Single-family, Multifamily, Hotel and Motel

Domestic Water Heating

What are the Energy Code Requirements for Residential Water-heating Systems?

The 2022 California Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) include requirements for residential water-heating equipment and distribution systems that are used for sanitary purposes for human occupancy.

This fact sheet covers the Energy Code's water-heating system requirements for New Construction, Additions and Alterations of residential occupancies which include single-family buildings, accessory dwelling units (ADUs), dwelling units in multifamily buildings, and guest rooms in hotels and motels. This fact sheet does not cover water-heating system requirements for nonresidential buildings and occupancies, multifamily common use areas, or water-heating systems used for pools and spas. For a list of buildings and occupancies, see Table 1. *Residential Occupancies and Building Types with Domestic Hot Water Requirements*

Importance of Compliance

Water heaters that are used to provide hot water for our sinks and showers are the only permanent (i.e., not plug-in) pieces of equipment in our homes used 24 hours a day, 7 days a week, 365 days a year. Even small energy savings associated with these systems can multiply into considerable savings over the lifetime of that equipment. As we get closer to our decarbonization goals in California, energy savings realized with domestic hot water equipment, distribution and design are major factors in reaching those goals.

To learn more about California's electrification goals, see the Energy Code Ace™ fact sheets: *2022 Designing Single-family Homes to Run on Clean Energy* and *2022 Residential Electric Readiness*.

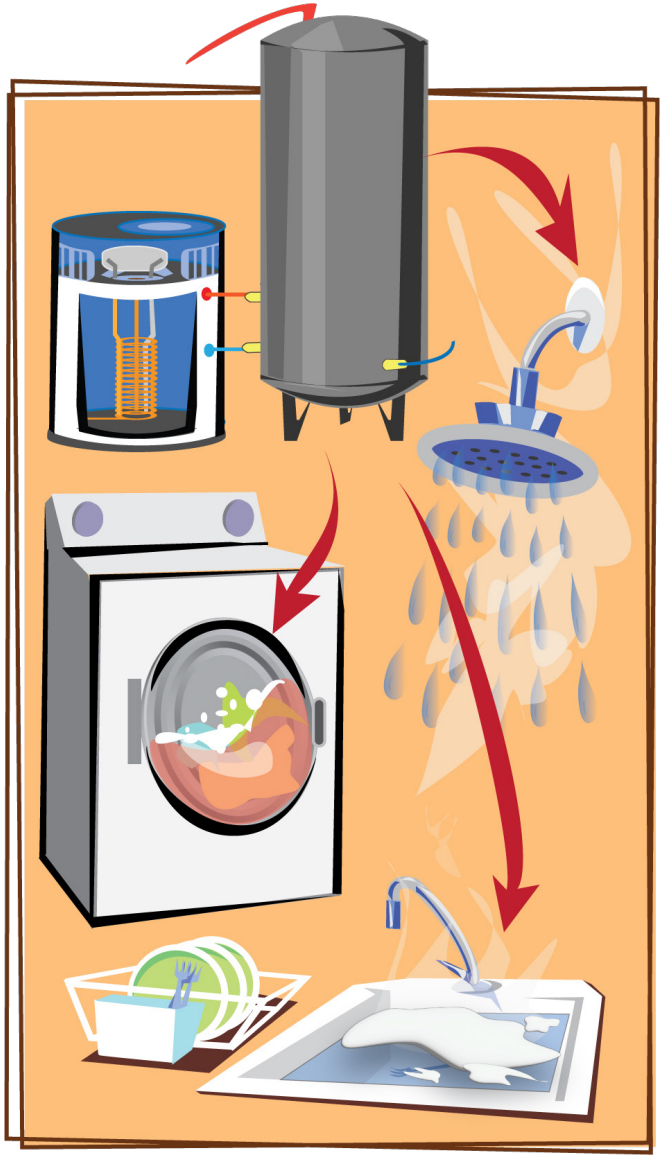

Figure 1. *Household Examples Which Require Hot Water*

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Related Energy Code Ace™ Fact Sheets

For information on the Home Energy Rating System (HERS) verification testing requirements for water-heating systems, see the Energy Code Ace™ *2022 Single-family Buildings Just the Basics: HERS Verification Fact Sheet*.

For information on nonresidential water-heating and hydronic space-heating requirements, refer to the *2022 Nonresidential Mechanical Systems Fact Sheet*.

EnergyCodeAce™

How Does this Fact Sheet Apply to Your Project?

Use this fact sheet to determine Energy Code domestic hot water requirements for New Construction, Additions and Alterations of residential buildings. There are two basic steps to comply with the Energy Code:

1. Meet all Mandatory Measures by installing required systems, equipment and devices and ensuring that they perform all functions required by the Energy Code.
2. Select your method of compliance by choosing either the Performance Approach or the Prescriptive Approach.

Mandatory Measures

All residential buildings with domestic hot water systems must meet a set of Mandatory requirements for minimum equipment efficiencies and system design. Examples of domestic hot water system features that are addressed by Mandatory Measures may include electric readiness (when gas water heaters are installed for each dwelling unit or hotel or motel guest room), controls, insulation and isolation valves.

Prescriptive Approach

The Prescriptive Approach is considered the most direct path to compliance. It is a set of prescribed performance levels for various building components where each component must meet the required minimum efficiency. There are different Prescriptive requirements for different Climate Zones and New Construction or Additions versus Alterations. The Performance Approach can be used to gain flexibility with the Prescriptive requirements.

Performance Approach

The Performance Approach builds on the Prescriptive Approach by allowing energy allotments to be traded between certain building systems for residential buildings. There can be proposed energy use trade-offs between features of the building envelope, domestic water-heating, space-heating, photovoltaics (PV) and cooling equipment. This compliance approach requires using energy analysis software that has been approved by the California Energy Commission (CEC). Note that Mandatory Measures cannot be traded away using the Performance Approach.

Occupancies and Buildings Covered in this Fact Sheet

Building Type	Code	Occupancy Group and Building Type California Building Code §310	Building and Space Types per Energy Code §100.1
Single-family Buildings	R-3	**Residential Group R-3:** Buildings with 2 or fewer dwelling units for permanent residents	**Single-family:** Occupancy Group R-3 buildings with 2 or fewer dwelling units Water-heating systems serving single-family dwelling units are subject to the Energy Code. Examples: Houses, duplexes, townhomes, accessory dwelling units (ADUs) *Occupancy Group U miscellaneous buildings and structures on single-family residential sites are excluded. Hotels, motels and multifamily buildings are excluded.*
Multifamily Buildings	R-2	**Residential Group R-2:** Buildings with 3 or more dwelling units for permanent residents	**Multifamily:** Buildings, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4 Examples: Dwelling units in apartment buildings *Hotels, motels and timeshares are excluded.*
	R-3	**Residential Group R-3:** Some multifamily congregate residences with primarily permanent residents	**Multifamily:** Buildings, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4 Examples: Dormitories *Boarding houses or alcohol or drug abuse recovery homes with over 6 guests are excluded*
	R-4	**Residential Group R-4:** Supervised residential environments for more than 6 ambulatory clients and up to 16 total residents, excluding staff	**Multifamily:** Buildings, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4 Examples: Assisted living facilities, halfway houses, drug treatment facilities
Hotel and Motel Buildings	R-1	**Residential Group R-1:** Buildings with sleeping units for primarily transient occupants	**Hotel and motel:** One or more buildings with 6 or more guest rooms, timeshares, boarding houses and drug or alcohol treatment facilities with 6 or more guests Examples: Hotel and motel guest rooms

Table 1. *Residential Occupancies and Building Types with Domestic Hot Water Requirements*

Key Terms

Domestic Water-heating System: See *service water heating*. Domestic water-heating systems are also referred to as domestic hot water (DHW) systems

Drain Water Heat Recovery (DWHR): A system that recovers heat from effluent in waste piping and uses it to preheat water in a domestic or service water-heating system to reduce water heating energy usage

Dwelling Unit: A single unit providing complete, independent living facilities for one or more persons including access, permanent provisions for living, sleeping, eating, cooking and sanitation

Heat Pump Water Heater (HPWH): A water heater that transfers thermal energy from one temperature level to a higher temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, pumps, or controls necessary for the device to perform its function

Multifamily Common Use Area: Enclosed spaces within the multifamily occupancy that are not dwelling units, such as common corridors or lobbies

Multi-pass Heat Pump Water Heater: A heat pump water heater in which the cold water passes through the heat pump or heat pumps multiple times, each time gaining a temperature increase, until the tank reaches the intended storage temperature

Single-pass Heat Pump Water Heater: A heat pump water heater in which the cold water passes through the heat pump or heat pumps once and is heated to the intended storage temperature

Service Water Heating: Heating of water for sanitary purposes for human occupancy, other than for space heating

Uniform Energy Factor (UEF): A measure of overall water heater efficiency that is determined by using the applicable test method in the Appliance Efficiency Regulations

Mandatory Equipment Certification and Minimum Efficiencies

§§110.1, 110.3(a), 110.3(b)

Installers should confirm and document that only certified products are installed. Use the Product Finder and Modernized Appliance Efficiency Database System (MAEDbS) tools to find certified products.

ECA Product Finder

(MAEDbS)

Products installed also must meet minimum efficiency requirements. Refer to the *2022 Residential Space Heating/Cooling and Water Heating Equipment Minimum Efficiencies Quick Reference*.

Solar Water-heating Equipment Certification

Multifamily, Hotel and Motel Solar Thermal per §170.2(d)3C and Single-Family per §150.1(c)8C

When using solar thermal or solar photovoltaic (PV) water-heating systems to show compliance with the Energy Code, those systems must be installed per the requirements of the Residential Reference Appendix RA4.4.20 including, but not limited to, certification of the solar water-heating system or collectors by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R&T), or by a listing agency that is approved by the Energy Commission.

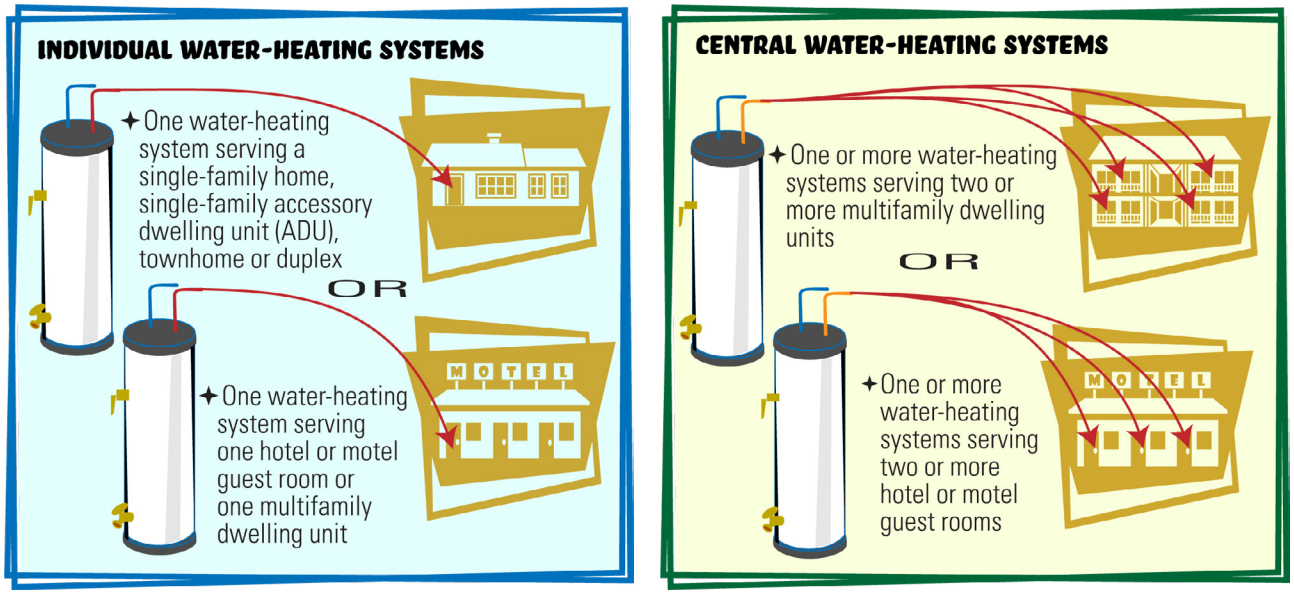


Figure 2. *Individual Water-heating Systems versus Central Water-heating Systems*

When Does a Residential Water-heating Project Trigger the Energy Code?

The Energy Code classifies projects as New Construction, Additions, Alterations or Repairs depending upon their scope. All projects except Repairs trigger the Energy Code. Table 2 below lists typical projects involving water-heating systems, identifies their project types and notes whether they trigger the Energy Code.

Residential Water-heating Projects that Trigger the Energy Code

Project Scope	Project Type	Is the Energy Code Triggered?
Construct a new single-family dwelling unit (including any new detached Accessory Dwelling Units), including any proposed water-heating system or systems	New Construction	**Yes**
Construct a new building on a single-family site that does not include a dwelling unit, such as a workshop, including any proposed water-heating system or systems	New Construction	No
Construct a new multifamily, hotel or motel building including any proposed water-heating system or systems serving dwelling units or guest rooms	New Construction	**Yes**
Add a new water-heating system as part of an Addition to an existing dwelling unit or hotel or motel guest room	Addition	**Yes**
Add a new water-heating system serving a new Accessory Dwelling Unit (ADU) attached to an existing single-family or multifamily property	Addition	**Yes**
Add an additional water heater that only serves a non-dwelling unit space (such as a garage or workshop)	Alteration	No
Replace an existing water heater with the same type in an existing dwelling unit or hotel or motel guest room	Alteration	**Yes**
Replace an existing water heater with a different type in an existing dwelling unit or hotel or motel guest room	Alteration	**Yes**
Add an additional water heater to an existing dwelling unit or hotel or motel guest room	Alteration	**Yes**
Add a new water heater to a multifamily common use area	Alteration	**Yes**
Add or replace a recirculation pump to an existing distribution system	Alteration	**Yes**
Add or replace hot water piping of an existing distribution system	Alteration	**Yes**
Add or replace hot water pipe insulation of an existing distribution system	Alteration	**Yes**
Repair any type of existing water heater *Examples of repairs include replacing components such as an anode rod, thermostat, flue, or tank insulation.*	Repair	No

Addition: Any change to a building that increases conditioned floor area and conditioned volume; any change that increases the floor area and volume of an unconditioned building of an occupancy group or type regulated by Title 24, Part 6; or any change that increases the illuminated area of an outdoor lighting application regulated by Title 24, Part 6 (See also *newly conditioned space*)

Alteration: Any change to a building's water-heating system, space-conditioning system, lighting system, electrical power distribution system, or envelope that is not an Addition; any change that is regulated by Title 24, Part 6 to an outdoor lighting system that is not an Addition; any change that is regulated by Title 24, Part 6 to signs located either indoors or outdoors; or any change that is regulated by Title 24, Part 6 to a covered process that is not an Addition (See also *fenestration alteration*)

Newly Constructed Building: A building that has never been used or occupied for any purpose

Repair: The reconstruction or renewal for the purpose of maintenance of any component, system, or equipment of an existing building that does not increase the preexisting energy consumption of the repaired component, system or equipment or that does not replace any component, system or equipment for which there are requirements in the Energy Code, which is considered an Alteration

Table 2. *Residential Water-heating Projects that Trigger the Energy Code*

Individual Water-heating Systems

An individual water-heating system serves only one dwelling unit within:

- A single-family residence, single-family accessory dwelling unit (ADU), duplex or townhome
- A multifamily building
- A hotel or motel (guest room)

  This is limited to one water heater serving one dwelling unit or guest room. If one water heater serves more than one multifamily dwelling units or hotel or motel guest rooms, that is considered a central water-heating system.

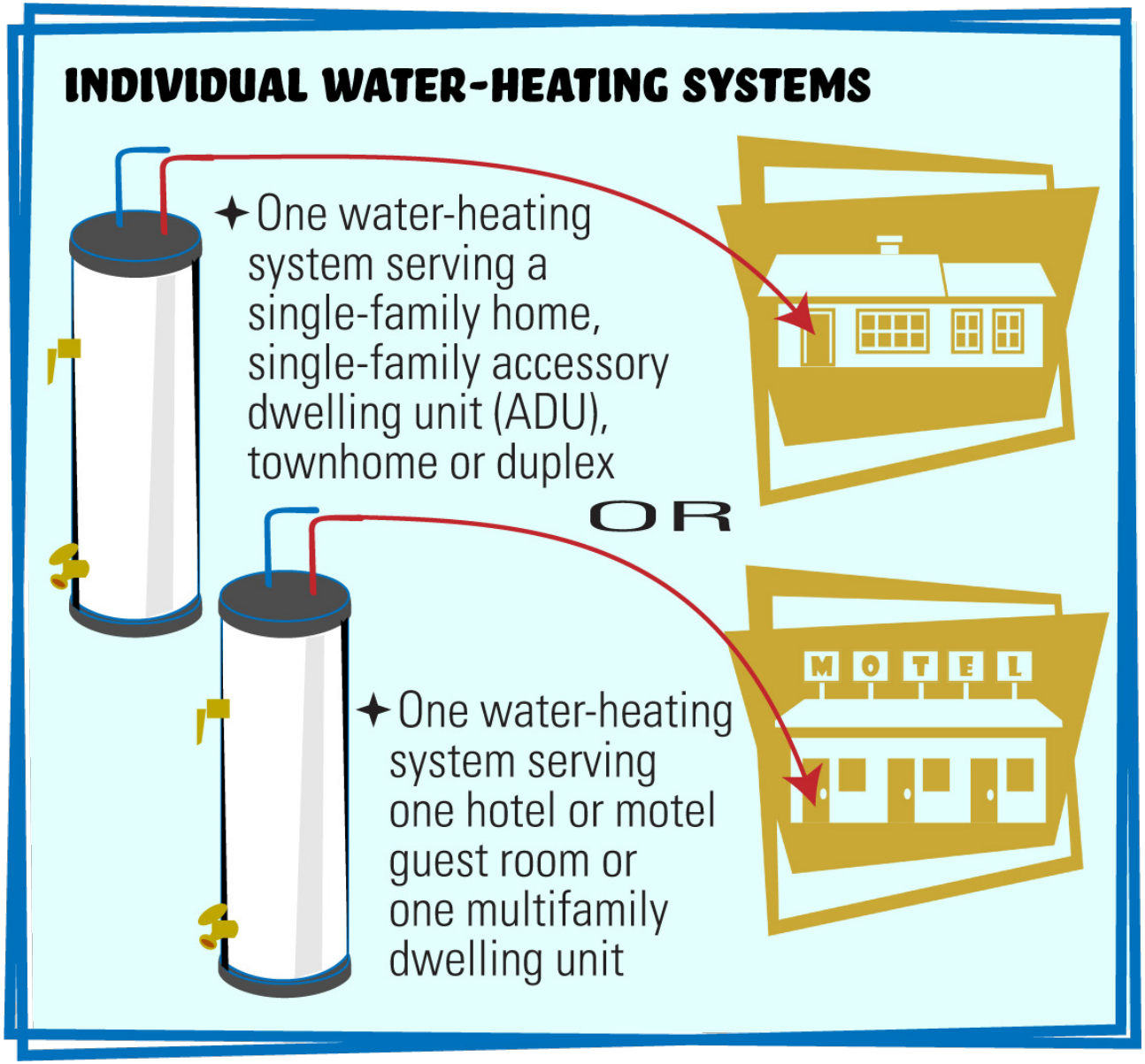


Figure 3: *Individual Residential Water-heating Systems*

New Construction and Additions: Individual Water-heating Systems

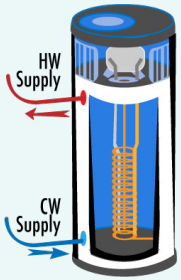
In New Construction and Addition projects involving residential individual water-heating systems, there are Energy Code requirements for the water-heating equipment and for its distribution systems. See Table 3 below for a summary of requirements for individual electric water-heating systems by equipment type. See Table 4 for a summary of requirements by gas equipment type and Table 5 for a summary of requirements by distribution system type.

Individual Residential Water-heating Systems: Electric Water Heaters

Table 3 below covers Mandatory and Prescriptive Energy Code requirements for different types of individual electric water-heating systems serving single-family buildings, multifamily dwelling units, and hotel and motel guest rooms.

Individual Residential Water-heating Systems

New Construction and Additions – Electric Water-heating Equipment

Equipment Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n); 150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Heat Pump – Tank  ***(Continued)***	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. Tankless electric water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	N/A	Prescriptive HPWH options: **HPWH Option 1:** One 240-volt heat pump water heater with the storage tank in the garage or in conditioned space, and also: ✦ In CZ 1 and 16, require compact hot water distribution meeting RA4.4.6. ✦ In CZ 16, also require drain water heat recovery per RA3.6.9 – HERS. **HPWH Option 2:** One 240-volt heat pump water heater NEEA Tier 3 or higher, and: In CZ 16 also require: ✦ Storage tank to be located in the garage or a conditioned space ✦ Drain water heat recovery per RA3.6.9 – HERS **HPWH Exception:** Dwelling units with one bedroom or less are allowed one 120-volt heat pump water heater. ***(Continued)***	N/A	Prescriptive HPWH options: **HPWH Option 1:** One 240-volt heat pump water heater, and also: ✦ In CZ 1 and 16, require compact hot water distribution meeting RA4.4.6. ✦ In CZ 16, also require drain water heat recovery per RA3.6.9 – HERS. **HPWH Option 2:** One 240-volt heat pump water heater NEEA Tier 3 or higher, and also: ✦ In CZ 16, require drain water heat recovery per RA3.6.9 – HERS.

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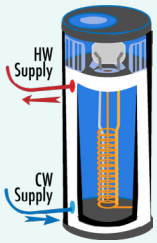
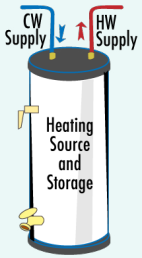
Individual Residential Water-heating Systems

New Construction and Additions – Electric Water-heating Equipment *(Continued)*

Equipment Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n); 150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
(Continued) **Heat Pump – Tank** 	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. Tankless electric water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	N/A	***Additions*** adding a second water heater that is a single HPWH must: ✦ Install the storage tank in an enclosed space. **And:** ✦ Place the water heater or storage tank of a split system on rigid insulation ≥ R-10. **And:** ✦ Install the HPWH with a communication interface per §110.12(a) or an ANSI/CTA-2045-B communication port.	N/A	N/A
Electric Resistance – Tank 	Same as above	N/A	Electric resistance water heating with a storage tank is not allowed prescriptively, so the Performance Approach must be used to show compliance.	N/A	Electric resistance water heating with a storage tank is not allowed prescriptively, so the Performance Approach must be used to show compliance.

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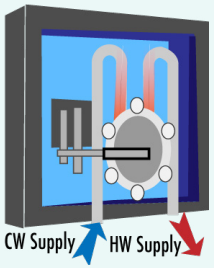
Individual Residential Water-heating Systems

New Construction and Additions – Electric Water-heating Equipment *(Continued)*

Equipment Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory** §§110.1, 110.3(a), 110.3(b), 110.3(c)	**Mandatory** §§150.0(n); 150.0(j)	**Prescriptive** §150.1(c)8 **Additions:** §150.2(a)1D	**Mandatory** §160.4	**Prescriptive** §170.2(d) **Additions:** §180.1(a)3
Electric Resistance - Tankless 	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand Tankless electric water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	N/A	Tankless electric resistance water heating with point-of-use distribution per RA4.4.5 is allowed prescriptively when the dwelling unit conditioned floor area is ≤ 500 ft². Other tankless electric resistance water heating options must use the Performance Approach to show compliance. ***Additions*** adding a second water heater: ✦ Additions ≤ 500 ft² may comply prescriptively by installing an electric resistance tankless water heater with point-of-use distribution per RA4.4.5.	N/A	Tankless electric resistance water heating is not allowed prescriptively, so the Performance Approach must be used to show compliance.

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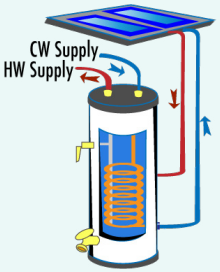
Individual Residential Water-heating Systems

New Construction and Additions – Electric Water-heating Equipment *(Continued)*

Equipment Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory** §§110.1, 110.3(a), 110.3(b), 110.3(c)	**Mandatory** §§150.0(n); 150.0(j)	**Prescriptive** §150.1(c)8 **Additions:** §150.2(a)1D	**Mandatory** §160.4	**Prescriptive** §170.2(d) **Additions:** §180.1(a)3
Electric Resistance – Tank with Solar Thermal or Photovoltaics 	In addition to the above: ✦ Unfired storage tanks and backup tanks must meet insulation requirements of §110.3(c)3.	✦ Solar water-heating systems and collectors must be certified. ✦ Collector loop piping must meet insulation requirements of §120.3(c).	✦ Solar water-heating system with electric backup must meet the installation criteria of RA4 and have an annual SSF ≥ 70%. ✦ Not allowed prescriptively when SS < 70%, so must use the Performance Approach.	✦ Solar water-heating systems and collectors must be certified. ✦ Collector loop piping must meet insulation requirements of §120.3(c).	Storage electric resistance water heating with solar thermal or PV is not allowed prescriptively, so the Performance Approach must be used for compliance.

***CZ** = Climate Zone; **HERS** = Home Energy Rating System; **HPWH** = heat pump water heater; **MAEDbS** = Modernized Appliance Efficiency Database System; **NEEA** = Northwest Energy Efficiency Alliance; **RA** = Residential Reference Appendix; **SSF** = solar savings fraction.*

For more information on water-heating system requirements, refer to:

Single Family Residential Compliance Manual, Chapter 5: Water Heating Requirements

Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements

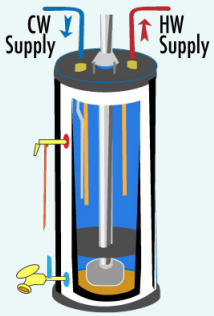
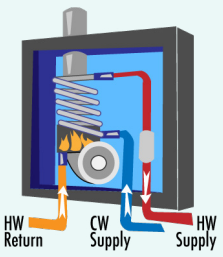
***Table 3.** Energy Code Equipment Requirements for Individual Residential Water-heating Systems in New Construction and Additions – Electric Water-heating Equipment*

Individual Residential Water-heating Systems: Gas Water Heaters

Tabel 4 below covers Mandatory and Prescriptive Energy Code requirements for different types of individual gas water-heating systems serving single-family buildings, multifamily dwelling units, and hotel and motel guest rooms.

Individual Residential Water-heating Systems

New Construction and Additions – Gas Water-heating Equipment

Equipment Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Gas Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n); 150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Tank 	All gas water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS On systems that have a total capacity > 167 kBtuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. Tankless gas water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	All gas water heaters: ✦ Must meet electric readiness requirements For more information, see the *2022 Residential Electric Readiness Fact Sheet*.	Gas water heating with a storage tank is not allowed prescriptively, so the Performance Approach must be used to show compliance.	All gas water heaters: ✦ Must meet electric readiness requirements ✦ Require Category III, IV or a Type B vent with straight pipe between outside termination and where the water heater is installed ✦ Condensate drain must be ≤ 2 inches higher than the base of water heater and allow natural draining without pump assistance. ✦ Require a gas supply line with ≥ 200,000 Btuh capacity	Gas water heating with a storage tank is not allowed prescriptively, so the Performance Approach must be used to show compliance.
Tankless (Instantaneous) 	Same as above	***Additions*** adding a second water heater: ✦ If tankless gas, it must meet electric readiness requirements.	Tankless gas water heating is allowed prescriptively in CZ 3, 4, 13 and 14 when gas input is ≤ 200,000 Btuh and heat pump space heating is installed. Tankless gas water heating in all other CZs can only show compliance using the Performance Approach .***Additions*** adding a second water heater: ✦ If tankless gas, it must meet electric readiness requirements.		Tankless gas water heating with gas input ≤ 200,000 Btuh is allowed prescriptively in all CZs. Tankless gas water heating with gas input > 200,000 Btuh must show compliance using the Performance Approach.

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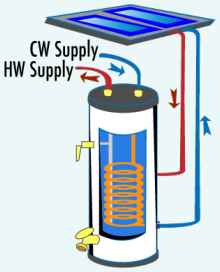
Individual Residential Water-heating Systems

New Construction and Additions – Gas Water-heating Equipment *(Continued)*

Equipment Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Gas Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n); 150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Tank with Solar Thermal 	All gas water heaters: ✦ Must meet minimum efficiency requirements. ✦ Require equipment certified by the manufacturer within MAEDbS On systems that have a total capacity > 167 kBtuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. Tankless gas water heaters with an input rating > 6.8 kBtuh or 2 kW must 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 In addition to the above: ✦ Unfired storage tanks and backup tanks must meet insulation requirements of §110.3(c)3.	In addition to the above: ✦ Solar water-heating systems and collectors must be certified. ✦ Collector loop piping must meet insulation requirements of §120.3(c).	Storage gas water heating with solar thermal is not allowed prescriptively, so the Performance Approach must be used to show compliance.	In addition to the above: ✦ Solar water-heating systems and collectors must be certified. ✦ Collector loop piping must meet insulation requirements of §120.3(c).	Storage gas water heating with solar thermal is not allowed prescriptively, so the Performance Approach must be used for compliance.

***CZ** = Climate Zone; **HERS** = Home Energy Rating System; **HPWH** = heat pump water heater; **MAEDbS** = Modernized Appliance Efficiency Database System; **NEEA** = Northwest Energy Efficiency Alliance; **RA** = Residential Reference Appendix; **SSF** = solar savings fraction.*

For more information on water-heating system requirements, refer to:

Single Family Residential Compliance Manual, Chapter 5: Water Heating Requirements

Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements

***Table 4.** Energy Code Equipment Requirements for Individual Residential Water-heating Systems in New Construction and Additions – Gas Water-heating Equipment*

Energy Code Distribution System Requirements for Individual Residential Water-heating Systems in New Construction and Additions

Table 5 below covers Mandatory and Prescriptive Energy Code requirements for the distribution systems available for individual water-heating systems in residential new construction and additions.

Individual Residential Water-heating Systems

Distribution System Requirements - New Construction and Additions

Distribution Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Description	**Mandatory §110.3(c)**	**Mandatory §150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d)**
Standard Hot Water Piping System *Standard distribution has no recirculation pumps or additional HERS verification measures. Pipe insulation must be installed per RA4.4.1.*	On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. Air release valve, recirculation loop backflow prevention, hose bibb and isolation valve to support pump priming, and pump isolation valve requirements will also apply.	Domestic hot water piping must: ✦ Be insulated as specified in *California Plumbing Code* §609.11, exceptions may apply ✦ Meet the insulation installation requirements of RA4.4.1	N/A	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A, exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	N/A

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Individual Residential Water-heating Systems

Distribution System Requirements - New Construction and Additions

Distribution Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Description	**Mandatory §110.3(c)**	**Mandatory §150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d)**
Compact Hot Water Distribution System *Based on using a plan view, use straight-line measurement to calculate a "weighted distance" to key hot water use points including the master bath, kitchen and the remaining furthest hot water fixture from the water heater.*	Recirculation systems require controls that can turn the system off automatically. On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand.	Domestic hot water piping must: ✦ Be insulated as specified in *California Plumbing Code* §609.11, exceptions may apply ✦ Meet the insulation installation requirements of RA4.4.1	Compact distribution per RA4.4.6 is required for Prescriptive compliance in CZ 1 and 16 when using a 240-volt HPWH.	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A, exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Compact distribution per RA4.4.6 is required for Prescriptive compliance in CZ 1 and 16 when using a 240-volt HPWH.
Point-of-Use System *All hot water fixtures in the dwelling unit, except for a stand-alone tub, must use no more pipe per run than defined in Table 4.4.5 in RA4.4.5.*	On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand.		Point-of-use per RA4.4.5 is required for Prescriptive compliance of tankless electric resistance water heaters (see Table 3).		N/A
Recirculation System with Non-demand Control Options *Encompasses all recirculation strategies that do not incorporate a demand control to minimize recirculating pump operation. For example:* ✦ *Aquastat* ✦ *Timer or timeclock* ✦ *Motion or occupancy sensor* ✦ *No controls*	Recirculation systems require controls that can turn the system off automatically. On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand.		Recirculation without demand controls is not allowed prescriptively, so the Performance Approach must be used to show compliance.		Recirculation without demand controls is not allowed prescriptively, so the Performance Approach must be used to show compliance.

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Individual Residential Water-heating Systems

Distribution System Requirements - New Construction and Additions

Distribution Type	All Building Types	Single Family		Multifamily, Hotel and Motel	
Description	**Mandatory §110.3(c)**	**Mandatory §150.0(j)**	**Prescriptive §150.1(c)8 Additions: §150.2(a)1D**	**Mandatory §160.4**	**Prescriptive §170.2(d)**
Recirculation System with Demand Control *Uses brief pump operation in response to a hot water demand manual on "signal" to circulate hot water through the recirculation loop and turns off within 5 minutes of being activated per RA4.4.9.* *For example:* ✦ *Push button controls* ✦ *Switch near fixture or at room level* ✦ *Vacancy sensor with push button to activate*	Recirculation systems require controls that can turn the system off automatically. On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand.	Domestic hot water piping must: ✦ Be insulated as specified in *California Plumbing Code* §609.11, exceptions may apply ✦ Meet the insulation installation requirements of RA4.4.1	Demand control with manual on/off installed per RA4.4.9 is required for Prescriptive compliance when using a recirculation system.	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A, exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Demand control with manual on/off installed per RA4.4.9 is required for Prescriptive compliance when using a recirculation system.
Drain Water Heat Recovery System *Recovers heat that would otherwise be lost down the drain during showers, and transfers that heat back to the water heater, shower mixing valve or both.*	N/A	RA4.4.1	Drain water heat recovery installed per RA3.6.9 – HERS is required for Prescriptive compliance in CZ 16 when using a 240-volt HPWH or a 240-volt NEEA Tier 3 HPWH or better.		Drain water heat recovery installed per RA3.6.9 – HERS is required for Prescriptive compliance in CZ 16 when using a 240-volt HPWH or a 240-volt NEEA Tier 3 HPWH or better.

***CZ** = Climate Zone; **HERS** = Home Energy Rating System; **HPWH** = heat pump water heater; **NEEA** = Northwest Energy Efficiency Alliance; **RA** = Residential Reference Appendix.*

For more information on distribution systems, refer to:
Single Family Residential Compliance Manual, Chapter 5.6: Distribution Systems
Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements

***Table 5.** Energy Code Distribution System Requirements for Individual Residential Water-heating Systems in New Construction and Additions*

Alterations: Individual Water-heating Systems

In Alteration projects involving residential individual water-heating systems, replacing some components triggers Energy Code requirements. See Table 6 on this page for a list of common Alterations and Repairs and whether they trigger the Energy Code. For more details on the requirements for Alterations to individual residential water-heating systems, see Tables 7 and 8.

Changes that Trigger the Energy Code for Individual Residential Water-heating System Alterations

For Details: Click a requirement title or code section → / Project Scope: ↓ Change this and nothing else	Water Heater Single-family: §150.2(b)1Hiii Multifamily, Hotel, Motel: §180.2(b)3C	Pipe Insulation Single-family: §§150.0(j)1, 150.2(b)1Hi Multifamily, Hotel, Motel: §§160.4(f), 180.2(b)3A	Recirculation Pump Single-family: §150.2(b)1Hii Multifamily, Hotel, Motel: §180.2(b)3B
Replace water heater and distribution system	**YES**	**Yes**	If a recirculation pump is used, demand control is required; otherwise, use the Performance Approach.
Replace water heater	**YES**	**Yes** For accessible hot water piping	No
Add a water heater	**YES**	**YES**	No
Replace hot water piping	No	**YES**	No
Replace hot water pipe insulation	No	**YES**	No
Replace recirculation pump	No	No	If a recirculation pump is used, demand control is required; otherwise, use the Performance Approach.
Add recirculation pump	No	No	Same as above

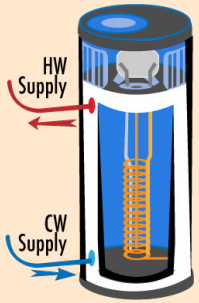
Table 6. *Changes that Trigger the Energy Code for Individual Residential Water-heating Systems*

Alterations: Individual Water-heating Systems

In Alteration projects involving residential individual water-heating systems, there are Energy Code requirements for the water-heating equipment and for distribution systems. See Table 7 below and Table 8 for a summary of requirements by equipment type. See Table 9 for a summary of requirements by distribution system type.

Individual Residential Water-heating Systems

Alterations – Electric Water-heating Equipment

Equipment Type	All Building Types	Single-family		Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n), 150.0(j)**	**Prescriptive §150.2(b)1H**	**Mandatory §160.4**	**Prescriptive §180.2(b)3**
Heat Pump – Tank 	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. Tankless electric water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	Newly installed and accessible existing hot water piping must be insulated.	Two HPWH options are allowed for Prescriptive alterations: **HPWH Option 1:** A single HPWH installed as follows: ✦ Install the storage tank in an enclosed space. **And:** ✦ Place the storage tank on rigid insulation ≥ R-10. **And:** ✦ Install the HPWH with a communication interface per §110.12(a) or an ANSI/CTA-2045-B communication port. **HPWH Option 2:** A single HPWH meeting NEEA Tier 3 or better If the altered distribution system uses recirculation pumps, the only Prescriptive option is a recirculation system with demand control. Other recirculation options must show compliance using the Performance Approach. See Table 5 for other distribution options.	Newly installed and accessible existing hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-An, exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Two HPWH options are allowed for Prescriptive alterations: **HPWH Option 1:** A single HPWH installed as follows: ✦ Install the storage tank in an enclosed space. **And:** ✦ Place the storage tank on rigid insulation ≥ R-10. **And:** ✦ Install the HPWH with a communication interface per §110.12(a) or an ANSI/CTA-2045-B communication port. **HPWH Option 2:** A single HPWH meeting NEEA Tier 3 or better If the altered distribution system uses recirculation pumps, the only Prescriptive option is a recirculation system with demand control. Other recirculation options must show compliance using the Performance Approach. See Table 5 for other distribution options.

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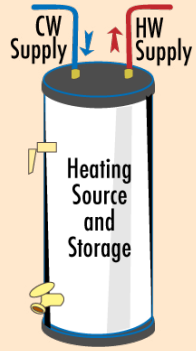
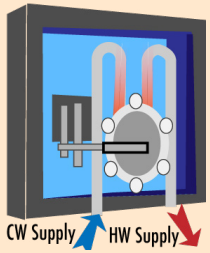
Individual Residential Water-heating Systems

Alterations – Electric Water-heating Equipment *(continued)*

Equipment Type	All Building Types	Single-family		Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n), 150.0(j)**	**Prescriptive §150.2(b)1H**	**Mandatory §160.4**	**Prescriptive §180.2(b)3**
Electric Resistance – Tank  **Electric Resistance - Tankless** 	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand Tankless electric water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	Newly installed and accessible existing hot water piping must be insulated.	Electric resistance water heating is allowed prescriptively if the existing water heater is electric resistance or a consumer electric water heater. If the altered distribution system uses recirculation pumps, the only Prescriptive option is a recirculation system with demand control. Other recirculation options must show compliance using the Performance Approach. See Table 5 for other distribution options.	Newly installed and accessible existing hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A, exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Electric resistance water heating is allowed prescriptively if the existing water heater is electric resistance or a consumer electric water heater. If the altered distribution system uses recirculation pumps, the only Prescriptive option is a recirculation system with demand control. Other recirculation options must show compliance using the Performance Approach. See Table 5 for other distribution options.

***CZ** = Climate Zone; **HPWH** = heat pump water heater; **MAEDbS** = Modernized Appliance Efficiency Database System; **NEEA** = Northwest Energy Efficiency Alliance.*

For more information on water-heating system requirements, refer to:

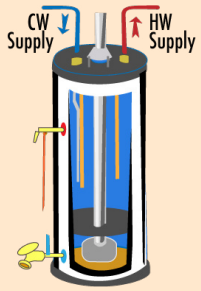
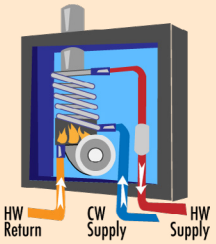
Single Family Residential Compliance Manual, Chapter 5: Water Heating Requirements

Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements

***Table 7.** Energy Code Equipment and Distribution System Requirements for Individual Residential Water-heating System Alterations – Electric Water-heating Equipment*

Individual Residential Water-heating Systems

Alterations – Gas Water-heating Equipment

Equipment Type	All Building Types	Single-family		Multifamily, Hotel and Motel	
Gas Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §§150.0(n), 150.0(j)**	**Prescriptive §150.2(b)1H**	**Mandatory §160.4**	**Prescriptive §180.2(b)3**
Tank  **Tankless (Instantaneous)** 	All gas water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand Tankless gas water heaters with an input rating > 6.8 kBtuh or 2 kW must 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	Newly installed and accessible existing hot water piping must be insulated.	A gas water heating system is allowed for Prescriptive alterations. If the altered distribution system uses recirculation pumps, the only Prescriptive option is a recirculation system with demand control. Other recirculation options must show compliance using the Performance Approach. See Table 5 for other distribution options.	Newly installed and accessible existing hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A, exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	A gas water heating system is allowed for Prescriptive alterations. If the altered distribution system uses recirculation pumps, the only Prescriptive option is a recirculation system with demand control. Other recirculation options must show compliance using the Performance Approach. See Table 5 for other distribution options.

***CZ** = Climate Zone; **HPWH** = heat pump water heater; **MAEDbS** = Modernized Appliance Efficiency Database System; **NEEA** = Northwest Energy Efficiency Alliance.*

For more information on water-heating system requirements, refer to:

Single Family Residential Compliance Manual, Chapter 5: Water Heating Requirements

Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements

***Table 8.** Energy Code Equipment and Distribution System Requirements for Individual Residential Water-heating System Alterations – Gas Water-heating Equipment*

Central Water-heating Systems

A central water-heating system is any water-heating system that serves:

- Multiple dwelling units in a multifamily building
- Multiple guest rooms in a hotel or motel

A central water-heating system could be a small system in which each water heater serves a few dwelling units. It also could be a large central system that serves all of the dwelling units within a building. The Energy Code sets different requirements based on the fuel type of the equipment and the number of dwelling units served by the system.

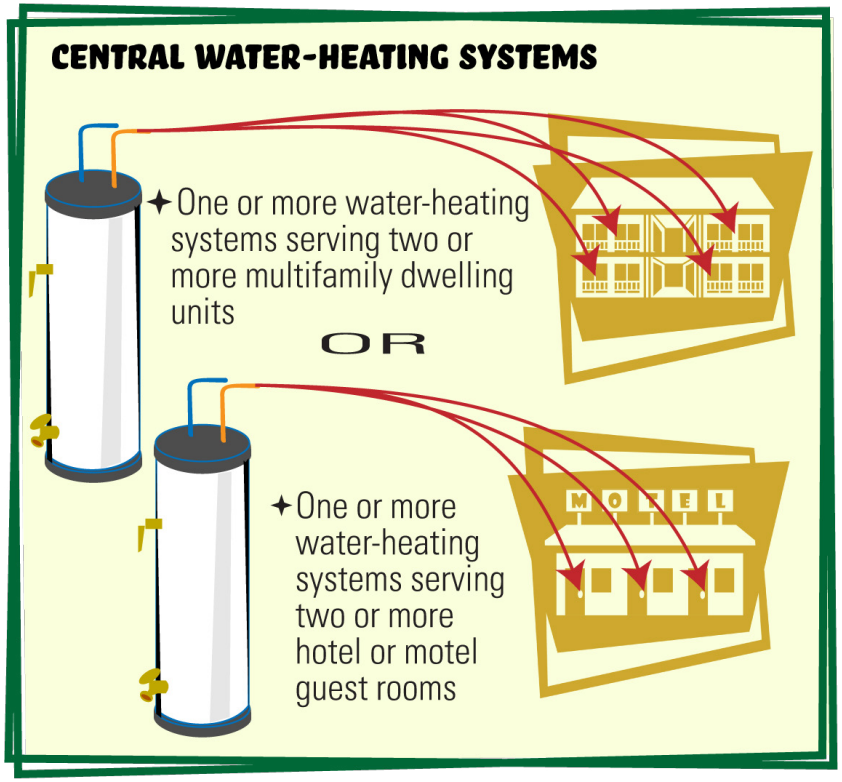


Figure 4. *Central Residential Water-heating Systems*

New Construction and Additions: Central Water-heating Systems

In New Construction and Addition projects involving residential central water-heating systems, there are Energy Code requirements for the water-heating equipment and for distribution systems. See Table 9 below for descriptions of distribution systems and Tables 10 and 11 for summaries of equipment and distribution system requirements by fuel type.

Distribution Systems Used in Central Residential Water-heating Systems

Distribution System Type	Description
Central Demand Recirculation System (Standard Distribution System)	*The standard distribution system for water heaters serving multiple dwelling units incorporates recirculation loops, which bring hot water to different parts of the building, and a demand control, which automatically shuts off the recirculation pump when the recirculation flow is not needed. Demand controls for central recirculation systems are automatic control systems that control the recirculation pump operation based on measurement of hot water demand and hot water return temperatures.*
Drain Water Heat Recovery System	*Recovers heat that would otherwise be lost down the drain during showers, and transfers that heat back to the water heater, shower mixing valve, or both.*
Central Heat Pump Water-heating System: Single-pass vs. Multi-pass Configuration	*In a single-pass HPWH system, the cold water passes through the heat pump or heat pumps once and is heated to the intended storage temperature.* *In a multi-pass HPWH system, the cold water passes through the heat pump or heat pumps multiple times, each time gaining a 7 to 10°F temperature increase, until the tank reaches the intended storage temperature.*
Central Heat Pump Water-heating System: Serial vs. Parallel Piping	*Both serial and parallel piping HPWH systems are temperature maintenance systems that consist of a recirculation pump, a storage tank (the loop tank), and a temperature maintenance heat source.* *A serial HPWH system has a swing tank design which uses a loop tank piped in series with the primary storage.* *A parallel HPWH system has a parallel loop tank design which uses a loop tank piped in parallel with the primary storage.*

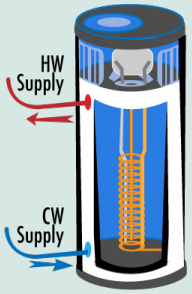
HPWH = *heat pump water heater.*

For more information on water-heating system requirements, refer to *Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements*.

Table 9. *Distribution Systems Used in Central Residential Water-heating Systems*

Central Residential Water-heating Systems

Equipment and Distribution System Requirements – Electric Water-heating Equipment

Equipment Type	All Building Types	Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Heat Pump – Tank Serving ≥ 2 dwelling units or hotel/motel rooms (typically called Cluster or Pod Design)  	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A; exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Prescriptive requirements for central HPWH systems: **Design:** Documentation must be provided per Joint Reference Appendix JA14.4 including correctly sized storage capacity; otherwise use the Performance Approach. **Storage:** Single-Pass: Primary thermal storage tanks must be piped in series if multiple tanks are used. Multi-Pass: Primary thermal storage tanks must be piped in parallel if multiple tanks are used. Primary Storage: Tank temperature setpoint must be ≥ 135°F. **Compressor:** Cut-off Temperature: Required to be ≤ 40°F ambient air temperature. **Recirculation:** Recirculation System: Required when serving > 8 dwelling units or hotel or motel guest rooms. Recirculation Loop Hot Water Return: Must connect to recirculation loop tank and NOT directly to primary HPWH inlet or primary thermal storage tanks. Recirculation Loop Tank: If used, must be electric (electric resistance or heat pump), be capable of multi-pass operation and have a setpoint ≥ 10°F lower than the primary storage tank temperature setpoint so that the recirculation loop tank is used for the temperature maintenance load before engaging the recirculation loop tank heater. ***Additions:*** There are no Prescriptive requirements when extending an existing central HPWH system to serve an addition.

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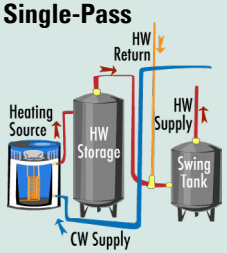
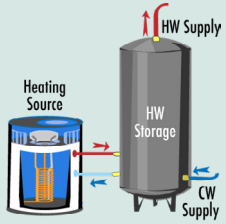
Central Residential Water-heating Systems

Equipment and Distribution System Requirements – Electric Water-heating Equipment *(continued)*

Equipment Type	All Building Types	Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Heat Pump – Central Single-Pass 	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A; exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Prescriptive requirements for central HPWH systems: **Design:** Documentation must be provided per JA14.4 including correctly sized storage capacity; otherwise use the Performance Approach. **Storage:** Single-Pass: Primary thermal storage tanks must be piped in series if multiple tanks are used. Multi-Pass: Primary thermal storage tanks must be piped in parallel if multiple tanks are used. Primary Storage: Tank temperature setpoint must be ≥ 135°F. **Compressor:** Cut-off Temperature: Required to be ≤ 40°F ambient air temperature. **Recirculation:** Recirculation System: Required when serving > 8 dwelling units or hotel or motel guest rooms. Recirculation Loop Hot Water Return: Must connect to recirculation loop tank and NOT directly to primary HPWH inlet or primary thermal storage tanks. Recirculation Loop Tank: If used, must be electric (electric resistance or heat pump), be capable of multi-pass operation and have a setpoint ≥ 10°F lower than the primary storage tank temperature setpoint so that the recirculation loop tank is used for the temperature maintenance load before engaging the recirculation loop tank heater. ***Additions:*** There are no Prescriptive requirements when extending an existing central HPWH system to serve an addition.
Heat Pump – Central Multi-Pass 			

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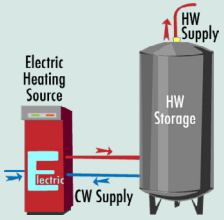
Central Residential Water-heating Systems

Equipment and Distribution System Requirements – Electric Water-heating Equipment *(continued)*

Equipment Type	All Building Types	Multifamily, Hotel and Motel	
Electric Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Electric Boiler 	All electric water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A; exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	Electric boilers are not allowed prescriptively, so they must show compliance using the Performance Approach.

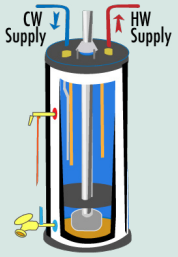
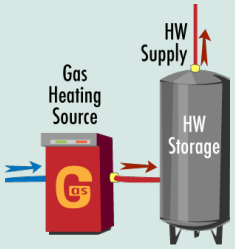
***CZ** = Climate Zone; **HERS** = Home Energy Rating System; **HPWH** = heat pump water heater; **JA** = Joint Reference Appendix; **MAEDbS** = Modernized Appliance Efficiency Database System; **RA** = Residential Reference Appendix; **SSF** = solar savings fraction.*

For more information on water-heating system requirements, refer to *Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements*.

***Table 10.** Energy Code Equipment and Distribution System Requirements for Central Residential Water-heating Systems in New Construction and Additions – Electric Water-heating Equipment*

Central Residential Water-heating Systems

Equipment and Distribution System Requirements – Gas Water-heating Equipment

Equipment Type	All Building Types	Multifamily, Hotel and Motel	
Gas Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Tank Serving ≥ 2 dwelling units or hotel/motel rooms (typically called Cluster or Pod Design)  	All gas water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand In addition to the above: ✦ Unfired storage tanks and backup tanks must meet insulation requirements of §110.3(c)3.	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A; exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2 Commercial boiler requirements: ✦ Systems ≥ 2.5 MMBtuh input capacity with nonpositive vent static pressure must meet combustion air positive shut-off requirements. ✦ ≥ 10 hp combustion air fans must have variable speed or have controls meeting limits of §160.4(e)2B. ✦ Systems ≥ 5 MMBtuh input capacity must meet excess oxygen concentration requirements of §160.4(e)3 unless the steady state full-load thermal efficiency is ≥ 90%.	Prescriptive requirements for central gas water-heating systems: ✦ **In CZ 1-9:** Systems with input capacity ≥ 1 MMBtuh require thermal efficiency ≥ 90%, not including units ≤ 100 MBtuh. Multiple units can meet these requirements using an input-capacity-weighted average efficiency. Not required when ≥ 25% of annual water heating is provided by site-solar or recovered energy ✦ **In CZ 10-16:** Not required **And:** ✦ Solar thermal systems: ◊ **In CZ 1-9:** Require ≥ 20% SSF without drain water heat recovery or ≥ 15% SSF with drain water heat recovery per RA 3.6.9 – HERS ◊ **In CZ 10-16:** Require ≥ 35% SSF without drain water heat recovery or ≥ 30% SSF with drain water heat recovery per RA 3.6.9 – HERS **And:** ✦ A recirculation system: ◊ Required for systems serving > 8 dwelling units or hotel or motel guest rooms ◊ Not required for systems serving ≤ 8 dwelling units or hotel or motel guest rooms
Boiler including Storage Tanks  			

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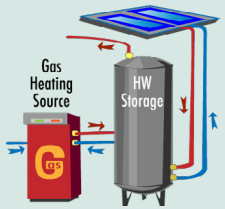
Central Residential Water-heating Systems

Equipment and Distribution System Requirements – Gas Water-heating Equipment *(continued)*

Equipment Type	All Building Types	Multifamily, Hotel and Motel	
Gas Water Heaters	**Mandatory §§110.1, 110.3(a), 110.3(b), 110.3(c)**	**Mandatory §160.4**	**Prescriptive §170.2(d) Additions: §180.1(a)3**
Solar Thermal Paired with Gas Water-Heating Systems 	All gas water heaters: ✦ Must meet minimum efficiency requirements ✦ Require equipment certified by the manufacturer within MAEDbS ✦ On systems that have a total capacity > 167,000 Btuh, outlets that require higher than service water temperatures must use separate systems or boosters for the extra demand. In addition to the above: ✦ Solar water-heating systems and collectors must be certified. ✦ Collector loop piping must meet insulation requirements of §120.3(c).	Domestic hot water piping must: ✦ Meet pipe insulation requirements of §160.4(f)1 per Table 160.4-A; exceptions may apply ✦ Meet pipe insulation protection requirements of §160.4(f)2	✦ Solar thermal system when paired with central gas water-heating system. ◊ **In CZ 1-9:** Require 20% SSF without drain water heat recovery or 15% SSF with drain water heat recovery per RA 3.6.9 – HERS ◊ **In CZ 10-16:** Require 35% SSF without drain water heat recovery or 30% SSF with drain water heat recovery per RA 3.6.9 – HERS ***Additions*** There are no Prescriptive requirements when extending an existing central HPWH system to serve an addition.

***CZ** = Climate Zone; **HERS** = Home Energy Rating System; **HPWH** = heat pump water heater; **JA** = Joint Reference Appendix; **MAEDbS** = Modernized Appliance Efficiency Database System; **RA** = Residential Reference Appendix; **SSF** = solar savings fraction.*

For more information on water-heating system requirements, refer to *Nonresidential and Multifamily Compliance Manual, Chapter 11.6: Water Heating Requirements*.

Table 11. *Energy Code Equipment and Distribution System Requirements for Central Residential Water-heating Systems – Gas Water-heating Equipment*

Alterations: Central Water-heating Systems

In Alteration projects involving residential central water-heating systems, replacing some components triggers Energy Code requirements. See Table 12 below for a list of common central system Alterations and Repairs and whether they trigger the Energy Code. For more details on the requirements for Alterations to individual residential water-heating systems, see Tables 7 and 8.

Changes that Trigger the Energy Code for Central Residential Water-heating System Alterations

For Details: Click a requirement title or code section → / Project Scope: ↓ Change this and nothing else	Water Heater Multifamily, Hotel, Motel: §§160.4, 170.2(d)2-3	Pipe Insulation Multifamily, Hotel, Motel: §160.4(f)	Recirculation Pump Multifamily, Hotel, Motel: §110.3(c)
Replace water heater with same type or different type including distribution	**YES** When replacing gas central water heating systems with heat pump central systems, all Mandatory requirements of new construction will apply to the new equipment (see Tables 10 and 11 above). Replacing existing systems with the same system type, such as replacing existing gas central equipment with new gas central equipment, also triggers Mandatory requirements.	**YES** For any added or altered piping subject to insulation requirements	**YES** If adding or replacing a recirculation pump of an existing distribution system, the altered recirculation system must meet all Mandatory requirements of §110.3(c). This includes air release valve, recirculation loop backflow prevention, hose bibb and isolation valve to support pump priming, and pump isolation valve requirements.
Replace water heater with same type or different type	**YES** When replacing gas central water heating systems with heat pump central systems, all Mandatory requirements of new construction will apply to the new equipment (see Tables 10 and 11 above). Replacing existing systems with the same system type, such as replacing existing gas central equipment with new gas central equipment, also triggers Mandatory requirements.	No	No
Add a water heating component (such as a Water Heater or Boiler) to an existing system	**YES** When adding new equipment, that new equipment must meet the applicable Mandatory and Prescriptive requirements of new construction (see Tables 10 and 11 above).	**YES** For any added or altered piping subject to insulation requirements	No

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Changes that Trigger the Energy Code for Central Residential Water-heating System Alterations			
For Details: Click a requirement title or code section → **Project Scope: ↓ Change this and nothing else**	**Water Heater** **Multifamily, Hotel, Motel: §§160.4, 170.2(d)2-3**	**Pipe Insulation** **Multifamily, Hotel, Motel: §160.4(f)**	**Recirculation Pump** **Multifamily, Hotel, Motel: §110.3(c)**
Add storage capacity (such as an unfired storage tank) to an existing system	No	**YES** For any added or altered piping subject to insulation requirements	No
Add photovoltaic (PV) or solar thermal to an existing system	No	**YES** For any added or altered piping subject to insulation requirements	No
Replace hot water piping	No	**YES** For any added or altered piping subject to insulation requirements	No
Replace hot water pipe insulation	No	**YES** For any added or altered piping subject to insulation requirements	No
Replace recirculation pump	No	No	**YES** When adding or replacing a recirculation pump of an existing distribution system, the altered recirculation system must meet all Mandatory requirements of §110.3(c). This includes air release valve, recirculation loop backflow prevention, hose bibb and isolation valve to support pump priming, and pump isolation valve requirements.
Add recirculation pump to existing system	No	No	Same as above

Table 12. *Changes that Trigger the Energy Code for Central Residential Water-heating System Alterations*

Energy Code Compliance Forms for Domestic Water-heating Systems

See Table 13 below for the applicable forms by building type.

Energy Code Compliance Forms for Domestic Water-heating Systems			
Building Type	**New Construction**	**Addition**	**Alteration**
Single Family	CF1R, CF2R, CF3R	CF1R, CF2R, CF3R	CF1R, CF2R, CF3R
Multifamily ≤ 3 Habitable Stories	LMCC, LMCI, LMCV	LMCC, LMCI, LMCV	LMCC, LMCI, LMCV
Multifamily ≥ 4 Habitable Stories, Hotel, Motel	NRCC, NRCI, NRCV	NRCC, NRCI, NRCV	NRCC, NRCI, NRCV

Table 13. *Energy Code Compliance Forms for Domestic Water-heating Systems*

For More Information

CALIFORNIA ENERGY COMMISSION

www.energy.ca.gov

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

2022 Building Energy Efficiency Standards

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

2022 Building Energy Efficiency Standards Summary

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

Energy Code Hotline

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

Email: Title24@energy.ca.gov

Online Resource Center

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

2022 Single-Family Residential Compliance Manual, Chapter 5

2022 Nonresidential and Multifamily Compliance Manual, Chapter 11.6

2022 Energy Code Compliance Software

Use CEC-approved software when following the Performance Approach of compliance for the 2022 Energy Code.

2022 Single-Family Residential Alternative Calculation Method Reference Manual

2022 Nonresidential and Multifamily Alternative Calculation Method Reference Manual

Modernized Appliance Efficiency Database System (MAEDbS)

Search this database to find products that comply with the Energy Code.

ADDITIONAL RESOURCES

HERS Providers

Check the CEC website to see if new providers have been approved.

CalCERTS (HERS Provider)

CHEERS (HERS Provider)

Ecosizer

Ecotope provides Ecosizer, a no-cost heat pump sizing tool.

Certified Solar Equipment

Find certified solar equipment at the links below:

Solar Rating and Certification Corporation (ICC-SRCC) Rating Summary Page

IAPMO R&T Solar Thermal Product Certification Directory

Reach Codes

Collaborating with cities, counties and stakeholders to drive reach code development and adoption for long-term climate and energy efficiency benefits. View a list of adopted ordinances at www.LocalEnergyCodes.com.

EnergyCodeAce™

www.energycodeace.com

Stop by this online "one-stop-shop" for no-cost tools, training and resources designed to help you comply with California's Title 24, Part 6 and Title 20.

Tools

www.energycodeace.com/tools

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

Reference Ace

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

Q&Ace

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

Product Finder

Find Title 24, Part 6, compliant products.

Forms Ace

Find the CF1R forms you need.

Virtual Compliance Assistant

Get interactive help to fill in NRCC or LMCC Forms.

Training

www.energycodeace.com/training

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

Of Special Interest:

- YouTube videos
- PG&E HPWH series

Resources

www.energycodeace.com/resources

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

Of Special Interest:

Fact Sheets for Buildings

- *2022 Residential Space Heating/Cooling and Water Heating Equipment Minimum Efficiencies*
- *2022 Designing Single-family Homes to Run on Clean Energy*
- *2022 Residential Electric Readiness*
- *2022 Single-family Buildings Just the Basics: HERS Verification*

Fact Sheets for Appliances

- MAEDbS 101

Check EnergyCodeAce.com for our latest 2022 tools, training and resources!

Create an account on the Energy Code Ace site and select an industry role for your profile in order to receive messages about all our offerings!

SCAN ME

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®), and Southern California Edison Company (SCE) under the auspices of the California Public Utilities Commission.