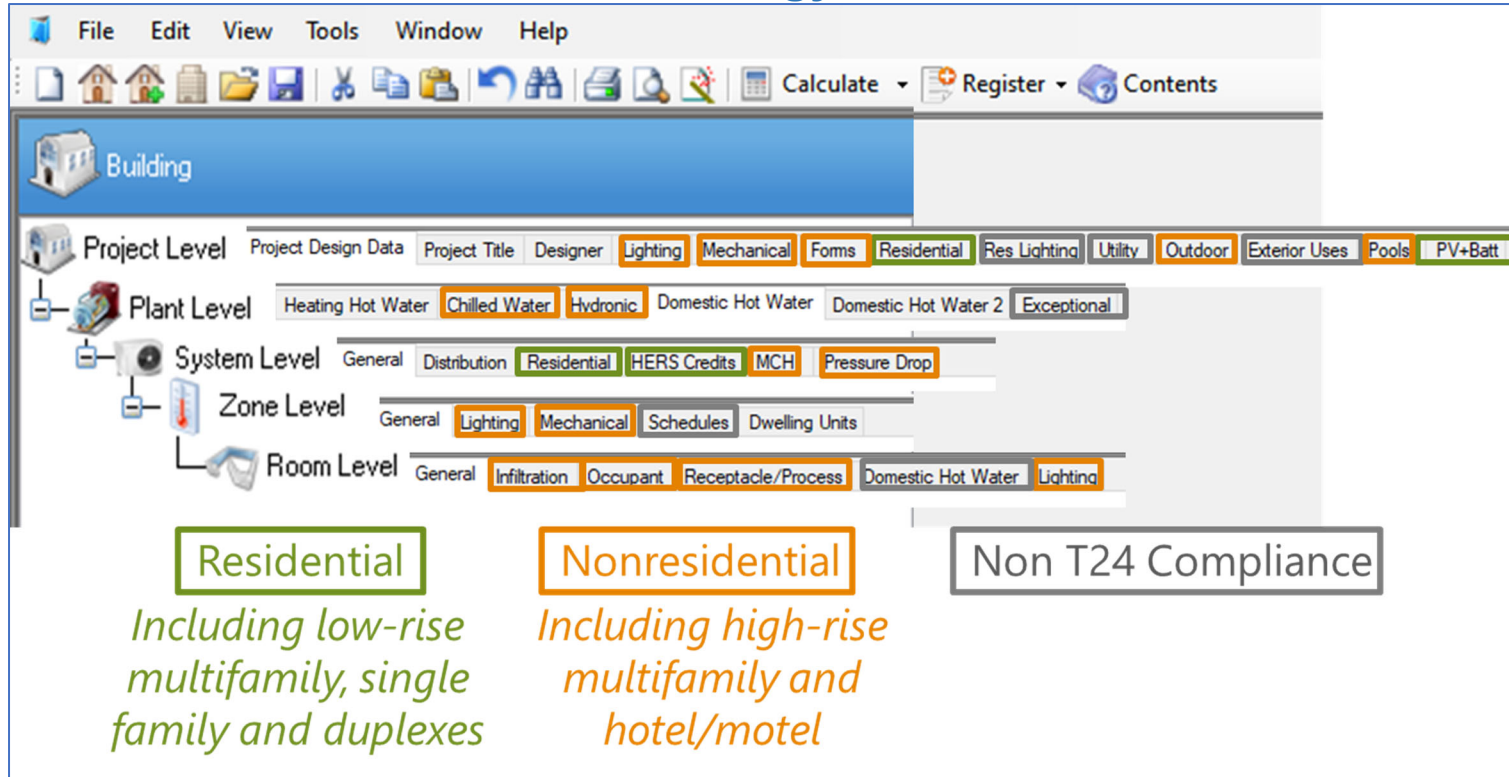


Overview of EnergyPro Structure

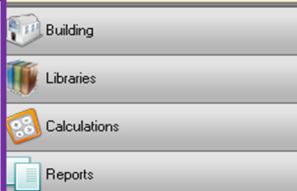



Residential
Including low-rise multifamily, single family and duplexes


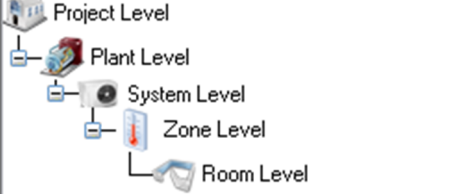
Nonresidential
Including high-rise multifamily and hotel/motel

Non T24 Compliance

Residential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8

Building Feature		Brief Description		
PV + Flexibility	EDR Score 150.1(b)1	New compliance metric for new single-family homes, new low-rise townhomes & multifamily buildings. Building efficiency must show compliance with no tradeoffs from PV systems.	Calculations <i>Residential T24 Performance</i>	<i>See PV + Flexibility</i>
	PV 150.1(c)14	New single-family homes, new low-rise townhomes & multifamily buildings to meet PV kW requirements per Res ACM.	Building	Project Level Tab: PV + Batt
	Battery 150.1(c)14	Can be used to reduce PV kW or trade with building efficiency features, depending on kWh size, for new single-family homes, new low-rise townhomes & multifamily buildings.	Building	Project Level Tab: PV + Batt


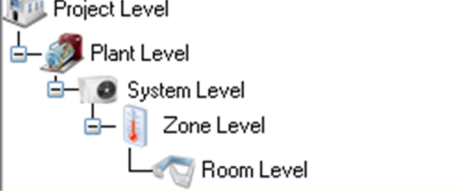
Residential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8

Building Feature		Brief Description		
Envelope	Roof 150.1(c)1	Above roof deck insulation option removed as prescriptive feature (can still use with performance approach). Below roof deck insulation R-value increased to R-19 and associated with roofing material installed with air gap (i.e. tile roofing) for prescriptive compliance (all other must use performance approach).	Libraries <i>Assembly</i>	Room Level <i>Roof</i> Tab: Performance: Res T24 Performance Prescriptive: JA4
	Roof: Additions 150.2(c)5	Roof insulation R-value increased to R-30 CZ 2-10, and R-38 in CZ 1&11-16.		
	Walls 150.0(c) 150.1(c)1B	Framed: Mandatory min. for 2 x 6 walls increased to R-20. Framed: Prescriptive U-factor for single family CZ 1-5, 8-16 reduced to 0.048. Above Grade Mass: Mandatory U-factor based on prescriptive measures.		
	Walls: Additions 150.2(a)1Bvi	Extended 2 x 6 framed walls increased to R-21.	Building	Project Level Tab: Project Design Data Building Type: Addition
	Fenestration 150.1(c)3A 150.1(c)5	Prescriptive U-factor reduced to 0.30 and SHGC reduced to 0.23 for CZ 2,4,6-15 Door considered fenestration (using rough opening) when ≥25% glass.	Libraries <i>Assembly</i>	Room Level <i>Fenestration</i>
	Solid Doors 150.1(c)5	NFRC rated U-factor of 0.20 or less except for door in home to the garage.	Libraries: <i>Assembly: Tab: JA4</i> NFRC = U-factor 0.20 Default = U-factor 0.50	Room Level <i>Door</i>
	Quality Insulation Installation (QII) 150.1(c)1E	HERS verification now a prescriptive requirement for new single-family homes, low-rise multifamily, and additions >700 ft ² (multifamily in CZ 7 exempt).	Building	Project Level Tab: Residential
	<i>Good to know</i>	<i>RA3.8 HERS verified "Envelope Leakage Testing" which can be a good measure with QII</i>	Building	Project Level Tab: Residential
	<i>Alterations: Good to know 150.2(b)2B</i>	<i>HERS verified "Existing Conditions" which must be verified before submitting for permit or any work done</i>	Building	Project Level Tab: Residential
Domestic Hot Water (DHW)	Heat Pump Tank System 150.1(c)8A	One NEEA 3 system allowed in garage or conditioned space in CZ 2-15. Other requirements required for CZ 1 & 16 and for non NEEA 3 systems.	Libraries <i>Boiler: "Import" heat pump water heater, these are NEEA 3</i>	Plant Level Tab: Domestic Hot Water <i>Model "Residential Heat Pump Water Heater"</i>
	Drain Water Heat Recovery (RA2.1)	If utilized, HERS verification required	Building	Zone Level Tab: Dwelling Units
	Alterations 150.2(b)1H	New allowance for heat pump DHW in CZ 1-15 New allowance for electric resistance tank DHW when natural gas not available at DHW location.	Libraries <i>Boiler</i> <i>"Import" heat pump water heater, these are NEEA 3</i>	Plant Level Tab: Domestic Hot Water <i>Model "Residential Heat Pump Water Heater" location</i>
		Building Project Level Tab: Project Design Data <i>select "propane"</i>	Plant Level Tab: Domestic Hot Water	

Residential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8

Building Feature		Brief Description	Building Libraries Calculations Reports	Project Level Plant Level System Level Zone Level Room Level
HVAC	Filter 150.0(m)	MERV-13 2" (exceptions allowed for 1" meeting Equation 150.0-A) for new ducted (>10 ft ² of ducting) systems or complete replacement (indoor, outdoor ducting) systems verified by HERS rater	<i>HERS auto selected by software for new HVAC system, and/or all new ducting modeled</i>	System Level <i>Tab: General and/or Distribution</i>
	IAQ Ventilation 150.0(o)	Increased CFM requirements per Equation 150.0-B	<i>Defaulted by software unless "non-default" system selected</i>	Project Level <i>Tab: Residential for "non-default" system</i>
	ADU IAQ 150.0(o)	All new accessory dwelling units must meet IAQ requirements including HERS verification	Building	Zone Level <i>Tab: General</i>
	Gas FAU + AC 150.0(m)13	HERS verification reduced to 0.45 W/CFM for gas furnaces manufactured as of July 3, 2019 for system including AC	Building	System Level <i>Tab: HERS Credits</i>
	Kitchen Range Hood 150.0(o)2B	HVI certification required for 100 CFM airflow and 3.0 sone sound rating verified by HERS rater	Building	Project Level <i>Tab: Residential</i>
	Whole House Fan Table RA2.1	Now verified by HERS rater	Building <i>Can use "default" or specify system</i>	Project Level <i>Tab: Residential</i> System Level <i>Tab: Residential</i>
	Heat Pumps Table RA2.1	HSPF and rated heat pump heating capacity to be verified by HERS rater	Libraries <i>Central</i>	System Level <i>Tab: General</i>
	Multifamily IAQ 150.0(o)1E	Balanced ventilation. Supply and exhaust systems serving each dwelling unit. If not balanced and using other (continuous supply or exhaust ventilation), HERS blower door compartmentalized testing of envelope infiltration rate is required	Building <i>Tab: Residential</i> Modeling "Balanced" <i>"Non-default" for IAQ</i>	Project Level <i>Tab: Residential</i> Zone Level <i>Tab: Dwelling Units</i>
	Alterations: HERS Duct Testing 150.2(b)1D/E	New 6% leakage requirement for HVAC alterations that include HVAC features located in the garage	Modeling "Default" <i>"Default" for IAQ</i>	<i>Software will auto select HERS blower door testing</i>
	<i>Good to know</i> RA3.1.4.1	<i>HERS verified duct design. Duct design required per ACCA Manual J, S, D for inputs</i>	Building <i>Triggered with new HVAC and/or ducting</i>	System Level <i>Tab: Distribution</i>
<i>Coming Soon</i> Docket 19-BSTD-02	<i>VCHP (mini ducted/ductless heat pumps) meeting VCHP compliance installation requirements</i>	Building	System Level <i>Tab: Distribution "Verified Duct"</i>	
		Libraries <i>Central</i>	System Level <i>Tab: General</i>	

Nonresidential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8

Building Feature		Brief Description		
Scope	All Appendix A	New prescriptive NRCC dynamic forms must be used (cannot use Bluebeam, download free version of Adobe)	Reports <i>Nonresidential T24 Prescriptive</i>	Project Level Tab: Forms
Mechanical	Efficiency 110.2	Increased efficiency requirements for VRF, Air-to-Air/Applies Heat Pumps, Single Package Vertical units, propeller/axial fan closed circuit cooling towers We can now model VRF. Be aware that currently you have to model the same amount of HVAC systems to ventilation systems. Example, if you have 1 outdoor VRF system, you can only model 1 ventilation system per zone so you may need to combine ventilation systems.	Libraries <i>Central and Zonal</i> <i>Use Energy Pro "example" file of the specific VRF manufacturer to pull in outdoor and indoor units.</i>	System Level Tab: General Zone Level Tab: Mechanical Zone Level: Mechanical System Data and VRF pipe length
	Fan Systems NR ACM	HVAC System mapping has been revised so that buildings less than 25,000 ft ² , 3 stories or less, and output less than 65,000 Btu/h is compared to single zone constant volume system.	Libraries <i>Central</i>	System Level Tab: General
	Air Filtration 120.1(b)1 & (c)1	MERV-13 2" filter (1" alternative option available). Fan power adjustment credits are now available for fully ducted supply/exhaust returns; return/exhaust control devices; MERV 16 or greater filter; carbon/gas phase air cleaners; exhaust filters, scrubbers and/or exhaust, and/or biosafety cabinet	Building	System Level Tab: Pressure Drop
	Ventilation 120.1(c)2 120.1(c)3 120.1(b) 120.1(d)5 120.2(e)3	Nonresidential/Hotel & Motel: Natural ventilation design and allowances have changed Nonresidential/Hotel & Motel: Ventilation rate categories have changed; Required ventilation rate larger of CFM/ft ² or actual # of occupants; Air class recirculation/transfer requirements added; Exhaust ventilation requirements added Multifamily specific: Natural ventilation not allowed for dwelling units; Revised airflow rate; Balanced ventilation method encouraged; Continuous supply/exhaust method will require HERS compartmentalized blower door verification; Kitchen hood HVI HERS verification Controls: Demand control ventilation (CO ₂) has new triggers and exceptions; Occupancy sensor triggers and design criteria has changed	Building	Zone Level Tab: Mechanical Ventilation Type
			Building	Zone Level Tab: Mechanical Zone Level Mechanical System Data

Nonresidential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8

Building Feature		Brief Description	Building Libraries Calculations Reports	Project Level Plant Level System Level Zone Level Room Level
Lighting	Rated Wattage 130.0(c)2 & 6	Revised methods for determining input wattage for line voltage medium screw based socket recessed luminaires; Inseparable or remote driver SSL/LED luminaires; LED tape and linear luminaires; Track lighting; PoE lighting	Libraries <i>Luminaire</i>	Space Level <i>Lighting</i>
	Indoor Controls 130.1	New Power Adjustment Factor (PAF) control options	Libraries <i>Assembly</i>	Room Level <i>Lighting</i> <i>Controls for Credit</i>
	Indoor Lighting Power Density (LPD) 140.6(c)	Revised building/space/tailored categories and allowances (LPD) for Complete Building Method, Area Category Method, Tailored Method	Building <i>Indoor Unconditioned: Requires "NRM2 Module" because indoor lighting in unconditioned spaces cannot be included in performance results.</i>	Zone Level <i>Tab: General then select "occupancy"</i>
	Outdoor BUG 130.2(b)	Revised trigger (6,200 lumens), and BUG requirements moved to Title 24 Part 11; new exception for multifamily & hotel/motel	Building <i>Requires "NRM4 Module" because outdoor lighting cannot be included in performance results.</i>	Project Level <i>Tab: Forms - LTO</i>
	Outdoor Controls 130.2(c)	Automatic scheduling requirements expanded; Motion sensor triggers and exceptions revised		Exterior Application <i>Add lighting fixtures</i>
	Outdoor Lighting Allowances 140.7(d)	General hardscape and specific allowance allowances have been reduced		
Covered Process	Laboratory and Factory Exhaust Systems 140.9(c)2 & 3	Fans with >10,000 CFM have new control requirements and acceptance testing verification	Building	Zone Level <i>Tab: Mechanical Ventilation Type</i>
Envelope	Fenestration 110.6(a) 140.3(a)	NA6 center of glass formula limited to 200 ft² or less	Libraries <i>Assembly</i>	Room Level <i>Fenestration</i>
		Demising fenestration only required to meet U-factor requirements of Table 140.3		
		Tubular skylights have their own allowances per Table 140.3		





Decoding EnergyPro:

Comply With Me

***Let's Talk Updates for
2019 Code:***

Low-Rise Residential



HELPING YOU PLAY YOUR CARDS RIGHT



Recording For Future Use



 **Decoding** * Residential Compliance™

 **Decoding** * QII™

 **Decoding** * 2019 Title 24, Part 6™

Let's Talk What's New

**This session is
being recorded.**

Last Decoding Talk...

 **Decoding** * 2019 Title 24, Part 6™

Let's Talk Healthcare Facilities

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Learn how to comply with California's building and appliance energy efficiency standards

www.EnergyCodeAce.com

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Tools ♠ Training ♠ Resources
to help you decode Title 24, Part 6 and Title 20



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





Who Are We?



Gina Rodda
Gabel Energy
gina@gabelenergy.com



BUILDING ENERGY ANALYSIS +
ENERGY CODE COMPLIANCE

Host: Gina Rodda

Gina Rodda, our host for the Decoding Talk series, is a Certified Energy Analyst (CEA) through CABEC, and LEED Accredited Professional (AP).

She is involved in providing residential and non-residential energy calculations for a variety of building types throughout California; an instructor of full day trainings; subject matter expert supporting future code development; aids the improvement to tools and resources supporting energy compliance through the private utility programs and the Energy Commission.

Gina has been in the energy modeling field since 1991.



Who Are We?



Martyn C. Dodd
Energy Soft



Co-Host: Martyn Dodd

Having written software used in California for Title 24 energy code compliance since 1984, Mr. Dodd is principal of EnergySoft, a Bay Area company that specializes in performance-based energy analysis for Title 24 and LEED.

Mr. Dodd has been involved in the California standards development process for the past four decades and has consulted on the Title 24 rules and procedures extensively in that time.

Mr. Dodd has taught over 2,000 training classes throughout North America on energy modeling and code compliance and has developed training curriculums for over 100 different classes related to building energy efficiency.



Decoding What's New



★ Review

- ✧ Updates associated with residential, and low-rise multifamily building features that have new or revised modeling regimes;
- ✧ Compliance options that might be used more often;
- ✧ Certificate of Compliance documentation supporting these new updates and compliance options;
- ✧ Where to get find more information and guidance on the 2019 Energy Code, modeling and energy consulting through Energy Code Ace and Energy Soft.



Why?



HELPING YOU PLAY YOUR CARDS RIGHT



Handouts

2019 ENERGY CODE

Ace Resources Title 24, Part 6 **Fact Sheet**

Nonresidential, High-Rise Residential, Hotel/Motel:
What's New in 2019?

What

Decoding + EnergyPro™
Let's Talk Updates for 2019 Code – Residential

Nonresidential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8		
Building Feature	Scope	Brief Description
	All Appendix A	New prescriptive NRCC dynamic Bluebeam, download free version
	Efficiency 110.2	Increased efficiency requirements for Pumps, Single Package Vertical circuit cooling towers. We can now model VRF. Be able to model the same amount of HVAC. Example, if you have 1 outdoor ventilation system per zone so ventilation systems.
	Fan Systems NR ACM	HVAC System mapping has been changed for buildings greater than 25,000 ft ² , 3 stories or less compared to single zone code.
	Air Filtration 120.1(b)1 & (c)1	MERV-13 2" filter (1" alternative adjustment credits are now available for supply/exhaust returns; return/or greater filter; carbon/gas phase scrubbers and/or exhaust, and Nonresidential/Hotel & Motel allowances have changed.
	Ventilation 120.1(c)2, 120.1(c)3, 120.1(b), 120.1(d)5, 120.2(e)3	Nonresidential/Hotel & Motel changed; Required ventilation for occupants; Air class recirculation; Exhaust ventilation requirements. Multifamily specific: Natural ventilation units; Revised airflow rate; Balancing encouraged; Continuous supply compartmentalized blower door HERS verification. Controls: Demand control ventilation exceptions; Occupancy sensor changed.

2019 ENERGY CODE

Ace Resources Title 24, Part 6 **Fact Sheet**

Low-Rise Residential:
What's New in 2019?

What

This fact sheet highlights key changes made to the 2016 Title 24, Part 6 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2019 Energy Code for low-rise residential buildings. The 2019 Energy Code becomes effective January 1, 2020. All measures listed apply to both single-family and low-rise multifamily dwellings unless otherwise noted.

SOLAR PHOTOVOLTAIC SYSTEM
 HEALTHY INDOOR AIR QUALITY

Decoding + EnergyPro™
Let's Talk Updates for 2019 Code – Residential

Residential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8		
Building Feature	Scope	Brief Description
	EDR Score 150.1(b)1	New compliance metric for new single-family homes, new low-rise townhomes & multifamily buildings. Building efficiency must show compliance with no tradeoffs from PV systems.
	PV 150.1(c)14	New single-family homes, new low-rise townhomes & multifamily buildings to meet PV kW requirements per Res ACM.
	Battery 150.1(c)14	Can be used to reduce PV kW or trade with building efficiency features, depending on kWh size, for new single-family homes, new low-rise townhomes & multifamily buildings.
	Roof 150.1(c)1	Above roof deck insulation option removed as prescriptive feature (can still use with performance approach). Below roof deck insulation R-value increased to R-19 and associated with roofing material installed with air gap (i.e. tile roofing) for prescriptive compliance (all other must use performance approach).
	Roof Additions 150.2(c)5	Roof insulation R-value increased to R-30 CZ 2-10, and R-39 in CZ 1&11-16.
	Walls 150.0(c), 150.1(c)1B	Framed: Mandatory min. for 2 x 6 walls increased to R-20. Framed: Prescriptive U-factor for single family CZ 1-5, 8-16 reduced to 0.048. Above Grade Mass: Mandatory U-factor based on prescriptive measures.
	Walls: Additions 150.2(a)1Bvi	Extended 2 x 6 framed walls increased to R-21.
	Fenestration 150.1(c)3A, 150.1(c)5	Prescriptive U-factor reduced to 0.30 and SHGC reduced to 0.23 for CZ 2,4,6-15 Door considered fenestration (using rough opening) when ≥25% glass.
	Solid Doors 150.1(c)5	NFRC rated U-factor of 0.20 or less except for door in home to the garage.
	Quality Insulation Installation (QII) 150.1(c)1E	HERS verification now a prescriptive requirement for new single-family homes, low-rise multifamily, and additions >700 ft ² (multifamily in CZ 7 exempt).
	Good to know	RA3 B HERS verified "Envelope Leakage Testing" which can be a good measure with QII
	Alterations: Good to know 150.2(b)2B	HERS verified "Existing Conditions" which must be verified before submitting for permit or any work done

EnergyCodeAce™
Helping you play your cards right

Title 24, Part 6 - Nonresidential, High-Rise Residential, Hotel/Motel What's New in 2019

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Which Code Year Applies? Apply for permit...

Jan. 2020- Dec. 2022

2019

**BUILDING ENERGY EFFICIENCY
STANDARDS FOR RESIDENTIAL
AND NONRESIDENTIAL
BUILDINGS**

FOR THE 2019 BUILDING
ENERGY EFFICIENCY
STANDARDS

TITLE 24, PART 6, AND ASSOCIATED
ADMINISTRATIVE REGULATIONS
IN PART 1.

STATE OF CALIFORNIA
ENERGY COMMISSION
2019

DECEMBER 2019
CEC-400-2019-020-CMF

CALIFORNIA ENERGY COMMISSION
Edmund G. Brown Jr., Governor



Helps you navigate the Standards using key word search capabilities, hyperlinked tables and related sections

Search...

2019 Building Energy Efficiency Standards - Reference Ace v16

2019 BUILDING ENERGY EFFICIENCY STANDARDS
REFERENCE APPENDICES
RESIDENTIAL COMPLIANCE MANUAL
NONRESIDENTIAL COMPLIANCE MANUAL

2019 Building Energy Efficiency Standards Reference Ace Tool

E

DECEMBER 2018
CEC-400-2018-020-CMF
CALIFORNIA ENERGY COMMISSION
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MAY 2019
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CALIFORNIA ENERGY COMMISSION
Loretta Harjo, Governor

2019
RESIDENTIAL ALTERNATIVE CALCULATION METHOD REFERENCE MANUAL
FOR THE 2019 BUILDING ENERGY EFFICIENCY STANDARDS
TITLE 24, PART 6, AND ASSOCIATED ADMINISTRATIVE REGULATIONS IN PART 1.

Contents Favorites



Energy Commission Resources

The screenshot shows the California Energy Commission website's Online Resource Center. The page features a navigation menu with options like HOME, PROCEEDINGS, RULES AND REGULATIONS, PROGRAMS AND TOPICS, FUNDING, DATA AND REPORTS, and SHOWCASE. Below the navigation is a search bar and a breadcrumb trail: Home > Programs and Topics > All Programs > Building Energy Efficiency Standards - Title 24 > Online Resource Center. The main content area is titled "Online Resource Center" and includes a paragraph explaining that the center provides educational assistance about Building Energy Efficiency Standards. To the right, there is a list of resources under "BUILDING ENERGY EFFICIENCY STANDARDS - TITLE 24", including links for 2022, 2019, and 2016 standards, and the Online Resource Center. Below this is a "CONTACT" section with the phone number 800-772-3300 (toll-free in California) and 916-654-5106 (outside California). There is also a "SUBSCRIBE" form with fields for First Name, Last Name, and Email, and a "SUBSCRIBE" button. At the bottom, there are two featured articles: "2019 Building Energy Efficiency Standards" and "2016 Building Energy Efficiency Standards", each with a thumbnail image and a brief description.

CEC Hotline

Monday – Friday, 8 a.m. to noon, 1 p.m. to 4:30 p.m.
1-800-772-3300 (CA), (916) 654-5106 (Outside CA)
Email: Title24@energy.ca.gov

List Server & Newsletter

Main conduit for stakeholder communication:
www.energy.ca.gov/listservers/
(Subscribe to Building Standards & Blueprint Newsletter)

Download the Blueprint Newsletter:
www.energy.ca.gov/efficiency/blueprint

Other Useful Links

CEC Online Resource Center:
<https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center>

Approved Compliance Software:
www.energy.ca.gov/title24/2019standards/2019_computer_prog_list.html



Online Resource Center

- Compliance Forms +
- Energy Videos +
- Trainings and Upcoming Events +
- Exhibitor Booth Handouts +



Enter keywords, e.g. Tracking Progress

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- DATA AND REPORTS ▾
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Home > Programs and Topics > All Programs > Building Energy Efficiency Standards - Title 24 > 2019 Building Energy Efficiency Standards

ENERGY STANDARDS AND FORMS



2019 Building Energy Efficiency Standards

The 2019 Building Energy Efficiency Standards take effect January 1, 2020. Find compliance manuals, forms, software, and supporting content.

2016 Building Energy Efficiency Standards

The 2016 Building Energy Efficiency Standards were effective January 1, 2017. Find compliance manuals, forms, software, and supporting content.



Past Building Energy Efficiency Standards

Historical archive of past standards (2013 and prior).

2019 Building Energy Efficiency Standards

The 2019 Building Energy Efficiency Standards update 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 +
- 2019 Compliance Software and Alternative Calculation Method (ACM) Manuals +
- 2019 Building Energy Efficiency Standards Rulemaking Documents +
- Fact Sheet +
- Frequently Asked Questions +

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
Outside California: 916-654-5106

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Building Energy Efficiency Standards

First Name *

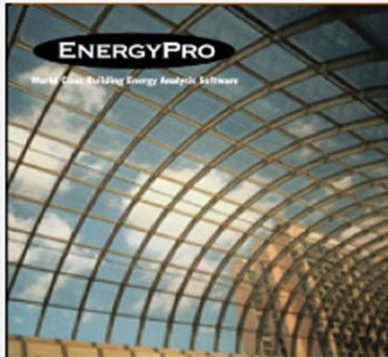
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Energy Commission Approved Software

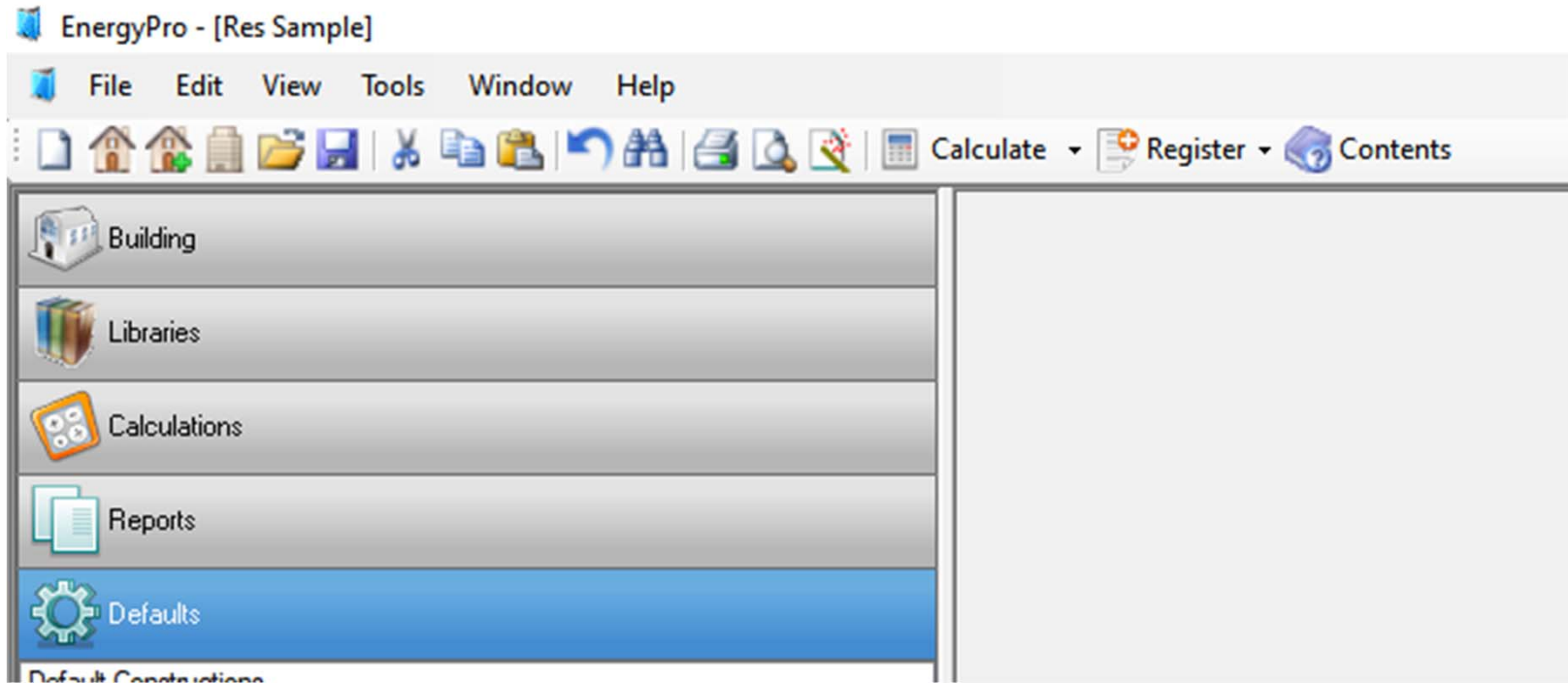
✦ As of January 2020

Residential Buildings, 2019 Standards			
Program Name	Approved versions usable for permit	Contact Information	Additional Information
CBECC-Res	<p>CBECC-Res 2019.1.0 was approved 5/15/2019.</p> <p>CBECC-Res 2019.1.1 corrects communications with the HERS registries and was approved 11/25/2019 for demonstrating performance compliance with the residential provisions of the 2019 California Building Energy Efficiency Standards (effective date 1/1/20).</p> <p>Permit applications made on or after January 1, 2020 must use CBECC-Res 2019.1. Download CBECC-Res 2019.1.1 setup (.exe file).</p> <p>Please review the resolutions for details of the public domain Compliance Software and associated Compliance Manager (CM).</p> <p>All CBECC-Res 2019 resolutions can be found here</p>	<p>California Energy Commission Building Standards Office 1516 9th Street, MS 37 Sacramento, CA 95814 ATTN: Dee Anne Ross 916-654-6560 deeanne.ross@energy.ca.gov</p>	<p>Quick Start Guide</p> <p>What's New and Different</p> <p>FAQs</p> <p>User Manual</p> <p>See the CBECC-Res Website for:</p> <ul style="list-style-type: none"> » Software Archive » ACM Tests » Reference Documents <p>Support: cbecc.res@energy.ca.gov</p>
EnergyPro	<p>EnergyPro Version 8.0 was approved on 9/11/2019. Permit applications made on or after January 1, 2020 must use EnergyPro Version 8.0.</p> <p>All EnergyPro (Residential) Resolutions - PDF</p>	<p>EnergySoft, LLC 1025 5th Street, Suite A Novato, CA 94945-2413 415-897-6400</p>	<p>See the EnergyPro Website</p> <p>Support: support@energysoft.com</p>



EnergyPro 8

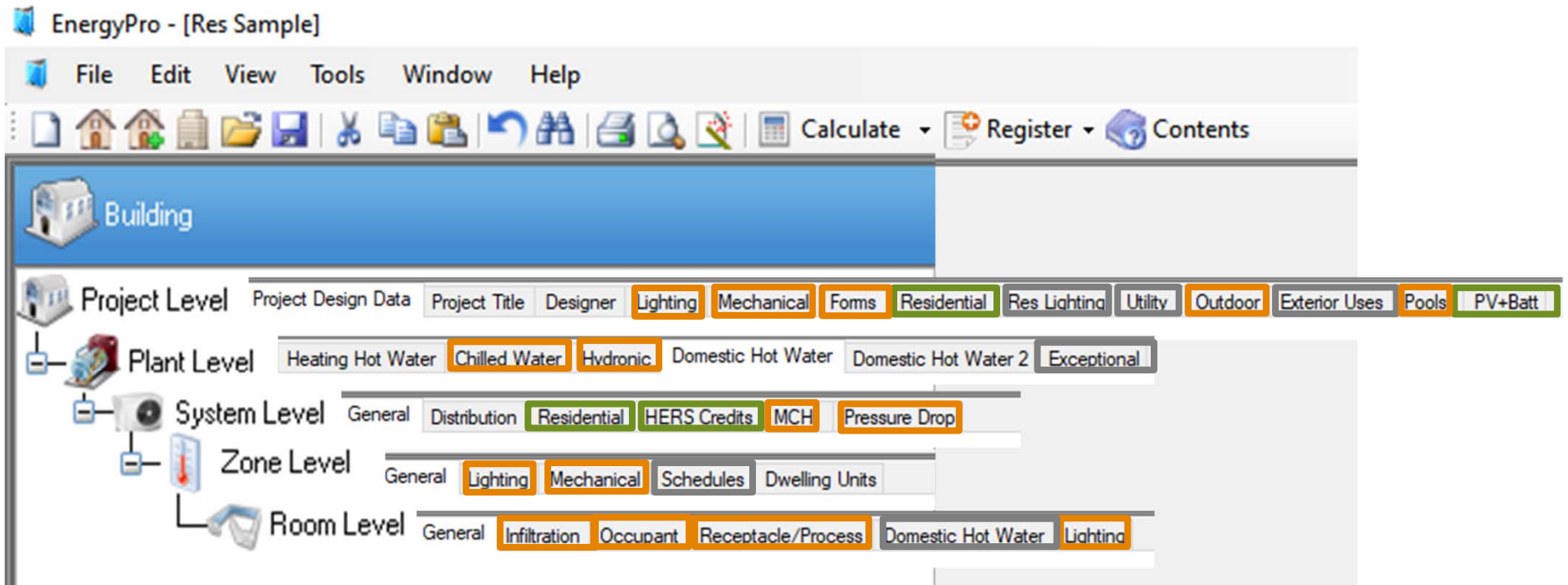
Overview of Structure





EnergyPro 8

Overview of Structure



Residential

Including low-rise multifamily, single family and duplexes

Nonresidential

Including high-rise multifamily and hotel/motel

Non T24 Compliance



Building: Scope of Work

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Project Design Data Project Title Designer Lighting Mechanical Foms Residential Res Lighting Utility Outdoor Exterior Uses Pools PV+Batt

General

Building Name: Residential Example

Building Type: New

ASHRAE Building Type: New

Job No:

Front Orientation: 90

Rotation: 0

Location

Country: UNITED STATES

State: California

City: San Bernardino

Zone: 10

User Defined Edit Select

Fuel Available at Site

Natural Gas

Propane



Building: Residential Occupancy

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plant Level

System Level

Zone Level

Room Level

General **Lighting** Mechanical Schedules Dwelling Units

Zone Details

Name: 1st Floor Zone

Zone Type: **Conditioned**

Occupancy: **Conditioned**

Ventilation Function: **Conditioned**

Accessory Dwelling Unit: **No**

Single Family

Multi-Family

Select Occupancy and Ventilation Function

Occupancy Name

Single Family

Multi-Family

Lighting Status: New

Year Built: 2019

Rotation: 0

Building Story: Select Floor 1

Display Perimeter: 0 feet 0 feet

North, East, South West



Let's Talk



HELPING YOU PLAY YOUR CARDS RIGHT





Challenges



- ✦ Challenge A:
 - ✦ PV + Flexibility



- ✦ Challenge B:
 - ✦ Envelope



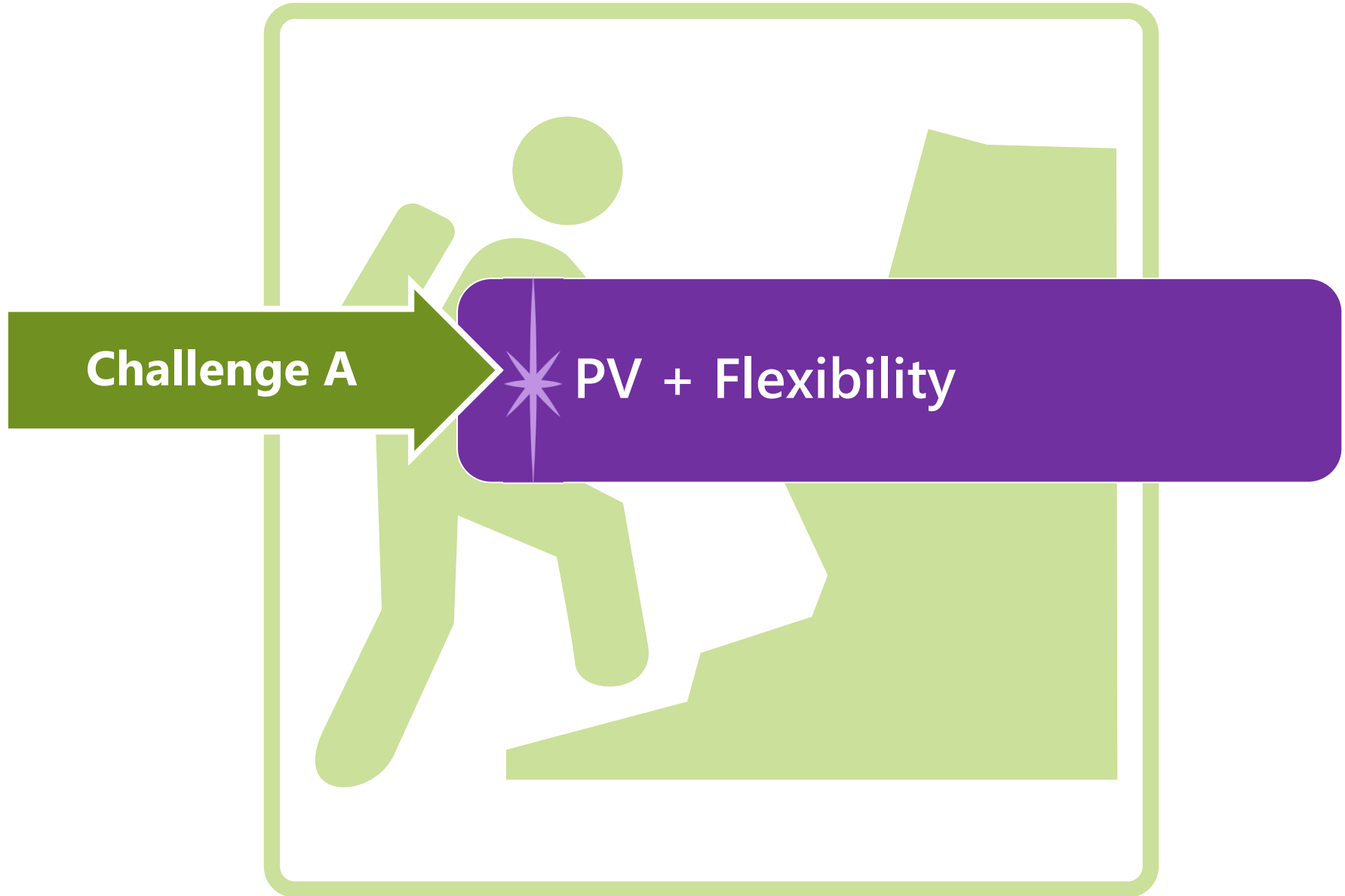
- ✦ Challenge C:
 - ✦ HVAC



- ✦ Challenge D:
 - ✦ Water Heating



Challenge A





Performance: Building Energy Efficiency Ratings



For Low-rise Residential Construction



Energy Code	New Construction	Additions	Alterations
2016	TDV	TDV	TDV
2019	EDR * NEW	TDV	TDV



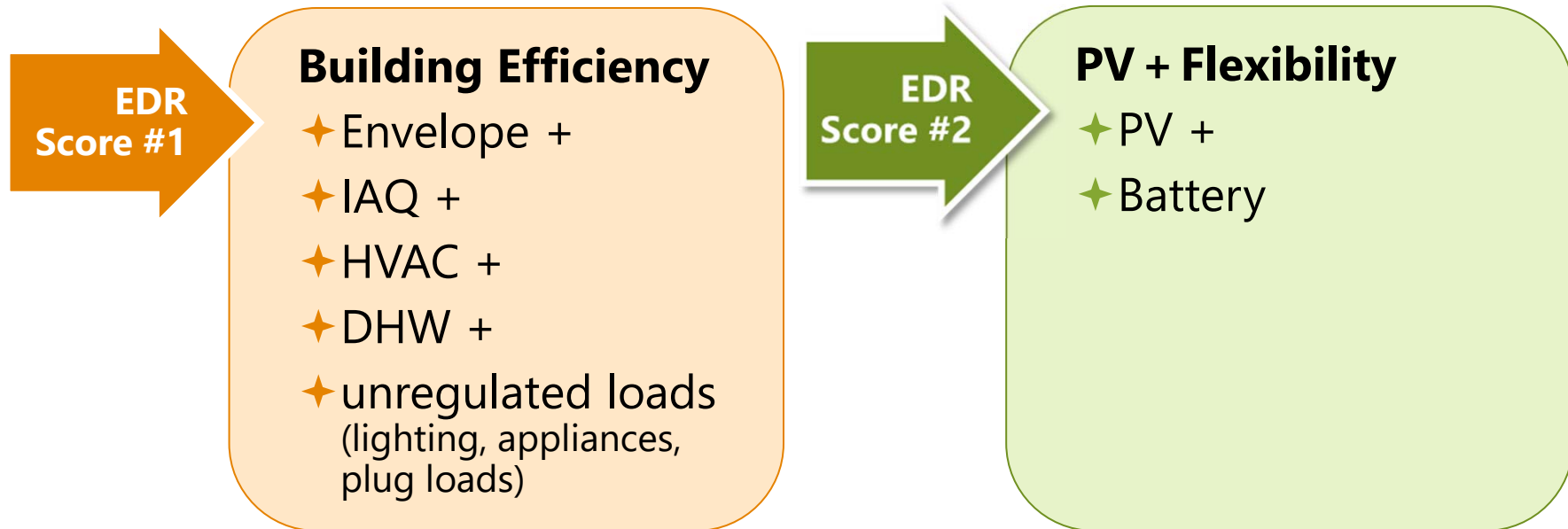
The Proposed Design's overall TDV energy usage (called "**Total EDR**") is found along this range. The **lower** the EDR index score, the better.



EDR as a Compliance Metric



The building's energy use is measured via two EDR scores:



The building complies when 2 conditions are met:

1. Proposed EDR \leq Standard EDR for **Building Efficiency** ✓

AND

2. **Building Efficiency EDR** - **PV + Flexibility EDR** = **Total EDR** ✓

"**Total EDR**" represents the overall TDV energy usage as a score → score that shows overall compliance



2019 PV Exceptions: Low-Rise

§150.1(c)14



If roof faces between E (90) and WNW (300)* and gets >70% sun, Prescriptive exceptions may apply

* If not within this orientation, Performance Approach to be used based on actual orientation.

If CA Flexible Installation (CFI) used in Performance Approach, additional requirements apply.

1: <80 ft² of contiguous area

★ No PV Required

- ★ Use Solar Ready requirements

2: Climate zone 15

- ★ PV sized per Table 150.1-C **OR** what effective annual solar access accommodates
- ★ Must be ≥ 1.5 W DC per ft² CFA

3: Two habitable stories

- ★ PV sized per Table 150.1-C **OR** what effective annual solar access accommodates
- ★ Must be ≥ 1.0 W DC per ft² CFA

4: Three or more habitable stories

- ★ PV sized per Table 150.1-C **OR** what effective annual solar access accommodates
- ★ Must be ≥ 0.8 W DC per ft² CFA

5: Planning approval before 1/1/2020 AND Solar ready zone is 80 to 200 ft²

- ★ PV sized per Table 150.1-C **OR** what effective annual solar access accommodates — whichever is smaller

6: Sized per 150.1-C AND installed in conjunction with ≥ 7.5 kWh battery storage that meets JA12

- ★ PV size may be reduced by 25% prescriptively, performance allowance based on battery configuration (see Res ACM)



EnergyPro

Modeling





PV + Battery

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Project Design Data Project Title Designer Lighting Mechanical Forms Residential Res Lighting Utility Outdoor Exterior Uses Pools **PV+Batt**

PV System

System Sizing: Specify PV Size

Target EDR: Use Standard PV Size
Maximize PV Credit
Size PV for Target EDR Score

Apply exception

Exception to PV Requirement per Section 150.1(c)14:

No Exception

(1) Effective solar access < 80 ft²
 (2) Smaller of solar access and home area-based size (CZ 15 only)
 (3) 2 habitable stories - smaller of solar access and home area-based
 (4) 3 habitable stories - smaller of solar access and home area-based
 (5) 80-200 ft² solar ready zone approved before 1/1/20

Photovoltaic 1 of 3

Battery Storage for PV

Control: Basic (Does not feed to the Grid)

Capacity: Basic (Does not feed to the Grid)
Time of Use
Advanced DR Control

Charging Efficiency: 96.0 %

Discharging Efficiency: 96.0 %

Apply Battery savings to EDR Efficiency Score

Module Type	Output (kW)	Array Type	Electronics	Cal Flex Install	Tilt (deg)	Azimuth	Inverter Eff
Standard	1.0	Fixed (open rack)	- none -	<input type="checkbox"/>	22.0	90	96.0
Standard	1.0	Fixed (open rack)	- none -	<input type="checkbox"/>	22.0	180	96.0
Standard	1.0	Fixed (open rack)	- none -	<input type="checkbox"/>	22.0	270	96.0



Forms

CF1R





CF1R Road Map

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Description: Title 24 Analysis

Calculation Date/Time: 2020-01-02T14:40:01-08:00

Input File Name: Res Sample.ribd19x

CF1R-PRF-01E

(Page 1 of 13)

GENERAL INFORMATION

01	Project Name	Residential Example			
02	Run Title	Title 24 Analysis			
03	Project Location	7188 Pleasant Way			
04	City	San Bernardino	05	Standards Version	2019
06	Zip code	90000	07	Software Version	EnergyPro 8.0
08	Climate Zone	10	09	Front Orientation (deg/ Cardinal)	90
10	Building Type	SingleFamily	11	Number of Dwelling Units	1
12	Project Scope	NewConstruction	13	Number of Bedrooms	3
14	New Cond. Floor Area (ft ²)	0	15	Number of Stories	2
16	Existing Cond. Floor Area (ft ²)	n/a	17	Fenestration Average U-factor	0.28
18	Total Cond. Floor Area (ft ²)	2000	19	Glazing Percentage (%)	19.50%
20	ADU Bedroom Count	0	21	ADU Conditioned Floor Area	800

Scope



Software Approved Version



https://ww2.energy.ca.gov/title24/2019standards/2019_computer_prog_list.html

ADU included



COMPLIANCE RESULTS

01	Building Complies with Computer Performance
02	This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.
03	This building incorporates one or more Special Features shown below

Registration Number:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Registration Date/Time:

Report Version: 2019.1.100
Schema Version: rev 20190401

HERS Provider:

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: EDR/PV

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Description: Title 24 Analysis

Calculation Date/Time: 2020-01-02T14:40:01-08:00

Input File Name: Res Sample.ribd19x

CF1R-PRF-01E

(Page 2 of 13)

EDR Table

ENERGY DESIGN RATING

	Energy Design Ratings		Compliance Margins	
	Efficiency ¹ (EDR)	Total ² (EDR)	Efficiency ¹ (EDR)	Total ² (EDR)
Standard Design	46.6	27.3		
Proposed Design	45.9	10	0.7	17.3
RESULT: ³ COMPLIES				

EDR Margin

- ¹ Efficiency EDR includes improvements to the building envelope and more efficient equipment
² Total EDR includes efficiency and demand response measures such as photovoltaic (PV) systems and batteries
³ Building complies when efficiency and total compliance margins are greater than or equal to zero

- Standard Design PV Capacity: 2.80 kWdc
- Proposed PV kWh output exceeds proposed electricity use by 20% which may violate NEM rules. Contact local utility.
- Proposed PV system increased to 5.36 kWdc (a factor of 5.362) to achieve target energy design rating

ENERGY USE SUMMARY

Energy Use (kTDV/ft ² -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	12.13	5.58	6.55	54
Space Cooling	27.3	23.51	3.79	13.9
IAQ Ventilation	1.87	1.87	0	0
Water Heating	26.37	34.84	-8.47	-32.1
Self Utilization Credit	n/a	0	0	n/a
Compliance Energy Total	67.67	65.8	1.87	2.8

PV

REQUIRED PV SYSTEMS

01	02	03	04	05	06	07	08	09	10	11
DC System Size (kWdc)	Exception	Module Type	Array Type	Power Electronics	CFI	Azimuth (deg)	Tilt Input	Array Angle (deg)	Tilt: (x in 12)	Inverter Eff. (%)
5.36	NA	Standard	Fixed (roof mount)	none	true	n/a	n/a	n/a	n/a	96

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
 Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: Battery

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Date/Time: 2020-01-02T14:40:01-08:00

CF1R-PRF-01E

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.ribd19x

(Page 3 of 13)

Battery

ENERGY DESIGN RATING BATTERY INPUTS

01	02	03	04	05	06
Control	Capacity (kWh)	Efficiency	Rate (kW)Rate (kW)	Efficiency	Rate (kW)Rate (kW)
Basic	5	0.95	n/a	0.95	n/a

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- PV System: 5.36 kWdc
- Battery System: 5 kWh (Self Utilization Credit taken)
- Whole house fan
- Indoor air quality, balanced fan
- Insulation below roof deck
- Northwest Energy Efficiency Alliance (NEEA) rated heat pump water heater; specific brand/model, or equivalent, must be installed

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

Building-level Verifications:

- Quality insulation installation (QII)
- Building air leakage/reduced infiltration
- Indoor air quality ventilation
- Kitchen range hood

Cooling System Verifications:

- Minimum Airflow
- Verified EER
- Verified SEER
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM

Heating System Verifications:

- Verified HSPF
- Verified heat pump rated heating capacity

HVAC Distribution System Verifications:

- Duct leakage testing

Domestic Hot Water System Verifications:

- Pipe Insulation, All Lines
- Drain water heat recovery system

Registration Number:

Registration Date/Time:

HERS Provider:

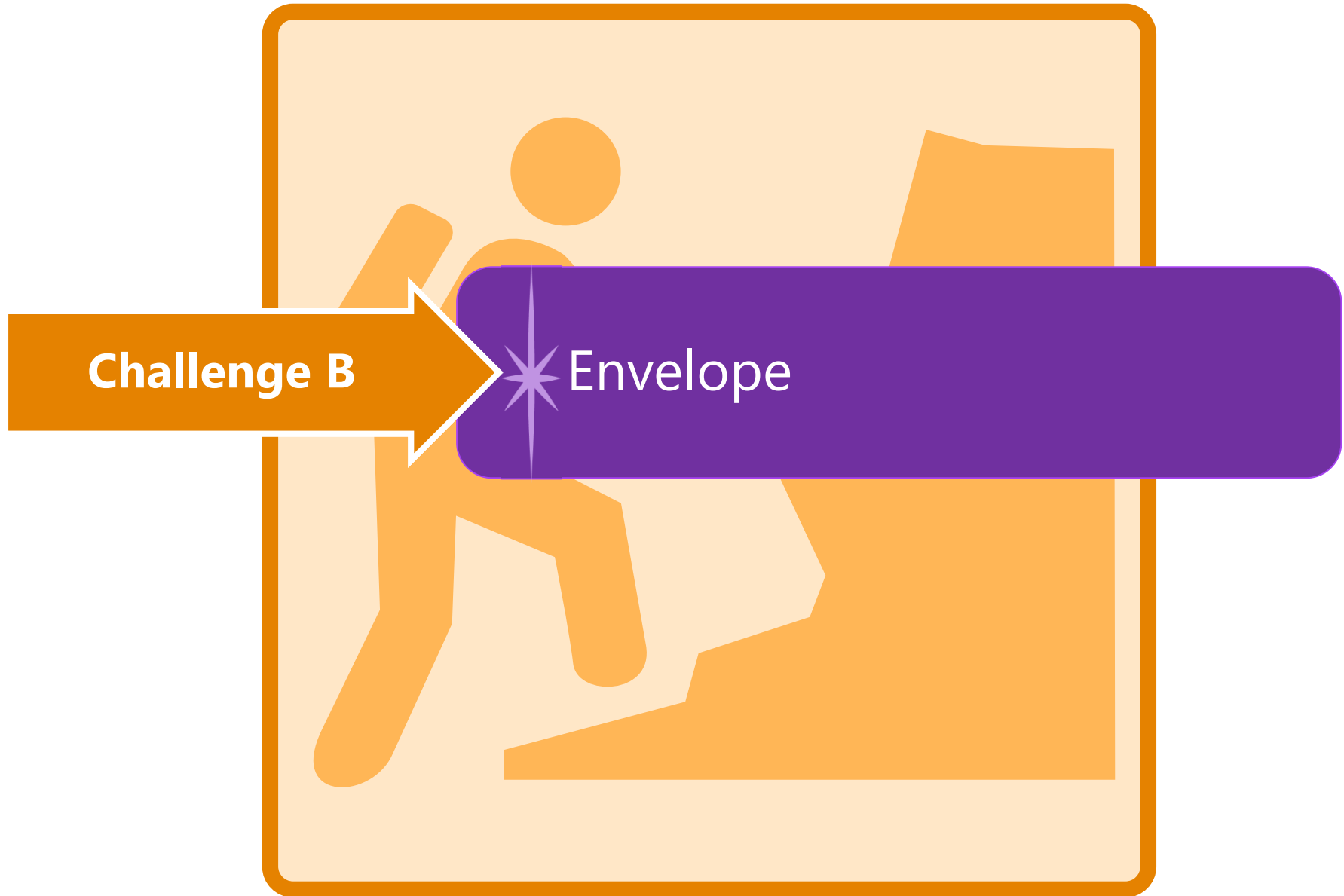
CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



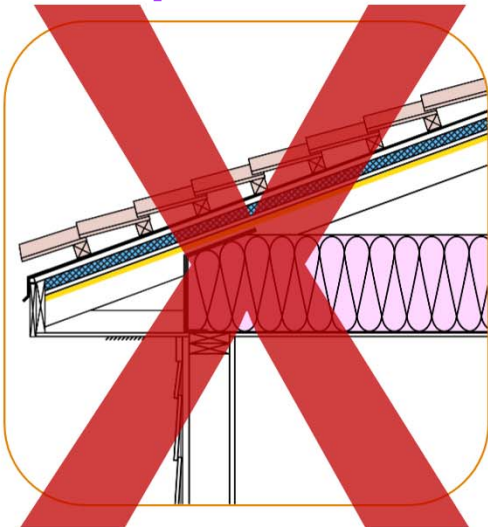
Challenge B





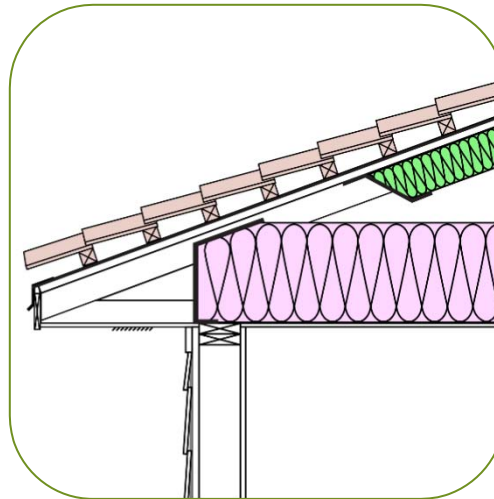
2019 Energy Code Allows 2 Prescriptive Options

Option A



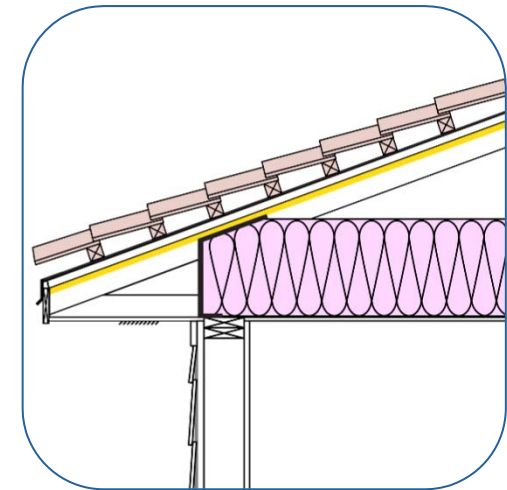
continuous insulation **at** or **above**
roof deck
AND
ceiling insulation between
attic and conditioned space

Option B



insulation **below** roof deck
(**between** framing) with roofing
installed **with air-space** (i.e. tile)
AND
ceiling insulation between
attic and conditioned space

Option C



Ducts and air handler
in conditioned space;
ONLY NEEDS
ceiling insulation between
attic and conditioned space

HPA Applies to Climate Zones 4, 8-16



Framed Wall

§150.0(c)



§150.1(c)1B



Mandatory Minimum

2 x 4 = U-factor of 0.102 (R-13)

2 x 6 = U-factor of 0.071 (R-20) *(was R-19)*

Prescriptive: CZ 6-7

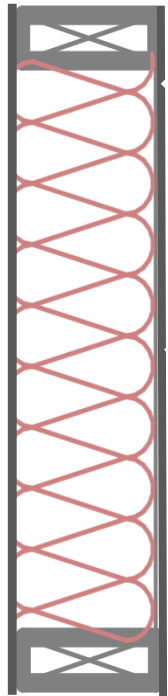
U-factor: 0.065 (2 x 4 with R-15 + R-4)

Prescriptive: All Other CZ's

Single Family: U-factor: 0.048 *(was 0.051)*

- 2 x 6 with R-21 *(was R-19)* + R-5 (1") or
- 2 x 6 with R-19 + R-7 (1-1/2") *(was 1")* or
- 2 x 4 with R-15 *(was R-13)* + R-10 (2") or
- Whatever can meet the 0.048 U-factor

Multifamily: U-factor: 0.051 *(no change)*



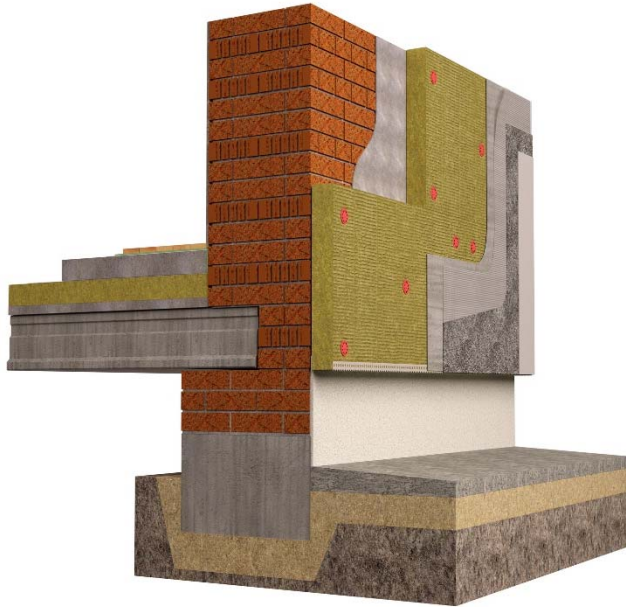


Above Grade Mass Walls

§150.0(c)5



(was prescriptive)



- ★ Per Prescriptive requirements of Table 150.1-A or B, which offers two options for compliance:
 - ✧ Interior insulation:
 - CZ 1-15 U-factor = 0.077
 - R-13 Continuous insulation with no framing *(was U = 0.070)*
 - CZ 16 U = 0.059 (R-17)
 - ✧ Exterior insulation:
 - CZ1-15 U-factor = 0.125
 - R-8 Continuous insulation with no framing
 - CZ 16 U = 0.077 (R-13) *(was U = 0.070)*
- ★ Mass wall defined as a density >45 lbs/cu ft



Fenestration & Doors

§150.1(c)3A



- ✦ Maximum U-Factor = 0.30 (*was 0.32*)
- ✦ Maximum SHGC = 0.23 (*was 0.25*)
- ✧ No requirement in Zones 1,3,5 &16 (*CZ 16 is a new exception*)
 - Zone 16 is now treated like the other heating climate zones, not like the cooling climate zones (encourages passive design)



Opaque Doors

§150.1(c)5



- ✦ Subject to a maximum NFRC rated U-Factor requirement of 0.20 (*new*)
 - ✧ Basically an R-5 insulated door.
- ✦ Same in all Climate Zones
- ✦ Includes doors to outside and to unconditioned spaces
 - ✧ Does not apply to doors from house to garage.
- ✦ Doors with 25% or more glass now treated as fenestration (windows). (*was 50%*)



HERS

Envelope





HERS Measures



HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
Envelope			
Quality insulation installation (QII)*		X	
Building envelope sealing			X
HERS verified pre-existing conditions			X
Spray Polyurethane Foam (SPF) QII: When R-values better than default (default=open cell @ 3.6 per inch / closed cell @ 5.8 per inch)			X

***QII:** Projects that do not perform QII will see a **compliance penalty** in Performance results.



EnergyPro

Modeling





Libraries: Opaque Envelope

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly

Central

Boiler

General JA4 **Res T24 Performance** Layers

Component Description

Name: R-15 Wall w/R-4

Type: Wall

Roof

Radiant Barrier in Attic

CRRC-1 Certified Roofing

Roofing Type: Lightweight (< 5 #/ft²)

Aged Solar Reflectance: 0.3 Thermal Emittance: 0.75

Door has Automatic Closer



Libraries: Opaque Envelope

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly

Central

Boiler

General JA4 Res T24 Performance Layers

Description

Construction Wood Framed

Description: 2x4 @ 16 in. O.C.

Insulation: R 15 JA-4 4.3.1-C4

Continuous Insulation: 4.0

This tab is used to edit the attributes of the assembly used for Prescriptive calculations in the software.

Added Interior Insulation

Framing: None

Insulation: 0 R-value

Thickness: 0 inches

Added Exterior Insulation

Framing: None

Insulation: 0 R-value

Thickness: 0 inches

JA4 Properties

Heat Capacity: 0.0 Btu/ft²°F

U-Factor: 0.065 Btu/hr-ft²°F

R-Value: 15.4 R-value



Libraries: Opaque Envelope

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly

Central

Boiler

General JA4 Res T24 Performance Layers

Attic

Unventilated

Truss Heel Height: 3.5 inches

Insulation covers framing at underside of roof deck

This tab is used to edit the attributes of the assembly used for Residential Title 24 Performance calculations in the software.

Insulation

Location	Insulation	Framing	Thickness
Cavity:	R 15	2x4 @ 16 in. O.C.	
Exterior:	4 R-value	None	0 inches
Interior:	0 R-value	None	0 inches

Other

Exterior Wall Finish: Stucco

Non standard spray foam insulation requiring QII Inspection



Building: Opaque Envelope

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level ← Only if "Addition" at Project Level

Plant Level

System Level

Zone Level

Room Level ↑

Name: Front Wall

Area: 320 ft²

Surface Type: New

New Assembly: R-21 Wall w/R-2

Orientation: 0

Tilt: 90

Wall Exception: None

Code Comparison

	U-Factor
T-24 Standard:	0.069
90.1 Baseline:	0.082
JA4:	0.059
Layers:	0.058

Assembly must use $\geq R-15$ → Wall Exception only valid for Wood Frame Walls on Additions R-15 and above



Libraries: Fenestration

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

- Assembly
- Fenestration
- Central
- Zonal
- Boiler
- Schedule

Name: Andersen Pemashield

Product Type: Manufactured

Visible Transmittance: 0.5

U-Factor

	U-Factor	SHGC
<input type="radio"/> Default	0.710 Btu/hr-ft ² °F	0.73
<input type="radio"/> Center of Glass	0.65 Btu/hr-ft ² °F	0
<input checked="" type="radio"/> NFRC Labeled	0.28 Btu/hr-ft ² °F	0.22

Fenestration Properties

Fenestration Type: Window Number of Panes: 2

Frame Type: Metal Tinted Operable

Door has Automatic Closer Pane Dividers



Building: Fenestration

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plant Level

System Level



Zone Level



Room Level



Name:

Area:

Surface Type:

New Fenestration:  

Overhang:  

Sidfin:  

Surface Geometry for Shading Devices


Window Width: feet

Window Height: feet

X Pos On Wall: feet

Y Pos On Wall: feet

X & Y Position inputs only required for the NR T24 Performance calculations when Overhangs or Sidfins have been specified on a Wall



Code Comparison

	U-Factor	SHGC
T-24 Standard:	0.300	0.23
90.1 Baseline:	0.500	0.30
Proposed:	0.280	0.20



Libraries: Opaque Doors

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly

Central

Boiler

General JA4 Res T24 Performance Layers

Component Description

Name: NFRC Wood Door

Type: Door

Roof

Radiant Barrier in Attic

CRRC-1 Certified Roofing

Roofing Type: Lightweight

Aged Solar Reflectance: 0.3

Door has Automatic Closer

General JA4 Res T24 Performance Layers

Description

Construction: Opaque Door

Description: Residential

Insulation: R-5 JA-4 4.5.1-A9

Continuous Insulation: 0.0

Added Interior Insulation

Framing: None

Insulation: 0 R-value

Thickness: 0 inches

Added Exterior Insulation

Framing: None

Insulation: 0 R-value

Thickness: 0 inches

JA4 Properties

Heat Capacity: 0.0 Btu/ft²°F

U-Factor: 0.200 Btu/hr-ft²°F

R-Value: 5.0 R-value

This tab is used to edit the attributes of the assembly used for Prescriptive calculations in the software.



Libraries: Opaque Doors

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly Fenestration Overhang Siding

Central Zonal Chiller Tower

Boiler Schedule Luminaire

Import

- Wall
- Roof
- Floor
- Slab-On-Grade
- Door

JA4 Library

Table	Const Type	Description	Insulation	U-Factor	Index
4.5.1	Opaque Door	Metal, Single-layer	- no insulation -	1.450	A1
		Metal, Double-layer	- no insulation -	0.700	A2
		Metal, Fire rated	Insul	0.500	A3
		Wood, 1-3/4 in.	- no insulation -	0.500	A4
		Wood, Other	- no insulation -	0.600	A5
		Metal, Roll up	- no insulation -	1.450	A6
		Metal, Sectional	Insul	0.179	A7
		Garage Door	- no insulation -	1.000	A8
		Residential	R-5	0.200	A9

OK

Cancel



Building: HERS Envelope

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Project Design Data Project Title Designer Lighting Mechanical Forms **Residential** Res Lighting Utility Outdoor Exterior Uses Pools PV+Batt

HERS Measures

- Quality Insulation Installation
- Envelope Leakage Testing

Leakage Type: New

Existing Leakage: 5.0 ACH50

New Leakage: 5.0 ACH50

HERS Verified Existing Conditions being Altered

- Wall/Door Construction
- Fenestration
- Roof Construction
- HVAC
- Attic Construction
- Domestic Hot Water
- Floor Construction
- Building Leakage

Multi-Family

- Central Laundry Facility Location: [Dropdown]

Crawlspace

Height: 2 feet

Ext. Perimeter: 160 feet

Ventilation Cooling

None

Other

- Input Non-Default IAQ fans at Zone Dwelling Tab

Maximum Vertical Distance (ft): 0

- Pre-Cool Building during Off-Peak (increases kWh use)



Forms

CF1R





CF1R Road Map: Envelope/Fenestration

CERTIFICATE OF COMPLIANCE

CF1R-PRF-01E

Project Name: Residential Example

Calculation Date/Time: 2020-01-02T14:40:01-08:00

(Page 5 of 13)

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.ribd19x

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft ²)	Window and Door Area (ft ²)	Tilt (deg)
Interior Floor	2nd Floor Zone	R-0 Floor No Crawlspace	n/a	n/a	700	n/a	n/a
Floor over Garage	2nd Floor Zone	R-19 Floor No Crawlspace	n/a	n/a	100	n/a	n/a
GarageWallFront	__Garage__	Garage Ext Wall	0	Right	180	128	90
GarageWallLeft	__Garage__	Garage Ext Wall	90	Front	198	0	90
GarageWallRight	__Garage__	Garage Ext Wall	270	Back	108	0	90

ATTIC

01	02	03	04	05	06	07	08
Name	Construction	Type	Roof Rise (x in 12)	Roof Reflectance	Roof Emittance	Radiant Barrier	Cool Roof
Attic __Garage__	Attic Garage Roof Cons	Ventilated	4	0.1	0.85	No	No
Attic 1st Floor Zone	Attic Roof1st Floor Zone	Ventilated	4	0.1	0.85	No	No
Attic 2nd Floor Zone	Attic Roof2nd Floor Zone	Ventilated	4	0.1	0.85	No	No

Fenestration
U-factor and SHGC



FENESTRATION / GLAZING

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Type	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft ²)	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Front Windows	Window	Front Wall	Right	0			1	60	0.28	NFRC	0.22	NFRC	Bug Screen
Left Windows	Window	Left Wall	Front	90			1	40	0.28	NFRC	0.22	NFRC	Bug Screen
Back Windows	Window	Back Wall	Left	180			1	72	0.28	NFRC	0.22	NFRC	Bug Screen
Right Windows	Window	Right Wall	Back	270			1	32	0.28	NFRC	0.22	NFRC	Bug Screen
Front Windows 2	Window	Front Wall 2	Right	0			1	60	0.28	NFRC	0.22	NFRC	Bug Screen
Left Windows 2	Window	Left Wall 2	Front	90			1	24	0.28	NFRC	0.22	NFRC	Bug Screen
Back Windows 2	Window	BackWall	Left	180			1	70	0.28	NFRC	0.22	NFRC	Bug Screen

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: Envelope/Solid Doors

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Date/Time: 2020-01-02T14:40:01-08:00

CF1R-PRF-01E

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.ribd19x

(Page 6 of 13)

FENESTRATION / GLAZING													
01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Type	Surface	Orientation	Azimuth	Width (ft)	Height (ft)	Mult.	Area (ft ²)	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
Right Windows 2	Window	Right Wall 2	Back	270			1	32	0.28	NFRC	0.22	NFRC	Bug Screen

Solid Doors
U-factor
 NFRC = 0.20
 Default ≥ 0.50

OPAQUE DOORS			
01	02	03	04
Name	Side of Building	Area (ft ²)	U-factor
Entry Door	Front Wall	21	0.2
Back Door	Back Wall	16.7	0.2
Door	Wall to Garage	20	0.2
GarageCarDoorFront	GarageWallFront	128	0.7

SLAB FLOORS						
01	02	03	04	05	06	07
Name	Zone	Area (ft ²)	Perimeter (ft)	Edge Insul. R-value and Depth	Carpeted Fraction	Heated
Covered Slab	1st Floor Zone	1200	90	None	80%	No
GarageSlab	__Garage__	440	54	None	0%	No

OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
Garage Ext Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	R-0	None / None	0.361	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: 3 Coat Stucco

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
 Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: Envelope/Assemblies

Opaque Surfaces
 Cavity Insulation
 Continuous Insulation
 U-factor



CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Date/Time: 2020-01-02T14:40:01-08:00

CF1R-PRF-01E

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.ribd19x

(Page 7 of 13)

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
R-21 Wall w/1 XPS	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	None / R-5	0.048	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R-5 Sheathing Exterior Finish: 3 Coat Stucco
R-13 Wall	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	R-13	None / None	0.092	Inside Finish: Gypsum Board Cavity / Frame: R-13 / 2x4 Other Side Finish: Gypsum Board
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-0	None / None	0.644	Roofing: Light Roof (Asphalt Shingle) Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x4
Attic Roof1st Floor Zone	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-18	None / None	0.062	Roofing: Light Roof (Asphalt Shingle) Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: R-13.0 / 2x4 Around Roof Joists: R-5.0 insul.
Attic Roof2nd Floor Zone	Attic Roofs	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-18	None / None	0.062	Roofing: Light Roof (Asphalt Shingle) Roof Deck: Wood Siding/sheathing/decking Cavity / Frame: R-13.0 / 2x4 Around Roof Joists: R-5.0 insul.
R-0 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-0	None / None	0.481	Cavity / Frame: no insul. / 2x4 Inside Finish: Gypsum Board
R-38+18 HP Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O. C.	R-38	None / None	0.025	Over Ceiling Joists: R-28.9 insul. Cavity / Frame: R-9.1 / 2x4 Inside Finish: Gypsum Board

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
 Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: Envelope/HERS

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Date/Time: 2020-01-02T14:40:01-08:00

CF1R-PRF-01E

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.ribd19x

(Page 8 of 13)

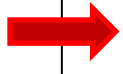
OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
R-0 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x12 @ 16 in. O. C.	R-0	None / None	0.196	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: no insul. / 2x12 Ceiling Below Finish: Gypsum Board
R-19 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x6 @ 16 in. O. C.	R-19	None / None	0.049	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6 Ceiling Below Finish: Gypsum Board

BUILDING ENVELOPE - HERS VERIFICATION

01	02	03	04
Quality Insulation Installation (QII)	Quality Installation of Spray Foam Insulation	Building Envelope Air Leakage	CFM50
Required	Not Required	Required	400.0

QII & Envelope Air Leakage



WATER HEATING SYSTEMS

01	02	03	04	05	06	07
Name	System Type	Distribution Type	Water Heater Name (#)	Solar Fraction (%)	Compact Distribution	HERS Verification
DHW Sys 1	Domestic Hot Water (DHW)	HERS Verified Pipe Insulation credit	DHW Heater 1 (1)	0	None	DHW Sys 1-hers-dhw
DHW Sys 2	Domestic Hot Water (DHW)	Standard Distribution System	DHW Heater 2 (1)	0	None	DHW Sys 2-hers-dhw

Registration Number:

Registration Date/Time:

HERS Provider:

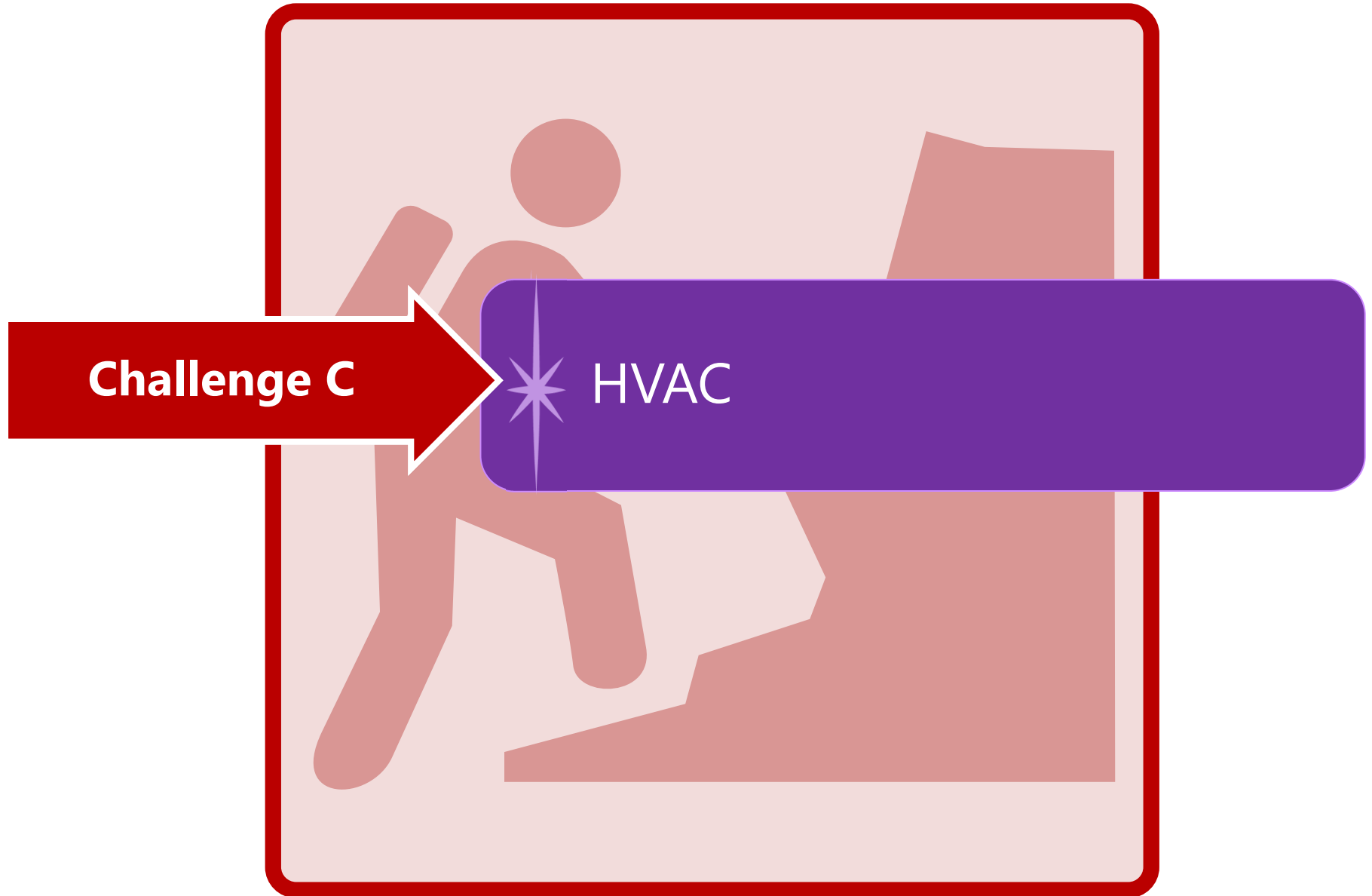
CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



Challenge C

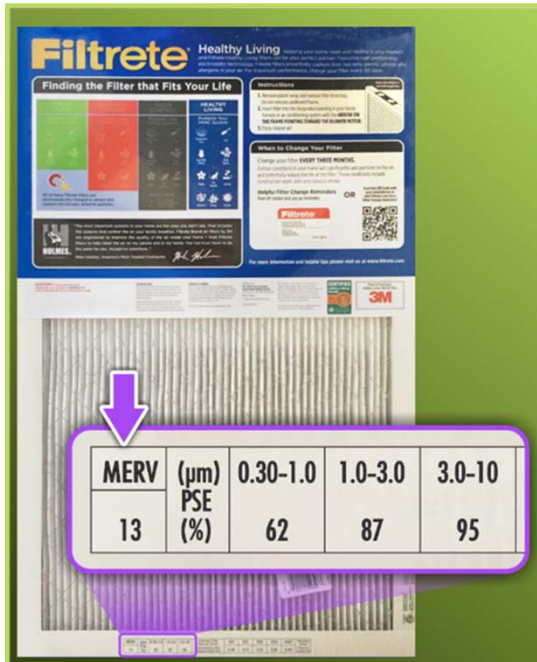




New Construction & Alterations

★ Minimum 2" MERV-13 Filter

- ✧ 1" filter is allowed if sized according to Equation 150.0-A
- ✧ Filter not required if 10 feet or less of ductwork



Alterations

- ✧ When all new ducting
- ✧ When all new ducting and new air handler



Single-family IAQ Fans

§150.0(o)



2019 Energy Code requires use of an updated formula to determine the minimum ventilation rate:

★ **Total Required Ventilation Rate (Equation 150.0-B)**

- ✧ **$Q_{tot} = 0.03 \times A_{floor} + 7.5 \times (N_{br} + 1)$**
 - Q_{tot} = Total required ventilation rate, cfm
 - A_{floor} = Dwelling-unit floor area, ft²
 - N_{br} = Number of bedrooms (not to be less than 1)

So, the 2019 rate is **almost double** that of 2016.

★ **NEW Applies to Additions > 1,000 ft² AND when a new dwelling unit is added to an existing Residential building (i.e. ADU)**



Low-rise Multifamily IAQ *NEW

§150.0(o)1E-F



2019 Energy Code allows these **three methods** for providing IAQ for low-rise multifamily dwellings using individual systems for each unit

Exhaust Only Ventilation (Continuous)

- ✦ Creates infiltration due to negative pressure in home
- ✦ Could potentially pull in deadly carbon monoxide as well as other air contaminants

Not great

Supply Only Ventilation (Continuous)

- ✦ Creates exfiltration due to positive pressure in home
- ✦ In contrast to exhaust only, at least incoming air is filtered

Better

Balanced System Ventilation

- ✦ Creates neither positive nor negative pressure (no infiltration)
- ✦ Separate, balanced fans exhaust indoor air and bring in outdoor air in equal amounts

Best



Low-rise Multifamily IAQ Testing

§150.0(o)1E



Exhaust Only and Supply Only Ventilation methods will require HERS blower door test

HERS verified blower door test requires:

- ✦ No more than 0.3 cubic ft per minute at 50 Pa (0.2" water) per ft² leakage based on dwelling unit's envelope surface area
- ✦ Ventilation rates based on **Equation 150.0-B** (ASHRAE 62.2)
- ✦ HERS field verification & diagnostic testing in accordance with Reference Residential Appendix **RA3.7.4.1**



Range Hoods *NEW

§150.0(o)2B



Range hoods (single family and low-rise multifamily) must be **HERS inspected** in the field to verify **HVI certified** for:

- ✦ Minimum ventilation airflow rate per ASHRAE 62.2 (**100 cfm for typical kitchen layouts**)
- ✦ Maximum sound ratings per ASHRAE 62.2 (**3.0 sones**)

Other airflow options are provided in ASHRAE 62.2 for continuous ventilation



Fan Performance

§150.0(m)13B



✦ Gas Furnace & AC:

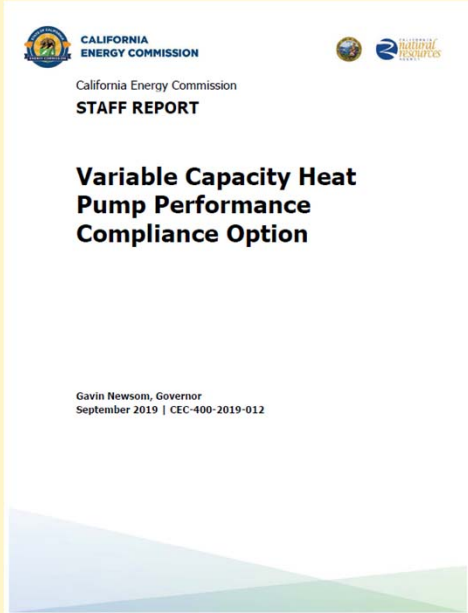
- ✦ Fan wattage must be HERS tested on forced air system with cooling to be no more than 0.45 W/cfm. (*was 0.58 w/cfm*)

This is possible when using furnaces dictated by Federal guidelines that goes into play July 2019 setting max. efficacy limits for residential furnace fans, otherwise known as a Fan Efficacy Rating (FER).

- EXCEPTION: Gas furnaces allowed to meet 0.58 w/cfm if manufactured before July 3, 2019.
- ✦ Other air handlers such as heat pumps and fan coils can still be 0.58 W/cfm



Equipment Type

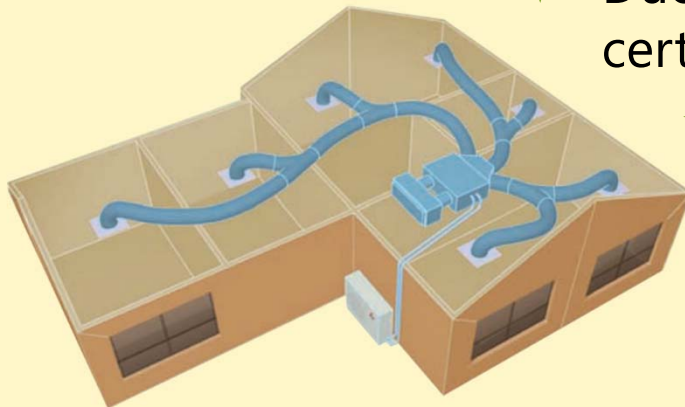


5% cooling / 12% heating energy savings
over minimum efficiency



- ◆ Mini and multi-split VCHP systems with ductless indoor units

- ◆ Ducted mini and multi split VCHP systems CEC certified low-static indoor units



- ◆ 50 W/ton continuous fan energy assumed for ducted VCHP systems unless manufacturer certifies the fan does not operate continuously in the factory default control configuration in which there is an additional compliance credit available.



Installation Requirements



- ✦ **Each habitable room must be directly served** by ducted air handler or ductless head – Transfer fans do not meet this requirement
 - *HABITABLE SPACE is space in a building for living, sleeping, eating or cooking, excluding bathrooms, toilets, hallways, storage areas, closets, utility rooms and similar areas.*
- ✦ All ducts and indoor units (ducted or ductless) must be **located entirely in conditioned space**
 - *Compliance credit for ducts in conditioned space*
- ✦ Wall mount thermostat required in each zone > 150 ft²
- ✦ Verified by HERS rater



HERS

HVAC





HERS Measures



HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
HVAC Ducting			
Duct sealing (maximum leakage)*	X		
Duct design (reduced surface area, high insulation, and duct location)			X
Ducts in conditioned space (<12 ft outside, low leakage)			X



HERS Measures (cont)



HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
Mechanical			
IAQ Ventilation: Whole building indoor air quality (IAQ) fan (continuous or intermittent), kitchen range hood, air filter device	X		
Ventilation Cooling: Whole house fan, central fan ventilation cooling system (CFVCS)			X
Refrigerant charge or charge indicator display		CZ 2, 8-15	CZ 1, 3-7, 16
Low leakage air handlers			X
Cooling air flow and air handler fan watt draw OR Verified return duct design	X		
High Efficiency Equipment: SEER, EER, HSPF			X
Rated Heat Pump Capacity			X
Zonal control			X
Evaporatively cooled condensers			X
VCHP installation verification			X



EnergyPro

Modeling





Libraries: HVAC

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

- Assembly
- Fenestration
- Overhang
- Sidefin
- Central
- Zonal
- Chiller
- Tower
- Boiler
- Schedule
- Luminaire

Computer Room

Heating Cooling Controls Outdoor Air Fans Evaporative Cooling Curves

Name: Pre 1983 Fau/AC

System Type: Split DX

Heating Coil: Split DX

Heating Type: Packaged DX

Furnace Type: Packaged VAV

Coil Control: Packaged MZ

Total Output: Built-Up Single Zone

Output @ 17F: Built-Up VAV

Electrical Power: Built-Up MZ

Supply Temp: 105 °F

Efficiency: 0.78 AFUE

Preheat Coils

- None
- Electric Setpoint: 0 °F
- Hot Water

Reheat Coils

- None
- Electric Delta T: 0 °F
- Hot Water

Baseboard Heat

- None
- Electric
- Hot Water





Libraries: HVAC

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building Libraries

Assembly
Central
Boiler

Heating Cooling Controls Outdoor Air Fans Evaporative Cooling Curves

Cooling Coil

Coil Control: Constant Temp

Output: 12000 Btu/hr

Sensible: 9500 Btu/hr

Supply Temp: 55 °F

Reset High: 64.4 °F

Reset Low: 55 °F

Efficiency: 14 SEER

Fan Heat Included in Output

Performance at ARI Conditions

Energy Efficiency Ratio 12.2 EER
12.9 IEER

Comp/Cond Power 0 kW

Number of Comp. Stages: 1

Condenser

Condenser Type: Air Cooled

Evap PC Eff: 0.8

Evap Pump Motor Design Power: 0 hp

Heating Cooling Controls Outdoor Air Fans Evaporative Cooling Curves

Fan Operation: Intermittent

Cycle System on at Night to Meet Loads

Maximum Humidity: 30 %



Building: Kitchen Hood

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plat Level

System

Zor

Project Design Data Project Title Designer Lighting Mechanical Forms **Residential** Res Lighting Utility Outdoor Exterior Uses Pools PV+Batt

HERS Measures

- Quality Insulation Installation
- Envelope Leakage Testing

Leakage Type: New

Existing Leakage: 5.0 ACH50

New Leakage: 5.0 ACH50

Project includes New or Replaced Kitchen Hoods

HERS Verified Existing Conditions being Altered

- Wall/Door Construction
- Fenestration
- Roof Construction
- HVAC
- Attic Construction
- Domestic Hot Water
- Floor Construction
- Building Leakage

Multi-Family

Central Laundry Facility Location: [Dropdown]

Crawlspace

Height: 2 feet

Ext. Perimeter: 160 feet

Ventilation Cooling

None

Other

- Input Non-Default IAQ fans at Zone Dwelling Tab

Maximum Vertical Distance (ft): 0

Pre-Cool Building during Off-Peak (increases kWh use)



Building: System

EnergyPro - [Res Sample]


File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plant Level

System Level 

Zone Level

Room Level

General Distribution Residential HERS Credits MCH Pressure Drop

System Details

Name: Res HVAC

System Type: New

New System: CARRIER 58MVP080-2/38TDB04830

Multiplier: 1

Use Supply Air Temperature specified in Central System for Load Calculations.

Serves I-1 or I-2 Occupancies (Healthcare)


ASHRAE 90.1 HVAC System Type Exception

90.1 Exempted Fan Power: 0 inches Heated Only Storage

Space > 5,000 sqft and Ceiling Height > 15' and LPD \geq 0.5 w/sqft (Section 140.3).

Hydronic Space Heating: None

Outside Air From: Outside





Building: System

Only if "Specify Whole House Fan" at Project Level (Residential Tab)

EnergyPro - [Res Sample]

File Edit View Tools Calculate Register Contents

Building

Project Level
Plant Level
System Level ←
Zone Level
Room Level

General Distribution Residential HERS Credits MCH Pressure Drop

Existing Ductwork not being altered with duct extensions added Duct Extension less than 40 feet

Distribution Type: New

Existing

Heating Distribution: Ducted Duct Location: Conditioned

Cooling Distribution: Ducted Duct Leakage: Duct Leakage not Verified

< 12 feet Duct in Unconditioned Duct Insulation: 8 R-value 6 %

Verified Duct 0 of 0

New

Heating Distribution: Ducted Duct Location: Attic

Cooling Distribution: Ducted Duct Leakage: Sealed Ducts with Leakage Verified

< 12 feet Duct in Unconditioned Duct Insulation: 6 R-value 6 %

Verified Duct 1 of 8

Type	Buried	Diameter	R-Value	Length	AtticRValue	AtticInsulType
Supply	<input checked="" type="checkbox"/>	8.000	R-6	45.00	R-38	Fiberglass
Supply	<input checked="" type="checkbox"/>	8.000	R-6	150.00	R-38	Fiberglass
Return	<input type="checkbox"/>	16.000	R-6	0.00	R-38	Fiberglass
Supply	<input checked="" type="checkbox"/>	8.000	R-6	45.00	R-38	Fiberglass



Building: System

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Only if "Specify Whole House Fan" at Project Level (Residential Tab)

Project Level ←

Plant Level

System Level ←

Zone Level

Room Level

General Distribution Residential HERS Credits MCH Pressure Drop

Lowrise Residential

Ventilation Cooling: 1500 cfm Power: 45 watts Vents directly to Outside

Wood Heat

Variable Capacity Heat Pump (< 65,000 Btuh) Certified as having an Automatic Fan

VCHP Ducting: Unducted

General Distribution Residential HERS Credits MCH Pressure Drop

Measures requiring HERS Testing

Verified Refrigerant Charge or Fault Indicator Display

Cooling Coil Airflow: 350 cfm/ton

Cooling Fan Power: 0.58 W/cfm

Bypass Ducts

Zonally Controlled

Multi-Speed Compressor



Building: Zone

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

- Plant Level
 - System Level
 - Zone Level** ←
 - Room Level

General **Lighting** Mechanical Schedules Dwelling Units

Zone Details

Name: 1st Floor Zone

Zone Type: Conditioned Accessory Dwelling Unit: No

Occupancy: Select Single Family

Ventilation Function: NA

90.1 Envelope Type: Grocery store

90.1 Ltg Occupancy: Building Area Office

of Floors: 1

Envelope Status: New

Lighting Status: New

Year Built: 2019

Rotation: 0

Building Story: Select Floor 1

North, East, South West

Display Perimeter: 0 feet 0 feet

Fossil
Fossil
Electric



Building: Zone

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level ← Only if "Input Non-Default IAQ" at Project Level (Residential Tab)

Plant Level

System Level

Zone Level ←

Room Level

General Lighting Mechanical Schedules Dwelling Units

Dwelling Unit Data 1 of 1

Area	Name
0.00	

Total Floor Area: 0 ft²
Zone Floor Area: 1200 ft²

Unit Info

Unit Name:

Floor Area per Unit: ft²

of Units:

Bedrooms per Unit:

Mechanical Ventilation

Fan Type:

Airflow: cfm

Power: watts

Heat Recovery: eff

Appliances

Range Fuel Type:

Refrigerator Specify Usage

Dishwasher Specify Usage kWh/gal

Washer

Dryer Fuel Type:

Option to input mechanical is set at the top level of the Tree, Residential tab.

Enable Compact at the DHW Tab. Enter plan view straight line distance measured from the DHW heater to the furthest use plumbing fixtures in the rooms shown.



Forms

CF1R





CF1R Road Map: HVAC

Heat Pump heating efficiency and capacity (17-degree F)



HERS HVAC equipment Measures



CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Description: Title 24 Analysis

Calculation Date/Time: 2020-01-02T14:40:01-08:00

Input File Name: Res Sample.ribd19x

CF1R-PRF-01E

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HVAC - HEAT PUMPS										
01	02	03	04	05	06	07	08	09	10	11
Name	System Type	Number of Units	Heating			Cooling		Zonally Controlled	Compressor Type	HERS Verification
			HSPF/COP	Cap 47	Cap 17	SEER	EER			
Heat Pump System 1	Central split HP	2	9.5	24000	18000	15	12.2	Not Zonal	Single Speed	Heat Pump System 1-hers-htpump

HVAC HEAT PUMPS - HERS VERIFICATION								
01	02	03	04	05	06	07	08	09
Name	Verified Airflow	Airflow Target	Verified EER	Verified SEER	Verified Refrigerant Charge	Verified HSPF	Verified Heating Cap 47	Verified Heating Cap 17
Heat Pump System 1-hers-htpump	Required	350	Required	Required	Yes	Yes	Yes	Yes

HVAC - DISTRIBUTION SYSTEMS											
01	02	03	04	05	06	07	08	09	10	11	12
Name	Type	Design Type	Duct Ins. R-value		Duct Location		Surface Area		Bypass Duct	Duct Leakage	HERS Verification
			Supply	Return	Supply	Return	Supply	Return			
Air Distribution System 1	Unconditioned attic	Non-Verified	R-6	R-6	Attic	Attic	n/a	n/a	No Bypass Duct	Sealed and Tested	Air Distribution System 1-hers-dist

Registration Number:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Registration Date/Time:

Report Version: 2019.1.100
Schema Version: rev 20190401

HERS Provider:

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: HVAC

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Date/Time: 2020-01-02T14:40:01-08:00

CF1R-PRF-01E

(Page 11 of 13)

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.ribd19x

HERS distribution measures

HVAC DISTRIBUTION - HERS VERIFICATION								
01	02	03	04	05	06	07	08	09
Name	Duct Leakage Verification	Duct leakage target (%)	Verified Duct Location	Verified Duct Design	Buried Ducts	Deeply Buried Ducts	Low-leakage Air Handler	Low Leakage Ducts Entirely in Conditioned Space
Air Distribution System 1-hers-dist	Yes	5	Not Required	Not Required	Not Required	Credit not taken	Not Required	No

HERS fan efficiency
(gas = 0.45 / heat pump = 0.58)

HVAC - FAN SYSTEMS			
01	02	03	04
Name	Type	Fan Power (Watts/CFM)	Name
HVAC Fan 1	HVAC Fan	0.58	HVAC Fan 1-hers-fan

HVAC FAN SYSTEMS - HERS VERIFICATION		
01	02	03
Name	Verified Fan Watt Draw	Required Fan Efficiency (Watts/CFM)
HVAC Fan 1-hers-fan	Required	0.58

IAQ
Balanced with heat recovery

IAQ (INDOOR AIR QUALITY) FANS					
01	02	03	04	05	06
Dwelling Unit	IAQ CFM	IAQ Watts/CFM	IAQ Fan Type	IAQ Recovery Effectiveness (%)	HERS Verification
SFam IAQVentRpt 1-1	40	0.2	Balanced HRV	65	Yes
SFam IAQVentRpt 2-1	40	0.2	Balanced HRV	65	Yes

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



CF1R Road Map: HVAC

HERS verified Whole House Fan



CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Description: Title 24 Analysis

Calculation Date/Time: 2020-01-02T14:40:01-08:00

Input File Name: Res Sample.ribd19x

CF1R-PRF-01E

(Page 12 of 13)

COOLING VENTILATION

01	02	03	04	05	06	07	08	09
Name	Airflow Rate (CFM/ft2)	Cooling Vent CFM	Cooling Vent Watts/CFM	Total Watts	Number of Fans	CFVCS Type	Exhausts to	HERS Verification
Whole House Fan	1.5	3000	0.14	420	1	Not a CFVCS	Attic	No

Registration Number:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Registration Date/Time:

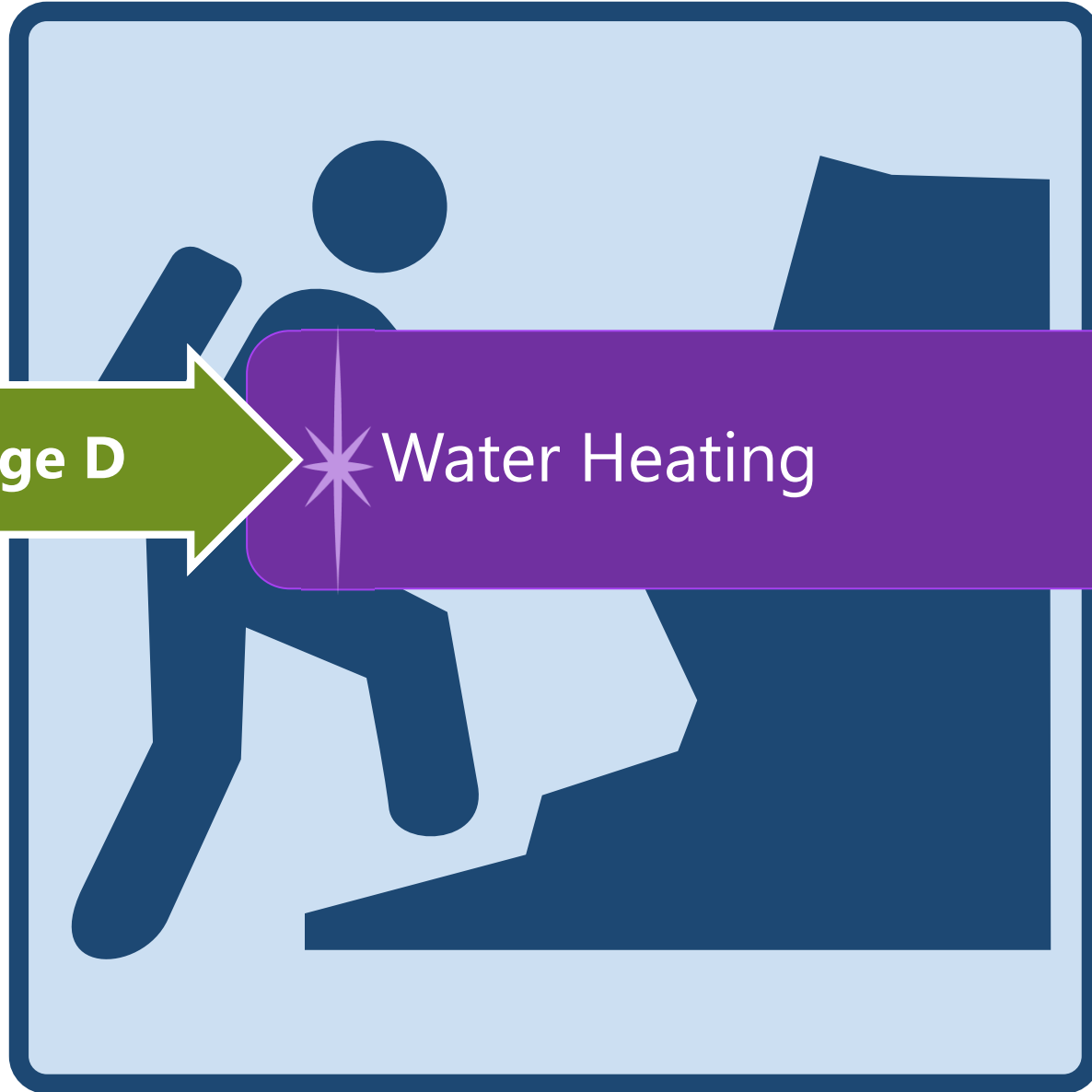
Report Version: 2019.1.100
Schema Version: rev 20190401

HERS Provider:

Report Generated: 2020-01-02 14:42:13



Challenge D



Challenge D

Water Heating



Domestic Hot Water (DHW)

§150.1(c)8A



- ✦ Any number of gas or propane tankless water heaters (*used to be just one*)
- ✦ If one large gas or propane water heater (>55 gallons/≤75,000 BTUH) is desired per dwelling unit, then: (*new*)
 - ✧ Fenestration with weighted U-Factor of 0.24 or less AND:
 - Compact hot water distribution HERS verified OR
 - A drain water heat recovery system HERS verified

OR



Domestic Hot Water (DHW) *New* §150.1(c)8A



- ✦ One heat pump water heater *IN GARAGE or CONDITIONED SPACE AND*
 - ✧ HERS verified Compact hot water distribution and a drain water heat recovery system OR
 - ✧ Add additional PV capacity:
 - CZ 2-15: increase PV size by 0.3 kW
 - CZ 1&16 increase PV size by 1.1 kW OR
- ✦ One Tier III NEEA rated (or higher) heat pump water heater with storage tank in garage or conditioned space:
 - ✧ If located in CZ 1&16: must increase the PV size by 0.3 kW



HERS

Plumbing





HERS Measures



HERS Measure	Mandatory	Prescriptive	Performance (if credit taken)
Plumbing (DHW)			
Pipe insulation			X
Verified design (parallel piping, compact design, point of use, drain water heat recovery and multifamily recirculation loop/controls)			X



EnergyPro

Modeling





Libraries: DHW

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building Libraries Assembly Central Boiler

Name: A. O. Smith HP10-50H45DV (50 gal)

Type: Gas Fired UEF Rated

Volume: Gas Fired Electric Res Heat Pump Indirect Gas

Input Rating: Uniform Energy Factor: 2.9

First Hour Rating: 64 gallons

Flow Rating: 64 gpm

Recovery Efficiency: 0.74

Elec Mini-Tank Standby: 0 watts

NEEA Rated Heat Pump A. O. Smith

Use Import to Select HP10-50H45DV (50 gal)

Import

- Gas Water Heater
- Electric Water Heater
- Boiler
- Heat Pump Water Heater

Select a Heat Pump Water Heater

Filter Criteria: Volume 0 to 9999

Brand	Model	Volume	UEF
A. O. Smith	HP10-80H45DV (80 gal)	80.0	2.90
A. O. Smith	HPTU 50 120 (50 gal)	50.0	2.90
A. O. Smith	HPTU 50N 120 (50 gal)	50.0	2.90
A. O. Smith	HPTU 66 120 (66 gal)	66.0	3.10
A. O. Smith	HPTU 66N 120 (66 gal)	66.0	3.10
A. O. Smith	HPTU 80 120 (80 gal)	80.0	2.90
A. O. Smith	HPTU 80N 120 (80 gal)	80.0	2.90
American	HPHE10250H045DV 120 (...)	50.0	2.90
American	HPHE10250H045DVN 120...	50.0	2.90
American	HPHE10266H045DV 120 (...)	66.0	3.10
American	HPHE10266H045DVN 120...	66.0	3.10
American	HPHE10280H045DV 120 (...)	80.0	2.90
American	HPHE10280H045DVN 120...	80.0	2.90
Bradford White	RE2H50R10B-1NCWT (50...	50.0	2.80
Bradford White	RE2H80R10B-1NCWT (80...	80.0	3.10
Kenmore	153.5925 (50 gal)	50.0	2.90
Kenmore	153.5926 (66 gal)	66.0	3.10
Kenmore	153.5928 (80 gal)	80.0	2.90
Lochinvar	HPA051KD 120 (50 gal)	50.0	2.90
Lochinvar	HPA052KD 120 (50 gal)	50.0	2.90

Select Cancel



Building: Hydronic Heating


EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plant Level 

System Level

Zone Level

Room Level

Heating Hot Water Chilled Water **Hydronic** Domestic Hot Water Domestic Hot Water 2 Exceptional

Name: Res DHW

Hot Water Boiler

Type: New

New Boiler: undefined

Multiplier: 1

Loop Setpoint Temperature: 65 °F Outside Air Temperature Reset

Hot Water Pump

Flow Rate per Pump: 0 gpm


Pump Multiplier: 1 Input as Watts

Design Power: 0 hp 0 watts

Head: 0 feet

Flow Control: One-Speed / 3 Way Valves

Min Flow Ratio: 1.00





Building: Hydronic Heating

The screenshot displays the EnergyPro software interface for configuring a hydronic heating system. The main window is titled "EnergyPro - [Res Sample]" and has a menu bar with "File", "Edit", "View", and "Tools". On the left, a navigation pane shows the hierarchy: "Building" (selected), "Project Level", "Plant Level" (indicated by a red arrow), "System Level", "Zone Level", and "Room Level".

The central pane shows the configuration for a "Hydronic Dedicated WH" system. The "Heating" tab is active, showing the following settings:

- Name: Hydronic Dedicated WH
- System Type: Split DX
- Computer Room Unit: Single Phase:
- Heating Coil: Heating Type: Hot Water, Furnace Type: Central, Coil Control: Constant Temp, Total Output: 45000 Btu/hr
- Preheat Coils: None, Electric, Hot Water (Setpoint: 0 °F)
- Reheat Coils: None, Electric, Hot Water (Delta T: 0 °F)
- Baseboard Heat: None

The bottom pane shows a tree view of a "Residential Example" project. The "Res HVAC" system is selected, and the "1st Floor Zone" is expanded to show components like "1st Floor", "R-38 Roof", "Front Wall", "Entry Door", "Front Windows", "Left Wall", "Back Wall", "Right Wall", "Covered Slab", and "Wall to Garage (Garage)".

The bottom-right pane shows the "System Details" for the "Res HVAC" system. The "New System" is set to "High Efficiency Heat Pump" with a multiplier of 2. The "Hydronic Space Heating" dropdown menu is open, showing options: "None", "DHW Boiler Provides Heat", and "Heating Boiler Provides Heat". The "Outside Air From" is set to "Outside".

Additional tabs at the bottom include "General", "Distribution", "Residential", "HERS Credits", "MCH", and "Pressure Drop". A small image of a white HVAC unit is visible on the right side of the bottom-right pane.



Building: Domestic Hot Water


EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plant Level 

System Level

Zone Level

Room Level

Heating Hot Water Chilled Water **Hydronic** Domestic Hot Water Domestic Hot Water 2 Exceptional

Name: Res DHW

Hot Water Boiler

Type: New

New Boiler: undefined

Multiplier: 1

Loop Setpoint Temperature: 65 °F Outside Air Temperature Reset

Hot Water Pump

Flow Rate per Pump: 0 gpm


Pump Multiplier: 1 Input as Watts

Design Power: 0 hp 0 watts

Head: 0 feet

Flow Control: One-Speed / 3 Way Valves

Min Flow Ratio: 1.00





Building: Domestic Hot Water

EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level
Plant Level
System Level
Zone Level
Room Level

Heating Hot Water Chilled Water Hydronic Domestic Hot Water Domestic Hot Water 2 Exceptional

DHW Boiler
Type: New
New Boiler: Bradford White RE2H50R10B-1NCWT (50 gal)
Multiplier: 1

Residential
Distribution: Standard
Compact Distribution: not compact
Solar Savings Fraction: Basic Credit, Expanded Credit (HERS req'd)

Multi-Family Central System

Pump
Control: No loops or central system pump
Pump Multiplier: Dual Loop Design
Design Power: Demand Control (Standard Design), Temperature modulation, Temperature modulation + monitoring

Piping
Length Outside: 0 feet
Length Underground: 0 feet
Length in Plenum: 0 feet
 Additional 1/2" Insulation

Residential Heat Pump Water Heater
Location: Inside
Room: <None>, 1st Floor: Residential Example/Res DHW/Res HVAC/1st Floor Zone/, 2nd Floor: Residential Example/Res DHW/Res HVAC/2nd Floor Zone/, Garage: Residential Example/Res DHW/Res HVAC/Garage/



Building: Domestic Hot Water


EnergyPro - [Res Sample]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Level

Plant Level 

System Level

Zone Level

Room Level

Heating Hot Water Chilled Water Hydronic Domestic Hot Water Domestic Hot Water 2 Exceptional

DHW Boiler

Type: New

New Boiler: Eemax AM012240T

Multiplier: 1

Multi-Family Central System

Pump

Control: No Control (continuous pumping)

Pump Multiplier: 1

Design Power: 0 hp

Residential

Distribution: Standard

Compact Distribution: Expanded Credit (HERS req'd)

Solar Savings Fraction: 0 %

Piping

Length Outside: 0 feet

Length Underground: 0 feet

Length in Plenum: 0 feet

Additional 1/2" Insulation

Residential Heat Pump Water Heater

Location: Garage Room:

Inputs on this tab will only affect the Title 24 Calculations



Forms

CF1R





CF1R Road Map: Water Heating

CERTIFICATE OF COMPLIANCE

Project Name: Residential Example

Calculation Description: Title 24 Analysis

Calculation Date/Time: 2020-01-02T14:40:01-08:00

Input File Name: Res Sample.ribd19x

CF1R-PRF-01E

(Page 9 of 13)

NEEA Water Heater and tank location

WATER HEATERS											
01	02	03	04	05	06	07	08	09	10	11	12
Name	Heating Element Type	Tank Type	# Units	Tank Vol (gal)	Energy Factor or Efficiency	Input Rating or Pilot	Tank Insulation R-value (Int/Ext)	Standby Loss or Recovery Eff.	1st Hr. Rating or Flow Rate	NEEA Heat Pump Brand or Model/Other	Tank Location or Ambient Condition
DHW Heater 1	Heat Pump Boiler	n/a	1	50	-NEEA	n/a	n/a	82	80\	BradfordWhite\BradfordWhiteRE2H50	Garage
DHW Heater 2	Electricity	Consumer Instantaneous	1	1	0.99-UEF	n/a	0	99	n/a	n/a	n/a

HERS Drain Water Heat Recovery details

WATER HEATING - DRAIN WATER HEAT RECOVERY			
01	02	03	04
Dwelling Unit type	DHW System and DWHR Names	Installation Configuration	Shower Drains
Dwelling	DHW Sys 1 - 1 - DWHR-1	Equal Flow	2
Dwelling	DHW Sys 2 - 1 - DWHR-2	Equal Flow	2

HERS Water Heating Measures

WATER HEATING - HERS VERIFICATION							
01	02	03	04	05	06	07	08
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Compact Distribution Type	Recirculation Control	Central DHW Distribution	Shower Drain Water Heat Recovery
DHW Sys 1 - 1/1	Required	Not Required	Not Required	None	Not Required	Not Required	Required
DHW Sys 2 - 1/1	Not Required	Not Required	Not Required	None	Not Required	Not Required	Required

SPACE CONDITIONING SYSTEMS								
01	02	03	04	05	06	07	08	09
Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name	Required Thermostat Type	Heating Equipment Count	Cooling Equipment Count
Res HVAC1	Heat pump heating cooling	Heat Pump System 1	Heat Pump System 1	HVAC Fan 1	Air Distribution System 1	SetbackSetback	2	2

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance

Report Version: 2019.1.100
Schema Version: rev 20190401

Report Generated: 2020-01-02 14:42:13



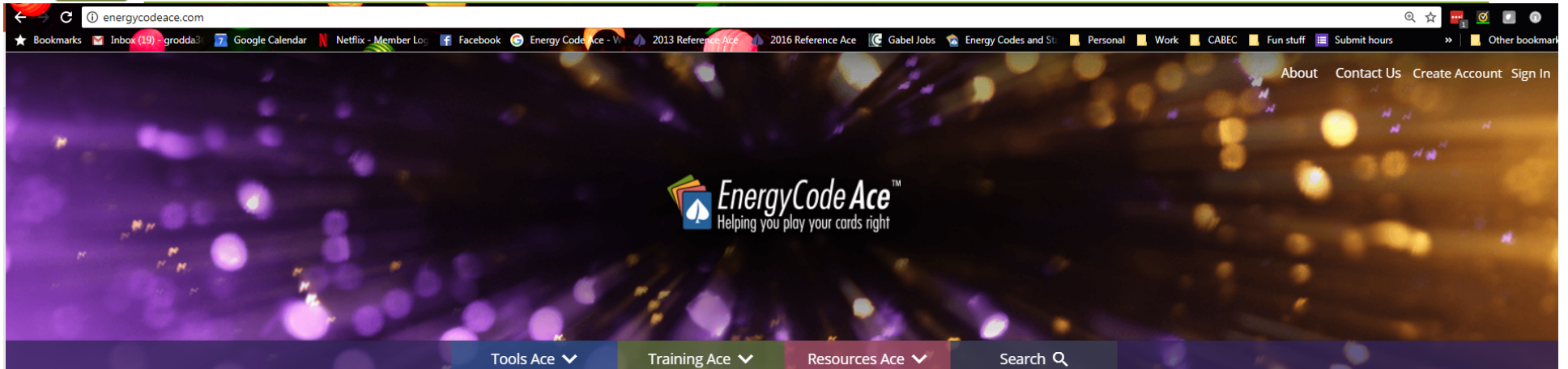
Next Steps



HELPING YOU PLAY YOUR CARDS RIGHT



Other ECA Resources



* Training Ace

Energy Code Ace free training courses target a wide range of "hot topic" measures and audience groups, and are provided in a variety of formats. Use the filters on this page to find the perfect class to help you "decode" the California building and appliance energy efficiency standards.

Can't find what you are looking for?

[Click here to see the complete list of courses and delivery options we offer.](#)

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📌 Title 24, Part 6 2019 Standards

Introduction to CBECC-Res Energy Modeling Software for Residential Buildings

This full-day training covers the basics of CBECC-Res energy modeling...

2019 Title 24, Part 6 Essentials — Nonresidential: Introduction to Modeling

This is a three-hour online, self-paced training experience that...

2019 Title 24, Part 6 Essentials - EnergyPro Software for Residential Compliance - Intermediate/Advanced

This training is intended for those with experience using EnergyPro software for Title 24 Compliance. The instructor, Martyn Dodd, will solicit questions from class participants, group these questions into categories, and answer as many questions as possible in the allotted class time. The training assumes experience with and knowledge of Title 24 and the residential compliance process.

[Show Available Training](#)

2019 Title 24, Part 6 Essentials — Nonresidential: Modeling

This highly interactive online live course addresses general principles...

2019 Title 24, Part 6 Essentials — Residential: Introduction to Modeling

This is a three-hour online, self-paced training experience that...

2019 Title 24, Part 6 Essentials - EnergyPro Software for Residential Compliance - Introduction

This half-day training covers the basics of EnergyPro software when used to document compliance with California Title 24 Energy Standards for residential buildings. It is intended for those with little or no experience with EnergyPro software and will cover basic inputs required to create a model for compliance documentation. The training assumes basic knowledge with Title 24 and the residential compliance process. The training includes hands-on experience in developing a Title 24 compliance model. Participants should understand basic inputs for modeling common residential building envelope details, electric lighting, and HVAC systems.

[Show Available Training](#)

2019 Title 24, Part 6 Essentials — Residential: Modeling

This highly interactive course addresses general principles and hands...

2019 Title 24, Part 6 Essentials — Residential: Modeling Tips

Through demonstration, hands-on practice with sample files and team...

2019 Title 24, Part 6 Essentials - EnergyPro Software for Nonresidential Compliance - Introduction

This half-day training covers the basics of EnergyPro software when used to document compliance with California Title 24 Energy Standards for nonresidential buildings. It is intended for those with little or no experience with EnergyPro software and will cover basic inputs required to create a model for compliance documentation. The training assumes basic knowledge with Title 24 and the nonresidential compliance process. The training includes 'hands-on' experience in developing a Title 24 compliance model. Participants should understand basic inputs for modeling common nonresidential building envelope details, electric lighting, and HVAC systems.

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Event Type

Live & 2 more

Standards & Regs

2019 Standards

Topics

... & 3 more

- Heating (DHW)
- Modeling
- Analysis
- CBECC
- Concepts
- EnergyPro
- IES-VE
- Multifamily
- Pools & Spas
 - Pool Pump Motors
- Prescriptive Package A
- Reach Codes
- Solar



Decoding EnergyPro:

Comply With Me

***Let's Talk Updates for
2019 Code:***

**Nonresidential
High-Rise Multifamily
Hotel & Motel**



HELPING YOU PLAY YOUR CARDS RIGHT



Residential Modeling 2019 Energy Code New Construction Project using EnergyPro 8

► Friday, January 31st, 2020 at 10:00 a.m. Pacific time

EnergyCode Ace™
Helping you play your cards right

Top chat

10:51 AM beebo210: ahhh thank you

10:51 AM Cynthia Stoneburner: Re: Wall finish change: You are changing the u-factor when you change the wall finish. We need to model the workaround u-factor of 0.051

10:52 AM ECA PGE: brian (at) selbyenergyinc (dot) com

10:53 AM Simik Simonian: Sorry, can we use Wall Surface Type Alter instead of New?

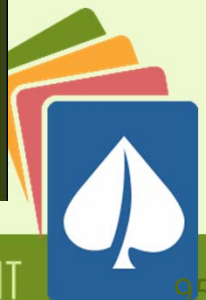
10:53 AM Mufaed Alshakhori: Is not more efficient to have 0.25 SHGC? Why would you get a penalty?

10:53 AM Diane Mendoza: Building department makes me remove that number that the software adds...they say it is confusing.

10:59 AM Jared Gochuico: If there is a new ducted furnace, would HERS registration be required?

11:01 AM Diane Mendoza: You could add a couple of ** at each wall name to indicate a note is at the end of the report.

HELPING YOU PLAY YOUR CARDS RIGHT





What

This fact sheet highlights key changes made to the 2016 Title 24, Part 6 Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) and incorporated in the 2019 Energy Code for low-rise residential buildings. The 2019 Energy Code becomes effective January 1, 2020. All measures listed apply to both single-family and low-rise multifamily dwellings unless otherwise noted

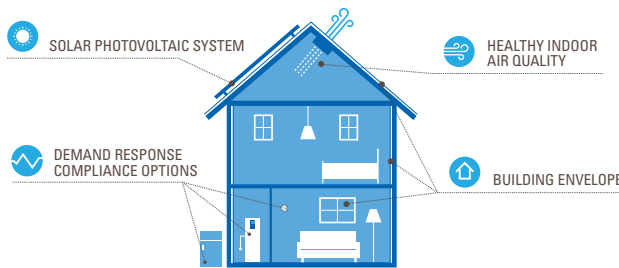


Figure 1– 2019 Energy Code Key Features Modified from *California Energy Commission Infographic*

Why?

Regularly updating the Energy Code helps ensure that builders use the most energy-efficient and energy-conserving technologies and construction practices, while being cost-effective for homeowners over the 30-year lifespan of a building. The California Energy Commission estimates that single-family homes built in compliance with the 2019 Energy Code will use about seven percent less energy due to energy-efficiency measures versus those built under the 2016 code. Once rooftop solar electricity generation is factored in, homes built under the 2019 code will use about 53 percent less energy than those under the 2016 standards. This will reduce greenhouse gas emissions by 700,000 metric tons over three years, equivalent to taking 115,000 fossil fuel cars off the road.

Multifamily

Occupancies R-1 and R-2 (R-3 includes single family, duplexes and townhomes 3-habitable stories or less above grade, and is subject to the single-family requirements of the Energy Code):

- Multifamily buildings 3-habitable stories or less above grade are addressed in the **low-rise residential** requirements of the Energy Code ([Sections 150.0, 150.1, 150.2](#))
- Multifamily buildings 4-habitable stories or more above grade are addressed in the **nonresidential, high-rise residential and hotel/motel** requirements of the Energy Code ([Sections 130 -141](#))

Relevant Code Sections

2019 California Building Energy Efficiency Standards, Title 24, Part 6:

- [Section 100.1\(b\)](#) – Definitions and Rules of Construction: Definitions
- [Section 150.0](#) – Mandatory Features and Devices
 - [150.0\(c\)](#) – Wall Insulation
 - [150.0\(k\)](#) – Residential Lighting
 - [150.0\(m\)](#) – Air-Distribution and Ventilation System Ducts, Plenums, and Fans
 - [150.0\(o\)](#) – Requirements for Ventilation and Indoor Air Quality
- [Section 150.1](#) – Performance and Prescriptive Compliance Approaches for Low-Rise Residential Buildings
 - [150.1\(c\)](#) – Prescriptive Standards/Component Package
- [Section 150.2](#) – Energy Efficiency Standards for Additions and Alterations to Existing Low-Rise Residential Buildings
 - [150.2\(b\)](#) – Alterations
- [Joint Reference Appendix JA8](#) – Qualification Requirements for High Efficacy Light Sources

Major Highlights

Natural Gas Availability Section 100.1(b)

A new definition for Title 24, Part 6 clarifies when natural gas must be considered “available.” For newly constructed buildings, natural gas is available if a gas service line can be connected to the site without a gas main extension. For additions and alterations, natural gas is available if a gas service line is connected to the existing building.

Mandatory MERV 13 Filters for New Ducted HVAC Section 150.0(m)12

New and complete replacement HVAC systems have new and updated Mandatory air filtration requirements. These apply to ducted forced-air space conditioning systems with over 10 feet of ducts, mechanical supply-only ventilation systems and the supply side of mechanical balanced ventilation systems. One important change is that the required filter efficiency has increased from MERV 6 (nominal 1” thick filter) to MERV 13 (nominal 2” thick filter, or equivalent 1” filter per Equation 150.0-A). Designers should consider how this may impact system design airflow.

PV (Photovoltaics) Section 150.1(c)14

There is a new Prescriptive requirement to install solar PV systems for new residential buildings. The Prescriptive minimum annual kWdc output capacity for the PV system is calculated per Section 150.1(c)14. The sizing calculation is based on conditioned floor area and number of dwelling units per building, with adjustments for Climate Zone and design limitations such as number of habitable stories. The Prescriptive minimum annual PV output is intended to meet or exceed the dwelling’s annual electrical usage. PV is not required for additions or alterations.

QII (Quality Insulation Installation)

HERS-verified QII has changed from a Performance compliance option that offers a large compliance credit compared to the baseline energy budget (the “standard design”) to a Prescriptive baseline requirement. This means that QII energy savings for 2019 are already part of the Performance energy budget (Section 150.1(c)1E). This is a major improvement in building envelope insulation and air leakage for new single-family and multifamily residences and additions over 700 ft². When QII is required, it is essential that the builder and/or installer coordinate with the HERS rater to facilitate timely inspections. Note: There is no QII requirement for multifamily buildings in Climate Zone 7.

All-Electric Compliance Options

The 2019 Prescriptive standards now allow all-electric compliance using heat pump space and water heating. This applies to new single-family and multifamily buildings, and also to low-rise residential additions and alterations. Having an all-electric compliance pathway is an important step on the way to California’s decarbonization goals.

Tables 150.1-A and B now include Prescriptive heat pump water heating options (see Mechanical Highlights below for more DHW detail). When combined with heat pump space heating, this allows for all-electric as well as mixed-fuel Prescriptive compliance options and adds the option of an all-electric Performance method baseline.



Figure 2 – Solar PV systems on new low-rise residential buildings is a new 2019 Energy Code requirement

Decarbonization Goals

California is aiming to reduce its greenhouse gas emissions (GHG) while creating an energy system that is resilient to climate risks, spurring innovation and a low-carbon transition nationally and internationally. California’s climate goals are among the most ambitious in the country.

	Assembly Bill 32	Senate Bill 32	Executive Order S-3-05
G Emission Reduction Goal	1990 levels by 2020	40% below 1990 levels by 2030	40% below 1990 levels by 2030

To date, the Energy Code has focused on reducing uneconomic, inefficient or unnecessary consumption of energy, as well as enhancing outdoor and indoor environmental quality.

For 2019 and beyond, the Energy Code will maintain its focus on increasing residential building efficiency, while also adopting renewable energy requirements to offset electric energy use and reduce GHG emissions. This can be achieved through a variety of measures, such as incremental steps toward “carbon neutral” buildings, and timely balancing of on-site energy production and consumption in support of a healthy, stable grid.

New Table 150.1-B Component Package for Low-Rise Multifamily

New Table 150.1-B sets out specific Prescriptive requirements for low-rise multifamily. These match the envelope, HVAC and water heating requirements in 2019 Table 150.1-A for single family, except:

- No QII requirement in Climate Zone 7
- R-13 below roof deck insulation is allowed for Roofs/Ceilings Option B in Climate Zones 10 and 16 (ceiling insulation same as Table 150.1-A)
- Exterior Walls: Maximum U-factors for above-grade framed walls are unchanged from 2016 low-rise residential values
 - U factor for Climate Zones 1-5 and 8-16 remains at 0.051
 - U-factor for Climate Zones 6 and 7 is still 0.065

Envelope Highlights

New Glazed Door Definition Section 100.1(b): Any door with $\geq 25\%$ glazed area is considered a glazed door, and the entire door must meet applicable fenestration requirements.

Mandatory

Framed Wall Insulation Sections 150.0(c)2 and 150.0(c)6: All 2x6 framed walls must have a maximum U-factor of 0.071. 2x6 wood-framed walls meet this with \geq R-20 insulation.

Masonry Wall Insulation Section 150.0(c)5: There is a new Mandatory requirement that all above-grade exterior and demising masonry walls must have either interior or exterior insulation as detailed in Prescriptive Tables 150.1-A and 150.1-B for above-grade mass walls.

Making mass wall insulation Mandatory is a major change to the insulation requirements for masonry walls in all low-rise residential buildings, including both single family and multifamily. It applies to mass walls in new construction, newly conditioned space, additions and alterations.

There is a choice of installing either continuous insulation meeting table R-values or meeting an overall U-factor for the mass wall assembly.

Mass wall insulation requirements based on Climate Zone and insulation location:

Climate Zones 1-15:

- Interior: Continuous insulation \geq R-13 or assembly U-factor \leq 0.077 OR
- Exterior: Continuous insulation \geq R-8 or assembly U-factor \leq 0.125

Climate Zone 16:

- Interior: Continuous insulation \geq R-17 or assembly U-factor \leq 0.059 OR
- Exterior: Continuous insulation \geq R-13 or assembly U-factor \leq 0.077

Prescriptive

Fenestration Section 150.1(c)3: Fenestration requirements have tightened incrementally overall:

- Changed maximum U-factor from 0.32 to 0.30 in all Climate Zones
- Changed maximum SHGC from 0.25 to 0.23 in Climate Zones 2, 4 and 6-15; no Prescriptive maximum SHGC in Climate Zones 1, 3, 5 and 16 (new in 16)

Opaque Exterior Doors Section 150.1(c)5: There is a new NFRC-rated maximum U-factor of 0.20 for all swinging exterior doors, including those with $< 25\%$ glazed area. This includes doors that separate conditioned space from unconditioned space, except for fire-rated doors between conditioned space and a garage.

Exterior Walls (single family) Section 150.1(c)1Bi: The maximum U-factor for above-grade framed walls in Climate Zones 1-5 and 8-16 changed from 0.051 to 0.048. This U-factor remains 0.065 for Climate Zones 6 and 7.

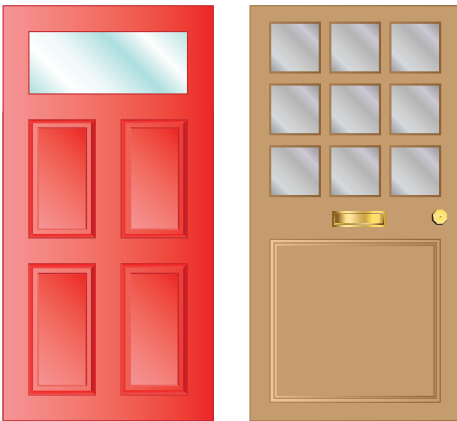


Figure 3 – Opaque Door (v) Glazed Door

High Performance Attic (HPA) Option A Removed / Only HPA Option B Remains Sections 150.1(c)1Ai-ii: Only HPA Option B remains as a Prescriptive attic option allowing ducts in a vented attic for new low-rise residential buildings. HPA Option B is limited to attic roofs where there is an air space between the roof deck and the roofing material. This is typically only found in concrete or clay tile roofs. HPA Option B also requires ceiling insulation in all Climate Zones and below roof deck insulation in Climate Zones 4 and 8-16.

New low-rise residential buildings with ducts in a vented attic that do not meet all of the Prescriptive requirements of HPA Option B must show Energy Code compliance using the Performance method.

Mechanical Highlights

Mandatory

Space Conditioning Airflow Rates and Fan Efficacy Section 150.0(m)13:

Airflow rates and fan efficacy have changed for certain completely new ducted space conditioning systems that include cooling. This does not apply to alterations. Particular system types that have changed include:

- **Single Zone Central Forced Air Systems Section 150.0(m)13B and Zonally Controlled Central Forced Air Systems Section 150.0(m)13C:**
 - For systems with gas furnaces manufactured on or after July 3, 2019, HERS-verified AHU fan efficacy changed from 0.58 to 0.45 W/CFM or less
 - For all other systems, HERS-verified fan efficacy remains at 0.58 W/CFM or less
- **Small Duct High Velocity Forced Air Systems Section 150.0(m)13D:**
 - Airflow for these systems has been reduced from 350 CFM/ton or more to 250 CFM/ton or more, and fan efficacy has changed from 0.58 W/CFM or less to 0.62 W/CFM or less
 - Both airflow and fan efficacy must be HERS-verified.

Ventilation and Indoor Air Quality Section 150.0(o):

All new dwelling units of any size, including ADUs, and additions >1000 ft² must meet 2016 ASHRAE 62.2 ventilation and IAQ requirements as modified in Section 150.0(o)1, and must also comply with Section 150.0(o)2 regarding HERS testing and verification. The 2019 Energy Code increases total ventilation rates required for residences compared to the 2016 code. Important changes include:

- **Single-family residences and townhomes:**
 - **Section 150.0(o)1Ci:** The Total Required Ventilation Rate is calculated per Equation 150.0-B:

$$Q_{tot} = 0.03(A_{floor}) + 7.5(N_{br} + 1)$$
 where:
 Q_{tot} = Total Required Ventilation Rate, CFM
 A_{floor} = Dwelling Unit Floor Area, ft²
 N_{br} = Number of Bedrooms (must be ≥ 1)
 - **Sections 150.0(o)1Cii-iii:** The required single-family mechanical ventilation rate is calculated by subtracting infiltration from total ventilation (see Sections 150.0(o)1Cii-iii for detailed equations)

- **Multifamily attached dwelling units:**

- **Section 150.0(o)1E:** Required total ventilation rates per dwelling unit are calculated using Equation 150.0-B (see above)
- **Sections 150.0(o)1Ei-ii:** Multifamily buildings have a choice between two options to provide required ventilation outside air to each unit:
 - (1) Install a balanced ventilation system in which both supply and exhaust fans operate simultaneously in response to shared controls, and in which the CFM of mechanically controlled supply outside air and exhaust air are within 20% of each other OR
 - (2) Install an unbalanced continuously operating supply ventilation system (supply fans only) or exhaust ventilation system (exhaust fans only) and also HERS-test and verify that the dwelling unit envelope meets certain air-leakage requirements (≤ 2 ACH50)

- **All dwelling units:**

- **Section 150.0(o)1A:** Neither single-family nor multifamily residences are allowed to meet ventilation requirements by using operable windows
- **Section 150.0(o)2A:** Single-family and multifamily ventilation outdoor airflow must be tested and HERS-verified to meet required rates
- **Kitchen range hoods** require minimum ventilation per 2016 ASHRAE 62.2, Section 5 (Section 150.0(o)2B) and maximum sound rating per 2016 ASHRAE 62.2, Section 7.2 (Section 150.0(o)1G)
 - This corresponds to 100 CFM ventilation for most kitchens and a sound rating of three sones or less
 - A HERS rater must verify that installed range hoods are listed in the [HVI Certified Home Ventilating Products Directory](#) and have been HVI-certified as meeting ASHRAE 62.2 ventilation and sound requirements

Prescriptive

Electric Heat Pump Water Heaters serving individual dwelling units have new prescriptive compliance options:

- **Section 150.1(c)8Av:** One NEEA Tier 3 heat pump water heater located in a garage or conditioned space
 - In Climate Zones 1 and 16 also need:
 - PV sized 0.3 kWdc larger than minimum from Section 150.1(c)14 OR
 - HERS-verified compact distribution
- **Section 150.1(c)8Aiv:** One heat pump water heater (not NEEA Tier 3) in combination with either added PV, or HERS-verified compact distribution and drain water heat recovery

Alterations Section 150.2(b)1Hiid

An Altered or Replacement Electric Water Heater is allowed if there is no natural gas connected to the existing water heater location. Generally, this means that an existing electric resistance water heater in a room that does not have a natural gas connection can be replaced with another electric resistance water heater.

Lighting Highlights

Mandatory Section 150.0(k)

High Efficacy Light Sources: The 2019 code updates [Table 150.0-A](#) light sources classified as high efficacy. High efficacy luminaires as defined by both the 2016 Joint Reference Appendix JA8 and the [2019 JA8](#) are allowed for the 2019 code cycle. Note, however, that [Table 150.0-A](#) includes some high efficacy light sources that do not require [JA8](#) certification.

Night, Step and Path Lights $\leq 5W$ and ≤ 150 lumens are exempt from high-efficacy and vacancy control requirements.

Lights in Drawers, Cabinets and Linen Closets that are $\leq 5W$ and ≤ 150 lumens, and that turn off automatically when the drawer, cabinet or closet is closed, are exempt from high efficacy and vacancy control requirements.

Alterations Section 150.2(b)1J

Existing recessed cans do not need to be replaced, but do need to use a [JA8](#) compliant trim kit or [JA8-E](#) lamp.

Performance Highlights

Energy Design Rating (EDR) Compliance for New Residences

The Performance Method compliance metric for new low-rise residential buildings is changing from time-dependent valuation (TDV) energy use per ft² to an Energy Design Rating (EDR). The EDR components include:

- **Energy Efficiency:** Standard Efficiency EDR is based on [Table 150.1-A](#) Prescriptive Component Package requirements for building envelope, HVAC system and water heating
- **Solar Electric + Demand Flexibility / PV + Battery Storage:** Standard PV EDR is based on the Prescriptive minimum PV kWdc from [Section 150.1\(c\)14](#) with no flexibility credit
- **Total Standard EDR** = Standard Efficiency EDR - Standard PV EDR

Proposed Efficiency and PV+Flexibility EDRs are based on the proposed building features.

Total Proposed EDR = Proposed Efficiency EDR - Proposed PV+Flexibility EDR

A new residence complies with the 2019 Energy Code when: Total Proposed EDR \leq Total Standard EDR.

How Prescriptive for New Residences Changes Performance Options

The Prescriptive PV requirement sets the Performance Standard PV EDR. One straightforward compliance path is to install a PV system that meets the Prescriptive kWdc. It is possible to reduce the required PV kWdc by improving building efficiency beyond the Prescriptive baseline and/or installing ≥ 7.5 kWh battery storage.

The substantial energy-efficiency benefits of QII are now in the Prescriptive baseline setting the Performance Standard Efficiency EDR. However, QII is not a Mandatory measure, so it may be traded away using a combination of other efficiency measures that match QII's high impact. Another QII trade-off option is to install ≥ 5 kWh battery storage to save energy generated by the PV system during the day for use at night (using the Self-Utilization credit).

Incremental tightening of Prescriptive envelope measures other than QII means fewer ways to improve the proposed building envelope in the Performance method. High-efficiency HVAC and water heating are some of the few options to trade off against worse-than-Prescriptive envelope measures. For Climate Zones with substantial cooling loads, building features such as fixed overhangs and side-fins that shade windows and glass doors are also promising Performance options.

Additions and Alterations

Performance method compliance for additions and alterations is still based on TDV energy use per ft² not EDR.

Performance and HERS Verification

The 2019 Energy Code changes some building features that trigger HERS verification when modeled for Performance compliance credit.

There are new HERS-verification requirements for above-standard efficiency EER and HSPF, non-default heat pump rated heating capacity, and whole house fan ventilation.

There are also new HERS requirements for some Mandatory measures, such as checking HVI certification for kitchen range hoods (see Mechanical Highlights above). HERS-verified Mandatory measures do not give Performance compliance credit, but building professionals must know when HERS verification is triggered, regardless of the compliance approach.

For More Information

Primary Documents

- Energy Code Section 100.1(b) – Definitions and Rules of Construction: Definitions
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1001definitionsandrulesofconstruction.htm
- Energy Code Section 150.0 – Mandatory Features and Devices
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1500mandatoryfeaturesanddevices.htm
- Energy Code Section 150.0(c) – Mandatory Features and Devices: Wall Insulation
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1500mandatoryfeaturesanddevices.htm#cwallinsulation.htm
- Energy Code Section 150.0(k) – Mandatory Features and Devices: Residential Lighting
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1500mandatoryfeaturesanddevices.htm#kresidentiallighting.htm
- Energy Code Section 150.0(m) – Mandatory Features and Devices: Air-Distribution and Ventilation System Ducts, Plenums, and Fans
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1500mandatoryfeaturesanddevices.htm#mairdistributionandventilationsystemductsplenumsandfans.htm
- Energy Code Section 150.0(o) – Mandatory Features and Devices: Requirements for Ventilation and Indoor Air Quality
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1500mandatoryfeaturesanddevices.htm#orequirementsforventilationandindoorairquality.htm
- Energy Code Section 150.1 – Performance and Prescriptive Compliance Approaches for Low-Rise Residential Buildings
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesforlowr.htm
- Energy Code Section 150.1(c) – Performance and Prescriptive Compliance Approaches for Low-Rise Residential Buildings: Prescriptive Standards/Component Package
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesforlowr.htm#cprescriptivestandardscomponentpackage.htm
- Energy Code Section 150.2 – Energy Efficiency Standards for Additions and Alterations to Existing Low-Rise Residential Buildings
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1502energyefficiencystandardsforadditionsandalterationsto.htm
- Energy Code Section 150.2(b) – Energy Efficiency Standards for Additions and Alterations to Existing Low-Rise Residential Buildings: Alterations
energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1502energyefficiencystandardsforadditionsandalterationsto.htm#balterations2.htm

- Energy Code Joint Reference Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixja8qualificationrequirementsforhighefficacylightsources.htm

California Energy Commission Information & Services

- Energy Standards Hotline: 1-800-772-3300 (Free) or Title24@energy.ca.gov
- Online Resource Center:
www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center
 - The Energy Commission’s main web portal for Energy Standards, including information, documents, and historical information

Additional Resources

- ASHRAE Technical Standards Bookstore (for ANSI/ASHRAE Standards 62.1 and 62.2)
ashrae.org/technical-resources/bookstore/standards-62-1-62-2
- HVI Certified Home Ventilating Products Directory
hvi.org/hvi-certified-products-directory/
- California Association of Building Energy Consultants (CABEC) Webinar
 - What’s New for Multifamily Ventilation in 2019
cabec.org/learning/
- Energy Code Ace:
EnergyCodeAce.com
 - An online “one-stop-shop” providing free resources and training to help appliance and building industry professionals decode and comply with Title 24, Part 6 and Title 20. The site is administered by California’s investor-owned utilities.

Of special interest:

- Fact Sheets
energycodeace.com/content/resources-fact-sheets/
 - What’s Changed for 2019: Low-Rise Residential
 - Residential High-Efficacy Lighting - Title 20 and Title 24, Part 6 JA8: Key Differences and Overlap
- Reference Ace™ – Easily navigate Title 24, Part 6 documents using search and hyperlinks
energycodeace.com/content/tools-ace/tool=reference-ace
 - 2019 Energy Code
 - 2016 Energy Code
- Training
energycodeace.com/training
 - Title 24: Where We’re Headed with the 2019 Standards
 - 2019 Title 24, Part 6: Where We’re Headed with the Residential Standards
 - Decoding What’s New: Let’s Talk 2019 Title 24, Part 6 – Residential
- Energy Code Ace Tools, Training and Resources Updated for the 2019 Code – More Coming Soon! Create an account on EnergyCodeAce.com and select a role in My Profile to receive emails when they’re published.



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