

## Overview of EnergyPro Structure

**Residential**  
*Including low-rise multifamily, single family and duplexes*

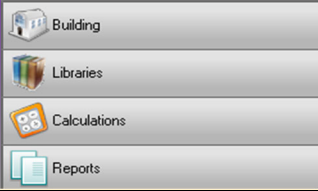
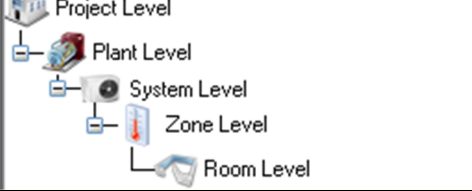
**Nonresidential**  
*Including high-rise multifamily and hotel/motel*

**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.	<b>Calculations</b> <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.	<b>Building</b>	<b>Project Level</b> <b>Tab: PV + Batt</b>
	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.	<b>Building</b>	<b>Project Level</b> <b>Tab: PV + Batt</b>


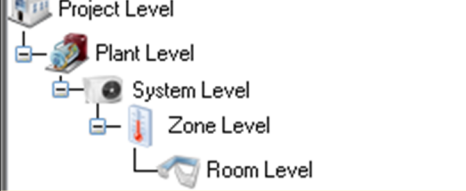
## Residential 2019 T24 P6 Updates– Where to Model in Energy Pro v. 8

<b>Building Feature</b>		<b>Brief Description</b>		
<b>Envelope</b>	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).	<b>Libraries</b> <i>Assembly</i>	<b>Room Level</b> <i>Roof</i> <b>Tab:</b> 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.		<b>Room Level</b> <i>Wall</i> <b>Tab:</b> Performance: Res T24 Performance Prescriptive: JA4
	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.	<b>Building</b>	
	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.	<b>Libraries</b> <i>Assembly</i>	<b>Room Level</b> <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.	<b>Libraries:</b> <i>Assembly: Tab: JA4</i> NFRC = U-factor 0.20 Default = U-factor 0.50	<b>Room Level</b> <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 ft² (multifamily in CZ 7 exempt).	<b>Building</b>	<b>Project Level</b> <b>Tab:</b> Residential
	<i>Good to know</i>	<i>RA3.8 HERS verified "Envelope Leakage Testing" which can be a good measure with QII</i>	<b>Building</b>	<b>Project Level</b> <b>Tab:</b> 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>	<b>Building</b>	<b>Project Level</b> <b>Tab:</b> Residential
<b>Domestic Hot Water (DHW)</b>	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.	<b>Libraries</b> <i>Boiler: "Import" heat pump water heater, these are NEEA 3</i>	<b>Plant Level</b> <b>Tab:</b> Domestic Hot Water <i>Model "Residential Heat Pump Water Heater"</i>
	Drain Water Heat Recovery (RA2.1)	If utilized, HERS verification required	<b>Building</b>	<b>Zone Level</b> <b>Tab:</b> 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.	<b>Libraries</b> <i>Boiler</i> <i>"Import" heat pump water heater, these are NEEA 3</i>	<b>Plant Level</b> <b>Tab:</b> Domestic Hot Water <i>Model "Residential Heat Pump Water Heater" location</i>
		<b>Building</b> <b>Project Level</b> <b>Tab:</b> Project Design Data <i>select "propane"</i>	<b>Plant Level</b> <b>Tab:</b> Domestic Hot Water	

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

<b>Building Feature</b>		<b>Brief Description</b>	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 <sup>2</sup> 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>	<b>System Level</b> <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>	<b>Project Level</b> <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	<b>Building</b>	<b>Zone Level</b> <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	<b>Building</b>	<b>System Level</b> <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	<b>Building</b>	<b>Project Level</b> <i>Tab: Residential</i>
	Whole House Fan Table RA2.1	Now verified by HERS rater	<b>Building</b> <i>Can use "default" or specify system</i>	<b>Project Level</b> <i>Tab: Residential</i> <b>System Level</b> <i>Tab: Residential</i>
	Heat Pumps Table RA2.1	HSPF and rated heat pump heating capacity to be verified by HERS rater	<b>Libraries</b> <i>Central</i>	<b>System Level</b> <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	<b>Building</b> <i>Tab: Residential</i> Modeling "Balanced" <i>"Non-default" for IAQ</i>	<b>Project Level</b> <i>Tab: Residential</i> <b>Zone Level</b> <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>	<b>Building</b> <i>Triggered with new HVAC and/or ducting</i>	<b>System Level</b> <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>	<b>Building</b>	<b>System Level</b> <i>Tab: Distribution "Verified Duct"</i>	
		<b>Libraries</b> <i>Central</i>	<b>System Level</b> <i>Tab: General</i>	

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

<b>Building Feature</b>		<b>Brief Description</b>		
<b>Scope</b>	<b>All Appendix A</b>	New prescriptive NRCC dynamic forms must be used (cannot use Bluebeam, download free version of Adobe)	<b>Reports</b> <i>Nonresidential T24 Prescriptive</i>	<b>Project Level</b> <b>Tab: Forms</b>
<b>Mechanical</b>	<b>Efficiency 110.2</b>	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.	<b>Libraries</b> <i>Central and Zonal</i>  <i>Use Energy Pro "example" file of the specific VRF manufacturer to pull in outdoor and indoor units.</i>	<b>System Level</b> <b>Tab: General</b>  <b>Zone Level</b> <b>Tab: Mechanical</b> <b>Zone Level: Mechanical System Data and VRF pipe length</b>
	<b>Fan Systems NR ACM</b>	HVAC System mapping has been revised so that buildings less than 25,000 ft <sup>2</sup> , 3 stories or less, and output less than 65,000 Btu/h is compared to single zone constant volume system.	<b>Libraries</b> <i>Central</i>	<b>System Level</b> <b>Tab: General</b>
	<b>Air Filtration 120.1(b)1 &amp; (c)1</b>	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	<b>Building</b>	<b>System Level</b> <b>Tab: Pressure Drop</b>
	<b>Ventilation 120.1(c)2 120.1(c)3 120.1(b) 120.1(d)5 120.2(e)3</b>	<b>Nonresidential/Hotel &amp; Motel:</b> Natural ventilation design and allowances have changed <b>Nonresidential/Hotel &amp; Motel:</b> Ventilation rate categories have changed; Required ventilation rate larger of CFM/ft <sup>2</sup> or actual # of occupants; Air class recirculation/transfer requirements added; Exhaust ventilation requirements added <b>Multifamily specific:</b> 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 <b>Controls:</b> Demand control ventilation (CO <sub>2</sub> ) has new triggers and exceptions; Occupancy sensor triggers and design criteria has changed	<b>Building</b>	<b>Zone Level</b> <b>Tab: Mechanical</b> <b>Ventilation Type</b>
			<b>Building</b>	<b>Zone Level</b> <b>Tab: Mechanical</b> <b>Zone Level Mechanical System Data</b>

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

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

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



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

# Comply With Me

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

[www.EnergyCodeAce.com](http://www.EnergyCodeAce.com)

offers **No-Cost**

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?

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Gina Rodda  
Gabel Energy  
[gina@gabelenergy.com](mailto: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?

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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

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### ★ Review

- ✧ Updates associated with *nonresidential, hotel/motel and 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 with more than 25,000 ft <sup>2</sup> , 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.

**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	Brief Description	Where to Model
<b>PV + Flexibility</b>	<b>EDR Score 150.1(b)1</b> 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.	<b>Calculations</b> Residential T24 Performance See PV + Flexibility
	<b>PV 150.1(c)14</b> New single-family homes, new low-rise townhomes & multifamily buildings to meet PV kW requirements per Res ACM.	<b>Building</b> Project Level Tab: PV + Batt
	<b>Battery 150.1(c)14</b> 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.	<b>Building</b> Project Level Tab: PV + Batt
	<b>Roof 150.1(c)1</b> 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).	<b>Libraries</b> Assembly Room Level Roof Tab: Performance: Res T24 Performance Prescriptive: JA4
	<b>Roof Additions 150.2(c)5</b> Roof insulation R-value increased to R-30 CZ 2-10, and R-39 in CZ 1&11-16.	<b>Libraries</b> Assembly Room Level Wall Tab: Performance: Res T24 Performance Prescriptive: JA4
	<b>Walls 150.0(c), 150.1(c)1B</b> 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.	<b>Building</b> Project Level Tab: Project Design Data Building Type: Addition
	<b>Walls: Additions 150.2(a)1Bvi</b> Extended 2 x 6 framed walls increased to R-21.	<b>Building</b> Libraries Assembly: Tab: JA4 NFRC = U-factor 0.20 Default = U-factor 0.50
	<b>Fenestration 150.1(c)3A, 150.1(c)5</b> 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.	<b>Libraries</b> Assembly Room Level Fenestration
	<b>Solid Doors 150.1(c)5</b> NFRC rated U-factor of 0.20 or less except for door in home to the garage.	<b>Libraries</b> Assembly: Tab: JA4 NFRC = U-factor 0.20 Default = U-factor 0.50 Room Level Door
	<b>Quality Insulation Installation (QII) 150.1(c)1E</b> HERS verification now a prescriptive requirement for new single-family homes, low-rise multifamily, and additions >700 ft <sup>2</sup> (multifamily in CZ 7 exempt).	<b>Building</b> Project Level Tab: Residential
	<b>Good to know</b> RA3 B HERS verified "Envelope Leakage Testing" which can be a good measure with QII	<b>Building</b> Project Level Tab: Residential
	<b>Alterations: Good to know 150.2(b)2B</b> HERS verified "Existing Conditions" which must be verified before submitting for permit or any work done	<b>Building</b> Project Level Tab: Residential

includes  
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residential,  
hotel/  
energy



# 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  
2018

DECEMBER 2018  
CEC-400-2018-020-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  
Edmund G. Brown, Jr., Governor

DECEMBER 2018  
CEC-400-2018-018-CMF  
CALIFORNIA ENERGY COMMISSION  
Edmund G. Brown, Jr., Governor

**R**

DECEMBER 2018  
CEC-400-2018-017-CMF  
CALIFORNIA ENERGY COMMISSION  
Edmund G. Brown, Jr., Governor

MAY 2018  
CEC-400-2018-025-CMF  
CALIFORNIA ENERGY COMMISSION  
Edmund G. Brown, Jr., Governor

MAY 2018  
CEC-400-2018-005-CMF  
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). A "SUBSCRIBE" form is also present, 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](mailto:Title24@energy.ca.gov)

## List Server & Newsletter

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

Download the Blueprint Newsletter:  
[www.energy.ca.gov/efficiency/blueprint](http://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](http://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

- HOME
- PROCEEDINGS ▾
- RULES AND REGULATIONS ▾
- PROGRAMS AND TOPICS ▾
- FUNDING ▾
- DATA AND REPORTS ▾
- SHOWCASE ▾

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 replace 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

## SUBSCRIBE

Building Energy Efficiency Standards

First Name \*

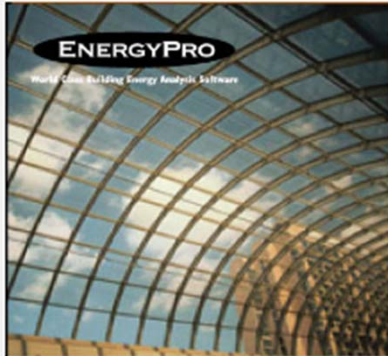
Last Name \*

Email \*

SUBSCRIBE



# EnergyPro Version 8



EnergyPro  
 Version 8.0.3.0  
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 Building Energy Analysis Software

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(415) 897-6400  
[www.energysoft.com](http://www.energysoft.com)

## Energy Commission Approved Software

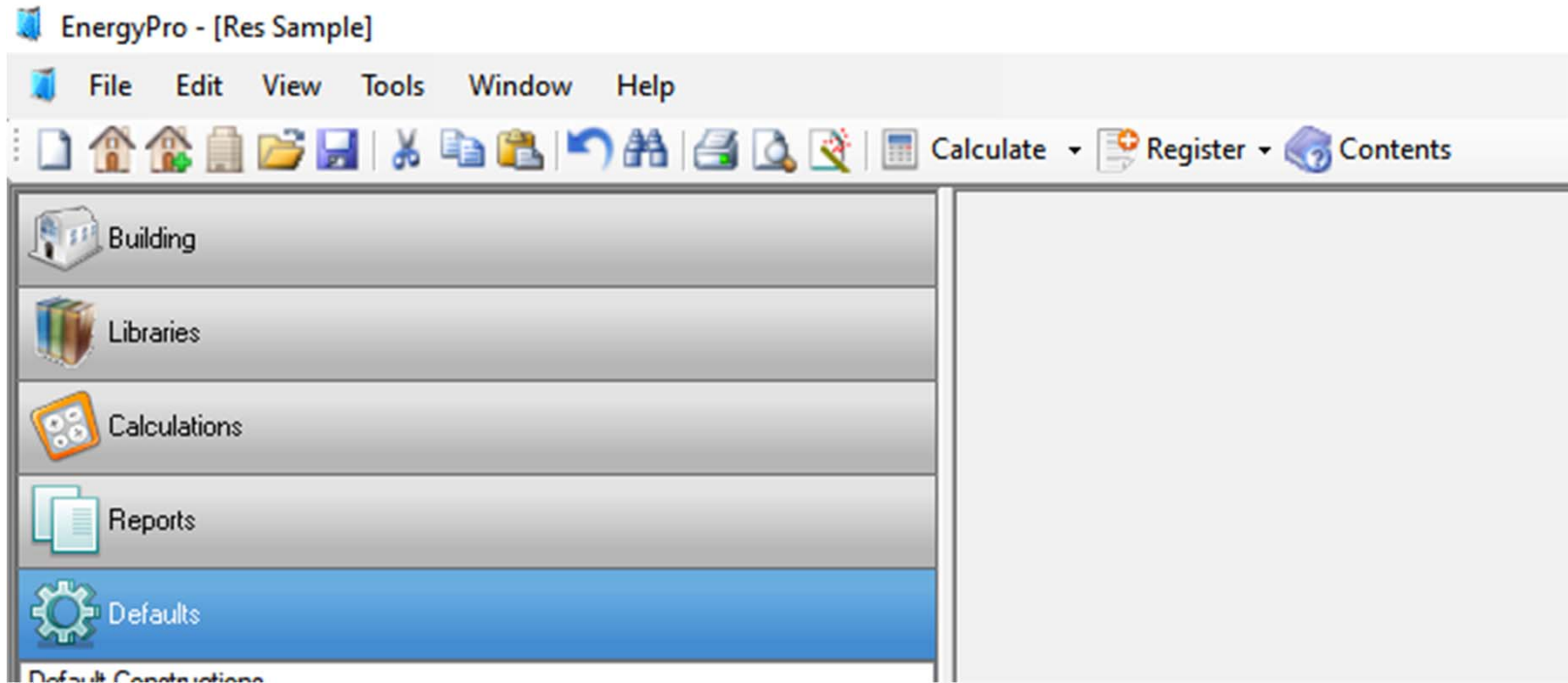
✦ As of January 2020

Nonresidential Buildings, 2019 Standards			
Program Name	Approved versions usable for permit	Contact Information	Additional Information
CBCECC-Com	<p>CBCECC-Com 2019.1.1 was approved 11/25/2019 for demonstrating performance compliance with the nonresidential provisions of the 2019 Building Energy Efficiency Standards. <a href="#">Download CBCECC-Com 2019.1.1 (1110) setup (.exe file)</a></p> <p>CBCECC-Com 2019.1.0 was approved 5/15/2019 and shall continue to be valid for demonstrating performance compliance with the nonresidential provisions of the 2019 Building Energy Efficiency Standards. <a href="#">Download CBCECC-Com 2019.1.0 (1079) setup (.exe file)</a></p> <p><a href="#">All CBCECC-Com 2019 resolutions - PDF</a></p>	<p>California Energy Commission            Building Standards Office            1516 9th Street, MS 37            Sacramento, CA 95814            ATTN: Larry Froess            916-654-4525  <a href="mailto:Larry.Froess@energy.ca.gov">Larry.Froess@energy.ca.gov</a></p>	<p>See the <a href="#">CBCECC-Com Website</a> for:</p> <ul style="list-style-type: none"> <li>» SketchUp and OpenStudio SketchUp Plugin</li> <li>» Prototype Models &amp; Tutorials</li> <li>» FAQ/Training</li> <li>» Software Archive</li> <li>» Quick Start Guide</li> <li>» User Manual</li> </ul> <p>Support:  <a href="mailto:cbcecc.com@energy.ca.gov">cbcecc.com@energy.ca.gov</a></p> <p><a href="#">Expiration Dates</a></p>
EnergyPro	<p>EnergyPro 8.0, using the simplified geometry two-dimensional (2D) option of the CBCECC-Com API, was approved 12/11/2019 as an alternative calculation method for demonstrating performance compliance with the nonresidential provisions of the 2019 California Building Energy Efficiency Standards.</p> <p><a href="#">All 2019 EnergyPro (Nonresidential) resolutions can be found here.</a></p>	<p>EnergySoft, LLC.            1025 5th Street, Suite A            Novato, CA 94945-2413            415-897-6400</p>	<p><a href="#">EnergyPro Website</a></p> <p><a href="#">Expiration Dates</a></p> <p><a href="#">FAQs</a></p> <p>Support:  <a href="mailto:support@energysoft.com">support@energysoft.com</a></p>



# EnergyPro 8

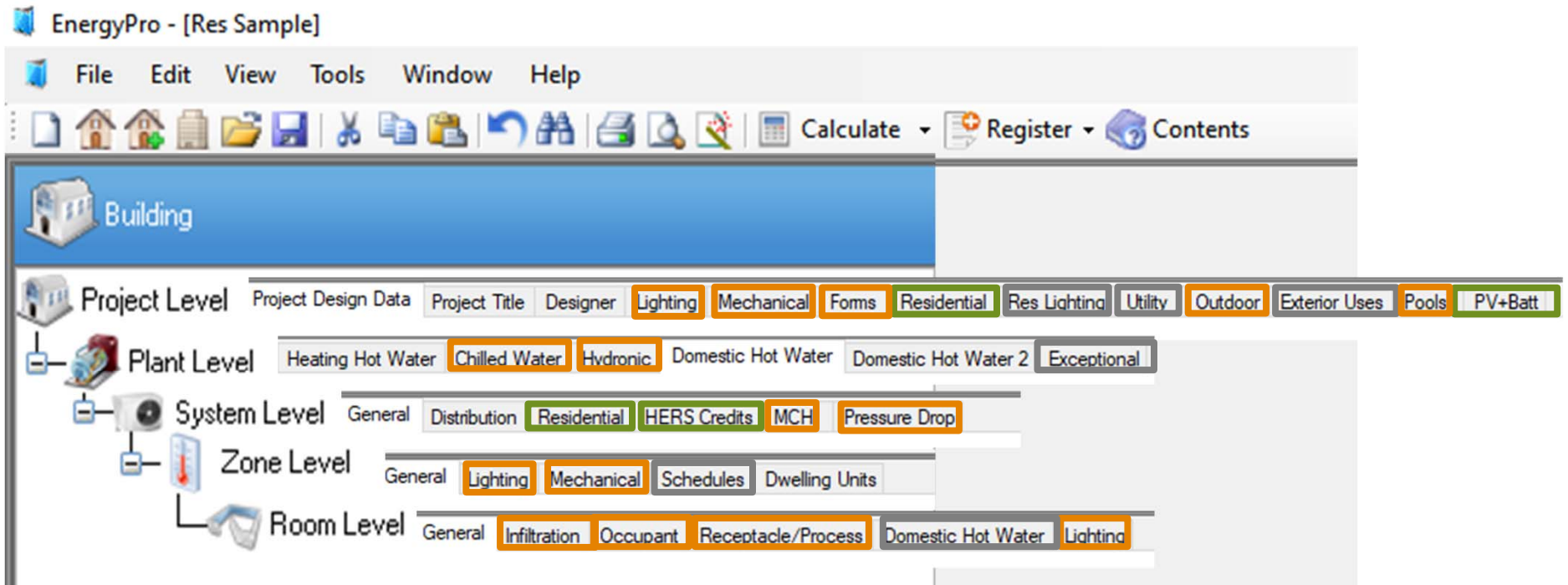
## Overview of Structure





# 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 Forms 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: Zone 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 Accessory Dwelling Unit: No

Occupancy: Select Occupancy and Ventilation Function

Ventilation Function: 90.1 Envelope Type: 90.1 Ltg Occupancy:

# of Floors: Envelope Status: Lighting Status: Year Built: Rotation: Building Story:

Display Perimeter: 0 feet 0 feet

Ventilation Function	Vent	Exhaust
General - Corridors	0.15	0.00
Lodging - Lobbies/pre-function	0.50	0.00
Misc - Transportation waiting	0.50	0.00
Residential - Common corridors	0.15	0.00
Retail - Mall common areas	0.25	0.00



Let's Talk



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# Challenges

---



- ✦ Challenge A:
  - ✦ Lighting



- ✦ Challenge B:
  - ✦ Envelope



- ✦ Challenge C:
  - ✦ HVAC



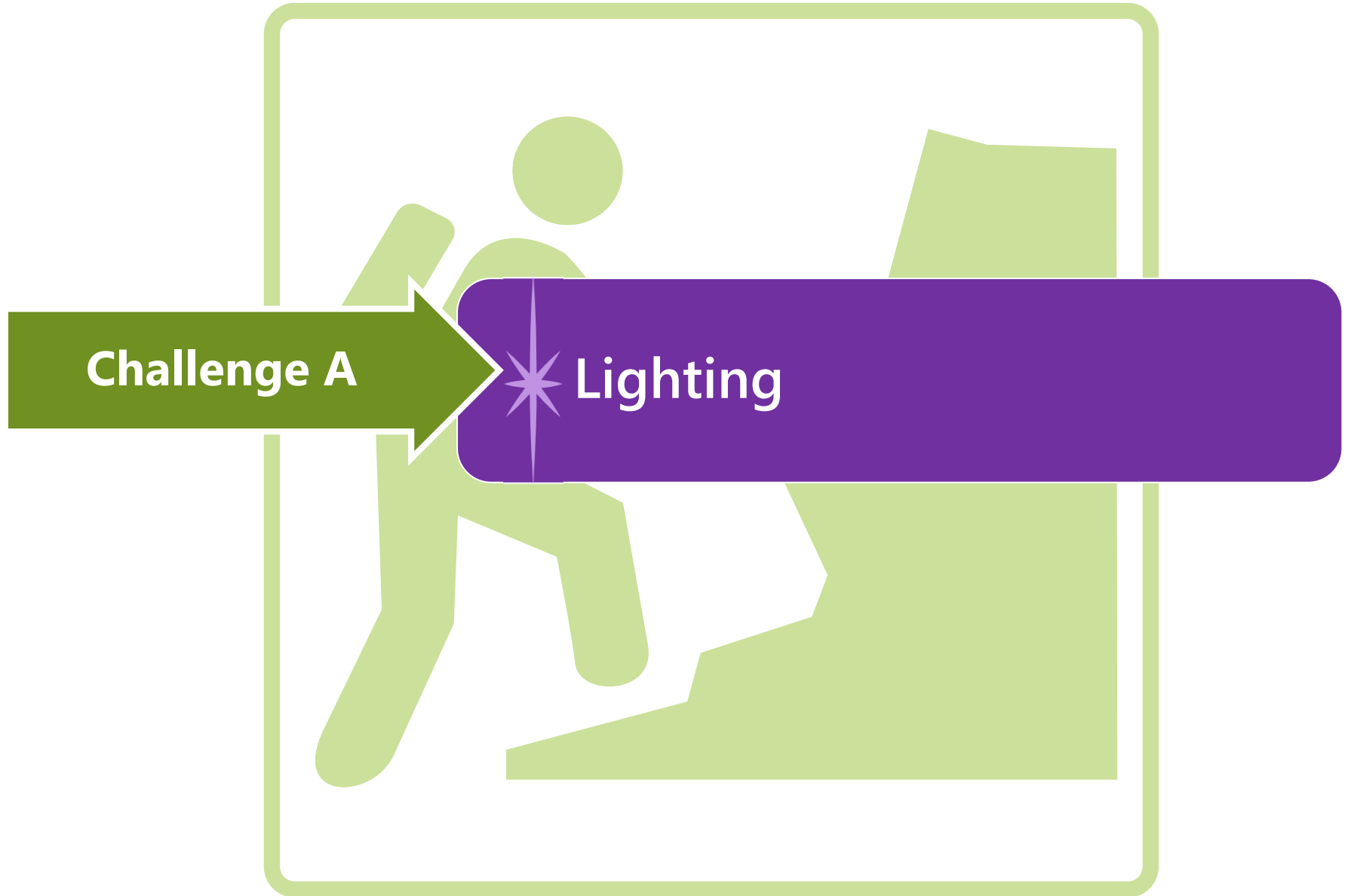
- ✦ Challenge D:
  - ✦ Water Heating





# Challenge A

---





## Rated Wattage

**A. No Current Limiter** being used, then greater of:




- ✧ 30 W/ft of track or plug-in busway  
*(was 45 W/ft)*
- ✧ Max. rated wattage of luminaires shown on plans

**B. With a Current Limiter** *(12.5 W/ft removed)* or Overcurrent Protection Panel:

- ✧ Volt-ampere rating of current limiter **OR**
- ✧ Ampere rating of all current protection devices combined times branch circuit voltage



## Excerpt from 2019 Table 140.6-A: Lighting Power Adjustment Factors (PAF)

	<p>5. Clerestories</p> <ul style="list-style-type: none"><li><input type="checkbox"/> Luminaires in daylit areas adjacent to clerestories (<i>vertical fenestration above 8 ft from finished floor</i>).</li><li><input type="checkbox"/> Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.</li></ul>	<p>5%</p>
 <p><b>Figure 5: Fixed slats</b> Source: Airolite</p>	<p>6. Horizontal Slats</p> <ul style="list-style-type: none"><li><input type="checkbox"/> Luminaires in daylit areas adjacent to vertical fenestration with interior or exterior horizontal slats.</li><li><input type="checkbox"/> Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.</li></ul>	<p>5%</p>
 <p><b>Figure 9: LightLouver profile and field installation</b> Source: LightLouver, Sacramento Municipal Utility District</p>	<p>7. Light Shelves</p> <ul style="list-style-type: none"><li><input type="checkbox"/> Luminaires in daylit areas adjacent to clerestories with interior or exterior light shelves. This PAF may be combined with the PAF for clerestories.</li><li><input type="checkbox"/> Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF</li></ul>	<p>10%</p>



# Area Category Lighting Allowances

§140.6(c)2



Table 140.6-C Area Category Method — Lighting Power Density Values (Watts/Ft<sup>2</sup>) — p. 1 of 3

Primary Function Area	Allowed LPD (W/ft <sup>2</sup> )	Additional Lighting Power <sup>1</sup>	
		Qualified Lighting System	Additional Allowance (W/ft <sup>2</sup> )
Auditorium Area	0.70	Ornamental	0.30
		Accent, display and feature <sup>3</sup>	0.20
Auto Repair / Maintenance Area	0.55	Detailed Task Work <sup>7</sup>	0.20
Audience Seating Area (New)	0.60	Ornamental	0.30
Beauty Salon Area	0.80	Detailed Task Work <sup>7</sup>	0.20
		Ornamental	0.30
Civic Meeting Place Area	1.00	Ornamental	0.30
Classroom, Lecture, Training, Vocational Areas	0.70	White or Chalk Board <sup>1</sup>	4.5 w/ft
Commercial / Industrial Storage (Modified)	Warehouse	---	---
	Shipping & Handling	---	---
Convention, Conference, Multipurpose and Meeting Area	0.85	Ornamental	0.30
Copy Room (Separate Category)	0.50	---	---
Corridor Area (Separate Category)	0.60	---	---
Dining Area	Bar/Lounge and Fine Dining	Ornamental	0.30
	Cafeteria / Fast Food		
	Family and Leisure		
Electrical, Mechanical, Telephone Rooms	0.40	Detailed Task Work <sup>7</sup>	0.20
Exercise / Fitness Center and Gymnasium Areas	0.50	---	---
Hotel Function Area (New)	0.85	Ornamental	0.30
Museum	Exhibition / Display	Accent, display and feature <sup>3</sup>	0.50
	Restoration Room (New)	Detailed Task Work <sup>7</sup>	0.20
Financial Transaction Area	0.80	Ornamental	0.30
General / Commercial and Industrial Work Areas	Low Bay	Detailed Task Work <sup>7</sup>	0.20
	High Bay	Detailed Task Work <sup>7</sup>	0.20
	Precision	Precision Specialized Work <sup>9</sup>	0.70
Library	Reading Area	Ornamental	0.30
	Stacks Area	Ornamental	---
Main Entry Lobby (Modified)	0.85	Ornamental	0.30
Locker Room	0.45	---	---
Lounge, Breakroom or Waiting Areas (Modified)	0.65	Ornamental	0.30
Concourse and Atria Area (Modified)	0.90	Ornamental	0.30
Office Area	> 250 square feet	Portable Lighting for office areas <sup>6</sup>	0.20
	≤ 250 square feet		
	Open plan office (New)		



# Outdoor Lighting

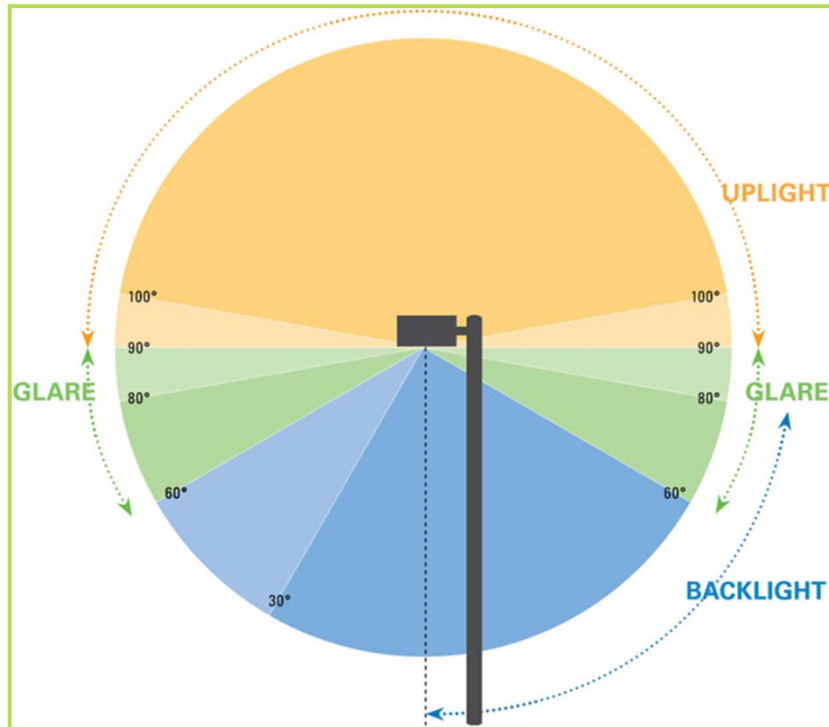


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# Cut-Off Requirements

§130.2(b)



- ✦ Cutoff fixture requirement triggered at 6,200 lumens (*was 150 Watts*)
- ✦ Backlight, Uplight and Glare triggered per Title 24, Part 11 (CalGreen) table (*was split up between Part 6 and Part 11*)
  - ✧ Adds the Backlight component to the regulation (*previously in Part 11*)
- ✦ *New* exception for outdoor lighting attached to high-rise Multifamily or Hotel/Motel **if** controlled from within dwelling units



# Auto Shut-off Controls

§130.2(c)2-3



- ✦ **Automatic Scheduling:** all lighting must be controlled to allow
  - ✦ At least 50% of lighting off at night (no more than 90% *new*) **AND**
  - ✦ At least two nighttime periods to be programmed (*new*)
  
- ✦ **Motion Sensing:** all lighting within 24 ft above grade must be controlled to allow



# New General Hardscape Allowances

§140.7(d)



Table 140.7-A: General Hardscape Lighting Power Allowance

Type of Power Allowance	Lighting Zone 0 <sup>3</sup>	Lighting Zone 1 <sup>3</sup>	Lighting Zone 2 <sup>3</sup>		Lighting Zone 3 <sup>3</sup>		Lighting Zone 4 <sup>3</sup>
	2019	2019	2019		2019		2019
			Asphalt	Concrete <sup>2</sup>	Asphalt	Concrete <sup>2</sup>	
Area Wattage Allowance (AWA)	No allowance <sup>1</sup>	0.018 W/ft <sup>2</sup>	0.023 W/ft <sup>2</sup>	0.025 W/ft <sup>2</sup>	0.025 W/ft <sup>2</sup>	0.030 W/ft <sup>2</sup>	0.030 W/ft <sup>2</sup>
Linear Wattage Allowance (LWA)		0.15 W/lf	0.17 W/lf	0.40 W/lf	0.25 W/lf	0.40 W/lf	0.35 W/lf
Initial Wattage Allowance (IWA)		180 W	250 W		350 W		400 W







EnergyPro

# Modeling





# Libraries: Track Lighting

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly Fenestration Overhang

Central Zonal Chiller

Boiler Schedule **Luminaire**

VRF HR Multi

Name	Watts	Default
80 w LED	80.0	<input type="checkbox"/>
25w LED	25.0	<input type="checkbox"/>
Track	300.0	<input checked="" type="checkbox"/>

Name: Track

Type: Track

Total Watts: 80  Default Value

Ext Lighting:  Cutoff Rating Required

Track Lighting

Type: Standard Track 30w/ft

Total Amps:

Track Length:

Track Head Watts:

Number of Heads: 8

Branch Circuit VA Rating: 100

Overcurrent Panel Voltage: 0

OK Cancel



Track Lighting

Type: Current Limiter Track

Total Amps: 12

Track Length: 10 feet

Track Head Watts: 25

Number of Heads: 8

Current Limiter VA Rating: 100

Overcurrent Panel Voltage: 0



# Libraries: Outdoor BUG

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

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

Name	Watts	Default
80 w LED	80.0	<input type="checkbox"/>
25w LED	25.0	<input type="checkbox"/>
Track	100.0	<input type="checkbox"/>

Name: 80 w LED

Type: General

Total Watts: 80  Default Value

Ext Lighting:  Cutoff Rating Required

Exterior BUG Ratings


Backlight Mounting: Back hemisphere 1-2 MH from prop line

Backlight Rating: > 2 MH from property line  
Back hemisphere 1-2 MH from prop line  
Back hemisphere 0.5-1 MH from prop line  
Back hemisphere < 0.5 MH from prop line

Uplight Rating:

Glare Mounting: > 2 MH from property line

Glare Rating: > 2 MH from property line  
Front hemisphere 1-2 MH from prop line  
Front hemisphere 0.5-1 MH from prop line  
Back hemisphere < 0.5 MH from prop line





# Building: Indoor Lighting Controls

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

Building

Project Design Data Project Title Designe Lighting Mechanic Forms Residential Res Lightin Utility Outdoor Exterior Uses Pools PV+Bat

Combined k  
+ P D

Building Level Controls

Demand Response: Not Required < 10,000 SF  
Required > 10,000 SF  
Not Required < 10,000 SF  
Not Required - Installing as PAF  
Not Required- Building ≤ 0.5 W/SF

Shut-off: See Area Level Controls  
Whole Building: Automatic Time Switch  
Whole Building: EMCS  
Whole Building: Occupancy Sensors  
See Area Level Controls

Area Level Control

Location	Occupancy	Area Control	Multi Level Control	Area Shut-off Control	Primary Daylighting	Secondary Daylighting	Interlock	Exemption
Corridors	Corridor Area	Auth. Personnel	Exempt *	Partial Off *	N/A	N/A	<input type="checkbox"/>	Multilevel not required since <...
	Corridor Area	Manual ON/OFF	Dimmer	Occ Sensor	Included	Included		
	Dining Area (Bar/Lounge and Dining Area (Cafeteria/Fast Food)	Auth. Personnel	Bi-level Switch	See Bldg Level	Exempt *	Exempt *		
	Dining Area (Family and Leisure)	Annunciated *	Exempt *	Partial Off *	N/A	N/A		
	Electrical, Mechanical, Teleph	Exempt *	Other *	Partial On *				
	Exercise/Fitness Center and C	Other *		Vacancy				
	Financial Transaction Area			Auto Timeswitch				
	General/Commercial & Industri			EMCS				
	General/Commercial & Industri			Exempt *				
	General/Commercial & Industri			Other *				
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	Healthcare Facility and Hospit							
	High-Rise Residential Living S							
	Hotel Function Area							
	Hotel/Motel Guest Room							
	Kitchen/Food Preparation Are							
	Kitchenette or Residential Ktc							
	Laundry Area							
	Library (Reading Area)							
	Library (Stacks Area)							
	Locker Room							
	Lounge, Breakroom, or Waitin							
	Main Entrv Lobby							

Documentation Sheet:

Additional Remarks:



# Building: Outdoor Lighting Zone

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

Building

Combined Hydronic Example

Res

Project Design Data Project Title Designer Lighting Mechanical Forms Residential Res Lighting Utility Outdoor Exterior Use Pools PV+Ba

Outdoor Lighting Zone: 3

Standard Outdoor Lighting

	Title-24	ASHRAE 90.1
<input checked="" type="radio"/> Use Standard	1,050 watts	3,000 watts
<input type="radio"/> Use Override	0 watts	

Proposed Outdoor Lighting

	Title-24	ASHRAE 90.1
<input checked="" type="radio"/> Use Standard	1,050 watts	3,000 watts
<input type="radio"/> Use Installed	400 watts	
<input type="radio"/> Use Override	0 watts	

Operating Schedule: undefined



# Building: Outdoor Lighting Controls

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

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

Combined

Mandatory Controls 1 of 1

Selections with an asterisk MUST include text describing the reason for exemption

Location	Shutoff	AutoSchedule	Motion Sensor	Exemption
Outside	Photocontrol	Yes	Yes	
	Photocontrol	Yes	Yes	
	Astronomical Timer	Yes - EMCS	NA: Façade, etc. ≤ 24ft	
	Exempt *	Exempt *	NA: Wall ≤ 24ft	
	Other *		Exempt *	

Additional Remarks:



# Lighting: Controls & Additional Allowance

EnergyPro - [VRF HR Multi\*]

File Edit View Tools Window Help

Calculate Register Contents

Building

Combined Hydronic Example

- Res DHW
- VRF
  - 4th Floor Apts
  - 3rd Floor Apts
  - 2nd Floor Apts
  - 1st Floor Apts
- 1st Floor
  - Front Wall
  - Left Wall
  - Back Wall
  - Right Wall
  - Covered Slab
  - Lighting

Name: Coridor

Luminaire: 25w LED

Status: New

Multiplier: 50

Reference Code: Corr

Controls for Credit: No Lighting Controls

Additional Allowance: No Additional Allowance

Exempt from Code:

- 0.20 w/ft<sup>2</sup> Detailed Task Work
- 0.35 w/ft<sup>2</sup> Specialized Task Work
- 0.30 w/ft<sup>2</sup> Ornamental
- 0.70 w/ft<sup>2</sup> Precision Work
- 4.5 w/ft<sup>2</sup> of white board or chalk board
- 0.2 w/ft<sup>2</sup> Accent, Display and Feature
- 0.15 w/ft<sup>2</sup> Decorative lighting
- 1.0 w/ft<sup>2</sup> Videoconferencing Studio
- 0.20 w/ft<sup>2</sup> Portable Lighting for Offices
- 0.10 w/ft<sup>2</sup> Tuneable White or Dim-To-Warm
- 0.95 w/ft<sup>2</sup> Transitional Lighting Off at Night

1,250 watts



# Lighting: Outdoor Concrete/Asphalt

Name:

Application Information

Lighting Application:

Area:  ft<sup>2</sup>

Perimeter:  feet

Quantity:

Concrete Hardscape

Code Comparison

	watts
T-24 Standard:	1,050
90.1 Baseline:	3,000
Proposed:	400





Forms

# NRCC





# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 1 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## A. GENERAL INFORMATION

1.	Project Location (city)	- specify -	8.	Standards Version	Compliance2019
2.	CA Zip Code	90000	9.	Compliance Software (version)	EnergyPro 8.0
3.	Climate Zone	11	10.	Weather File	MARYSVIII.F-RFAIF-AFR_724837_c72010.epw
4.	Total Conditioned Floor Area in Scope	16,000 ft <sup>2</sup>	11.	Building Orientation (deg)	(N) 0 deg
5.	Total Unconditioned Floor Area	0 ft <sup>2</sup>	12.	Permitted Scope of Work	NewComplete
6.	Total # of Stories (Habitable Above Grade)	4	13.	Building Type(s)	Mixed Occupancy
7.	Total # of dwelling units	15	14.	Gas Type	NaturalGas

Software Approved Version

[https://ww2.energy.ca.gov/title24/2019standards/2019\\_computer\\_prog\\_list.html](https://ww2.energy.ca.gov/title24/2019standards/2019_computer_prog_list.html)

Scope

## B. PROJECT SUMMARY

Table Instructions: Table B shows which building components are included in the performance calculation. If indicated as not included, the project must show compliance prescriptively if within permit application.

Building Components Complying via Performance				Building Components Complying Prescriptively	
Envelope	<input checked="" type="checkbox"/>	Performance	Covered Process: Commercial Kitchens	<input type="checkbox"/>	Performance
	<input type="checkbox"/>	Not Included		<input checked="" type="checkbox"/>	Not Included
Mechanical	<input checked="" type="checkbox"/>	Performance	Covered Process: Computer Rooms	<input type="checkbox"/>	Performance
	<input type="checkbox"/>	Not Included		<input checked="" type="checkbox"/>	Not Included
Domestic Hot Water	<input checked="" type="checkbox"/>	Performance	Covered Process: Laboratory Exhaust	<input type="checkbox"/>	Performance
	<input type="checkbox"/>	Not Included		<input checked="" type="checkbox"/>	Not Included
Lighting (Indoor Conditioned)	<input checked="" type="checkbox"/>	Performance	The following building components are ONLY eligible for prescriptive compliance and should be documented on the NRCC form listed if within the scope of the permit application (i.e. compliance will not be shown on the NRCC-PRF-E). Electrical power systems, commissioning and solar ready requirements are mandatory and should be documented on the NRCC form listed if applicable (i.e. compliance will not be shown on the NRCC-PRF-E.)		
	<input type="checkbox"/>	Not Included			
Solar Thermal Water Heating	<input type="checkbox"/>	Performance	Mandatory Measures		
	<input checked="" type="checkbox"/>	Not Included	Electrical Power Distribution S110.11      NRCC-ELC-E is required Commissioning S120.8      NRCC-CXR-E is required Solar Ready S110.10      NRCC-SRA-E is required		

Building features included in performance results



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 2 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## C1. COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS (Annual TDV Energy Use, kBtu/ft<sup>2</sup>-yr)

### COMPLIES

Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV) <sup>1</sup>
Space Heating	24.12	6.54	17.58
Space Cooling	49.09	10.96	38.13
Indoor Fans	34.77	7.07	27.70
Heat Rejection	--	--	--
Pumps & Misc.	0.12	--	0.12
Domestic Hot Water	21.57	25.13	-3.56
Indoor Lighting	9.57	5.78	3.79
<b>ENERGY STANDARDS COMPLIANCE TOTAL</b>	<b>139.24</b>	<b>55.48</b>	<b>83.76 (60.2%)</b>

<sup>1</sup> Notes: The number in parenthesis following the Compliance Margin in column 4, represents the Percent Better than Standard.

← Compliance

## C2. RESULTS FOR 'ABOVE CODE' QUALIFICATIONS<sup>1</sup>

This project is pursuing CalGreen Tier 1  This project is pursuing CalGreen Tier 2

Miscellaneous Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV) <sup>1</sup>
Receptacle	35.87	35.87	0.0
Process	--	--	--
Other Ltg	34.90	34.90	0.0
Process Motors	--	--	--
<b>COMPLIANCE TOTAL PLUS MISCELLANEOUS COMPONENTS</b>	<b>210.01</b>	<b>126.25</b>	<b>83.8 (39.9%)</b>

<sup>1</sup> Notes: This table is used to document compliance with programs OTHER THAN Title 24 Part 6, if applicable.

## D. EXCEPTIONAL CONDITIONS

This project uses the Simplified Geometry Performance Modeling Approach which is not capable of modeling daylighting controls and assumes the prescriptive Secondary Daylit Control requirements are met. PRESCRIPTIVE COMPLIANCE documentation (form NRCC-LTI-02-E) for the requirements of section 140.6(d) Automatic Daylighting Controls in Secondary Daylit Zones is required.

This project includes Domestic Hot Water in the analysis. Please verify that Domestic Hot Water is included in the design for the permitted scope of work.



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 9 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## M. COVERED PROCESS SUMMARY §140.9

This Section Does Not Apply

## N. INDOOR LIGHTING SUMMARY §140.6

### N1. INDOOR CONDITIONED LIGHTING GENERAL INFO § 140.6<sup>1</sup>

1 Occupancy Type <sup>1</sup>	2 Conditioned Floor Area <sup>2</sup> (ft <sup>2</sup> )	3 Installed Lighting Power (Watts)	4 Lighting Control Credits (Watts)	5 Additional (Custom) Allowance		Confirmed	
				Area Category Footnotes (Watts)	Tailored Method (Watts)	Pass	Fail
						<input type="checkbox"/>	<input type="checkbox"/>
High-Rise Residential Living Spaces	12,000		0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
Corridor Area	4,000	1,450	0	0	0	<input type="checkbox"/>	<input type="checkbox"/>
<b>Building Totals:</b>	<b>16,000</b>	<b>1,450</b>	<b>0</b>	<b>0</b>	<b>0</b>		

Wattage Allowance based on occupancy and CFA

<sup>1</sup> See Table 140.6-C

<sup>2</sup> See NRCC-ITI-01-E for unconditioned spaces

<sup>3</sup> Lighting information for existing spaces modeled is not included in the table

### N2. INDOOR CONDITIONED LIGHTING SCHEDULE § 130.0<sup>1</sup>

Name or Item Tag	Complete Luminaire Description (i.e., 3-lamp fluorescent troffer, F32T8, one dimmable electronic ballast)	Watts per luminaire	How Wattage is Determined		Total Number Luminaires	Installed Watts	Confirmed	
			CEC Default from NAB	According to §130.0(c)			Pass	Fail
			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
Corr	25w LED	25	No	Yes	50	1,250	<input type="checkbox"/>	<input type="checkbox"/>
track	Track	100	No	Yes	2	200	<input type="checkbox"/>	<input type="checkbox"/>

Fixture schedule

<sup>1</sup> Lighting power densities were used in the compliance model; building departments will need to check prescriptive forms for luminaire schedule details.



# Certificate of Compliance Performance Form (NRCC-PRF) vs Prescriptive

NRCC-PRF-01-E: Overall Project  
Certificate of Compliance

Produced for all  
Nonres projects using  
Performance approach

NRCC-CXR-E: Commissioning  
Design Review

Produced as needed  
based on project  
characteristics

NRCC-ELC-E: Electrical Power  
Distribution

NRCC-ENV-E: Envelope

NRCC-LTI-E: Indoor Lighting

NRCC-LTO-E: Outdoor Lighting

NRCC-LTS-E: Sign Lighting

NRCC-MCH-E: Mechanical

NRCC-PRC-E: Covered Process

NRCC-SRA-E: Solar Ready

NRCC-PLB-E: Plumbing (DHW)

✦ All Performance projects have a  
NRCC-PRF-01-E:  
Overall Certificate of Compliance  
summarizing:

✦ Standard Design and  
Proposed Design TDV energy  
and compliance:

- Indoor Conditioned Spaces
  - Envelope
  - HVAC and plumbing
  - Lighting
  - Process ventilation fans  
(i.e. garage)

✦ Other Certificates of Compliance  
generated depends on the scope  
of the project, and when not  
included in Performance.



# NRCC-LTO Road Map

STATE OF CALIFORNIA  
**Outdoor Lighting**  
NRCC-LTO-E

CERTIFICATE OF COMPLIANCE

Project Name: Multi-Family Sample

Project Address:

STATE OF CALIFORNIA  
**Outdoor Lighting**  
NRCC-LTO-E

CALIFORNIA ENERGY COMMISSION

CALIFORNIA ENERGY COMMISSION

NRCC-LTO-E

(Page 4 of 7)

Date Prepared: 1/26/2020

**G. CUTOFF REQUIREMENTS (BUG)**

*This table includes fixtures of >=6,200 initial lumens indicated on Table F as needing to comply with Cutoff Requirements. Maximum lumens can be found in Title 24, Part 11, Section 5.106.8.*

01	02	03	04	05	06	07	08	09	10	11	12	
Backlight Rating <sup>2</sup>	Backlight Rating <sup>2</sup>			Uplight Rating <sup>2</sup>			Glare Rating (Lumens) <sup>2</sup>			Field Inspector		
Name or Item Tag	Complete Luminaire Description	Mounting Height <sup>1</sup>	Max Allowable Backlight Rating <sup>3</sup>	Backlight Rating Per Design	Lighting type	Max Allowable Uplight Rating <sup>3</sup>	Uplight Rating Per Design	Mounting Height <sup>1</sup>	Max Allowable Glare Rating <sup>3</sup>	Glare Rating Per Design	Pass	Fail
Pole	80 w LED	Back hemisphere is 1 - 2 MH from prop line	B4	B3	All other outdoor lighting, including decorative	U3	U3	2 MH from property line	G3	G0	<input type="checkbox"/>	<input type="checkbox"/>

<sup>1</sup> FOOTNOTES: Mounting Height is labeled MH in this table.  
<sup>2</sup> Authority Having Jurisdiction may ask for Luminaire cut sheets or other documentation to confirm luminaire type, uplight ratings and glare ratings used for compliance per §130.2(b)  
<sup>3</sup> BUG ratings with a lower number than the 'Max Allowable' are compliant. Ex. If Max Allowable is Bug Rating B4, then B0, B1, B2 and B3 are all compliant.

**H. OUTDOOR LIGHTING CONTROLS**

*This table demonstrates compliance with controls requirements for all new or altered luminaires installed as part of the permit application. For alteration projects, luminaires which are existing to remain (ie untouched) and luminaires which are removed and reinstalled (wiring only) do not need to be included in this table even if they are within the spaces covered by the permit application.*

*When an option having a \* is selected, the notes section of this table must be completed. The lighting controls section of the Compliance Summary Table on the first page will show "DOES NOT COMPLY" if the notes are left blank.*

**Mandatory Controls**

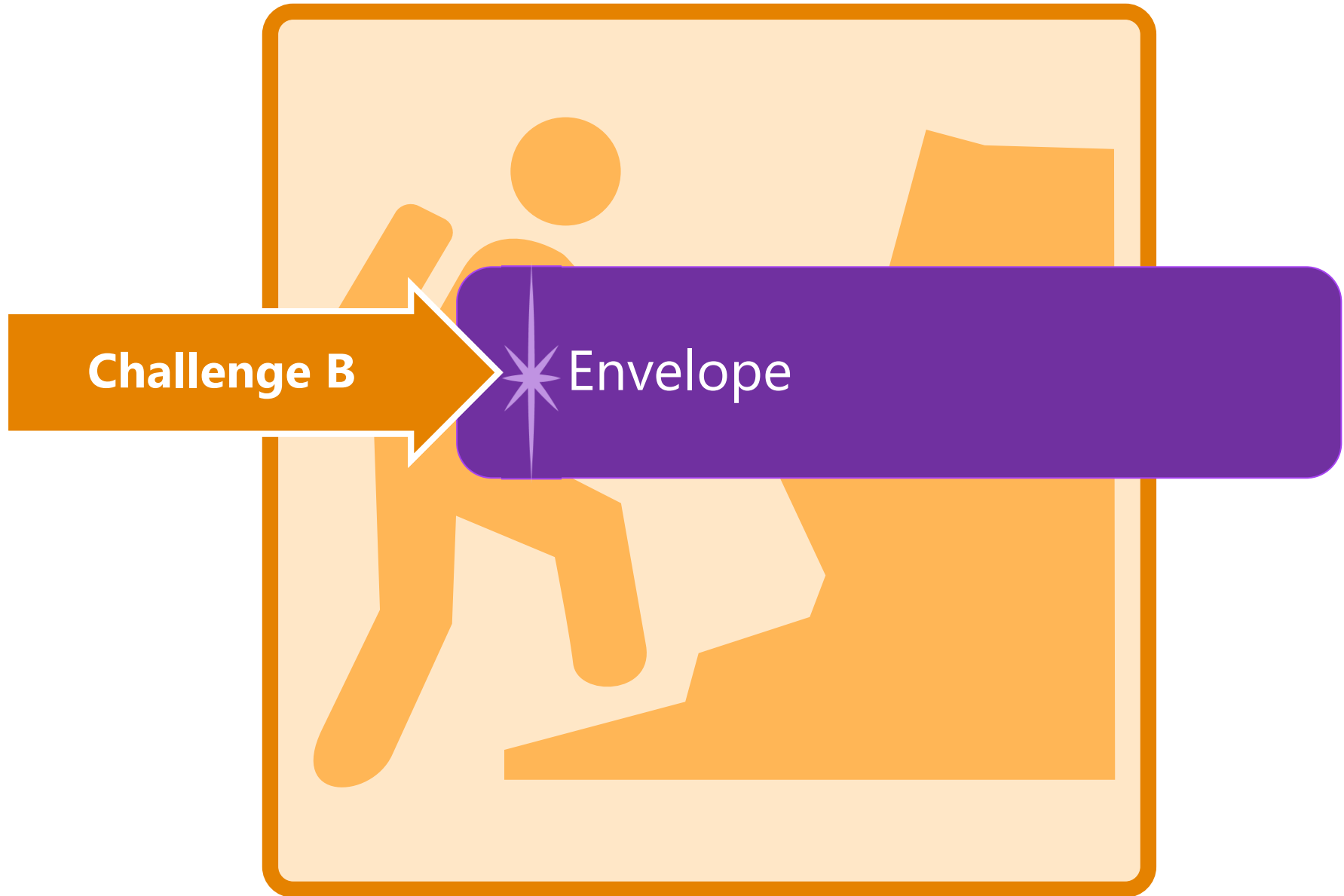
01	02	03	04	05
Area Description	Shut-Off §130.2(c)1	Auto-Schedule §130.2(c)2	Motion Sensor §130.2(c)3	Field Inspector
Outside	Photocontrol	Yes	Yes	Pass
				Fail

\* NOTES: Controls with a \* require a note in the space below explaining how compliance is achieved.  
EX: Not permitted by health & safety to be turned off; EXCEPTION 1 to §130.2(c)



# Challenge B

---








# Fenestration

§ 110.6(a)   
§ 140.3(a) 

## Minimal Changes



-  Center of Glass formula (NA6) allowance now 200 ft<sup>2</sup> (*was 1,000 ft<sup>2</sup>*)
-  Windows in “demising walls” only has to meet the U-factor requirements of the applicable climate zone (Table 140.3) (*this was not clear before*)
-  Tubular skylights now have their own prescriptive requirements: (*new*)
  - ✧ U-factor = 0.88
  - ✧ SHGC = N/A
  - ✧ VT = 0.38





EnergyPro

# Modeling





# Libraries: Fenestration

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

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

Name: PPG Solexia COG NA6

Product Type: Site-Built (Visible Transmittance: 0.5)

U-Factor: 0.29 Btu/hr-ft<sup>2</sup>-°F (SHGC: 0.49)

Center of Glass

NFRC Labeled: 0.57 Btu/hr-ft<sup>2</sup>-°F (SHGC: 0.49)

Fenestration Properties

Fenestration Type: Curtainwall/Storefrn (Number of Panes: 2)

Frame Type: Metal (Tinted, Operable, Pane Dividers)

Door has Automatic



Forms

# NRCC





# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 3 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## E. HERS VERIFICATION

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.

- Highrise residential ventilation airflow
- Highrise residential kitchen hood rated by HVI

## F. ADDITIONAL REMARKS

This Section Does Not Apply

## G. ENVELOPE GENERAL INFORMATION

1	2	3	4
Opaque Surfaces & Orientation	Total Gross Surface Area	Total Fenestration Area	Window to Wall Ratio
North-Facing <sup>1</sup>	3,200 ft <sup>2</sup>	800 ft <sup>2</sup>	25.0%
East-Facing <sup>2</sup>	1,280 ft <sup>2</sup>	112 ft <sup>2</sup>	08.7%
South-Facing <sup>3</sup>	3,200 ft <sup>2</sup>	720 ft <sup>2</sup>	22.5%
West-Facing <sup>4</sup>	1,280 ft <sup>2</sup>	128 ft <sup>2</sup>	10.0%
Total	<b>8,960 ft<sup>2</sup></b>	<b>1,760 ft<sup>2</sup></b>	<b>19.6%</b>
Roof	4,000 ft <sup>2</sup>	0 ft <sup>2</sup>	00.0%

← Window to wall ratio

### Notes:

<sup>1</sup> North-Facing is oriented to within 45 degrees of true north, including 45°00'00" east of north (NE), but excluding 45°00'00" west of north (NW).

<sup>2</sup> East-Facing is oriented to within 45 degrees of true east, including 45°00'00" south of east (SE), but excluding 45°00'00" north of east (NE).

<sup>3</sup> South-Facing is oriented to within 45 degrees of true south, including 45°00'00" west of south (SW), but excluding 45°00'00" east of south (SE).

<sup>4</sup> West-Facing is oriented to within 45 degrees of true west, including 45°00'00" north of due west (NW), but excluding 45°00'00" south of west (SW).



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 4 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## H. FENESTRATION ASSEMBLY SUMMARY §110.6

1.	2.	3.	4.	5.	6.	7.	8.	9.
Fenestration Assembly Name / Tag or I.D.	Fenestration Type / Product Type / Frame Type	Certification Method <sup>1</sup>	Assembly Method	Area ft <sup>2</sup>	Overall U-factor	Overall SHGC	Overall VT	Status <sup>2</sup>
High Performance	Vertical Fenestration Operable Window N/A	NFRC Rated	Manufactured	1760	0.28	0.22	0.50	N

<sup>1</sup> Newly installed fenestration shall have a certified NFRC Label Certificate or use the CEC default tables found in Table 110.6-A and Table 110.6-B. Center of Glass (COG) values are for the glass-only, determined by the manufacturer, and are shown for ease of verification. Site-built fenestration values are calculated per Nonresidential Appendix NA6 and are used in the analysis.

<sup>2</sup> Status: N - New, A - Altered, E - Existing

Default, COG or NFRC

## I. ENVELOPE DETAILS §120.7 & §140.3

### II. OPAQUE SURFACE ASSEMBLY SUMMARY

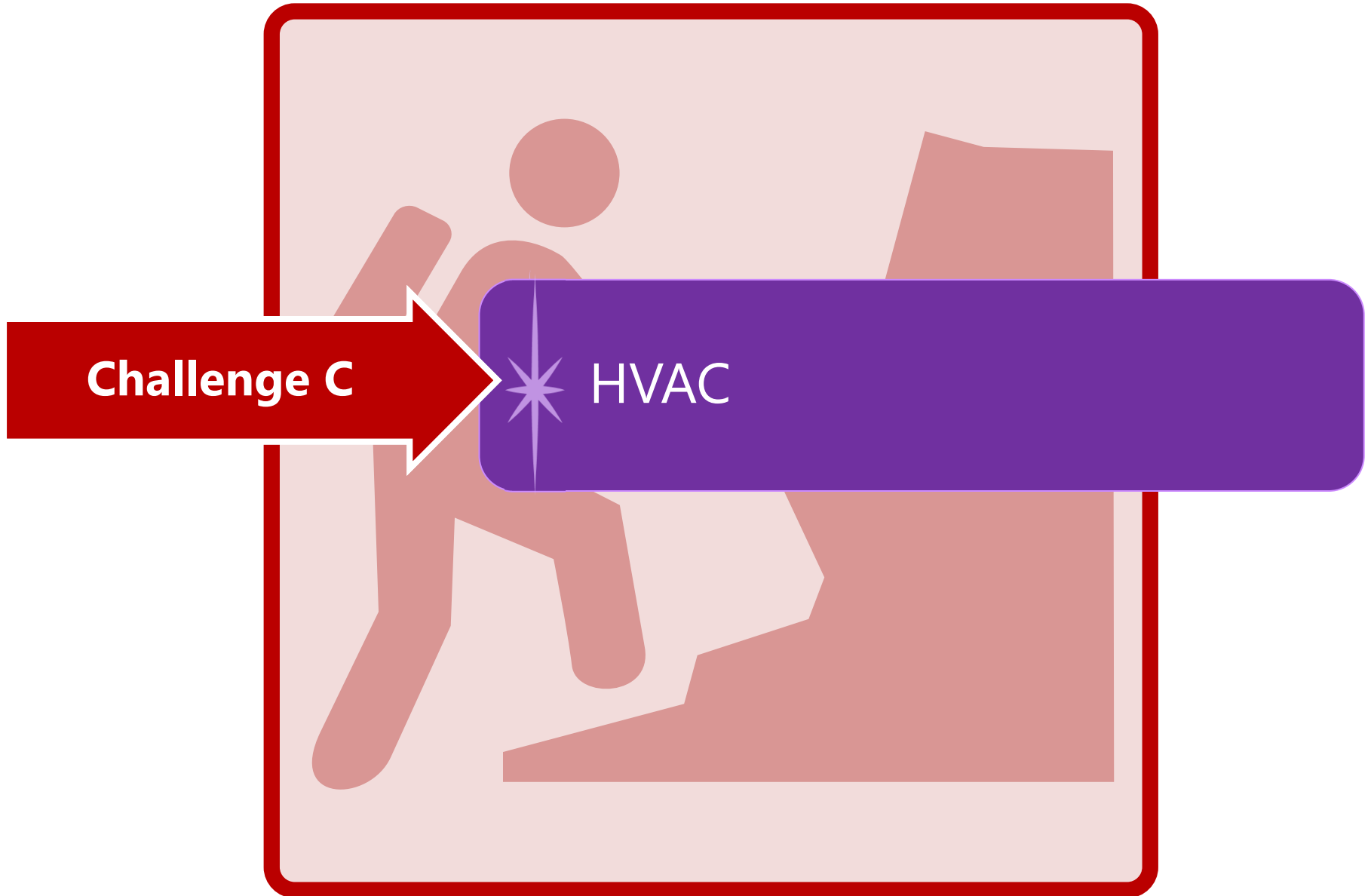
1	2	3	4	5	6	7	8	9
Surface Name	Surface Type	Description of Assembly Layers	Area (ft <sup>2</sup> )	Framing Type	Cavity R-Value	Continuous R-Value	U-Factor / F-Factor / C-Factor	Status <sup>1</sup>
R-19 Wall <sup>8</sup>	Exterior Wall	Stucco - 7/8 in. Vapor permeable felt - 1/8 in. Wood framed wall, 16in. OC, 5.5in., R-19 Gypsum Board - 1/2 in.	8960	Wood	19	NA	U-Factor: 0.072	N
R-13 Floor No Crawlspace <sup>19</sup>	Interior Floor	Wood framed floor, 16in. OC, 5.5in., R-13 Plywood - 1/2 in. Carpet - 3/4 in.	12000	Wood	13	NA	U-Factor: 0.061	N
Slab On Grade <sup>40</sup>	Underground Floor	Slab Type = Unheated Slab On Grade Insulation Orientation = None Insulation R-Value = R0	4000	NA	0	NA	F-Factor: 0.730	N
R-30 Roof Attic <sup>49</sup>	Roof	Asphalt shingles - 1/4 in. Vapor permeable felt - 1/8 in. Plywood - 1/2 in. Air - Cavity - Wall Roof Ceiling - 4 in. or more Wood framed roof, 24in. OC, 3.5in., R-30 Gypsum Board - 1/2 in.	4000	Wood	30	NA	U-Factor: 0.038	N

<sup>1</sup> Status: N - New, A - Altered, E - Existing



# Challenge C

---





## Variable Refrigerant Flow (VRF)

### ★ AC's Air Cooled (Table 110.2-H)

- ✧  $\geq 65,000 - < 135,000$ : **15.5 IEER** (*was 13.1 IEER*)
- ✧  $\geq 135,000 - < 240,000$ : **14.9 IEER** (*was 12.9 IEER*)
- ✧  $\geq 240,000$ : **13.9 IEER** (*was 11.6 IEER*)

### ★ Can now be modeled in performance method!!



# NR & Hotel/Motel & Multifamily Air Filtration

§120.1(c)1 /NR ACM



## **Nonresidential & Hotel/Motel occupancies require Mandatory:**

- ✦ **Minimum MERV 13** filtration for outdoor air supply
- ✦ **Minimum 2" Filter** or equal

## **Fan Power Adjustments:**

- ✦ Performance 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





## Demand Control Ventilation

- ✦ Typically a CO<sub>2</sub> sensor, will be required when:
  - ✧ A high-density spaces (40 ft<sup>2</sup>/person or less) **AND**
    - System has an outside air economizer **or**
    - Modulating outside air control (*new*) **or**
    - System has Outside Air >3,000 cfm. (*new*)
  
- ✦ Many exceptions removed such as:
  - ✧ Classrooms (*they now must provide if triggered*)
  - ✧ Occupancy sensor ventilation control was required (*now you might need both demand and occupancy sensor control*).

Space type exceptions expanded, such as:

- ✦ Daycare Sickrooms
- ✦ Science Labs
- ✦ Barber Shops
- ✦ Beauty and nail salons



# Ventilation Control

§120.1(d)5

§120.2(e)3



## Occupancy Sensor

- ✦ Required for the same spaces in which lighting occupancy sensor controls are required (§130.1(c)5)
  - ✧ Offices 250 ft<sup>2</sup> or smaller,
  - ✧ Multipurpose rooms less than 1,000 ft<sup>2</sup>
  - ✧ Classrooms of any size,
  - ✧ Conference rooms of any size,
  - ✧ Restrooms of any size (*new*),
  - ✧ Corridors & Stairs
- If the ventilation Table 120.1-A does not allow for the ventilation to go to ZERO, then the space is exempt
- When spaces are served with one unit, and one space is not allowed to go to ZERO, all spaces are exempt



# Ventilation Table 120.1-A

§120.1



Table 120.1-A – Minimum Ventilation Rates — p. 1 of 6

Occupancy Category	Area Outdoor Air Rate <sup>1</sup> Ra cfm/ft <sup>2</sup>	Min Air Rate for DCV <sup>2</sup> cfm/ft <sup>2</sup>	Air Class	Notes
<b>Educational Facilities</b>				
Daycare (through age 4)	0.21	0.15	2	
Daycare sickroom	0.15		3	
Classrooms (ages 5-8)	0.38	0.15	1	
Classrooms (age 9 -18)	0.38	0.15	1	
Lecture/postsecondary classroom	0.38	0.15	1	F
Lecture hall (fixed seats)	-	0.15	1	F
Art classroom	0.15		2	
Science laboratories	0.15		2	
University/college laboratories	0.15		2	
Wood/metal shop	0.15		2	
Computer lab	0.15		1	
Media center	0.15		1	A
Music/theater/dance	1.07	0.15	1	F
Multiuse assembly	0.50			F
<b>Food and Beverage Service</b>				
Restaurant dining rooms	0.50			
Cafeteria/fast-food dining	0.50			
Bars, cocktail lounges	0.50			
Kitchen (cooking)	0.15		2	

Note F Occupancy Sensor allowed to turn off ventilation when not occupied



Issue 128 | October - December 2019

## BLUEPRINT

CALIFORNIA ENERGY COMMISSION  
EFFICIENCY DIVISION

### IN THIS ISSUE

- 2019 Energy Code: NRFC Rated Exterior Doors
- 2019 Energy Code: Compliance Software
- 2019 Energy Code: HERS Providers
- Process Space
- Q&A
  - Daylighting Controls and Opaque Curtain Walls
  - Building Commissioning
  - HVAC Occupancy Sensor Zone Control Requirements
  - Lighting Power Exceptions and Control Requirements
  - Occupant Controlled Smart Thermostats

#### 2019 ENERGY CODE: NRFC RATED EXTERIOR DOORS

The California Energy Commission's (CEC) *2019 Building Energy Efficiency Standards* (Energy Code) requires non-field fabricated exterior doors to meet U-factor and labeling requirements for all buildings. This includes opaque doors, defined as having less than 25 percent glazing material.

Exterior doors' labeled efficiency values must either use a National Fenestration Rating Council (NFRC) rating or use the default values listed in **Reference Joint Appendix JA4.5**. The default values are intentionally conservative and will not meet low-rise residential prescriptive requirements. Note: Doors with 25 percent or greater glazing are treated as fenestration.

#### 2019 ENERGY CODE: COMPLIANCE SOFTWARE

The CEC has approved several compliance software programs for the 2019 Energy Code. The list of approved software versions and their corresponding approval and expiration dates is available on the **2019 compliance software** web page. Check back often for approved version updates.

ENERGY PERFORMANCE RATINGS	
Product Description**	U-Factor / Solar Heat Gain Coefficient (SHGC)
Default Frame***	1/4 Lite (1/4)   1/2 Lite (1/2)   3/4 Lite (3/4)   Full Lite (100%)
Without Glaz.	0.20 / 0.06   0.30 / 0.19   0.38 / 0.33   0.40 / 0.40
With Glaz.	0.21 / 0.04   0.24 / 0.11   0.26 / 0.11   0.28 / 0.38
Non-Thermally-Broken	0.23 / 0.05   0.28 / 0.13   0.30 / 0.34   0.34 / 0.40
Thermally Broken	0.24 / 0.04   0.25 / 0.10   0.27 / 0.29   0.29 / 0.40
Flush/Embedded	U-Factor: 0.19   SHGC: 0.04
Air Leakage	< 0.5 cm <sup>3</sup> /m <sup>2</sup>

NFRC Door Label

For residential buildings, the following programs are approved:

- CBECC-Res 2019.1.0
- EnergyPro 8.0

For nonresidential buildings, the following programs are approved:

- CBECC-Com 2019.1.0
- EnergyPro 8.0

The CEC welcomes feedback on Blueprint. Please contact the editor at: [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)

#### HVAC Occupancy Sensor Zone Control Requirements

Are both occupancy sensor ventilation control (OSVC) and occupancy sensors zone control (OSZC) required to control ventilation and space conditioning systems as described in Sections 120.1(d)5 and 120.2(e)3?

Yes, when both of the following conditions exist:

- Occupant sensors are required for lighting controls per Section 130.1(c)5, 6, or 7.
- All occupancy categories in the zone have Note F in Table 120.1-A allowing the ventilation to be reduced to zero when the space is in occupied-standby mode.

#### Can ventilation to a zone be reduced to zero if an occupancy sensor is used when it is not required?

Yes. If an occupancy sensor is used when it is NOT required by Sections 130.1(c)5, 6, or 7, the airflow to the zone can be reduced to zero as described in Section 120.2(e)3. However, all occupancy categories in the zone must have Note F in Table 120.1-A allowing ventilation to be reduced to zero when in occupied-standby mode.

Are OSVC and OSZC still required for HVAC systems in a multi-occupancy category zone if one or more of the occupancy categories do not have a Note F in Table 120.1-A, but occupancy sensors are required by Sections 130.1(c)5, 6, or 7?

No. In this case occupancy sensors are not required for ventilation or space conditioning controls as described in Sections 120.1(d)5 and 120.2(e)3, and ventilation must be supplied at all times during scheduled occupancy. All occupancy categories in a zone must have Note F in Table 120.1-A to allow the ventilation to be reduced to zero when the zone is in occupied-standby mode. Note: Occupancy sensors are still required for lighting control.

#### Can one of either OSVC in Section 120.1(d)5 or OSZC in Section 120.2(e)3 be required and not the other?

No. Sections 120.1(d)5 or §120.2(e)3 are tied together. Either all of Section 120.1(d)5 and all of Section 120.2(e)3 are required, or neither is required.

#### Is an occupancy sensor required in each room of a zone?

Yes. Whenever using occupancy sensors for ventilation control, whether required or not, all rooms within the zone must have an occupancy sensor and the zone is not considered vacant until all rooms in the zone are vacant. See Section 120.2(e)3 for exceptions.

#### Lighting Power Exceptions and Control Requirements

For indoor lighting, if lighting is excluded from the indoor power limitations per Section 140.6(a)3, is that lighting also excluded from the indoor lighting control requirements of Section 130.1?

No. Indoor lighting excluded from the power limitations of Section 140.6 is not necessarily exempt from the mandatory control requirements of Section 130.1. These sections are independent of each other.

For outdoor lighting, if lighting is excluded from the outdoor power limitations per the exceptions to Section 140.7(a), is that lighting also excluded from the outdoor lighting control requirements of Section 130.2?

No. The only outdoor lighting control exception that aligns with the outdoor power exceptions is Exception 2 to Section 130.2(c)3. This means that if the lighting in question is exempt from the power limitations, it is also exempt from the motion sensing control requirements of 130.2(c)3. All other sections still apply.



# NR & Hotel/Motel Exhaust Ventilation

§120.1



## Exhaust Ventilation

**NEW**

- ✧ Min. required per **Table 120.1-B**
- ✧ Exhaust makeup air can use combination of
  - Outdoor air **AND/OR**
  - Recirculated air **AND/OR**
  - Transfer air



# Multifamily Ventilation

**NEW**

§120.1(b)1B



2019 Energy Code allows these **three methods** for providing mechanical ventilation for high-rise residential attached dwellings using individual systems for each unit

## Exhaust Only Ventilation (Continuous)

- ✦ Creates infiltration due to negative pressure in home
- ✦ Could potentially pull in air from other dwellings 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**



**Note:** these requirements are **very tight** and could be challenging to achieve.

- ✦ An 1,100 ft<sup>2</sup> apartment using exhaust or supply only ventilation would need to meet a max of 330 CFM<sub>50</sub> envelope leakage (2 ACH<sub>50</sub>).

## 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 ft<sup>2</sup> leakage based on dwelling unit's envelope surface area
- ✦ Ventilation rates based on **Equation 120.1-B** (ASHRAE 62.2)
- ✦ Dwelling unit mechanical ventilation field verification & diagnostic testing in accordance with Reference NR Appendix **NA7.18.1**

### **Not permitted as a ventilation source:**

- ✦ Operable windows
- ✦ Continuous operation of the forced air system



# Multifamily HERS: Range Hoods

§120.1(b)2B



## High-rise Res Range Hoods Require (in order): \*NEW

### 1) Acceptance Testing Verification (NRCA)

- ✦ Does NOT have to be performed by ATT
- ✦ Can be done by installing contractor confirming range hood HVI certified as meeting ASHRAE 62.2 airflow (100 CFM for most kitchens) and sound rating (3 sones or less) reqs

### 2) HERS inspection in the field (NRCV)

- ✦ Acceptance Testing Verification required **before** HERS inspection (see above) to confirm range hood HVI certification

### 3) Form Registration

- ✦ **NRCC** – No HERS registration required
- ✦ **NRCA** – No HERS registration required
- ✦ **NRCV** – **Must be registered** with NR HERS Provider:
  - ✦ NRCV-MCH-32-H





## Laboratory and Factory Exhaust Systems (*New*)

- ✦ Fan power regulated on fans > 10,000 cfm by either:
  - A. Discharge per ANSI Z-.5-2012 OR
  - B. Systems with filtration, scrubbers or air treatment = 0.85 w/cfm
    - All others = 0.65 w/cfm OR
  - C. Variable volume flow rate based upon wind speed and direction using anemometers OR
  - D. Variable volume flow rate based upon contaminant concentration
- ✦ Requires field verification of fan system via Acceptance Testing



EnergyPro

# Modeling





# Libraries: Exporting

EnergyPro - [Daikin AC Example]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly Fenestration Overhang Sidefin

Central Boiler Zonal Schedule

Select Target Libraries for Export

Default Library

VRF HR Multi

Export

Name	Type	Heat Output	Heat Eff.	Cool Output	Cool Eff.
Daikin REYQ120PATJ	Variable Ref. Flow	135,000	11.5 kW	120,000	10.4 kW
Daikin REYQ120PAYD	Variable Ref. Flow	135,000	11.5 kW	120,000	10.4 kW
Daikin REYQ120PBTJ	Variable Ref. Flow	135,000	10.5 kW	120,000	9.4 kW
Daikin REYQ120PBYD	Variable Ref. Flow	135,000	10.5 kW	120,000	9.4 kW
Daikin REYQ120PTJU	Variable Ref. Flow	135,000	10.5 kW	120,000	9.4 kW

1 of 103

Name	Type	Ratio	Heating	Sensible
FXFQ48PVJU	Variable Ref. Flow	1.00	54,000	35,300
FXFQ36PVJU	Variable Ref. Flow	1.00	40,000	28,600
FXFQ30PVJU	Variable Ref. Flow	1.00	34,000	22,300
FXFQ24PVJU	Variable Ref. Flow	1.00	27,000	18,900
FXFQ18PVJU	Variable Ref. Flow	1.00	20,000	14,100
FXFQ12PVJU	Variable Ref. Flow	1.00	13,500	10,300
FXFQ09PVJU	Variable Ref. Flow	1.00	10,500	9,500
FXTQ54PAVJU	Variable Ref. Flow	1.00	60,000	54,000
FXTQ48PAVJU	Variable Ref. Flow	1.00	54,000	48,000
FXTQ42PAVJU	Variable Ref. Flow	1.00	47,000	42,000
FXTQ36PAVJU	Variable Ref. Flow	1.00	40,000	36,000
FXTQ30PAVJU	Variable Ref. Flow	1.00	34,000	30,000
FXTQ24PAVJU	Variable Ref. Flow	1.00	27,000	24,000
FXTQ18PAVJU	Variable Ref. Flow	1.00	20,000	18,000
FXTQ12PAVJU	Variable Ref. Flow	1.00	13,500	12,000
FXZQ18M7VJU	Variable Ref. Flow	1.00	21,000	13,000
FXZQ12M7VJU	Variable Ref. Flow	1.00	14,000	8,000
FXZQ09M7VJU	Variable Ref. Flow	1.00	11,100	6,700
FXZQ07M7VJU	Variable Ref. Flow	1.00	8,700	5,900
FXMQ96MVJU	Variable Ref. Flow	1.00	108,000	71,000
FXMQ72MVJU	Variable Ref. Flow	1.00	81,000	56,900
FXMQ48PVJU	Variable Ref. Flow	1.00	54,000	35,800
FXMQ36PVJU	Variable Ref. Flow	1.00	40,000	28,800
FXMQ30PVJU	Variable Ref. Flow	1.00	34,000	23,800
FXMQ24PVJU	Variable Ref. Flow	1.00	27,000	15,600
FXMQ18PVJU	Variable Ref. Flow	1.00	20,000	14,400

1 of 59

General Fan Outside Air

Name: FXFQ48PVJU

Type: Variable Ref. Flow

Thermostat Type: Proportional

Minimum Airflow Ratio: 1.00

Zone is Heated

Heating Output: 54000 Btu/hr

Cooling Output: 48000 Btu/hr

Sensible Output: 35300 Btu/hr



# Libraries: HVAC

EnergyPro - [VRF HR Multi\*]

File Edit View Tools Window Help

Calculate Register Contents

Building

Libraries

Assembly

Central

Boiler

Heating Cooling Controls **Outdoor Air** Fans Evaporative Cooling Curves

Name: Daikin REYQ20

System Type: Variable Ref. Flow

Computer Room

Heating Coil: Heat Pump

Heating Type: Heat Pump

Furnace Type: None

Coil Control: Heat Pump

Total Output: VAV

Output @ 17: Variable Ref. Flow

Electrical Power: Single Package Vertical Unit

Supply Temp: 105 °F

Efficiency: 3.3 COP

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 - [VRF HR Multi\*]

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: 240000 Btu/hr

Sensible: 240000 Btu/hr

Supply Temp: 52 °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 12.5 EER 12.5 IEER

Comp/Cond Power 8.21 kW

Number of Comp. Stages: 1

Condenser

Condenser Type: Air Cooled

Evap PC Eff: 0.8

Evap Pump Motor

Design Power: 0 hp

Variable Refrigerant Flow

Type: Daikin VRV IV

Heat Recovery

Min Operating Temp: -15 °F

Condensing Unit Located Indoors

Indoor Drybulb Temp: 70 °F

Indoor Wetbulb Temp: 65 °F



# Building: System

EnergyPro - [VRF HR Multi]


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: VRF

System Type: New

New System: Daikin REYQ20

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 >= 0.5 w/sqft (Section 140.3).

Hydronic Space Heating: None

Outside Air From: Outside





# Building: System

EnergyPro - [VRF HR Multi]


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

HVAC System Pressure Drop

Device	Airflow Rate		
<input type="checkbox"/> Fully ducted return	0 cfm		
<input type="checkbox"/> Return and/or Exhaust control devices	0 cfm		
<input type="checkbox"/> MERV 16 or greater filter	0 cfm	Design pressure drop:	0 inches
<input type="checkbox"/> Carbon and other gas-phase air cleaners	0 cfm	Clean filter pressure drop:	0 inches

Exhaust System Pressure Drop

Device	Airflow Rate		
<input type="checkbox"/> Fully ducted exhaust air	0 cfm		
<input type="checkbox"/> Exhaust filters, scrubbers or other exhaust	0 cfm	Design pressure drop:	0 inches
<input type="checkbox"/> Biosafety cabinet	0 cfm	Design pressure drop:	0 inches



# Building: Zone

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

General **Lighting** Mechanical Schedules Dwelling Units

Building

Project Level

Plant Level

System

Zone

**Zone Level Mechanical System Data**

Zonal System: FXDQ24M

Zonal Multiplier: 15 VRF Pipe Length: 45 feet

Demand Control Ventilation:

Operable Window Interlock:  Add Cooling:

Supply AC per Hour: 0 Occ Sensor Vent:

Heating Supply Air Flowrate: 0 cfm

Cooling Supply Air Flowrate: 0 cfm

Ventilation Type: **Zone Ventilation**

Ventilation (from Room and Ve

Proposed

Ventilation: 0 cfm/ft<sup>2</sup> 0 cfm/ft<sup>2</sup>

Air Changes/hr: 0 AC/hr

Exhaust: 0.07 cfm/ft<sup>2</sup> 0 cfm/ft<sup>2</sup>

**Ventilation**

Type: **Balanced Ventilation**

Quantity: General Exhaust  
Laboratory Exhaust  
Commercial Kitchen Exhaust  
Parking Garage Exhaust  
Supply Ventilation  
Balanced Ventilation

Flow Control:

Heat Recovery:

Fan Control: Constant Volume

Fan Type: Centrifugal Air Foil

Configuration: Blow-Through

Design Airflow: 270 cfm

Minimum Airflow: 0 cfm

Design Power: 0.0800 hp

Drive Efficiency: 100 %

Input as Watts 100 watts





# Building: Zone


EnergyPro - [VRF HR Multi]

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

Dwelling Unit Data 1 of 1

Area	Name
800.00	Upper Units

Unit Info

Unit Name: Upper Units

Floor Area per Unit: 800 ft<sup>2</sup>

# of Units: 5

Bedrooms per Unit: 3

Mechanical Ventilation

Fan Type: Exhaust

Airflow: 0 cfm

Power: 0 watts

Heat Recovery: 0 eff

Appliances

Range Fuel Type: Fossil

Refrigerator  Specify Usage 669 kWh/yr

Dishwasher  Specify Usage 0.46 kWh/gal

Washer

Dryer Fuel Type: Fossil

Total Floor Area: 4000 ft<sup>2</sup>

Zone Floor Area: 4000 ft<sup>2</sup>

Option to input IAQ fans 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

# NRCC





# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 5 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## I2. OVERHANG DETAILS

This Section Does Not Apply

## I3. OPAQUE DOOR SUMMARY

1	2	3
Assembly Name	Overall U-factor	Status <sup>1</sup>
Wood Door11	0.500	N

## J. CRRC ROOFING PRODUCT SUMMARY §140.3

This Section Does Not Apply

## K. HVAC SYSTEM SUMMARY §110.1 & §110.2

### K1. Dry System Equipment (furnaces, air handling units, heat pumps, VRF, etc.)

Dry System Equipment <sup>1</sup> (Fan & Economizer info included below in Table N)

1	2	3	4				5			10
			Heating		Cooling		Efficiency	Total Cooling Output (kBtu/h)	Efficiency	
Equipment Name	Equipment Type	Qty	Total Heating Output (kBtu/h)	Supp Heat Source (Y/N)	Supp Heat Output (kBtu/h)	Efficiency				Total Cooling Output (kBtu/h)
4th Floor Common41	Exhaust (NA)	1	0	No	0	NA	0	NA	N	
2-3rd Floor Apts-VRF	VRF (VRF)	1	135	No	0	NA	120	NA	N	
3-2nd Floor Apts-VRF	VRF (VRF)	1	135	No	0	NA	120	NA	N	
4-1st Floor Apts-VRF	VRF (VRF)	1	135	No	0	NA	120	NA	N	
5-4th Floor Common-VRF	VRF (VRF)	1	135	No	0	NA	120	NA	N	
VRF	VRF	1	2400	NA	NA	COP-7.40	240	EER-29.23	N	

<sup>1</sup> Status: N - New, A - Altered, E - Existing



HVAC System Type



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 6 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## K2. ECONOMIZER & FAN SYSTEMS SUMMARY \$140.4<sup>1</sup>

1	2	3	4	5	6	7	8	9	10	11	12	13
Name or Item Tag	System Type	Design OA	Supply Fan				Return Fan				Economizer Type (if present)	Status <sup>5</sup>
	packaged, DOAS, etc.	CFM	CFM	BHP	Watts	Control	CFM	BHP	Watts	Control		
2-3rd Floor Apts-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N
3-2nd Floor Apts-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N
4-1st Floor Apts-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N
5-4th Floor Common-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N

<sup>1</sup> Status: N - New, A - Altered, E - Existing

Process fans (parking garage in this case)

## K3. EXHAUST FAN SUMMARY

1	2	3	4	5	6	7
System ID	Zone Name	Qty	CFM	Motor BHP	Motor Watts	Total Static Pressure (in H2O)
Floor Common41	4-4th Floor Common	1	1,200	0.080	69.8	0.28

## K4. Wet System Equipment (boilers, chillers, cooling towers, etc.)

This Section Does Not Apply

## K5. DHW EQUIPMENT SUMMARY

1	2	3	4	5	6	7	8	9	10	11
DHW Name	Heater Element Type	Tank Type	Qty	Tank Vol (gal)	Rated Input (kBtu/h)	Efficiency	Tank Insulation R-value (Int/Ext)	Standby Loss Fraction	Heat Pump Type	Tank Location or Ambient Condition
Laars HH0325CN12*B1	- specify -					NA	NA	SBLF: -99,996.000	NA	NA
Laars HH0325CN12*B1 2	Gas	Indirect	1	100.00	325	Thrm. Eff.: 0.830	0.0 / 0.0	NA	NA	Unconditioned



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 7 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

K6. MULTI-FAMILY HOTEL/MOTEL CENTRAL DHW SYSTEM DETAILS											§ 110.3
1.	2.	3.	4.	5.	6.	7.		8.			
System Name	Configuration	Type	Qty in System	Central Dist. Type	Unit Dist. Type	Recirculating Pump		Piping Length			
						Efficiency	BHP	Plenum	Outside	Buried	Add ½" Insulation (HERS)
MF0-Laars HH0325CN12* B1	"DHW System"	Central	1	Demand Control (Standard Design for new construction)	NA	0.85	0 (kW)				

K7. SOLAR HOT WATER HEATING SUMMARY										
This Section Does Not Apply										

K8. SYSTEM FEATURES §120.2					
1	2	3	4	5	6
System Name	Optimum Start	Window Interlocks per §140.4(n)	Evaporative Cooling	Heat Recovery	Other Controls
VRF	NA		NA	Yes	LoadPriority
Res DHW2 - SHW	NA	NA	NA	NA	Fixed Temperature Control, No DDC

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

K9. MECHANICAL VENTILATION AND REHEAT §120.1								
1	2	3	4	5	6	7	8	9
Zone Name	Mechanical Ventilation							DCV or Occupant Sensor Controls, or Both
	Ventilation Function	# hotel rooms	# of people	# of bedrooms	Min Supply OA CFM	Min Exhaust CFM	Conditioned Area (sf)	
1-3rd Floor Apts	NA	0	20.00	15	270	0	4000	NA
2-2nd Floor Apts	NA	0	20.00	15	270	0	4000	NA
3-1st Floor Apts	NA	0	20.00	15	270	0	4000	NA
4-4th Floor Common	Lodging - Lobbies/pre-function	0	20.00	0	2000	0	4000	Occupant Sensor



Ventilation CFM



Ventilation Controls



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 8 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## K10. DISTRIBUTION SUMMARY §120.4/140.4(I)

1	2	3	4	5
Equipment Name	Dry System Distribution			Status <sup>1</sup>
	Duct Leakage Verification Y/N	Ducts		
		Insulation R-Value	Location	

<sup>1</sup> Status: N - New, E - Existing

Does the Project include Zonal Systems?	Yes
---	-----

## K11. ZONAL SYSTEM AND TERMINAL UNIT SUMMARY § 140.4

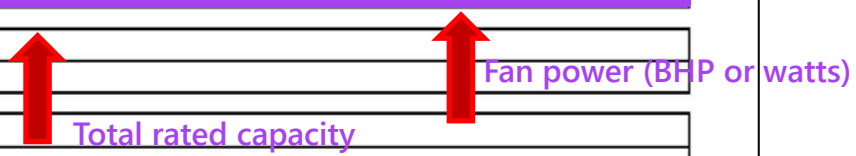
1	2	3	4	5	6	7	8	9	10	11	12
System ID	Zone Name	System Type	Rated Capacity (kBtuh)		Airflow (cfm)			Fan			
			Heating	Cooling	Design	Min.	Min. Ratio	BHP	Watts	Cycles	ECM Motor
2-3rd Floor Apts-EXH	1-3rd Floor Apts	VentilationOnly	NA	NA	NA	NA	NA	NA	NA	<input type="checkbox"/>	<input type="checkbox"/>
2-3rd Floor Apts-VRF	1-3rd Floor Apts	VRF	135.00	120.00	2900	NA	NA	0.520	453.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3-2nd Floor Apts-EXH	2-2nd Floor Apts	VentilationOnly	NA	NA	NA	NA	NA	NA	NA	<input type="checkbox"/>	<input type="checkbox"/>
3-2nd Floor Apts-VRF	2-2nd Floor Apts	VRF	135.00	120.00	2900	NA	NA	0.520	453.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4-1st Floor Apts-EXH	3-1st Floor Apts	VentilationOnly	NA	NA	NA	NA	NA	NA	NA	<input type="checkbox"/>	<input type="checkbox"/>
4-1st Floor Apts-VRF	3-1st Floor Apts	VRF	135.00	120.00	2900	NA	NA	0.520	453.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5-4th Floor Common-VRF	4-4th Floor Common	VRF	135.00	120.00	2900	NA	NA	0.520	453.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>

## K12. EVAPORATIVE COOLER SUMMARY

This Section Does Not Apply
-----------------------------

## L. UNMET LOAD HOURS

This Section Does Not Apply
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# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 17 of 18
Project Address:	Rocklin 90000	Calculation Date/Time:	17:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cbd19x		

## Q. DECLARATION OF REQUIRED CERTIFICATES OF VERIFICATION

Table Instructions: Selections shall be made by Documentation Author to indicate which Certificates of Verification must be submitted for the features to be recognized for compliance. These documents must be retained and provided to the building inspector during construction and can be found online at: [https://www.energy.ca.gov/title24/2019standards/2019\\_compliance\\_documents/Nonresidential\\_Documents/NRCV/](https://www.energy.ca.gov/title24/2019standards/2019_compliance_documents/Nonresidential_Documents/NRCV/)

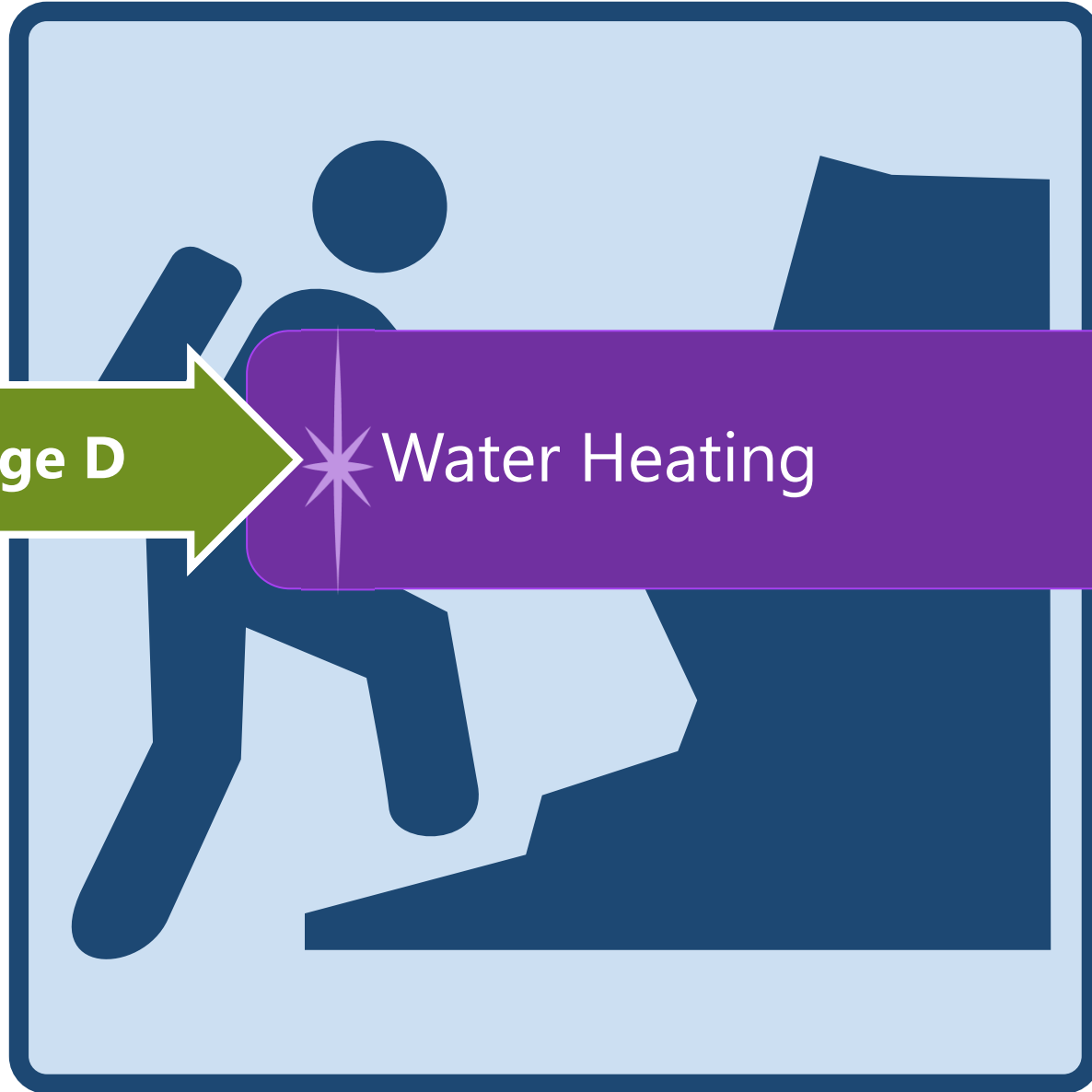
Building Component	YES	NO	Form/Title	Field Inspector	
				Pass	Fail
Mechanical	<input type="checkbox"/>	<input checked="" type="checkbox"/>	NRCV-MCH-04-H Duct Leakage Test	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	NRCV-MCH-24-H Enclosure Air Leakage	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	NRCV-MCH-27 Indoor Air Quality & Mechanical Ventilation	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	NRCV-MCH-32-H Local Mechanical Exhaust	<input type="checkbox"/>	<input type="checkbox"/>
Plumbing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	NRCV-PLB-21-H - HERS verified central systems in high-rise residential, hotel/motel application	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	NRCV-PLB-22-H - HERS verified single dwelling unit systems in high-rise residential, hotel/motel application	<input type="checkbox"/>	<input type="checkbox"/>

 HERS verification, these are the only forms that need to be registered with HERS registry



# Challenge D

---



Challenge D

Water Heating





# Hotel/Motel & Multifamily Drain Water Heat Recovery

§ 150.1(c)8B



✦ Solar savings fraction (SSF) can be reduced by 5% if HERS verified drain water heat recovery system used:

✧ CZ 1-9: 20% SSF

■ **Reduced to 15% SSF**

✧ CZ 10-16: 35% SSF

■ **Reduced to 30% SSF**

✦ Min. rated effectiveness =  $\geq 42\%$

✦ Recover heat from 50% of the showers located above the first floor and:

✧ Must at least transfer that heat either back to all the respective showers, or the water heater.

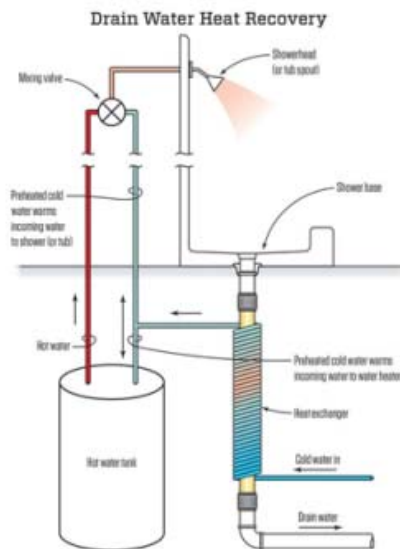


Figure 1: DWHR in equal flow configuration

Source: Journal of Light Construction, September 2016



EnergyPro

# Modeling





# Building: Zone

EnergyPro - [VRF HR Multi]

File Edit View Tools Window Help

Calculate Register Contents

General **Lighting** Mechanical Schedules Dwelling Units

Dwelling Unit Data 1 of 1

Area	Name
800.00	Upper Units

Unit Info

Unit Name: Upper Units

Floor Area per Unit: 800 ft<sup>2</sup>

# of Units: 5

Bedrooms per Unit: 3

Mechanical Ventilation

Fan Type: Exhaust

Airflow: 0 cfm

Power: 0 watts

Heat Recovery: 0 eff

Appliances

Range Fuel Type: Fossil

Refrigerator  Specify Usage 669 kWh/yr

Dishwasher  Specify Usage 0.46 kWh/gal

Washer

Dryer Fuel Type: Fossil

Option to input IAQ fans 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.

Shower Drain Water Heat Recovery

- Feeds to Shower Cold Water
- No Heat Recovery Devices
- Feeds to Shower and DHW
- Feeds to DHW Return
- Feeds to Shower Cold Water

Compact DHW Distribution

Distance to Kitchen: 20 feet

Distance to M Bath: 20 feet

Distance to Other: 20 feet

Total Floor Area: 4000 ft<sup>2</sup>




Zone Floor Area: 4000 ft<sup>2</sup>



# Central Heat Pump Water Heaters

## Prescriptive Measure "Fix" Docket 19-BSTD-01

<https://efiling.energy.ca.gov/GetDocument.aspx?tn=231318&DocumentContentId=63067>

 CALIFORNIA ENERGY COMMISSION  

December 19, 2019

**Executive Director Determination Pursuant to Section 150.1(c)8C**

The 2019 California Energy Code (Energy Code) specifies two prescriptive pathways for installation of a domestic water heating system serving multiple dwelling units, applicable both to low-rise residential (Title 24, California Code of Regulations, Part 6, Section 150.1(c)8) and to high-rise residential and hotel/motels (Section 140.5(b), which refers to 150.1(c)8).

The first option specified in subsection B, permits the installation of a gas or propane water heating system that incorporates a recirculation system with a minimum of two loops and sufficient solar thermal water heating equipment to achieve a minimum solar savings fraction. The second pathway, specified in subsection C, permits "[a] water heating system serving multiple dwelling units determined by the executive director to use no more energy than the one specified in subsection B."

Staff has received multiple requests from stakeholders pursuant to section 150.1(c)8C to approve water heating systems designed to use electric heat pump technology that deliver equivalent or superior efficiency compared to the gas system specified in 150.1(c)8B. In response to these requests, staff have assessed the attached central heat pump water heating system specification and recommended executive director approval on the basis of this assessment.

In accordance with Section 150.1(c)8C, the executive director hereby determines that a central heat pump water heating (CHPWH) system that meets the installation criteria in attachment 1 and attachment 2 with the following additional requirements will consume no more energy than the pathway specified in Section 150.1(c)8B, and therefore may be used to show compliance with Section 150.1(c)8C:


- For Climate Zones 1 through 9, a solar water-heating system with a minimum solar savings fraction (SSF) of 0.20, or additional photovoltaic system capacity of 0.1 kWdc per dwelling unit in excess of the requirement specified in Section 150.1(c)14.
- For Climate Zones 10 through 15, a solar water-heating system with a minimum SSF of 0.35, or additional photovoltaic system capacity of 0.1 kWdc per dwelling unit in excess of the requirement specified in Section 150.1(c)14.

energy.ca.gov  
1516 9th Street, Sacramento, CA 95814

Page 2

- For Climate Zone 16, a minimum of 2 inches of pipe insulation for the recirculation loop and a solar water-heating system with a minimum SSF of 0.35; or a minimum of 2 inches of pipe insulation for the recirculation loop and additional photovoltaic system capacity of 0.1 kWdc per dwelling unit in excess of the requirement specified in Section 150.1(c)14.

Based on this information, the central heat pump water heater system will use no more energy than the one specified in Title 24, California Code of Regulations, Part 6, Section 150.1(c)8B and 140.5(b), and therefore may be used to satisfy the prescriptive requirement for low-rise residential and high-rise residential and hotel/motel building water-heating systems serving multiple dwelling units specified by Section 150.1(c)8C.

Sincerely,  
  
Drew Bohan  
Executive Director

**ATTACHMENTS**

Attachment 1	Prescriptive Sizing and Layout Requirements for Central Heat Pump Water Heaters
Attachment 2	Piping Schematic



Forms

# NRCC





# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 6 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

## K2. ECONOMIZER & FAN SYSTEMS SUMMARY \$140.4<sup>1</sup>

1	2	3	4	5	6	7	8	9	10	11	12	13
Name or Item Tag	System Type	Design OA	Supply Fan				Return Fan				Economizer Type (if present)	Status <sup>5</sup>
	packaged, DOAS, etc.	CFM	CFM	BHP	Watts	Control	CFM	BHP	Watts	Control		
2-3rd Floor Apts-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N
3-2nd Floor Apts-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N
4-1st Floor Apts-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N
5-4th Floor Common-VRF	VRF	0	2900	0.520	453.8	ConstantVolume	NA	NA	NA	NA	NA	N

<sup>1</sup> Status: N - New, A - Altered, E - Existing

## K3. EXHAUST FAN SUMMARY

1	2	3	4	5	6	7
System ID	Zone Name	Qty	CFM	Motor BHP	Motor Watts	Total Static Pressure (in H2O)
4th Floor Common41	4-4th Floor Common	1	1,200	0.080	69.8	0.28

## K4. Wet System Equipment (boilers, chillers, cooling towers, etc.)

This Section Does Not Apply

## K5. DHW EQUIPMENT SUMMARY

1	2	3	4	5	6	7	8	9	10	11
DHW Name	Heater Element Type	Tank Type	Qty	Tank Vol (gal)	Rated Input (kBtu/h)	Efficiency	Tank Insulation R-value (Int/Ext)	Standby Loss Fraction	Heat Pump Type	Tank Location or Ambient Condition
Laars HH0325CN12*B1	- specify -					NA	NA	SBLF: -99,996.000	NA	NA
Laars HH0325CN12*B1 2	Gas	Indirect	1	100.00	325	Thrm. Eff.: 0.830	0.0 / 0.0	NA	NA	Unconditioned



# NRCC-PRF Road Map

Project Name:	Multi family Example	NRCC-PRF-01-E	Page 7 of 18
Project Address:	90000	Calculation Date/Time:	16:15, Sun, Jan 19, 2020
Input File Name:	VRF HR Multi.cibd19x		

K6. MULTI-FAMILY HOTEL/MOTEL CENTRAL DHW SYSTEM DETAILS											§ 110.3
1.	2.	3.	4.	5.	6.	7.		8.			
System Name	Configuration	Type	Qty in System	Central Dist. Type	Unit Dist. Type	Recirculating Pump		Piping Length			
						Efficiency	BHP	Plenum	Outside	Buried	Add ½" Insulation (HERS)
MFO-Laars HH0325CN12* B1	"DHW System"	Central	1	Demand Control (Standard Design for new construction)	NA	0.85	0 (kW)				

K7. SOLAR HOT WATER HEATING SUMMARY					
This Section Does Not Apply					

K8. SYSTEM FEATURES §120.2					
1	2	3	4	5	6
System Name	Optimum Start	Window Interlocks per §140.4(n)	Evaporative Cooling	Heat Recovery	Other Controls
VRF	NA		NA	Yes	LoadPriority
Res DHW2 - SHW	NA	NA	NA	NA	Fixed Temperature Control, No DDC

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

K9. MECHANICAL VENTILATION AND REHEAT §120.1								
1	2	3	4	5	6	7	8	9
Zone Name	Mechanical Ventilation							DCV or Occupant Sensor Controls, or Both
	Ventilation Function	# hotel rooms	# of people	# of bedrooms	Min Supply OA CFM	Min Exhaust CFM	Conditioned Area (sf)	
1-3rd Floor Apts	NA	0	20.00	15	270	0	4000	NA
2-2nd Floor Apts	NA	0	20.00	15	270	0	4000	NA
3-1st Floor Apts	NA	0	20.00	15	270	0	4000	NA
4-4th Floor Common	Lodging - Lobbies/pre-function	0	20.00	0	2000	0	4000	Occupant Sensor



# Next Steps

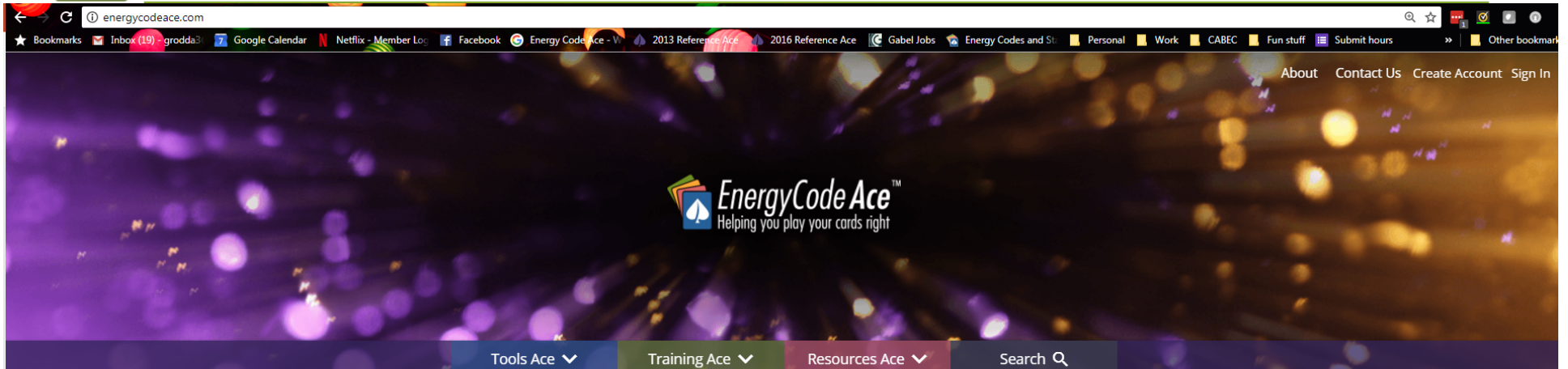


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### 📌 Title 24, Part 6 2019 Standards

<p><b>Introduction to CBECC-Res Energy Modeling Software for Residential Buildings</b></p>	<p><b>2019 Title 24, Part 6 Essentials — Nonresidential: Modeling</b></p>	<p><b>2019 Title 24, Part 6 Essentials — Residential: Modeling</b></p>
<p><b>2019 Title 24, Part 6 Essentials — Nonresidential: Introduction to Modeling</b></p>	<p><b>2019 Title 24, Part 6 Essentials — Residential: Introduction to Modeling</b></p>	<p><b>2019 Title 24, Part 6 Essentials — Residential: Modeling Tips</b></p>
<p>This is a three-hour course that answers the questions of how to comply with the Efficiency Standard. It does NOT address hands-on work with software who are uncertain about complying with the software. This 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.</p> <p><a href="#">Show Available Training</a></p>	<p><b>2019 Title 24, Part 6 Essentials - EnergyPro Software for Residential Compliance - Intermediate/Advanced</b></p> <p>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.</p> <p><a href="#">Show Available Training</a></p>	<p><b>2019 Title 24, Part 6 Essentials - EnergyPro Software for Residential Compliance - Introduction</b></p> <p>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.</p> <p><a href="#">Show Available Training</a></p>

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# Residential Modeling 2019 Energy Code New Construction Project using EnergyPro 8

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

The screenshot shows a Zoom meeting in progress. On the left, a desk is visible with two large monitors displaying software interfaces, a laptop, a keyboard, and a microphone. On the right, a chat window is open, showing a list of messages from participants. The chat messages are as follows:

- 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.

At the bottom left of the screenshot is the EnergyCode Ace logo with the tagline "Helping you play your cards right". At the bottom right of the screenshot is a stack of colorful cards with a blue spade icon on top.





## 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 nonresidential, high-rise residential and hotel/motel buildings. The 2019 Energy Code becomes effective January 1, 2020. All measures listed apply to nonresidential, high-rise residential and hotel/motel buildings, unless otherwise noted.

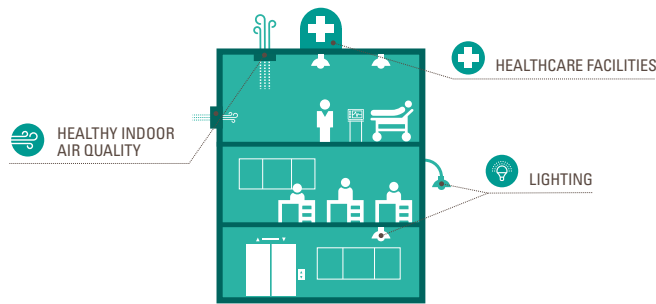


Figure 1— 2019 Energy Code Key Features Modified from *California Energy Commission Infographic*

## 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 over the lifespan of a building. California's energy-efficiency standards for buildings and appliances have saved consumers billions in lower electricity and natural gas bills.

The 2019 Energy Code for nonresidential, high-rise residential and hotel/motel buildings emphasizes better lighting and ventilation. It also extends energy-efficiency requirements to newly constructed healthcare facilities for the first time. The California Energy Commission estimates that it will reduce energy use by about 30 percent compared to the 2016 code, largely due to lighting improvements. This should result in lower energy bills and reduced greenhouse gas emissions.

### Multifamily

Occupancies R-1 and R-2 (R-3 includes single family, duplexes and townhomes 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 ([Subchapters 3, 4, 5 & 6](#))

### Relevant Code Sections

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

- [Section 100.0\(a\)](#) – Scope: Buildings Covered
- [Section 100.1\(b\)](#) – Definitions and Rules of Construction: Definitions
- [Section 110.6\(a\)](#) – Mandatory Requirements: Certification of Fenestration Products and Exterior Doors other than Field-fabricated
- [Section 120.0](#) – Mandatory Requirements
- [Section 120.1](#) – Requirements for Ventilation and Indoor Air Quality
  - 120.1(b) – High-rise Residential Buildings
  - 120.1(c) – Nonresidential and Hotel/Motel Buildings
  - 120.1(d) – Operation and Control Requirements for Minimum Quantities of Outdoor Air
  - 120.1(g) – Air Classification and Recirculation Limitations
- [Section 120.2](#) – Required Controls for Space Conditioning Systems
  - 120.2(e)3 – Shut-Off and Reset Controls: Occupancy Sensor Zone Controls

- **Section 130.1** – Mandatory Indoor Lighting Controls
  - 130.1(a) – Manual Area Controls
  - 130.1(b) – Multi-Level Lighting Controls
  - 130.1(c) – Shut-Off Controls
  - 130.1(d) – Automatic Daylighting Controls
  - 130.1(f) – Control Interactions
- **Section 130.2** – Outdoor Lighting Controls and Equipment
  - 130.2(b) – Luminaire Cutoff Requirements
  - 130.2(c) – Controls for Outdoor Lighting
- **Section 140.3** – Prescriptive Requirements for Building Envelopes
  - 140.3(a) – Envelope Component Requirements
  - 140.3(d) – Daylighting Design Power Adjustment Factors (PAFs)
- **Section 140.6** – Prescriptive Requirements for Indoor Lighting
- **Section 140.7** – Prescriptive Requirements for Outdoor Lighting
- **Section 140.9** – Prescriptive Requirements for Covered Process
  - Section 140.9(c) – Laboratory and Factory Exhaust Systems
- **Section 141.0** – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Additions, Alterations, and Repairs
  - 141.0(b)2 – Alterations: Prescriptive Approach
  - 141.0(c) – Repairs
- **Section 150.1(c)8** – Prescriptive Standards/Component Package for Low-Rise Residential Buildings: Domestic Water-Heating Systems
- **Joint Reference Appendix JA8** – Qualification Requirements for High Efficacy Light Sources
- **Nonresidential Reference Appendix NA6** – Alternate Default Fenestration Procedure to Calculate Thermal Performance
- **Nonresidential Alternative Calculation Method (ACM) Reference Manual Tables 2, 3 & 5**



*Figure 2 – Solar PV systems may be installed with electric heat pump water heaters serving high-rise residential dwelling units or hotel/motel guest rooms as a new prescriptive water heating compliance option in the 2019 Energy Code*

## Healthcare Facility Highlights **Sections 100.0(a), 100.1(b)**

For the first time, the 2019 Energy Code extends requirements for a number of measures to newly constructed healthcare facilities, including hospitals. These measures include (but are not limited to) building envelope, lighting and mechanical systems.

There is a new [definition in Title 24, Part 6](#) to support this change. A “Healthcare Facility” is any building or portion thereof licensed pursuant to California Health and Safety Code Division 2, Chapter 1, Section 1204 or Chapter 2, Section 1250.

Healthcare Facilities are Occupancy I (Institutional) buildings including:

- I-2: Buildings and structures used for medical care on a 24-hour basis for more than five persons who are incapable of self-preservation, or classified as nonambulatory or bedridden

But not occupancies:

- I-1 (assisted living facilities)
- I-3 (prisons)
- I-4 (day care facilities)

To account for their special health and safety requirements, Healthcare Facilities are exempt from certain Energy Code requirements either entirely or because they are covered by other California codes. Many of these exceptions relate to mechanical and ventilation systems, and their control requirements. Some of these exemptions include:

- **Section 120.1(a)**: Ventilation requirements per Chapter 4 of the California Mechanical Code rather than Title 24, Part 6
- **Section 130.1(a)**: Manual Area Controls for lighting not required to be located in the same room with controlled lighting for psychiatric and secure areas because it may pose a health and safety hazard
- **Sections 130.1(b,c)**: Exempt from Multi-Level Lighting Controls and Lighting Shut-Off Controls
- **Sections 140.4(b-d,f,j-o)**: Exempt from most Prescriptive requirements for Space Conditioning Systems

The 2016 Energy Code definition for “Medical Buildings and Clinic Buildings” that were not Occupancy I has been removed from the 2019 Energy Code. Medical office buildings are considered Occupancy B not Occupancy I, so they are treated as normal office occupancies.

## Envelope Highlights

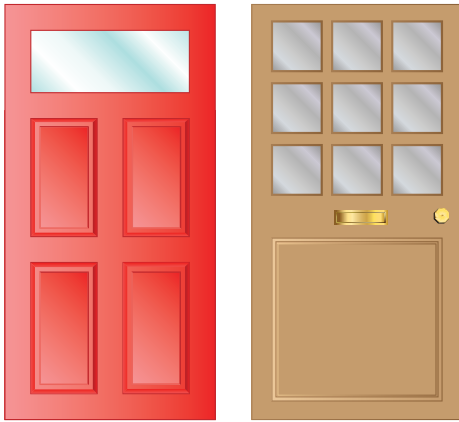


Figure 3 – Opaque Door (v) Glazed Door

**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

**Site-Built Fenestration Section 110.6(a):** The maximum total area of new fenestration for which U-factor, solar heat gain coefficient (SHGC) and visible transmittance (VT) can be calculated using the 2019 Nonresidential Reference Appendix NA6 center-of-glass formula has been reduced from 1,000 ft<sup>2</sup> to 200 ft<sup>2</sup>. This applies to nonresidential, high-rise residential and hotel/motel buildings. There are different area allowances for alterations and for low-rise residential buildings.

### Prescriptive

**Vertical Windows in Demising Walls Section 140.3(a)3:** Such windows are required to have U-factors less than or equal to the applicable area-weighted vertical fenestration U-factors from Tables 140.3-B, C or D. Vertical windows in demising walls have no SHGC or VT requirements.

**Tubular Daylighting Devices (TDD) Section 140.3(a)6:** TDDs are a new skylight type added to Prescriptive Table 140.3-B for nonresidential buildings. They require a maximum area-weighted U-factor of 0.88 and a minimum area-weighted VT of 0.38, but they have no SHGC requirements.

**Alterations Section 141.0(b)2A:** A new note clarifies that glass replaced in an existing sash and frame, or sashes replaced in an existing frame are considered repairs, rather than alterations. In these cases, Section 141.0(c) requires that the replacement be at least equivalent to the original in performance.

## Mechanical Highlights

### Mandatory

#### MERV 13 Filters for New Ducted HVAC Section 120.1(b)1 & 120.1(c)1

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 120.1-A). Designers need to consider how this may impact system design airflow.

#### High-Rise Multifamily Ventilation and Indoor Air Quality Section 120.1(b)2

All new attached dwelling units of any size must meet ASHRAE 62.2 ventilation and IAQ requirements as modified in Section 120.1(b)2A, and must also comply with Section 120.1(b)2B regarding HERS testing and verification. The 2019 Energy Code increases total ventilation rates required for residences compared to the 2016 code. Important changes include:

**Mechanical Ventilation Required Section 120.1(b)2Ai:** Dwelling units may not meet ventilation requirements by using operable windows.

**Mechanical Ventilation Airflow Rate Section 120.1(b)2Aiva:** The Total Required Ventilation Rate is calculated per Equation 120.1-B:

$$Q_{\text{tot}} = 0.03(A_{\text{floor}}) + 7.5(N_{\text{br}} + 1)$$

where:

$Q_{\text{tot}}$  = Total Required Ventilation Rate, CFM

$A_{\text{floor}}$  = Dwelling Unit Floor Area, ft<sup>2</sup>

$N_{\text{br}}$  = Number of Bedrooms (must be  $\geq 1$ )

**Multifamily Ventilation Options** Section 120.1(b)2Aivb: For multifamily buildings, you 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 cubic feet per minute (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 ( $\leq 2 \text{ ACH}_{50}$ )

**Airflow Performance** Section 120.1(b)2Bi: Multifamily ventilation outdoor airflow must be tested and HERS-verified to meet required rates.

**Kitchen Range Hoods** require minimum ventilation per ASHRAE 62.2 Section 5 (Section 120.1(b)2Bia) and maximum sound rating per ASHRAE 62.2 Section 7.2 (Section 120.1(b)2Avi). This corresponds to 100 CFM ventilation for most kitchens and a sound rating of three sones or less. The installing contractor will need to provide an NRCA Acceptance Testing form confirming that the installed range hood is HVI-certified as meeting ASHRAE 62.2 ventilation and sound requirements. After that is complete, a HERS rater must inspect the installed range hoods and verify that they are correctly listed in the HVI Certified Home Ventilating Products Directory and have been HVI-certified as meeting ASHRAE 62.2 ventilation and sound requirements.

### High-Rise Multifamily HERS Verifications

There are new HERS requirements for some high-rise residential Mandatory measures, such as checking HVI certification for kitchen range hoods, dwelling unit envelope leakage testing for unbalanced ventilation systems and outdoor airflow testing (see descriptions above). HERS testing and verification has not been common for high-rise residential buildings but these new Mandatory requirements are likely to change that. Under the 2019 Energy Code, building professionals must know when HERS verification is triggered, and schedule required testing and verification at the appropriate times in the construction process.

### Nonresidential and Hotel/Motel Ventilation and Indoor Air Quality Requirements

**Nonresidential and Hotel/Motel Ventilation Options** Sections 120.1(c)2 and 120.1(c)3: All occupiable nonresidential and hotel/motel spaces must meet minimum ventilation requirements through mechanical ventilation, natural ventilation plus mechanical ventilation or possibly natural ventilation alone.

**Natural Ventilation** Section 120.1(c)2: Naturally ventilated spaces meeting the design criteria of Section 120.1(c)2 must also have mechanical ventilation installed per Section 120.1(c)3, with two exceptions. Natural ventilation is allowed without mechanical ventilation if: (1) ventilation openings are permanently open or controlled to stay open when occupied (controls must be easily accessible to occupants) or (2) there is no mechanical space conditioning serving the zone.

**Mechanical Ventilation** Section 120.1(c)3: Required minimum CFM of outdoor air to the zone is the larger of that calculated by (1) multiplying updated Table 120.1-A minimum ventilation rates by net occupiable floor area of the ventilation zone or (2) for spaces with fixed seating or an expected number of occupants, multiplying number of occupants by 15 CFM/occupant of outside air.

**Transfer Air** (see Exception to Section 120.1(c)3) may be used to meet mechanical ventilation requirements if the total amount of outdoor air provided is enough to meet the ventilation requirements for each space individually and if the transfer air meets the new Air Classification and Recirculation Limitations.

**Air Classification and Recirculation Limitations** Section 120.1(g): The main idea of the new air classifications is to make sure that contaminated air from one space is not transferred to other spaces that have cleaner air. There are four Air Classes, and they range from Class 1 Air which is the cleanest and which can be recirculated or transferred to any other space, to Class 4 Air which is so contaminated that it cannot even be

### Revised/Expanded 2019 Table 120.1-A: Minimum Ventilation Rates

Table 120.1-A has been substantially revised and expanded for the 2019 Energy Code. The old version of Table 120.1-A for the 2016 Energy Code showed ventilation rates in CFM/ft<sup>2</sup> of conditioned floor area (CFA) for 10 broad ventilation occupancies plus "all others" to cover any not included. The required ventilation rates for 2016 were the larger of CFA times 2016 Table 120.1-A values or the expected number of occupants times 15 CFM/occ, so ventilation calculations required doing both calculations and selecting the larger.

In the 2019 Energy Code, Table 120.1-A gives Area Outdoor Air Rates ( $R_a$ ) in CFM/ft<sup>2</sup> of net occupiable area of the ventilation zone, and the table has expanded to 75 specific occupancy categories. Only occupancies with fixed seating require outdoor air calculations based on the number of occupants.

Table 120.1-A now also includes three additional columns of values:

- Minimum Air Rates for DCV (Demand Control Ventilation) in CFM/ft<sup>2</sup> which apply to Section 120.1(d)4E
- Air Class per Section 120.1(g) for transfer air used to meet ventilation requirements per the exception to Section 120.1(c)3
- Notes on some special cases within Table 120.1-A, including Note F which allows ventilation rates to be reduced to zero in occupied standby mode for certain occupancy categories

recirculated back into the original room or transferred to other Class 4 zones. Class 2 Air can be recirculated or transferred to Class 2, Class 3 and Class 4 with some limitations, but not to Class 1. Class 3 Air can be recirculated within the original space it came from, but not transferred to any other spaces. There are exceptions for small amounts of Class 2 ( $\leq 10\%$  outdoor air) and Class 3 ( $\leq 5\%$  outdoor air) recirculated or transferred air when using energy recovery devices.

Estimated Air Classes for air leaving different occupancy spaces are listed in [Tables 120.1-A, B and C](#). When air from spaces with different Air Classes is mixed together, the new mixture is reclassified with the highest (i.e., most contaminated) air classification of any of the parts.

**Exhaust Ventilation** [Section 120.1\(c\)4](#): Exhaust airflow must be designed to meet the minimum rates in the new [Table 120.1-B](#).

**Minimum Outdoor Air Control Requirements** [Section 120.1\(d\)](#): Changes to demand control ventilation and occupant sensor ventilation controls include:

**Required Demand Control Ventilation (DCV)** [Section 120.1\(d\)3](#): Demand ventilation controls are required for spaces with design occupant density, or CBC egress occupant load density, of  $\geq 25$  people/1000 ft<sup>2</sup> ( $\leq 40$  ft<sup>2</sup> per person), if the system serving the space has one or more of the following:

- An air economizer OR
- Modulating outside air control OR
- A maximum design outdoor airflow rate  $> 3,000$  CFM

The controls must meet the requirements of [Section 120.1\(d\)4](#). The 2019 Energy Code removes exceptions to DCV for a number of specific occupancies and healthcare/medical buildings, while it adds new exemptions for daycare sickrooms, science labs, barber shops and nail salons.

**Demand Control Ventilation Devices** [Section 120.1\(d\)4](#): Minimum Air Rates for DCV in CFM/ft<sup>2</sup> have been added to [Table 120.1-A](#) for occupancy types that require DCV. When the system is operating, the controls must maintain the minimum DCV ventilation levels for spaces with CO<sub>2</sub> sensors, while also maintaining ventilation that meets the Area Outdoor Air Rates ( $R_a$ ) from [Table 120.1-A](#) for other spaces served by the system, or the exhaust air rate, whichever is greater.

**Occupant Sensor Ventilation Control Devices** [Sections 120.1\(d\)5 and 120.2\(e\)3](#):

There are two notable changes to these requirements:

1. Spaces that are required to have occupancy sensor ventilation devices according to [Section 130.1\(c\)](#) (offices  $\leq 250$  ft<sup>2</sup>, multipurpose rooms  $> 1,000$  ft<sup>2</sup>, and classrooms, conference rooms and restrooms of any size), and that are also designated in the updated and revised [Table 120.1-A](#) as Note F (which allows ventilation to go down to zero when in stand-by mode) must be placed in occupied standby mode when all rooms in the zone are unoccupied for more than five minutes
2. Demand control ventilation is no longer an exception for occupancy sensor controls

## Prescriptive

**Electric Heat Pump Water Heaters** serving individual high-rise residential dwelling units and hotel/motel guest rooms, including additions and alterations, 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. Climate Zones 1 and 16 also require:

- 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.



# Lighting Highlights

## Mandatory

**Indoor Lighting Controls** [Section 130.1](#): There have been some clarifications to indoor lighting control requirements, including some new requirements and exceptions, plus a new code section on how different lighting controls must interact with each other.

**Shut-Off Controls** [Section 130.1\(c\)](#): There are several changes to this section, including:

- There is new, explicit code language that **all installed indoor lighting must have automatic controls to reduce lighting power when the space is typically unoccupied**
- [Section 130.1\(c\)5](#): Restrooms of any size have been added to the list of space types that require occupancy sensors to turn off all lighting when the room is not occupied
- Exception 2 to [Section 130.1\(c\)](#) clarifies that luminaires providing required egress lighting must maintain minimum illumination levels per CBC Section 1008 while in partial-off mode

**Automatic Daylighting Controls** [Section 130.1\(d\)](#): There are three new exceptions to daylighting control requirements.

Automatic Daylighting Controls are **not** required for:

1. Exception 1: Areas under skylights if existing structures or natural objects block direct sunlight through the skylight between 8:00 am and 4:00 pm for more than 1,500 hours per year
2. Exception 2: Spaces next to vertical glazing below overhangs and with no vertical glazing above the overhangs, if the overhang projection-to-rise ratio is  $> 1.5$  for South, East and West orientations or  $> 1.0$  for North orientation
3. Exception 6: Lighting in sidelit daylit zones for retail sales areas and wholesale showrooms

**Control Interactions** [Section 130.1\(f\)](#): This new section defines the rules to allow different indoor lighting control types to work together seamlessly and meet all [Section 130.1](#) control functions. This section is important because it explains how to deal with potentially conflicting requirements for different controls installed in the same space. For example, the manual area control for general lighting in a space ([Section 130.1\(a\)](#)) is required to allow all the other controls to set or adjust light levels per [Sections 130.1\(b\)](#) through [\(e\)](#). However, the shut-off control for a space ([Section 130.1\(c\)](#)) must also allow use of the manual area control to turn lights on, even if it overrides a pre-programmed schedule. [Section 130.1\(f\)](#) lists seven different control interaction possibilities.

*See [Section 141.0\(b\)2l](#) Prescriptive highlight below for additional changes to indoor lighting control requirements for alterations.*

**Outdoor Lighting Controls and Equipment** [Section 130.2](#): There have been some changes to outdoor lighting cutoff requirements and the code language on outdoor lighting controls has been reorganized and revised.

**Luminaire Cutoff Requirements** [Section 130.2\(b\)](#)

- Changed the trigger for meeting Backlight, Uplight and Glare (BUG) requirements from  $> 150$  watts to  $\geq 6,200$  lumens
  - Outdoor luminaires with  $\geq 6,200$  lumens must meet the BUG requirements of Title 24, Part 11 Section 5.106.8
- Exception 7 to [Section 130.2\(b\)](#) adds that outdoor lighting attached to high-rise residential or hotel/motel buildings and controlled from within a dwelling unit or guest room is exempt from cutoff requirements

**Automatic Scheduling Controls** [Section 130.2\(c\)2](#): The 2019 Energy Code added this new section that consolidates and updates previous outdoor lighting controls. It requires automatic scheduling controls that:

- Can reduce lighting power by at least 50% and no more than 90%, and can turn off lighting when an area is not occupied

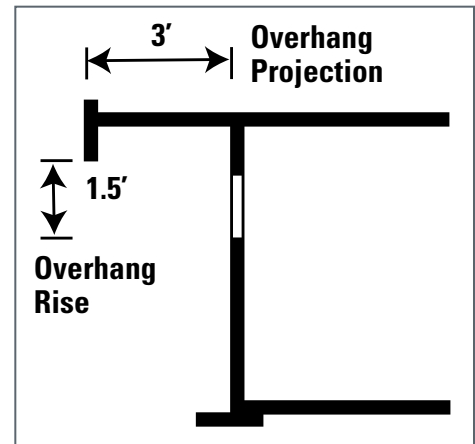


Figure 3 – Overhang Projection-to-Rise Ratio Example for Daylighting Controls Exception 2 to [Section 130.1\(d\)](#): In this example the Overhang Projection-to-Rise Ratio =  $3'/1.5' = 2$

- Allow at least two separate nighttime schedules with independent lighting levels plus a two-hour override option
- Require acceptance testing
- May be combined with motion sensors or other outdoor lighting controls

**Motion Sensing Controls** [Section 130.2\(c\)3](#): The 2019 Energy Code added this new section that consolidates and updates previous outdoor lighting motion sensor control requirements, as follows:

- Motion sensors must be able to reduce lighting power by at least 50% and no more than 90%, and must be able to turn off lighting when an area is not occupied
- Motion sensors must be able to reduce lighting power within 15 minutes of area being vacated and to turn lights back on when occupied
- Controlled luminaire wattage per sensor must be  $\leq 1,500$  watts
- Motion sensors (alone or in combination with other controls) are required for wall-mounted luminaires with bilaterally symmetric distribution (i.e., wall packs) mounted  $\leq 24$  feet above grade that illuminate building façades, ornamental hardscape or outdoor dining
  - They are also required for other outdoor luminaires where the bottom of the light fixture is mounted  $\leq 24$  feet above grade
- Exceptions 1 and 2 to [Section 130.2\(c\)3](#) state that motion sensors are not required for outdoor luminaires with  $\leq 40$  watts nor for exempt lighting in [Section 140.7\(a\)](#)
- Exception 3 to [Section 130.2\(c\)3](#) states that outdoor lighting may have minimum time out longer than 15 minutes or a minimum lighting power reduction greater than 50% to comply with any applicable health or life safety law, statute or regulation

## Prescriptive

**Indoor Lighting Power Allowances** in [Section 140.6](#) have been reduced across the board based on improved LED lighting efficiencies. This is similar to ASHRAE 90.1.

- [Table 140.6-B](#) Complete Building Method LPDs reduced by about 36%
- [Table 140.6-C](#) Area Category Method LPDs reduced by about 31%
- [Table 140.6-G](#) Tailored Method General Lighting reduced by about 18.5%, with additional reductions for display and ornamental/special effects lighting

These allowances apply to nonresidential buildings and nonresidential spaces within high-rise residential and hotel/motel buildings. For designers who have not yet switched to LED lighting, these changes are likely to increase LED lighting use for those space types throughout California or require reconsideration of indoor lighting design strategies.

**Outdoor Lighting Power Allowances** in [Section 140.7](#) have been reduced overall based on improved LED lighting efficiencies:

- [Table 140.7-A](#) General Hardscape LPDs reduced by about 35%
- [Table 140.7-B](#) Additional Lighting Power Allowances for Specific Applications reduced by about 50%

These allowances apply to outdoor illuminated areas for nonresidential buildings and nonresidential outdoor illuminated areas associated with high-rise residential and hotel/motel buildings. For designers who have not yet switched to LED lighting, these changes are likely to increase LED lighting use for outdoor lighting throughout California or require reconsideration of outdoor lighting design strategies.

**New Indoor Lighting PAF for Envelope Daylighting Devices plus Dimming**: Lighting compliance credit is available for clerestory fenestration, interior/exterior horizontal slats and interior/exterior light shelves as defined in [Section 140.3\(d\)](#) when installed with continuous dimming daylighting controls per [Section 130.1\(d\)](#).

**Altered Indoor Lighting Systems** [Section 141.0\(b\)2l](#): The 2019 Energy Code requirements for indoor lighting alterations have been substantially revised. Alterations now include all lighting changes, and there are new alteration triggers, exceptions and changes to control requirements.

Prescriptive indoor lighting alteration requirements are triggered when 10% or more of the luminaires in an enclosed space are altered. This includes ballast/driver and lamp changes made at the same time, but not those made separately.

Alterations must meet the requirements of [Section 141.0\(b\)2l i, ii or iii](#):

- Lighting alterations** to meet lighting power requirements of [Section 140.6](#) and the lighting control requirements of [Table 141.0-F](#). This option requires compliance with all the same lighting power density (LPD) and control requirements as an entirely new lighting system, except that general and display/ornamental/special effects lighting does not need to be controlled separately if existing circuits are being reused. This allowance for reusing existing circuits applies to the options in [ii](#) and [iii](#) as well.
- If the alteration **does not exceed 80%** of the area category lighting power allowance in [Section 140.6](#), control requirements are reduced per [Table 141.0-F](#). By using less installed lighting power than the option in [i](#), the option in [ii](#) becomes exempt from multi-level, daylighting and demand response controls.
- If a **one-for-one luminaire replacement project** (i.e., retrofits) limited to a building or tenant space of  $\leq 5,000$  ft<sup>2</sup> can show that the existing wattage is being reduced 40% with the altered luminaires, control requirements are reduced per [Table 141.0-F](#). This option is limited to small buildings or tenant spaces in which replacement lighting can be documented as 40% less than the existing lighting, but it gains exemption from multi-level, daylighting and demand response controls.

Prescriptive indoor lighting alteration requirements are not triggered for the following existing and new exceptions to [Section 141.0\(b\)2l](#):

- Exception 2: Changes to lighting in a room with only one luminaire
- Exception 3: Any alteration that would directly disturb existing asbestos, unless asbestos is being intentionally removed at the same time as the lighting alteration

- Exception 5: Any alteration limited to adding lighting controls or replacing lamps, ballasts or drivers
- Exception 6: Up to 50 one-for-one luminaire replacements (i.e., retrofits) in a year, either per complete floor of a building or per complete tenant in a multi-tenant building

Exception 4 for acceptance testing is unchanged: Acceptance testing is not required if controls are added to ≤ 20 luminaires.

## Covered Process Highlights

### Prescriptive

**Laboratory and Factory Exhaust Systems** Section 140.9(c): This section now covers factory exhaust systems as well as laboratory exhaust, and it has been expanded to include exhaust transfer air, fan power consumption and fume hood automatic sash closure.

**Exhaust System Transfer Air** Section 140.9(c)2: Conditioned supply air delivered to any space with mechanical exhaust must meet the requirements in Section 140.4(o).

**Fan System Power Consumption** Section 140.9(c)3: All newly installed fan exhaust systems > 10,000 CFM that serve a laboratory or factory, must meet subsection A and either B, C or D:

- Systems discharge per ANSI Z9.5-2012
- The exhaust fan system power must not exceed 0.85 W/CFM of exhaust air for systems with air filtration, scrubbers, or other air treatment devices. For all other exhaust fan systems, the system power must not exceed 0.65 W/CFM of exhaust air. Exceptions may apply.
- The volume flow rate at the stack must vary based on the measured 5-minute averaged wind speed and wind direction obtained from a calibrated local anemometer. Acceptance testing is required.
- The volume flow rate at the stack must vary based on the measured contaminant concentration in the exhaust plenum from a calibrated contaminant sensor installed within each exhaust plenum. Acceptance testing is required.

**Fume Hood Automatic Sash Closure** Section 140.9(c)4: Variable air volume (VAV) laboratory fume hoods with vertical only sashes located in fume hood intensive laboratories, as defined in Table 140.9-B, shall have an automatic sash closure system meeting specific requirements including acceptance testing.

## Performance Method

### How Prescriptive Changes Influence Performance Options

Reduced Prescriptive indoor lighting power allowances for nonresidential buildings and nonresidential spaces in high-rise residential and hotel/motel buildings eliminate a significant energy compliance trade-off in the Performance method. Designers who have already been using LED lighting in their projects may have become used to using that indoor lighting compliance credit to trade-off against other building features that were less energy efficient. The change in the indoor lighting energy budgets may require designers to rethink their strategies for some building envelope or mechanical system features.

## Impact of Revised HVAC System Mapping in the 2019 Nonresidential Alternative Calculation Method (ACM) Reference Manual

Updates to the 2019 Nonresidential Alternative Calculation Method (ACM) Reference Manual, Section 5.1.2 HVAC System Map change the Performance method standard design HVAC system assumptions, and this is likely to change compliance results. Some of the biggest changes are:

2016 NR ACM <sup>1</sup>		2019 NR ACM <sup>2</sup>	
Building Type	Standard Design	Building Type	Standard Design
<b>Residential &amp; Hotel/Motel Guest Room</b>		<b>Residential &amp; Hotel/Motel Guest Room</b>	
≤ 3 Floors	System 1 PTAC	≤ 7 Floors	System 1 SZAC
≥ 4 Floors	System 2 FPFC	≥ 8 Floors	System 2 FPFC
<b>Nonresidential (not Covered Process)</b>		<b>Nonresidential (not Covered Process)</b>	
< 10,000 ft <sup>2</sup>		< 25,000 ft <sup>2</sup>	
1 Floor	System 3 PSZ	≤ 3 Floors	System 7 SZVAV <sup>3</sup>
> 1 Floor	System 5 PVAV	4 or 5 Floors	System 5 PVAV
		> 5 Floors	System 6 VAWS
10,000 - 150,000 ft		25,000 – 150,000 ft <sup>2</sup>	
Any # Floors	System 5 PVAV	≤ 5 Floors	System 5 PVAV
		> 5 Floors	System 6 VAWS
> 150,000 ft <sup>2</sup>		> 150,000 ft <sup>2</sup>	
1 Floor	System 7 SZVAV	Any # Floors	System 6 VAWS
> 1 Floor	System 6 VAWS		

<sup>1</sup> See 2016 Nonresidential ACM Reference Manual Tables 4, 5 & 7 for details.

<sup>2</sup> See 2019 Nonresidential ACM Reference Manual Tables 2, 3 & 5 for details.

<sup>3</sup> For 2019, System 7 SZVAV (Packaged Single Zone VAV with gas heating) for all space types except laboratories will have a minimum fan speed ratio of 0.5 for Standard Design cooling capacity ≥ 65 kBtu/h, and will actually be constant volume (minimum fan speed ratio of 1) for standard design cooling capacity < 65 kBtu/h. SZVAV systems for laboratories will have a minimum fan speed ratio of 0.2 for all standard design cooling capacities.

Table 1 – Nonresidential ACM: 2019 (v) 2016

The 2019 changes to the baseline system assumptions for small nonresidential buildings correspond to typical building practices better than some of the 2016 assumptions. This should help provide Performance compliance results that match design expectations for those building and system types.

# For More Information

## Primary Documents

- Energy Code Section 100.0 – Scope  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section100scope1.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section100scope1.htm)
- Energy Code Section 100.1 – Definitions and Rules of Construction  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1001definitionsandrulesofconstruction.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1001definitionsandrulesofconstruction.htm)
- Energy Code Section 110.6 – Mandatory Requirements for Fenestration Products and Exterior Doors  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1106mandatoryrequirementsforfenestrationproductsandexteri.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1106mandatoryrequirementsforfenestrationproductsandexteri.htm)
- Energy Code Section 120.0 – Mandatory Requirements  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1200general.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1200general.htm)
- Energy Code Section 120.1 – Requirements for Ventilation and Indoor Air Quality  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1201requirementsforventilationandindoorairquality.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1201requirementsforventilationandindoorairquality.htm)
- Energy Code Section 130.1 – Mandatory Indoor Lighting Controls  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1301mandatoryindoorlightingcontrols.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1301mandatoryindoorlightingcontrols.htm)
- Energy Code Section 130.2 – Outdoor Lighting Controls and Equipment  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1302outdoorlightingcontrolsandequipment.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1302outdoorlightingcontrolsandequipment.htm)
- Energy Code Section 140.3 – Prescriptive Requirements for Building Envelopes  
[energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1403prescriptiverequirementsforbuildingenvelopes.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1403prescriptiverequirementsforbuildingenvelopes.htm)
- Energy Code Section 140.6 – Prescriptive Requirements for Indoor Lighting  
[energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1406prescriptiverequirementsforindoorlighting.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1406prescriptiverequirementsforindoorlighting.htm)
- Energy Code Section 140.7 – Prescriptive Requirements for Outdoor Lighting  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1407prescriptiverequirementsforoutdoorlighting.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1407prescriptiverequirementsforoutdoorlighting.htm)
- Energy Code Section 140.9 – Prescriptive Requirements for Covered Process  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1409prescriptiverequirementsforcoveredprocesses.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1409prescriptiverequirementsforcoveredprocesses.htm)
- Energy Code Section 141.0 – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Additions, Alterations, and Repairs  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1410additionsalterationsandrepairsstoexistingnonresidential1.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1410additionsalterationsandrepairsstoexistingnonresidential1.htm)
- Energy Code Section 150.1(c)8 – Performance and Prescriptive Compliance Approaches for Low-Rise Residential Buildings: Domestic Water Heating Systems  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesforlowr.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1501performanceandprescriptivecomplianceapproachesforlowr.htm)
- Energy Code Joint Reference Appendix JA8 – Qualification Requirements for High Efficacy Light Sources  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixa8qualificationrequirementsforhighefficacylightsources.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixa8qualificationrequirementsforhighefficacylightsources.htm)

- Energy Code Nonresidential Reference Appendix NA6 – Alternate Default Fenestration Procedure to Calculate Thermal Performance  
[energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixna6alternatedefaultfenestrationproceduretocalculatetherm1.htm](http://energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixna6alternatedefaultfenestrationproceduretocalculatetherm1.htm)
- Nonresidential Alternative Calculation Method (ACM) Reference Manual  
[www.energy.ca.gov/2019publications/CEC-400-2019-006/CEC-400-2019-006-CMF.pdf](http://www.energy.ca.gov/2019publications/CEC-400-2019-006/CEC-400-2019-006-CMF.pdf)

## California Energy Commission Information & Services

- Energy Standards Hotline: 1-800-772-3300 (Free) or [Title24@energy.ca.gov](mailto:Title24@energy.ca.gov)
- Online Resource Center:  
[www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center](http://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center)
  - The Energy Commission’s main web portal for the Energy Code, 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](http://ashrae.org/technical-resources/bookstore/standards-62-1-62-2)
- HVI Certified Home Ventilating Products Directory  
[hvi.org/hvi-certified-products-directory/](http://hvi.org/hvi-certified-products-directory/)
- California Association of Building Energy Consultants (CABEC) Webinars
  - What’s New for Multifamily Ventilation in 2019!
  - 2019 Energy Code: Lighting Updates  
[cabec.org/learning/](http://cabec.org/learning/)
- Energy Code Ace:  
[EnergyCodeAce.com](http://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/](http://energycodeace.com/content/resources-fact-sheets/)
    - What’s Changed for 2019: Nonresidential, High-Rise Residential, Hotel/Motel
    - 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](http://energycodeace.com/content/tools-ace/tool=reference-ace)
      - 2019 Energy Code
      - 2016 Energy Code
    - Training  
[energycodeace.com/training](http://energycodeace.com/training)
      - Title 24: Where We’re Headed with the 2019 Standards
      - 2019 Title 24, Part 6: Where We’re Headed with the Nonresidential Standards
      - Decoding What’s New: Let’s Talk 2019 Title 24, Part 6 – Nonresidential

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