THE BUILDERS’ GUIDE TO
California’s 2019
Title 24 Code
The 2019 Title 24 Code brings 50% more stringency to residential housing in just one code cycle. It’s all done in the noble interest of cost-effective energy efficiency, but it is challenging to building professionals who must balance new requirements with profitability.

Here’s the definitive guide to the major changes the 2019 code brings, pitfalls to avoid, and ways to comply.

**QUANTUM LEAP**

According to energy consultant Martyn Dodd of Energy Soft, most notably, the heat pump water heater is an important point many people don’t realize about the code. “Homesowners and developers need to know that code-required items will pay for themselves over the lifetime of the building.”

With greatness comes hard work for the California building industry, but keeping up with the new code doesn’t have to be an onerous process. According to the experts interviewed for this guidebook—which focuses on low-rise residential (single-family homes and multi-family, three stories or less)—if builders plan properly, use building science best practices, and lean on strong manufacturers with reputable products, they can meet the 2019 code.

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"Now that the state is forcing PV investment in residential, homeowners are asking, ‘Do I do the minimum required of me or do I add more energy efficient electric appliances such as a heat pump water heater?’”

— Gina Rodda, Gabel Energy

**HOW YOU HEAT YOUR WATER MATTERS™ BRADFORD WHITE AEROTHERM® SERIES**

The Bradford White AeroTherm Series heat pump water heaters combine the installation and servicing features valued by plumbing professionals with the energy and cost saving benefits important to today’s energy conscious consumer.

According to Jeremy Crane, Partner for Signature Sales, a rep firm for Bradford White, AeroTherm stands out from the heat pump water heater competition because of its service. “We provide service beyond the sale—a strong white glove treatment, tech service center, and warranty support,” he says. Bradford White employs dedicated people who are used to talking to contractors. “Many of our support team members were Plumbers or HVAC techs themselves. It’s very helpful to have that component, because we can walk them through issues and answer questions,” Crane says. Bradford White provides training to the professionals through its For the Pros® training platform, which enables the professionals to fully service and provide for the homeowner.

**HIGHLIGHTS OF AEROTHERM® INCLUDE:**

- 60- and 80-gallon capacities-comparable replacements for 40-, 50-, or 80-gallon standard electric water heaters
- Provides the same amount of hot water as standard electric 60- or 80-gallon water heaters
- Same water and electrical connections as a standard electric water heater
- Top water connections
- A convenient height and weight for transporting on its side
- Quick and easy replacements and installations

**Designed for indoor installation such as basement, garage, closet, utility room, attic, etc.**

- Four operating modes: Heat Pump, Hybrid, Electric and Vacation
- Electronic controls make it simple to change the temperature or operating mode

Bradford White recommends professional installation on all products, most notably, the heat pump water heater.
BIG CHANGES

In addition to the two new additions to the code outlined in "Brand New For 2019," the following details the main updates builders should know about, adapted from "2019 Title 24: Where We’re Headed With The Residential Standards."

Residential Envelope

ABOVE DECK AND BELOW DECK ROOF INSULATION

- Above Deck Roof Insulation is no longer a prescriptive option.
- Below deck insulation is still a prescriptive option. New insulation requirements below the roof deck increased from R-18 to R-19 in climate zones 4, 8-16. For multifamily, R-13 is allowed in zones 10 and 16.
- The location of ducts and AHU in conditioned space is still an option.
- Builders can still use above-deck insulation with performance modeling.

WALL INSULATION IN HARSH CLIMATES

In climate Zones 1-6 and 8-16 requires more wall insulation. High-performance walls are specified with u-factor reduced to 0.046. This ups a 2x6 wall with R-21 insulation in the cavity and additional 1” rigid (R-9) installed on the outside of the wall.

ABOVE GRADE MASS WALLS

This is any wall with density greater than 45 lbs/ft². There are two options for compliance:
- Interior insulation R-10 Continuous (R-17 in Zone 16)
- Exterior insulation R-8 Continuous (R-13 in Zone 16)
- Below Grade Mass Walls
  - Two options for compliance:
    - Interior insulation R-13 Continuous (R-15 in Zone 16)
    - Exterior insulation R-5 Continuous (R-15 in Zones 14-15, R-19 in Zone 16)

QII Quality Insulation Installation (QII) is now required on most residential buildings under prescriptive compliance.
- Insulation can have no voids.
- It requires insulation by a HERS Inspection of insulation in under floor, wall, roof ceiling, air barrier. Inspections must be done before the walls are closed up.
- It will set the baseline in performance approach. This is prescriptive not mandatory but if you don’t do it you will have a 10-17%/NT in terms of compliance.
- Applies to new construction as well as additions larger than 700 square feet.

All piping insulated
- A drain-water heat recovery system

HEAT PUMP WATER HEATER

There are two pathways to compliance. Mixed fuel pathway with the baseline being a gas water heater, and electric. The most viable approach is to use a Tier III NEIA rated unit (must increase the PV size by 0.3 kW in Zones 1 and 16).
- Others include:
  - Compact hot water distribution HERS verified plus.
  - A drain water heat recovery system HERS verified.
- Or in Zones 2-16 increase PV size by 0.3 kW.
- Or in Zones 1 and 16 increase PV size by 1 kW.

REPLACEMENT WATER HEATERS

A replacement water heater can be one of the following:
- Natural gas or propane unit.
- An electric resistance unit if no gas is at the water heater location.
- If no natural gas, may replace an electric water heater (60 gallons or less).
- A heat pump water heater located indoors in climate zones 1-16.

RESIDENTIAL LIGHTING

Luminaire Requirements: Night lights, shop lights, and path lights require a vacancy sensor if light is over 5 watts or 150 lumens.
- Light source internal to drawers, cabinet or linen closets require a vacancy sensor if light is over 5 watts or 150 lumens unless they are equipped with controls that automatically turn the lighting off when closed.
- In bathrooms, garages, laundry rooms and utility rooms there needs to be at least one luminaire controlled by either a vacancy sensor or an occupancy sensor (must be configured in Vacancy sensor mode before final).

MULTIFAMILY SOLAR HOT WATER SYSTEM

This is applicable to units serving multiple dwelling units (central system) and still requires a solar system.
- 20% net solar fraction in Zones 1-9.
- 35% net solar fraction in Zones 10-16.
- You can reduce the NSF by 6% if each dwelling unit has a drain water heat recovery system (HERS verified).
Heat pump technology is tried-and-true technology we know well. Bradford White has taken that technology and adapted it to our water heater and run it in reverse from how a refrigerator works. You take a little bit of warmth—anything above 35 degrees F—and you can use that to heat your water up to a maximum of 140 degrees.”

—Gregg Holladay, Bradford White Water Heaters

The CEC took a closer look at water heating solutions and found much to extol about heat pump water heaters. For 2019, the CEC added heat pump water heaters to the code as an alternative to tankless systems. According to Gregg Holladay, Business Development Manager, Bradford White Water Heaters, two reasons stand out:

1. Electric-to-electric replacement. The incredible efficiency of heat pump water heaters (550 watts to heat water versus 4500 watts used by electric resistance units) means energy savings can be had without the use of fossil fuels. The CEC seized the opportunity to promote the use of a product that takes 75 percent of the energy use out of the second-highest-energy-consuming component of a house.

2. The potential use of Heat Pump Water heaters for load control by utilities, both shedding load during peak times, and storage of hotter water during “off peak” creating a thermal “battery.” Unlike gas tank water heaters with flue stacks that allow heat to escape, heat pump water heater tanks are well insulated with very little heat loss over long periods of time in standby. Utilities, which knows that moving heat is cheaper than creating heat, want to use these water-storage units as “batteries” – the perfect place to offload excess solar heat gathered from the expanding number of PV systems. The grid has the potential to send excess power directly to customers’ water heaters where it can remain hot all day.

The first new item is Community Shared Solar or Battery System. This allows for a common shared system to offset any solar and/or battery requirements of a building. Because the CEC is now requiring that new homes have PV production, this provides an opportunity to provide for the needs of a project without doing so directly on the building site. A builder, for example, could choose to locate solar off site on less valuable land.

To use community shared solar, the system must:

- Be operational before the final permit is signed off on the building
- Provide equivalent or better performance than what is specified for the building
- Directly benefit the building (not other properties), although it doesn’t have to be directly tied into the building, it can be fed to the grid though its benefit can’t transfer to another building
- Provide benefit to the building for 20 years minimum

The second important change is the way builders show compliance in the performance approach. 2019 uses Energy Design Rating (EDR). Currently, it is TDV (Time Dependent Valuation).

The EDR rating is scored on two aspects:

1. Performance of heating, cooling, and domestic hot water systems
2. Performance of heating, cooling, and domestic hot water PLUS appliances, lighting, plug loads and PV

So it might play out like this: A builder could design a high-performance home but not include PV. The first goal is passed, but because he doesn’t have the necessary PV production required by code, the house will fail.

In another situation, say a builder puts up a home that has lots of windows but offsets their energy use with a huge PV system. While he will clear goal one, he will be wildly off balance with goal one, and the house will fail.

The idea behind the two goals is that the CEC is looking for a balance of energy efficiency and PV production. (Additions and alterations will still be rated via TDV and not subject to the PV or use of appliances and receptacles rules.)
WINNING HEARTS AND MINDS

From the 4,000-foot view, heat pump water heaters are the perfect solution for reducing California’s energy use. But further down, in the trenches, the message gets tricky.

Tom Alkire, owner of RepWest, serving Bradford White in Northern California and Northern Nevada, says the challenges the code has presented to builders and manufacturers has created winners and losers by technology or in the field, which can inhibit innovation and fair competition.

Alkire points out that builders already resisted the change, then got over it, and now contractors are the ones who fight the move. “Going to heat pump from tankless... it’s a foreign object to them,” Alkire says. “Contractors are busier than ever, and now there are additional trades involved. But we can educate them,” he adds. (See “Product Spotlight,” page 3)

Holladay says the education process is ongoing, but that making the case for the superiority of heat pump technology is simple. It comes down to technology and cost savings.

Regarding technology, any resistance to heat pump water heating technology can be handily dismissed. “I always ask builders how many heat pumps they have in their houses,” Holladay says. When he gets blank stares, he rattles off a few: refrigerators, wine chillers, freezers.

“This is tried-and-true technology we know well,” he explains. “We have taken that technology and adapted it to our water heater and run it in reverse from how a refrigerator works. You take a little bit of warmth—anything above 35 degrees F—and you can use that to heat your water up to a maximum of 40 degrees.”

The cost savings story is also compelling. “Electric heat pump technology is more efficient because it is moving heat, not generating heat,” Holladay says. “It comes in at 3.39 UEF. A higher UEF will decrease your cost and result in a faster payback on the product. Bradford White’s AeroTherm® Series heat pump water heater will save an average of $350* in energy each year when compared to a standard electric water heater.”

“IT’S a product that helps homeowners,” Holladay summarizes. “It’s bigger than the product itself. Heat pump water heating is the best green technology out there because it pays for itself so quickly.”

*Information provided by the Air Conditioning, Heating and Refrigeration Institute (AHRI) and Bradford White. Savings based on the estimated annual operating cost of a standard 50-gallon electric tank water heater using $0.11/kWh per year vs. the 50-gallon, 3.39 UEF AeroTherm® heat pump water heater using $0.11/kWh per year and national average electricity rate of 12 cents/kWh. For T&D guide information, please visit www.ahri.org.

New Solar Rules

The CEC’s 2019 directive calls for a minimum system size of “2 to 3 kilowatts, depending mostly on the size of the home.” However, builders installing batteries would get “compliance credits,” allowing them to further reduce the size of the solar system. A storage battery can reduce the PV sizes from Equation 150.1-C by 20% if installed in conjunction with a PV system. The battery storage must have a minimum capacity of 7.5 kWh.

At first glance, the PV requirement might seem like an incredible cost burden to place on new home buyers. However, the CEC sees this as a net positive. Some have estimated this will increase the sticker price of new homes by $8,000 to $16,000.

However, since most homes are mortgaged, one has to examine the effect on the monthly mortgage payment. According to the CEC, the new requirement should raise the monthly mortgage payment by $40. That increase will be offset by an estimated $80 monthly savings in utility bills. C.R. Herro, Meritage’s Vice President of Environmental Affairs, told the OC Register that “the new energy standards add about $25,000 to $30,000 to the construction costs compared with homes built to the 2006 code, but that increased cost will result in $60,000 to $60,000 in the owner’s reduced operating costs over the 25-year life of the home’s solar system.”

Two important notes about the solar requirement:

1. Not every home will need to comply. Exceptions or alternatives will be allowed when homes are shaded by trees or buildings or when the home’s roof is too small to accommodate solar panels.

2. Builders have a couple of design options. They can either have solar panels installed on the individual home, or build a shared solar-power system serving a group of homes. In the case of rooftop panels, they can either be owned outright and rolled into the home price, or made available for lease on a monthly basis.

For more information on the renewables portion of Title 24, watch the webinar “Decoding Title 24 Renewables.”
ENERGY CONSULTANTS TO THE RESCUE

INA RODDA of Gabel Energy believes that the intensiveness of the 2019 code is pushing builders to use energy consultants to meet the requirements, but that unfortunately many use the “$99-no-matter-the-project” consultants and are not getting quality work and, in many cases, not getting through the building department.

Energy Code Ace’s Jill Marver encourages the industry to engage Certified Energy Analysts (CEAs). People can find CEAs on CABEC’s website.

This is welcome news to Jeremy Crane, Sales Manager/Partner for Signature Sales, representing Bradford White in Southern California, who thinks education is good but consultants are even better.

“Most builders punt to a consultant,” he says. “I understand that because I have gone to some education seminars and it’s like going to a 200 level college course without taking the 100 level first. We work in plumbing and now they have created a whole new industry with the different codes, abbreviations, and language. For many builders, it’s a little over their heads.”

RESOURCES ABOUND

Builders have a variety of online and in-person Title 24 education tools at their disposal.

The California Energy Alliance (CEA) is another place to get Title 24 information. This organization unites representatives from a broad range of organizations concerned about energy and the built environment. CEA focuses on the promotion and realization of deep energy savings, sustainable energy generation, and integration through pragmatic means.

“This group is important to understand,” says John Busch, Regional Sales Manager of Leviton’s Southwest Region and Chair of the Code Compliance Subcommittee for CEA.

“What’s happened to the utilities has dominated the code. CEA brought together stakeholders to assist the CEC in the development of codes.”

Another organization is NEEA (Northwest Energy Efficiency Alliance), an alliance of more than 140 Northwest utilities and energy efficiency organizations. “We work on progressive initiatives, such as Title 24, and partner with organizations to support them with technical information,” says Geoff Wickes, NEEA’s Senior Product Manager, Emerging Technologies.

He sees Title 24 as a harbinger of where energy efficiency is going in the West and across the country. “We provide lab-to-field analysis and product performance.” This testing allows the CEC to determine which technologies have potential Title 24 application. The organization provides education throughout the Northwest. You can learn more about their initiatives at https://neea.org.