12 (9.5° from the horizontal). ROOF, STEEP-SLOPED is a roof that has a ratio of rise to run ≥ 2:12 (9.5° from the horizontal).				
Title 24, Part 6, Section 150.0 – MANDATORY FEATURES AND DEVICES					
150.0(a)	Ceiling and Rafter Roof Insulation: No Change.				
150.0(b)	Loose-fill Insulation: No Change.				
150.0(c)	Wall Insulation <ul style="list-style-type: none"> Wood-framed walls: 2 x 4 = U-factor 0.102 (R-13); 2 x 6 = U-factor 0.071 (R-20) Non-framed walls: U-factor = 0.102 Mass (masonry) walls: Must meet Prescriptive requirements, there are no Mandatory requirements. 				

150.0(d)	Raised-floor Insulation: Wood-framed U-factor = 0.037 (R-19). Clarified for use with wood-framed assembly.
150.0(f)	Slab Edge Insulation: No Change.
150.0(g)	Vapor Retarder: No Change.
150.0(q)	Fenestration Products: No Change.
T-24 Section & Notes	 Prescriptive – Change Summaries
Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES	
150.1(a)	Basic Requirements Minor Changes.
150.1(b)	Performance Standards
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	<ol style="list-style-type: none"> Newly Constructed Buildings: EDR will be the measurement of compliance based on two components: $\#1 \text{ EDR} - \#2 \text{ EDR} = \text{Total EDR}$ <ul style="list-style-type: none"> Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR. Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR. EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115). Additions and Alterations to Existing Buildings: Measurement for compliance will use TDV energy and not EDR. Compliance Demonstration Requirements for Performance Standards <ol style="list-style-type: none"> Certificate of Compliance and Application for a Building Permit: 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. Field Verification: 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"> Building Enclosure Air Leakage being used for compliance. Quality Insulation Installation (QII) being used for compliance.
150.1(c) Insulation requirements for roof and walls have been changed in Table 150.1-A.	Prescriptive Standards/Component Package <ol style="list-style-type: none"> Insulation <ol style="list-style-type: none"> Roof and Ceiling Insulation: 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"> Single Family: <ul style="list-style-type: none"> 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. Option C: No Change. Walls: 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"> Single Family: <ul style="list-style-type: none"> <u>Wood Framed</u> <ul style="list-style-type: none"> 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). CZ 6-7: No Change. <u>Mass with interior insulation</u> <ul style="list-style-type: none"> 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). CZ 16: Above grade: No Change. Below grade: U-factor = 0.067 (was 0.066); R-15. <u>Mass with exterior insulation</u> <ul style="list-style-type: none"> CZ 1-15: Above grade and below grade: No Change. CZ 16: Above grade: U-factor = 0.077 (was 0.070); Below grade: No Change. Raised Floors: No change for single family or multifamily. Slab Floors: No change for single family or multifamily. QII: Required in all CZ for single family. Radiant Barrier: No change for single family or multifamily.





CZ 16 does not have SHGC requirements or west-facing limitations.	<p>3. Fenestration: For both single family and multifamily:</p> <ul style="list-style-type: none"> • Glass door glazing $\geq 25\%$ of door area now considered fenestration (was 50%). • U-factor: 0.30 (was 0.032). • Solar Heat Gain Coefficient (SHGC) Requirements: CZ 2, 4, 6-15: Yes; CZ 1, 3, 5, 16: No. • Max. total area: No Change. • Max. min. west facing: CZ 16 no longer has a west facing limitations, otherwise no change.
	4. Shading: No Change.
	5. Exterior Opaque Doors: Doors (less than 25% glazing is considered opaque): NFRC-rated U-factor ≤ 0.20 . EXCEPTION for swinging doors between garage and house that are required to be fire rated.
	11. Roofing Products: No change for single family or multifamily.
Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS	
150.2(a)	Additions
	1. Prescriptive Approach
	A. Additions of Any Size
	i. Extended Walls: 2 x 4 must use R-15 and 2 x 6 must use R-21.
	ii. Fenestration: No Change.
	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.
	iv. QII is required for additions > 700 ft ² 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.
	B. Additions ≤ 700 ft ²
	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).
	ii. Radiant Barrier: Required in CZ 2-15.
	iii. Extended Walls: 2 x 4 must use R-15 and 2 x 6 must use R-21.
	iv. Fenestration: No Change.
	v. QII: Not required.
	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.
150.2(b)	Alterations
	1. Prescriptive Approach
	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.
	I. Roofs: Replacing or ADDING a new surface layer to 50% or more of the roof area, otherwise no change.

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	 Mandatory		 Prescriptive	 Performance	 Additions Alterations
	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) **Data Registries and Related External Digital Data Sources, And Electronic Document Repositories:** Provisions added to include external digital data sources to the registry procedures.

10-109(k) **Photovoltaic System Requirement Determinations:** 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) **Community Shared Solar Electric Generation System or Battery Storage System Offset:** 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.


1. 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.
2. Energy Performance: Community system must be able to provide the energy performance promised by the compliance paperwork.
3. 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).
4. Durability: Community system used for compliance must be designed to be installed for at least 20 years.
5. Additionality: The energy savings used for compliance of one building cannot be used for any other reason.
6. 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).

10-115(b) **Application for Commission Approval:** 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) **Commission Approval:** 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>BATTERY SYSTEM, STATIONARY STORAGE 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>DEMAND FLEXIBILITY MEASURE 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>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.</p>
Definitions added to support the new requirements for new homes.	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>SOLAR ELECTRIC GENERATION SYSTEM or PHOTOVOLTAIC SYSTEM 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	Solar Ready Buildings: 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>Solar Ready Buildings:</p> <ol style="list-style-type: none"> 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. Low-rise Multifamily buildings that do not have a PV (photovoltaic) system meeting the requirements of Section 150.1.
110.10(b)	<p>Solar Zone</p> <ol style="list-style-type: none"> Minimum Solar Zone Area <ol style="list-style-type: none"> Single Family: For those homes in which PV is not installed per Section 150.1(c)14, to have 250 ft² on roof or overhang of the home. <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 ft² 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"> Low-sloped Roof: Roof area where annual solar access is ≥70%. Steep-sloped Roof: Roof area oriented 90°-300° of true north in which the annual solar access is ≥70%. <p>EXCEPTION 5: Solar zone of ≤150 ft² 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"> ENERGY STAR® dishwasher and either ENERGY STAR refrigerator OR whole house fan OR SAE J1772 Level 2 EVSE/EV charge with 40 amperes or more Azimuth: Steep sloped roof shall design solar zones on roofs oriented 90°-300° of true north.
	<ol style="list-style-type: none"> Shading: No Change. Structural Design Loads on Construction Documents: No Change.

110.10(c)	Interconnection Pathways: 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)	Documentation: No Change.
110.10(e)	Main Electrical Service Panel: Min. busbar rating of 200 amps and “reserved” space for future double pole circuit breaker labeled “For Future Solar Electric.”
T-24 Section & Notes	 Prescriptive – Change Summaries
Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES	
150.1(a)	Basic Requirements: Minor Changes.
150.1(b)	Performance Standards
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	1. Newly Constructed Buildings: EDR will be the measurement of compliance based on two components: #1 EDR - #2 EDR = Total EDR <ul style="list-style-type: none"> • Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR. • Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR. EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).
	2. Additions and Alterations to Existing Buildings: Measurement for compliance will continue to use TDV energy and not EDR. 3. Compliance Demonstration Requirements for Performance Standards A. Certificate of Compliance and Application for a Building Permit: 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	Prescriptive Standards/Component Package 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 ² 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 ² 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 ² 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 ² 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 ² , 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%.
Title 24, Part 6, Reference Joint Appendix JA11 – QUALIFICATION REQUIREMENTS FOR PHOTOVOLTAIC SYSTEM	
JA11.1	Purpose and Scope: Requirements for PV using either Prescriptive and Performance method.
JA11.2	System Orientation a. Prescriptive: PV system (including all modules) $\leq 2:12$ (or 10°) with azimuth range 90° - 300° 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° - 270° of true north and all modules matching tilt of roof pitch of $\leq 7:12$.
JA11.3	Shading: Use one of the following methods: a. Min. Shading Criterion OR b. PV Array Geometries Performance Input using the Performance method.

JA11.4	Solar Access Verification: 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	System Monitoring Requirements: Remote Monitoring Capability (web or mobile) must provide dwelling occupants specific information regarding the PV system.
JA11.6	Interconnection Requirements: Inverters must meet UL1741 including supplement A. PV system must comply with Rule 21 per CPUC.
JA11.7	Certificates and Availability: CF2R required to be provided by Installer at time of building inspection.
JA11.8	Enforcement Agency: Must confirm the registered CF2R provided is accurate to installation.
T-24 Section & Notes	 Performance – Change Summaries
RESIDENTIAL ALTERNATIVE CALCULATION METHOD (ACM) REFERENCE MANUAL	
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.
REFERENCE JOINT APPENDIX JA12 – QUALIFICATION REQUIREMENTS FOR BATTERY STORAGE SYSTEM	
JA12.1	Purpose and Scope: Requirements for battery storage using the Performance method when in combination with PV system.
JA12.2	Qualification Requirements 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"> • Capacity of $\geq 5\text{kWh}$ • AC-AC single charge/discharge cycle with $\geq 80\%$ efficiency • Warranty of energy retention of 70% nameplate capacity after 4,000 cycles, OR 10 year warranty c. Control Requirements <ul style="list-style-type: none"> • Can be remotely programmed for charge/discharge periods; AND • 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 • 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"> 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 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 3. Advanced Demand Response Control: Meet Basic OR TOU Control, AND be able to charge and discharge from demand response signals. 4. Alternative Control Approved by Energy Commission. Allow for future controls types not known at this time. d. System Checks: At least twice: Within 10 calendar days of onset of summer and winter TOU schedule.
JA12.3	Interconnection and Net Energy Metering Requirements: System to comply with Rule 21 and Net Energy Metering (NEM) rules per CPUC. Enforcement Agency: To confirm the registered CF2R provided is accurate to installation and meeting control strategy specified in CF1R-PRF-01-E.
Title 24, Part 6, Section 150.2 – ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS	
150.2(a)	Additions: PV not required.

LIGHTING – SINGLE FAMILY & MULTIFAMILY DWELLING UNITS

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

Building Application	 Mandatory		 Prescriptive	 Performance	 Additions Alterations
	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)
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)
Indoor Lighting (cond, uncond. & parking garages)	§§110.9, 130.0	§150.0(k)			
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)	Residential Lighting 1. Luminaire Requirements
	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. Interior Lighting Switching Devices and Controls 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. Residential Outdoor Lighting a. Single-family Residential Buildings: Minor changes.
	4. Internally Illuminated Address Signs: Minor Changes.

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

150.2(b)	Alterations 1. Prescriptive Approach J. Lighting: 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	 Mandatory		 Prescriptive	 Performance	 Additions Alterations
	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

T24 Section & Notes  **Mandatory – Change Summaries**

Title 24, Part 6, Sections 150.0(r) and 110.10 – SOLAR READY BUILDINGS

150.0(r)	Solar Ready Buildings: Must meet the requirements of Section 110.10 applicable to the building project.
110.10(a)	Low-rise Multifamily, including Mixed-Use Occupancy Buildings: No Change.
110.10(b)	<p>Solar Zone: Solar zones areas cannot be less than:</p> <p>1. Minimum Solar Zone Area</p> <ul style="list-style-type: none"> Roof area ≤ 10,000 ft²: No Change. Roof area > 10,000 ft²: No Change. <p>B. Low-Rise Multifamily:</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"> Low-sloped Roof: Roof area where annual solar access is ≥ 70%. Steep-sloped Roof: Roof area oriented 90°-300° of true north in which the annual solar access is ≥ 70%. <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"> ENERGY STAR® dishwasher and either ENERGY STAR refrigerator OR a whole house fan (using electronically commutated motor) OR Demand response home automation system (per Section 110.12(a)) controlling appliances and lighting OR CA Plumbing Code greywater system to be used for irrigation system OR CA Plumbing Code rainwater catchment system using 65% of roof rainwater. <p>EXCEPTION 5: Roof used for parking, automobile hardscape or heliport. (No Change.)</p> <p>2. Azimuth: Steep sloped roof shall design solar zones on roofs oriented 90°-300° of true north.</p> <p>3. Shading: No Change.</p> <p>4. Structural Design Loads on Construction Documents: No Change.</p>
110.10(c)	<p>Interconnection Pathways</p> <ol style="list-style-type: none"> Drawings must indicate “reserved” location for future inverters/metering equipment/pathway for conduit between solar zone and electrical service AND Central water heating systems must have drawings indicate “reserved” pathway for plumbing between solar zone and water heater.
110.10(d)	Documentation: No Change.

110.10(e)	Main Electrical Service Panel: Min. busbar rating of 200 amps and “reserved” space for future double pole circuit breaker labeled “For Future Solar Electric.”											
Title 24, Part 6, Section 150.0 – MANDATORY FEATURES AND DEVICES												
150.0(k)	Residential Lighting: See Lighting section in this What’s Changed fact sheet for dwelling unit lighting requirements. 3. Residential Outdoor Lighting											
	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. Residential Garages for Eight or More Vehicles: No Change.											
	6. Interior Common Areas of Low-rise Multifamily Residential Buildings: Minor Changes.											
150.0(o)	Requirements for Ventilation and Indoor Air Quality											
	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 ² 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	Kitchen Hood Requirements: 2016 ASHRAE 62.2, Tables 5.1 and 5.2											
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 ft²</td> <td> <ul style="list-style-type: none"> Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s) Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ach </td> </tr> <tr> <td>Non-enclosed Kitchen</td> <td> <ul style="list-style-type: none"> Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s) Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) </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 ²	<ul style="list-style-type: none"> Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s) Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ach 	Non-enclosed Kitchen	<ul style="list-style-type: none"> Vented range hood (including appliance-range hood combinations): 100 CFM (50 L/s) Other kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) 	Continuous Local Ventilation Exhaust Airflow Rates	Enclosed Kitchen	5 air changes per hour, based on kitchen volume
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150.0(n)	Domestic Water-Heating Systems 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.											
T-24 Section & Notes	Prescriptive – Change Summaries											
Title 24, Part 6, Section 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES												
150.1(a)	Basic Requirements: Minor Changes.											
150.1(b)	Performance Standards											
New method to determine compliance for new buildings but does NOT apply to additions/alterations.	1. Newly Constructed Buildings: EDR will be the measurement of compliance based on two components: #1 EDR - #2 EDR = Total EDR <ul style="list-style-type: none"> Building Energy Efficiency Design Rating: Compliance to be shown independently from #2 EDR. Solar Electric Generation and Demand Flexibility Design Rating: Subtracted from #1 EDR to get the Total EDR. EXCEPTION allows for a community shared system approved by the Energy Commission (see Title 24, Part 1, Section 10-115).											
	1. Additions and Alterations to Existing Buildings: 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>Prescriptive Standards/Component Package</p> <p>1. Insulation</p> <p>A. Roof and Ceiling Insulation: 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"> • 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. <p>B. Walls: 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"> • Multifamily: <ul style="list-style-type: none"> <u>Wood Framed: No Change.</u> <ul style="list-style-type: none"> – CZ 1-5 and 8-16: U-factor = 0.051 (i.e., 2 x 6 16" and R-4) (1" rigid insulation outside framing). – CZ 6-7: U-factor = 0.065 (i.e., 2 x 4 16" and R-4) (1" rigid insulation outside framing). <u>Mass with interior insulation: Same as single family:</u> <ul style="list-style-type: none"> – 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). – CZ 16: Above grade: No Change. Below grade: U-factor = 0.067 (was 0.066); R-15. <u>Mass with exterior insulation: Same as single family:</u> <ul style="list-style-type: none"> – CZ 1-15: Above and below grade: No Change. – 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.
	<p>C. Raised Floors: No change for single family or multifamily.</p> <p>D. Slab Floors: No change for single family or multifamily.</p> <p>E. Quality Insulation Installation (QII): 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. Radiant Barrier: No change for single family or multifamily.</p> <p>3. Fenestration: For both single family and multifamily:</p> <ul style="list-style-type: none"> • Glass door glazing 25% or more of door area (was 50%). • U-factor: 0.30 (was 0.032). • Solar Heat Gain Coefficient (SHGC) Requirements: CZ 2, 4, 6-15: Yes; CZ 1, 3, 5, 16: No. • Max. total area: No Change. • Max. min. west facing: CZ 16 no longer has a west facing limitations, otherwise no change.
	<p>4. Shading: No Change.</p> <p>5. Exterior Opaque Doors: Doors (less than 25% glazing is considered opaque): NFRC-rated U-factor ≤ 0.20. EXCEPTION for swinging doors between garage and house that are required to be fire rated.</p>
	<p>8. Domestic Water-Heating Systems:</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"> i. Equipment: Minor Changes. ii. Recirculation systems: Minor Changes. iii. Solar Water-Heating System: <ol style="list-style-type: none"> a. CZ 1-9 = 0.20 solar fraction; CZ 10-16 = 0.35 solar fraction OR b. HERS-verified drain water heat recovery system can reduce solar fraction in CZ 1-9 = 0.15; in CZ 10-16 = 0.30.
	<p>11. Roofing Products: No change for single family or multifamily.</p>



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