

2019 Energy Code

What's New Overview

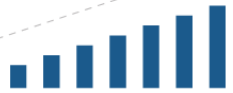


California Energy Commission
Efficiency Division
July 2020



PRIMARY FUNCTIONS OF THE

CALIFORNIA ENERGY COMMISSION



**Advancing State
Energy Policy**



**Investing in
Energy Innovation**



**Developing
Renewable Energy**



**Preparing for
Energy Emergencies**



**Achieving
Energy Efficiency**



**Transforming
Transportation**



**Overseeing
Energy Infrastructure**



**Intergovernmental
Collaboration**



Energy Code History

The Warren-Alquist Act established the California Energy Commission (CEC) in 1974

- Authority to develop and maintain Building Energy Efficiency Standards (Energy Code)
- Requires the CEC to update periodically, usually every three years
- Requires the Energy Code to be cost-effective over the economic life of the building

WARREN-ALQUIST ACT

Warren-Alquist
State Energy Resources
Conservation and
Development Act

Public Resources Code
Section 25000 et seq.



CALIFORNIA
ENERGY COMMISSION
Gavin Newsom, Governor

2020 EDITION
JANUARY 2020
CEC-140-2020-001



2019 Energy Code Goals

- Increase building energy efficiency while maintaining cost-effectiveness
- Contribute to California's greenhouse gas (GHG) reduction goals
- Reduce impact on grid through efficiency and photovoltaic (PV) generation
- Provide independent compliance paths for both mixed-fuel and all-electric homes
- Develop and provide tools for CalGreen Part 11 reach codes and other beyond code practices





2019 Lessons Learned

- New developments had significant impacts on zero net energy goals
- Large utility scale solar to meet 50% renewable portfolio standards requirements
- Net energy metering (NEM) rules and time-of-use (TOU) compensation for customer-owned generation
 - NEM rules currently treat grid as virtual storage, where extra generation can be stored and used later
 - NEM and life-cycle costing are laws and we must operate within their confines



Future Energy Codes

- First priority is energy efficiency
- Transitioning to GHG-based metric that promotes electrification
- Moving away from equal hourly netting to support grid flexibility
- Maintaining solar self-utilization and demand response measures

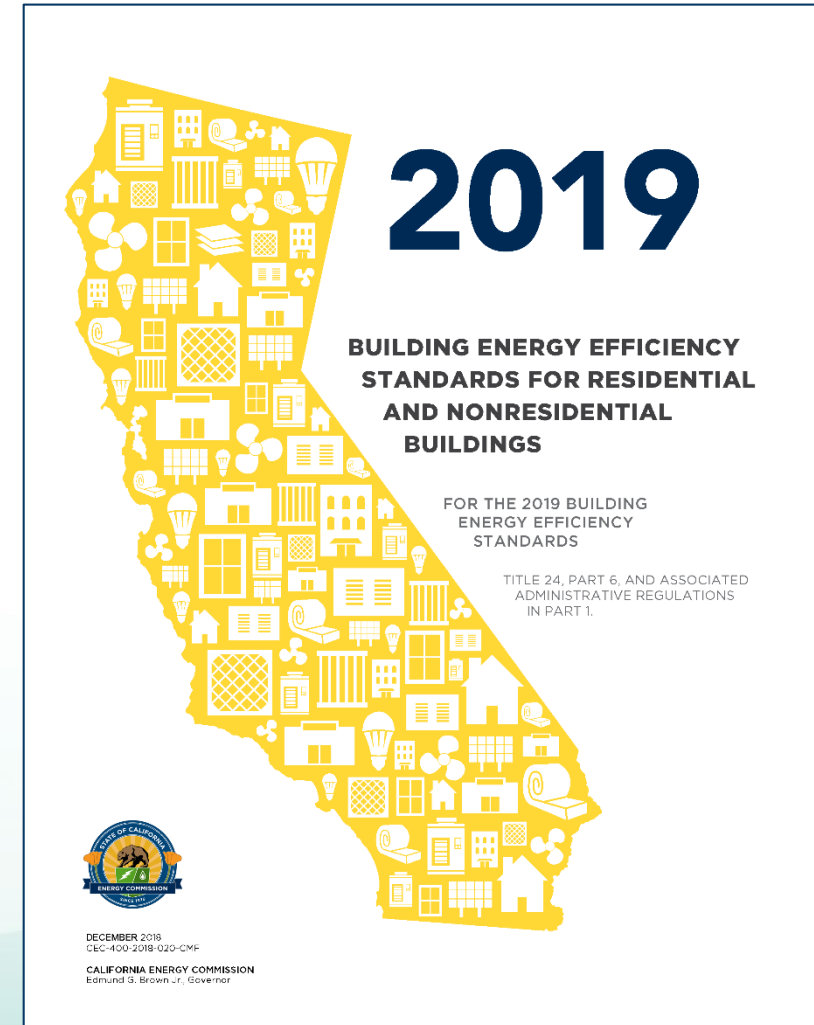




2019 Energy Code

Effective January 1, 2020

- Building permit applications submitted on or after effective date
- Must use 2019 software and forms





2019 Energy Savings

Low-rise residential

- 7% more efficient than 2016 Standards
- Energy consumption reduced by an average 53% with PV
- Monthly lifecycle cost is \$40 with savings of \$80 for typical home
- GHG emission reduction of 700k metric tons over 3 years





Residential Changes Summary

Performance

- New energy design rating (EDR)
- PV and quality insulation installation (QII) part of the standard design

Water heaters

- Prescriptive options for heat pump

Solar photovoltaic prescriptive requirement

- Several exceptions to reduce PV size

HVAC - Indoor air quality (IAQ)

- MERV 13 filtration
- ASHRAE 62.2-2016 applied with modifications
- HERS verification for kitchen range hoods

Increased efficiency for envelope

- New U-factor for doors
- Wall and ceiling insulation
- QII prescriptive requirement



CALIFORNIA'S 2019 RESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in lower electricity and natural gas bills. The 2019 Building Energy Efficiency Standards for residential buildings includes a first-in-the-nation requirement to install solar photovoltaic systems. Other features enable homes to reduce the electricity demand from the grid, helping to reduce energy bills and the carbon footprint.

\$19,000 SAVINGS OVER A 30 YR. MORTGAGE | INITIAL COST \$9,500



SOLAR PHOTOVOLTAIC SYSTEM

Promote installing solar photovoltaic systems in newly constructed residential buildings. The systems include smart inverters with optional battery storage. This will increase the self-utilization of the electricity generated to power the home's electricity loads including plug-in appliances. California is the first state in the nation to require smart systems on homes.



DEMAND RESPONSE COMPLIANCE OPTIONS

Encourage battery storage and heat pump water heaters that shift the energy use of the house from peak periods to off-peak periods. Utilities moving to time-of-use pricing assists the grid to meet the state's climate change goals and helps homes reduce energy bills.



HEALTHY INDOOR AIR QUALITY

Enable using highly efficient filters that trap hazardous particulates from both outdoor air and cooking and improve kitchen ventilation systems. Moving air around and in and out of the home while filtering out allergens and other particles makes the home healthier.



BUILDING ENVELOPE

Strengthen insulation in attics, walls and windows to improve comfort and energy savings. Keeping the heat out during the summer and warm air during the winter makes a home more resilient to climate change.

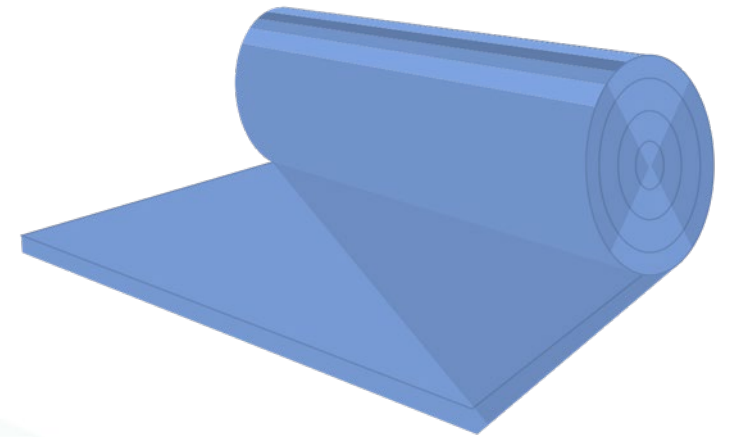




Envelope Changes Summary

Residential

- Addition of exterior door labeling requirements
 - 25% or more glass is fenestration
- Increased window efficiency
 - Max U-factor of 0.30, SHGC of 0.23
- High performance attics
 - R-19 between rafters becomes new baseline
- High performance walls
 - Max U-factor of 0.048
- QII prescriptive baseline
 - HERS verification required





Quality Insulation Installation Prescriptive Requirements

Residential § 150.1(c)1E

Quality insulation installation (QII)

- Requires HERS verification of installed insulation and exterior air barrier
- Meet criteria in Reference Residential Appendix RA3.5
- Not mandatory, but difficult to offset
- Modeling without can have 7-11% penalty
- Climate zone 7 not required for multifamily

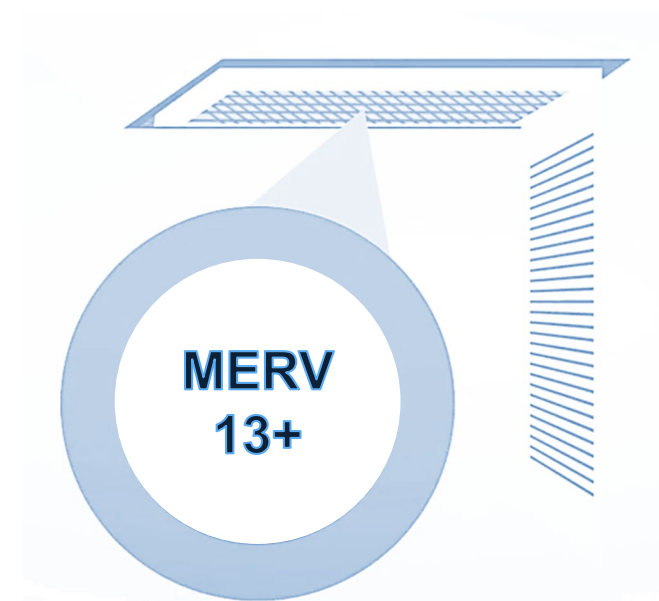




HVAC Changes Summary

Residential

- Aligns mid-size equipment efficiencies with ASHRAE 90.1
- Changes requirements for duct insulation in conditioned spaces
- Aligns IAQ with 2016 ASHRAE 62.2 with some amendments
- Modified requirements for small duct high velocity systems
- Increased fan efficiency for furnace air handlers

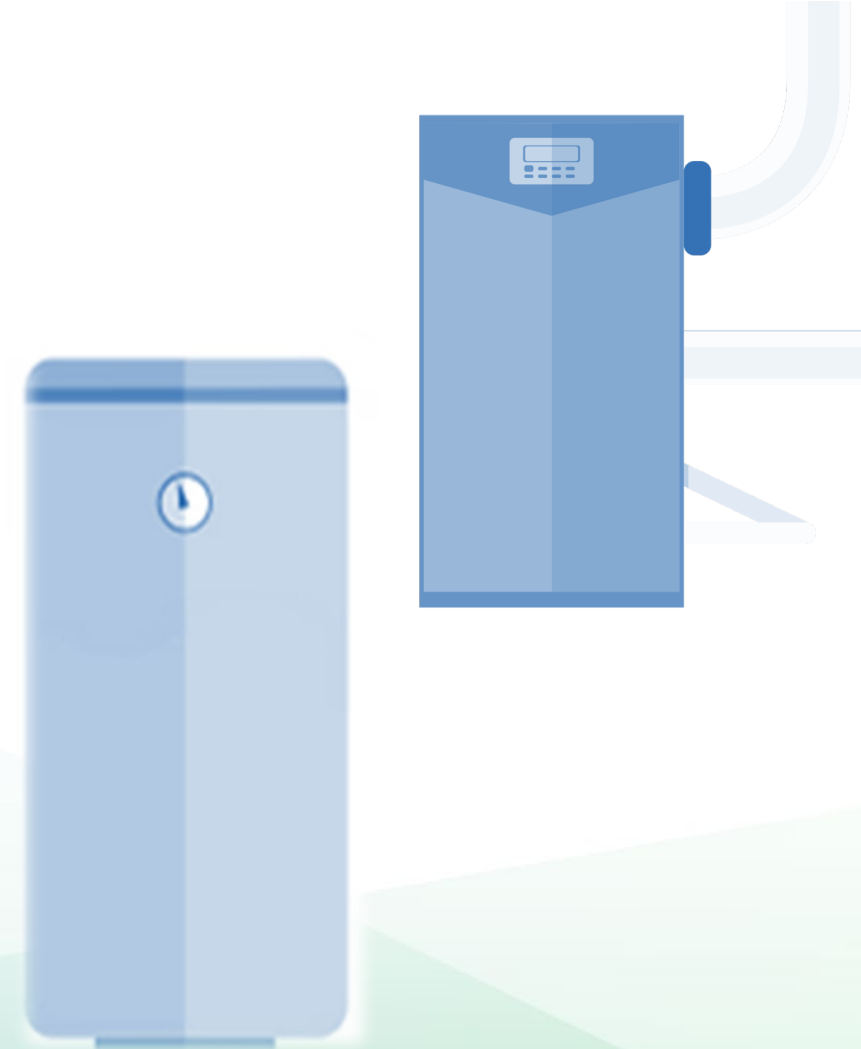




Water Heating Changes Summary

Residential

- Heat pump water heaters can be installed prescriptively in climate zones 1-15
- Gas water heaters must have dedicated 125 volt, 20-amp receptacle within 3 feet, connected to panel with 3 conductor 10 AWG wire
- **Alterations:** Electric water heater can be installed if natural gas is not connected to the existing water heater location





Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14

- PV systems sized to offset annual kWhs of mixed-fuel home
- Meet requirements in Reference Joint Appendix JA11
 - Verification of number of panels, panel type, size, orientation, tilt, and shading
 - Solar access tools approved
 - [Solar assessment tools web page](https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/solar-assessment-tools) at <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/solar-assessment-tools>
 - Remote monitoring capability required, with mobile app
- Several exceptions





Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14

PV Sizes for Mixed Fuel Homes. 2700 SF Prototype			
CZ	Efficiency EDR without PV, based on 2019 Efficiency Measures	Total EDR with PV	kW PV Size for Displacing kWh Electric Only
1 - Humboldt	48.0	26.5	3.4
2 - Santa Rosa	41.2	18.0	2.9
3 - San Francisco	46.9	22.7	2.8
4 - San Jose	43.1	22	2.9
5 - Santa Maria	42.5	20.2	2.7
6 - Costal LA	48.0	20.9	2.9
7 - San Diego	48.0	14.9	2.7
8 - Disneyland	43.0	14.6	2.9
9 - Burbank	46.2	23.3	3.1
10 - Riverside	45.2	23.5	3.3
11- Redding	43.3	23.4	3.8
12 - Sacramento	43.1	24.5	3.1
13 - Fresno	44.8	22.1	4.0
14 - Palmdale	44.6	21.3	3.4
15 - Palm Springs	48.0	17.9	5.7
16 - Tahoe	46.3	27.5	3.0

- Average PV size is 2.8 kW
- Average PV installed in existing homes is 7.2kW
- Varies with climate zone and house size



Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14



Exceptions

- Shading due to external barriers
- Dwelling unit plan with solar ready approved prior to January 1, 2020
- Variances allowed for multi-story buildings with limited roof space
- PV size may be reduced 25% with battery storage system (minimum 7.5 kWh)



PV Compliance Options

Residential



Rooftop Installation

- Outright purchase – big initial investment by homeowner, larger monthly savings
- Lease and PPA options – little or no initial investment, smaller monthly savings

Community Solar

- Alternative to rooftop PVs
- Must be approved by the CEC





2019 CalGreen Part 11

CalGreen and optional reach codes may specify more aggressive performance targets than base codes

- Tier 1 and Tier 2 targets can be reached
 - Greater energy efficiency
 - Larger PV systems with at least 5 kWh battery storage system
- Approved software can be used to demonstrate compliance

Climate Zone	Base Code EDR Target	CalGreen Tier 1 EDR Target	CalGreen Tier 2 EDR Target
12 – Sacramento	24.5	12 - 13	0



2019 Energy Savings

Nonresidential, high-rise residential, hotel and motels

- 30% more efficient than 2016 Standards
- Savings due mainly to lighting upgrades
- LED lighting first year savings of 480 GWh





Nonresidential Changes Summary

Healthcare facilities included

- Several exceptions

Envelope U-factors

- Values lowered

Lighting updates

- Lighting power densities based on LEDs
- Indoor lighting alterations simplified

Indoor air quality

- MERV 13 filtration

HVAC ventilation

- ASHRAE 62.1-2016 applied
 - Minimum exhaust rates
- ASHRAE 62.2 applied to high-rise residential
 - Verification for kitchen range hoods

Covered process requirements for laboratories

- Fan power and fume hood



CALIFORNIA'S 2019 NONRESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in lower electricity and natural gas bills. The 2019 Building Energy Efficiency Standards for nonresidential buildings include better lighting and ventilation. The standards also extend requirements for the first time to newly constructed healthcare facilities.

HEALTHY INDOOR AIR QUALITY

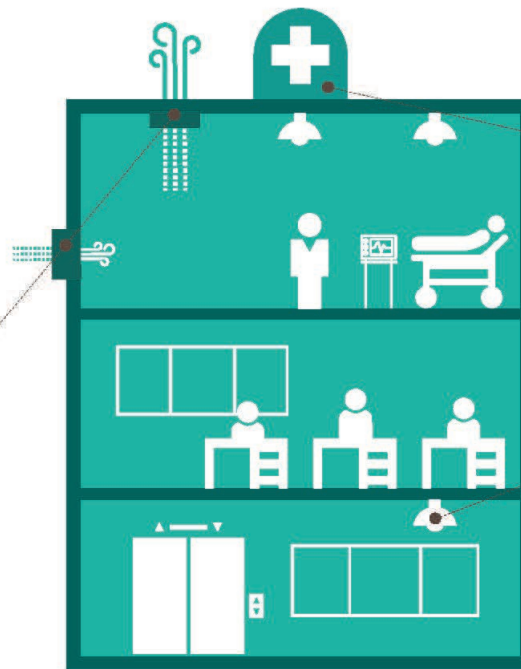
Enable using highly efficient filters that trap hazardous particulates from both outdoor air and cooking and improve kitchen ventilation systems. Moving air around and in and out of the home while filtering out allergens and other particles helps improve the health of a building. The standards add air flow requirements specific to small duct, high velocity systems, and sets, sensor control requirements.

HEALTHCARE FACILITIES

For the first time, energy efficiency standards extend to newly constructed healthcare facilities and incorporates the appropriate application of standards.

LIGHTING

Update indoor and outdoor lighting values to assume the use of LED lighting. LED lights use little energy and will save money on monthly electricity bills meaning smaller operating budgets for commercial buildings. Maintenance costs are reduced because bulbs do not need to be changed as often. The standards also add occupancy sensing requirements for restrooms.





Lighting and Indoor Air Quality Changes Summary

Nonresidential

Lighting

- Indoor and outdoor lighting baseline shifts to LEDs
 - LEDs now cost effective and feasible
 - Likely will not affect lighting designers
 - Most impact will be on envelope design
 - Less energy savings from lighting to trade-off with envelope
- New power adjustment factors (PAF) for advanced daylighting design

Air filtration

- MERV 13 filters now mandatory
 - Should expect higher surface area 1" filters or 2" filters





HVAC and Ventilation Changes Summary

Nonresidential

HVAC

- Heat pump minimum efficiency increased
- VRF system minimum efficiency increased
- Cooling tower fans, pumps minimum efficiency increased

Ventilation

- Incorporated natural and exhaust ventilation procedures of 2016 ASHRAE 62.1
- High-rise residential dwelling units meet ASHRAE 62.2
 - Must be a balanced system; or
 - A continuously operating supply or exhaust system
 - HERS blower door testing required
 - HERS Verification for kitchen range hoods



Covered Processes and Healthcare Changes Summary

Nonresidential

Covered processes

- Fan efficiency and automatic sash closure requirements for laboratory fume hoods
 - Acceptance testing required
- Efficiency and system control requirements for adiabatic condensers
 - Applies to refrigerated warehouses and supermarkets

Healthcare facilities are now included

- I-1 and I-2 occupancy
- There are many exceptions for these occupancies



2019 Documents Online

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2019 Building Energy Efficiency Standards

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

[Expand All](#)

2019 Building Energy Efficiency Standards and Compliance Manuals 

2019 Compliance Forms 

BUILDING ENERGY EFFICIENCY STANDARDS - TITLE 24

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

CONTACT

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

Toll-free in California: 800-772-3300
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- Energy Code
- Reference Appendices
- Compliance Manuals
- Forms



2019 Energy Code

Easy navigation features and updates

Energy Code

- Table of contents links
- Section and table links
- Table 100.0-A links
- Index

Compliance Manuals

- Table of contents links
- Future errata with clarifications will be published





2019 Compliance Forms and Tools

- New dynamic versions
- Reduced overall number of forms
- Prescriptive forms online
- Sample performance compliance forms available with approved software
- New EZ building climate zone search tool





2019 Compliance Software

To demonstrate Energy Code compliance with the performance approach

View [approved versions](https://www.energy.ca.gov/title24/2019standards/2019_computer_prog_list.html) at

https://www.energy.ca.gov/title24/2019standards/2019_computer_prog_list.html

- Residential
 - CBECC-Res 2019.1.2
 - EnergyPro 8.1 Residential
 - Right-Energy 2019.1.1
- Nonresidential
 - CBECC-Com 2019.1.2
 - EnergyPro 8.1 Commercial

Calculation Date/Time: 2019-07-08T18:42:27-07:00			CF1R-PRF-01E
Input File Name: Sample T24 2019 CBECC.ribd19			(Page 1 of 12)
05	Standards Version	2019	
07	Software Version	CBECC-Res 2019.1.0 (1079)	



Online Resource Center

Online Resource Center

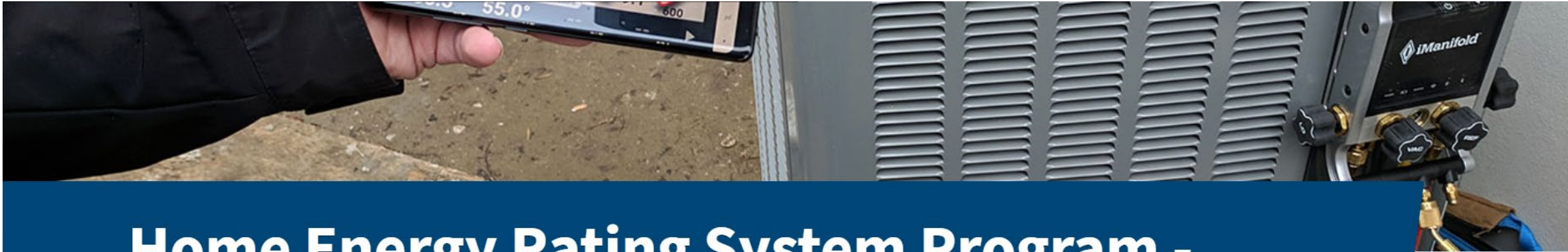
Educational documents and training information for building communities and enforcement agencies to assist with building energy standards compliance.

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2019 HERS Providers



Home Energy Rating System Program - HERS

The Home Energy Rating System (HERS) Program tests and rates the energy performance of a home. The California Energy Commission's HERS Program addresses construction defects and poor equipment installation, including HVAC systems and insulation. The Energy Commission has a list of approved HERS providers who train and certify raters.

SUBSCRIBE

Building Energy Efficiency Standards

First Name *



2019 ATTCP Program



Acceptance Test Technician Certification Provider Program - ATTCP

Acceptance Test Technicians perform required tests for lighting controls and mechanical systems in nonresidential buildings. The California Energy Commission's approved Acceptance Test Technician Certification Providers (ATTCP) train, certify, and oversee the technicians and their employers.

CONTACT

[Joe Loyer](#)

916-654-4811



Blueprint Newsletter

Blueprint Newsletter

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

NEWSROOM

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Thank you