

HVAC AND DOMESTIC HOT WATER: Mandatory Measures

Color background indicates code language: NO CHANGE REVISED NEW FOR 2016

Measure	T-24 Section	Notes
Systems & Equipment <i>§110.0 has added new language regarding conformance to Title 20</i>	110.0(b)	New language regarding certification of manufactured systems, equipment, appliances and building components that need to meet Title 20 requirements (regulated appliances), or certification requirements per Title 24, Part 6 (not a regulated appliance under Title 20). Certification to the Energy Commission is the responsibility of the manufacturer.
Heating Equipment Efficiency	110.2(a)	Table 110.2-B: Heating mode water and groundwater source heat pumps COP minimum values (1/1/2017). Table 110.2-E: SPVHP and PTHP COP minimum values (1/1/2017). Table 110.2-J: Oil-fired unit heater minimum efficiency increased to 81% E _c (1/1/2017). Table 110.2-K: Boiler minimum efficiencies to change 3/2/2020.
Cooling Equipment Efficiency	110.2(a)	Table 110.2-A: Air conditioners: air cooled and water cooled IEER minimum values (1/1/2016). Table 110.2-B: Air and water cooled heat pumps IEER and EER minimum values (1/1/2016). Table 110.2-D: Air and water cooled chillers Path A and B minimum efficiencies (1/1/2017). Table 110.2-E: Cooling mode PTAC, PTHP and SPVAC EER minimum values (1/1/2017). Table 110.2-G: Evaporative cooling towers added.
Space Conditioning Equipment	110.2(b-f)	No Change
Service Water Heating Systems & Equipment Installation	110.3(a)(b) 110.3(c)7	No Change. NOTE: Temperature control listed in ASHRAE Handbook HVAC Applications Guide volume 2011 is Table 3 (as is stated within Standards); in volume 2015 it can be found in Chapter 50, Table 19. Isolation valves. Instantaneous water heaters with an input rating greater than 6.8 kBTU/hr (2 kW) shall have isolation valves on both the cold water supply and the hot water pipe leaving the water heater, and hose bibbs or other fittings on each valve for flushing the water heater when the valves are closed.
Pool & Spas	110.4(a)(b)	No Change
Pilot Lights	110.5(a-d)	No Change
Residential HVAC & Water Heating	150.0(e) Fireplaces 150.0(h) 3B Equipment 150.0(i) Thermostats 150.0(j) Water system insulation 150.0(m)1 Air distribution 150.0(m)2-12 150.0(m)13 Duct and air grille sizing 150.0(n-p)	No Change Liquid line filter dryers required per manufacturers' instructions for AC and heat pump systems. Allows for EMCS instead of setback thermostat when required per §110.2(c). Since federal standards have increased minimum efficiency on tank water heaters, an R-12 external blanket is no longer required since they are provided via internal tank insulation by manufacturer (to meet minimum federal efficiency). Minor changes in language regarding below grade piping, cooling system piping, and insulation protection. Minimum duct insulation, no matter where it is located, such as inside the conditioned space, must be insulated with a minimum of R-4.2. 11. Duct testing: Total leakage shall not exceed 5% for single family homes and townhouses. All others: No Change Slight change in language specifically to single zone central forced air system for the airflow fan watt draw minimum requirements. Zonally controlled central forced air systems shall be capable of simultaneously delivering, in every zonal control mode, airflow from the dwelling, through the air handler fan and delivered to the dwelling ≥350 CFM per ton of nominal cooling capacity, and operating at an air-handling unit fan efficacy of ≤ 0.58 W/CFM as confirmed by field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.3 Some new exceptions apply for small duct high velocity systems and multispeed/variable speed compressor systems. No Change

Measure	T-24 Section	Notes
Space Heating & Space Cooling	150.1(c)7A Refrigerant charge	Slight changes to language regarding code requirements to refrigerant charge and cleaning up language in which there may have been differences between code and Residential Reference Appendixes. Charge Indicator Display (CID) was changed to Fault Indicator Display (FID).
Domestic Hot Water <i>See RA3.5 for the requirements for Quality Insulation Installation (QII) as verified by a HERS rater</i>	150.1(c)8 DHW	For recirculation distribution systems serving individual dwelling units, only Demand Recirculation Systems with manual control pumps as specified in the Reference Appendix RA4.4 shall used. When systems service a single dwelling unit, it must meet one of the following three choices for installation: <ol style="list-style-type: none"> i. A single gas or propane instantaneous water heater with an input of 200,000 BTUH or less and no storage tank, and meets the requirements of Sections 110.1 and 110.3 shall be installed. ii. A single gas or propane storage type water heater with an input of 105,000 BTUH or less, rated volume less than or equal to 55 gallons and meets the requirements of Sections 110.1 and 110.3. The dwelling unit shall meet all of the requirements for HERS verified QII as specified in the RA3.5, and in addition, one of the following shall be installed: <ol style="list-style-type: none"> a. A compact hot water distribution system that is HERS verified as specified in the RA4.4.16 OR b. All domestic hot water piping shall be insulated and HERS verified as specified in the RA4.4.1; RA4.4.3; RA4.4.14. iii. A single gas or propane storage type water heater with an input of 105,000 BTUH or less, rated volume of more than 55 gallons, and meets the requirements of §110.1 and 110.3, and in addition one of the following shall be installed: <ol style="list-style-type: none"> a. A compact hot water distribution system that is HERS verified as specified in the RA4.4.16 OR b. All domestic hot water piping shall be insulated and HERS verified as specified in the RA4.4.1; RA4.4.3; RA4.4.14.
	150.1(c)8B Multi Electric Resistance removed	No Change Electric resistance DHW system is no longer a prescriptive system type allowed. (Previously, an electric resistance system was allowed in cases where natural gas was not available and a solar hot water system with SSF ≥ 50% was used. This exception was REMOVED).
Space Conditioning Distribution Systems <i>See envelope prescriptive requirements in §150.1(c)1 for further guidance on attic requirements</i>	150.1(c)9	New requirements. Distribution system must meet one of the following options: <ol style="list-style-type: none"> A. High performance attics. Air handlers or ducts are allowed to be in ventilated attic spaces when the roof and ceiling insulation levels meet Option A or B in TABLE 150.1-A (high performance attics per the envelope requirements). Duct insulation levels shall meet the requirements in TABLE 150.1-A. B. Duct and air handlers located in conditioned space. Duct systems and air handlers of HVAC systems shall be located in conditioned space and be verified by a HERS rater per RA3.1.4.3.8. Duct insulation levels shall meet the requirements in TABLE 150.1-A. NOTE: Gas heating appliances installed in conditioned spaces must meet the combustion air requirements of the California Mechanical Code Chapter 7, as applicable.
Central Fan Integrated Ventilation	150.1(c)10	New requirements that this type of system be certified as an intermittent system per RA3.7.4.2.
Ventilation Cooling	150.1(c)12	Requirements have changed from a total air flow CFM from 2 CFM/square feet to 1.5 CFM/ft ² and have at least one ft ² of attic vent free area for each 750 CFM (was 375 CFM) OR as per manufacturer's specifications.
HVAC System Bypass Ducts	150.1(c)13	No Change
Additions & Alterations	150.2(b)1C New HVAC systems 150.2(b)1D Altered Ducts 150.2(d)1E Duct Sealing 150.2(b)1F Cooling 150.2(b)1G: DHW	Removed prescriptive insulation requirement for ducts located inside of indirectly conditioned space. If in unconditioned location, Table .2-A prescriptive duct insulation applies. Altered ducts >40 linear feet, regardless of location, must meet HERS testing per RA3.1. Revised language to match 150.1 and exception #3 added regarding return grill/duct sizing for complete replacement duct systems. When new piping is installed, all accessible existing piping must be insulated per §150.0(j)2. When changing out a water heater on an existing home, existing utility source can be used as long as natural gas has not been brought to the home. If a recirculation pump is added it must use a "manual pump" control. One additional water heater can be added to an existing home as long as it is a gas tankless unit. Other unit types trigger a performance run. Water heaters added in additions must meet the requirements of "new construction", except if no natural gas is connected to building then an electric resistance can be used if < 60 gallons. If recirculation system installed, it must use manual control as specified in RA4.4.

ENVELOPE:  **Mandatory Measures**

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Measure	T-24 Section	Notes
Fenestration & Exterior Doors	110.6(a)1 Air Leakage 150.0(q)1 U-factor Exemption	Pet doors must meet 0.3 cfm/ft ² when tested according to ASTM E283 at 75 pascals (or 1.57 pounds/ft ²). AAMA/WDMA/CSA 101/I.S.2/A440-2011 specification is equivalent to ASTM E283 at a pressure differential of 75 pascals (or 1.57 pounds/ft ²) satisfies the air leakage certification requirements of this section. Up to 30 ft ² of dual glazed greenhouse or garden windows is exempt from the max. U-factor requirement.
Solar Ready	110.10(a-b) 110.10(c-e) 110.10(b)1. A-B Single and Multifamily	January 1, 2014 is no longer a trigger date for solar ready, all subdivision maps potentially trigger solar ready requirements. No Change Exceptions for Single-family and Multifamily buildings in regards to Solar Ready have been revised in regards to the ability to trade solar ready for other various options. New options such as option i: Demand Response Thermostat AND ENERGY STAR® dishwasher AND either ENERGY STAR® refrigerator or a electronically commutated whole house fan have been added.
Opaque Surfaces <i>See prescriptive requirements §150.1(c)1 for high performance attic requirements that explain reduction of U-factor requirements</i>	150.0(a) Ceiling and Rafter Roof Insulation 150.0(b) Loose-fill 150.0(c) Above Grade Walls 150.0(d) Raised Floors 150.0(f) Slab Edge 150.0(g) Vapor Retarder	New construction weighted U-factor changed to 0.043 based on wood framing with insulation having R-22 (down from U-factor=0.031/R-value=R-30) or better. Vented attics must have insulation installed at ceiling. Unvented attics can have insulation installed at either ceiling or roof. Insulation shall be in direct contact with continuous roof or ceiling, which can be installed above or below roof deck, or at drywall ceiling. No Change 2x4 framed walls (wood or metal) to meet U-factor=0.102 (equivalent R-13 of wood framed assembly) OR, 2x6 framed walls (wood or metal) to meet U-factor=0.074 (equivalent R-19 of wood framed assembly) OR, Anything else, such as non framed walls, to meet, such as non-framed walls, U-factor=0.102. Slight language changes U-factor=0.037 (R-19 wood framed floor) remains the same (does not apply to raised concrete floors). Language from §150.0(l) moved to here with no change. Slight changes on how requirements are stated, but no change otherwise.
Additions & Alterations <i>Performance approach now clarifies that 2 or more components of the same type may be used for trade-offs</i>	150.2(a)1 Additions <1,000 ft ² : A. Walls 150.2(b)1 Hi Cool Roof	Extensions to existing walls allowed to match existing depth (2x4=R-15/2x6=R19). Exception "g" has been revised in which in CZ 10-15 need only have R-2 or greater (not R-4) above roof deck.

ENVELOPE:  **Prescriptive Measures**

Measure	T-24 Section	Notes
Basic & Performance	150.1(a)(b)	No Change
Envelope <i>Insulation placement AND minimum U-factor for both roof and walls has changed dramatically</i>	150.1(c)1 Insulation A. Roof: Vented Attic Options B. Walls C. Floors D. Slabs 150.1(c) 2 Radiant Barrier 150.1(c) 3 and 4 Fenestration 150.1(c) 11 Roofing Products	A. Per Table 150.1-A: Insulation installed ABOVE the roof deck in addition to above the ceiling. B. Per Table 150.1-A: Insulation installed UNDER the roof deck in addition to above the ceiling. C. Per Table 150.1-A: Insulation at ceiling AND ducts and air handler to be in conditioned space. Per Table 150.1-A. U-factors have changed (U=0.051 except CZ 6 and 7) to reflect a thicker wall. EXAMPLE: 2 x 6 wood framed 24" OC with R-21 and additional R-4 insulation outside framing. This does NOT include mass walls. No Change Minimal change to code language. See Table 150.1-A for revised radiant barrier requirements based on attic type and CZ. No Change No Change

LIGHTING: Mandatory Measures

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Measure	T-24 Section	Notes
Lighting Control Devices, Systems, Ballast Luminaires <i>Residential spaces in mixed use buildings have new requirements</i>	110.9(b)4.F	All Occupant Sensing Control types shall be programmed to turn OFF all or part of the lighting no longer than 20 minutes (formerly 30 minutes) after the space is vacated, except as specified by §130.1(c)8.
	110.9(e) JA8 High Efficacy	Residential only: To qualify as JA8 high efficacy light source for compliance with the residential lighting Standards in §150.0(k), a residential light source shall be certified to the Energy Commission according to JA8.
Indoor Lighting <i>Most of the sections within §150.1(k) have been restructured containing new information</i> <i>All residential lighting must be high efficacy. JA8 has increased prominence in the 2016 code, and must be reviewed carefully in terms of what can be considered a "high efficacy" luminaire</i> <i>Kitchen lighting no longer has different requirements than the rest of the home</i>	150.0(k)1	All luminaires that are installed shall be high efficacy per Table 150.0-A.
	A. Luminaire Efficacy	The number of electrical boxes that are more than 5 feet above the finished floor, and do not contain a luminaire or other device, shall be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, vacancy sensor control, or fan speed control.
	B. Blank Electrical Boxes	Must meet ALL of the following:
	C. Recessed Downlights Fixtures	<ul style="list-style-type: none"> i. Be listed per 100.1 for zero clearance insulation contact (IC). ii. Have a label certifying it is air tight (AT). Exhaust fan housings are exempt. iii. Be sealed with gasket or caulk.
	D. through F.	iv. Hardwired luminaires provide the ability to be readily accessible from the below the ceiling for maintenance.
	G. Screw-Based	v. Shall NOT contain screw based sockets.
	150.0(k)2 Controls	vi. Shall contain light sources that comply with JA8 requirements and be marked "JA8-2016-E".
	A. Dimmers/LED	No Change
	B. through I.	Screw based luminaires can be considered high efficacy in this version of the standards, provided they meet the following compliance criteria:
	J. Vacancy Sensor	<ul style="list-style-type: none"> i. Recessed can lights (see §150.1(k)1.C above). ii. Lamps that comply with the requirements in JA8 AND iii. Contain light sources marked as "JA8-2016" or "JA8-2016-E" as allowed per JA8 (HID's exempt).
K. Vacancy or Dimmer	All forward phase cut dimmers used with LED light sources shall comply with NEMA SSL 7A.	
L. Under Cabinet	No Change	
Outdoor Lighting <i>See Tables 6-3 through 6-5 in Chapter 6 of the 2016 Residential Compliance Manual for added clarity.</i>	150.0(k)3	All luminaires that are installed shall be high efficacy per Table 150.0-A.
	Luminaire Efficacy	Shall meet i in addition to either ii or iii must be provided:
	A. Single Family: Permanently mounted to a building on the property	<ul style="list-style-type: none"> i. On/Off switch that does NOT override to ON for the following controls AND ii. Photocell AND motion sensor (override only allowed if automatically resets within six hours) OR iii. Photocontrol and automatic time switch (override only allowed if automatically resets within six hours) OR Astronomical time clock (override only allowed if automatically resets within six hours) OR EMCS that provides the functionality of a astronomical time clock AND meets installation criteria of §130.4 AND does not allow the luminaire to always be on, AND is programmed to turn the outdoor lights off during the day.
	B. through D.	No Change
	150.0(k)4-5	No Change
150.0(k)6 Low-Rise	Common areas that are ≤20% of total conditioned sf, lighting to be high efficacy AND controlled by motion sensor.	

Access the 2016 Building Energy Efficiency Standards through the California Energy Commission: www.energy.ca.gov/title24/2016standards



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