

# Decoding 2016 Title 24, Part 6

## Let's Talk Energy Code Resources

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This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.



# Welcome



HELPING YOU PLAY YOUR CARDS RIGHT





## Recording For Future Use

This session is being recorded.



**Ace Training** \* **Decoding Talks™**

**Archives**

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- ⊕ **Decoding + 2016 Title 24, Part 6™**
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- ⊕ **Decoding + 2016 Nonresidential Lighting™**



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## California Statewide Codes & Standards



This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.



## Who Are We?

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Gabel Associates, LLC  
[gina@gabelenergy.com](mailto:gina@gabelenergy.com)

### Host: Gina Rodda

Gina Rodda, our host for the Decoding Talk series, is a Certified Energy Analyst (CEA), 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; and host of various webinars specific to Title 24 (Part 6) Building Energy Efficiency Standards.

Gina has been in the energy modeling field since 1991, through the course of *eight* California building energy code cycles.



GABEL ASSOCIATES, LLC  
BUILDING ENERGY ANALYSIS & ENERGY CODE COMPLIANCE

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## Who Are We?

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Senior Manager, NORESKO  
[sblair@noresko.com](mailto:sblair@noresko.com)

### Co-Host: Sally Blair

Sally Blair is a core team member leading initiatives for California's investor-owned utilities (IOUs) for identifying gaps and implementing recommendations to improve compliance and enforcement of the Title 24, Part 6 energy code.

She is currently supporting SCE, SDG&E, SoCal Gas and PG&E on code compliance improvement projects under the auspices of the CPUC and in support of CEC.

She holds a BS in mechanical engineering, and an MBA.



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## Our Goal Today

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- ✦ Title 24 Part 6:
  - ✧ What, about the energy code, applies to whom;
  - ✧ When, and how, should the energy code be incorporated into a project;
  - ✧ Where can information be found to support the above.

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## Agenda

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<u>Agenda for Today</u>	<u>Approx. Length</u>
✦ Welcome.....	10 minutes
✦ Why?!.....	15 minutes
✦ Let's Talk.....	80 minutes
✧ <i>Challenge A: Mandatory.....</i>	<i>20 minutes</i>
✧ <i>Challenge B: Prescriptive.....</i>	<i>20 minutes</i>
✧ <i>Challenge C: Performance.....</i>	<i>20 minutes</i>
✧ <i>Challenge D: Current Affairs.....</i>	<i>20 minutes</i>
✦ Next Steps.....	5 minutes
✦ Wrap Up.....	10 minutes



Why?



HELPING YOU PLAY YOUR CARDS RIGHT



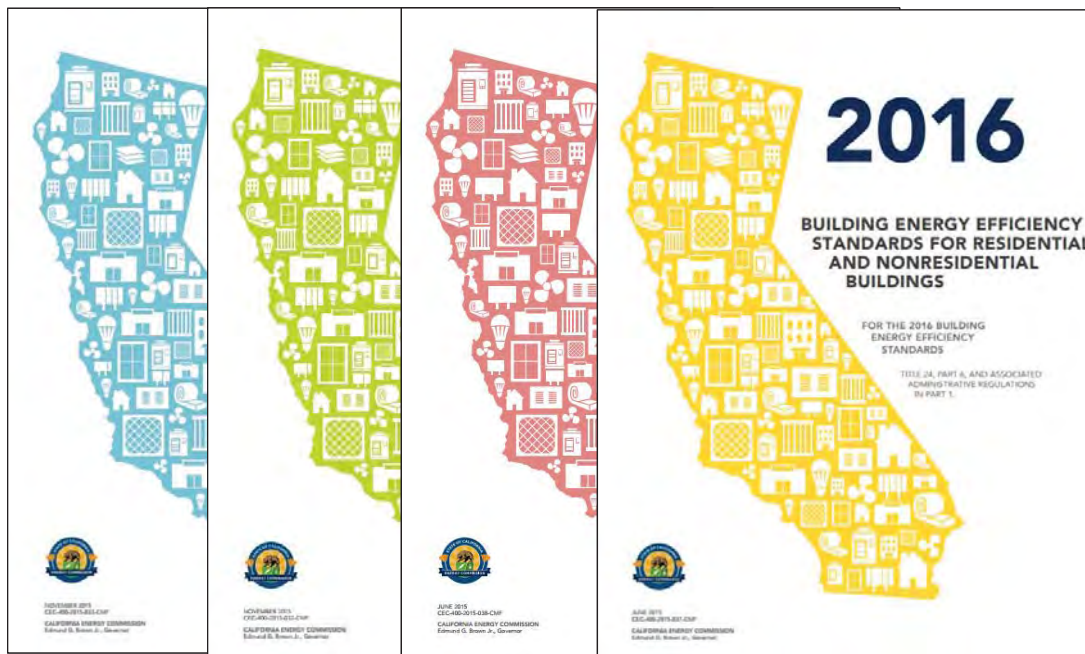
## Title 24: CA Building Code



- ★ Part 1: Administrative
- ★ Part 2: ICC Changes
- ★ Part 2.5: Residential Buildings
- ★ Part 3: Electrical Code
- ★ Part 4: Mechanical Code
- ★ Part 5: Plumbing Code
- ★ **Part 6: ENERGY CODE**
- ★ Part 8: Historic Building
- ★ Part 9: Fire Code
- ★ Part 10: Existing Buildings
- ★ Part 11: Environmental Code



# What? Title 24 Part 6: Energy Code



<http://www.energy.ca.gov/title24/2016standards/index.html>

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TABLE 100.0-A APPLICATION OF STANDARDS								
Occupancies	Application	Mandatory	Prescriptive	Performance	Additions Alterations			
General Provisions for All Buildings			100.0, 100.1, 100.2, 110.0					
Nonresidential, High-Rise Residential, And Hotels/Motels	General	120.0	140.0, 140.2		141.0			
	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3	140.0, 140.1				
	Envelope (unconditioned process spaces)	N.A.	140.3(c)					
	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3, 120.4, 120.5, 120.8	140.4					
	Water Heating	110.3, 120.3, 120.8, 120.9	140.5					
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6					
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6					
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7					
	Electrical Power Distribution	110.11, 130.5	N.A.					
	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N.A.					
Solar Ready Buildings	110.10	N.A.			141.0			
Covered Processes <sup>1</sup>	Envelope, Ventilation, Process Loads	110.2, 120.6	140.9	140.1	120.6, 140.9			
Signs	Indoor and Outdoor	130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H			
Low-Rise Residential	General	150.0			150.2(a), 150.2(b)			
	Envelope (conditioned)	110.6, 110.7, 110.8, 150(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g)	150.1(a, c)	150.1(a), 150.1(b)				
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)						
	Water Heating	110.3, 150.0(j, n)						
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)						
	Outdoor Lighting	110.9, 130.0, 150.0(k)						
	Pool and Spa Systems	110.4, 150.0(p)				N.A.	N.A.	150.2(a), 150.2(b)
	Solar Ready Buildings	110.10				N.A.	N.A.	N.A.

<sup>1</sup> Nonresidential, high-rise and hotel/motel buildings that contain covered processes may conform to the applicable requirements of both occupancy types listed in this table.



# How Is Title 24 Part 6 Written?



## By Those Who Participate

- ✦ Title 24 Part 6 is written by a specific audience...stakeholders.
- ✧ Workshops are conducted to present Standards language to obtain public suggestions and comment.
  - California IOU's and some PUC's conduct Codes & Standards programs to support revisions to the Standards
    - CASE (Codes and Standards Enhancement) initiatives
  - Organizations and individuals may also propose new measures



## CEC: Future Code

<http://www.energy.ca.gov/title24/2019standards/>



# Have a voice!

2019 STANDARDS UPDATE SCHEDULE	
DATE	MILESTONES
February 2016-July 2016	Measures Identified and approval
August 2016 to June 2017	Stakeholder meeting/workshop & final staff workshop
June 1, 2017	CASE Reports submitted to the CEC
December 1, 2017	45-day Language Hearings
March 1, 2018	Adoption of 2019 Standards at Business Meeting
June 1, 2018 to November 2018	Staff work on Software, Compliance Manuals, Electronic Documents Available to Industry
November 1, 2018	Approval of the Manuals
January 1, 2019	Software, Compliance Manuals, Electronic Documents Available to Industry
January 1, 2020	Effective Date



# Let's Talk



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## Our Question To You

1. Do you have a favorite resource you use for California energy code?
2. *What are your top 3 wishes for energy code resources?*
3. If you could wave your magic wand, Title 24 Part 6 code changes would include \_\_\_\_\_ to make your job easier?
4. *Is there a resource you like to use, but think needs more improvement?*

1. Simplify
2. Organize
3. Clarity

*It used to just be the code itself but has quickly become the Energy Code Ace website and checklists over the last year or so.*

*Side by side discussion/explanation/examples for the changed rules and stand-alone for the new rules. Just like you will find in the IAEI Code Analysis book for the changes to the Electrical Code.*

CEC website





## Challenges

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- ✦ Challenge A:
  - ✦ Mandatory Measures



- ✦ Challenge B:
  - ✦ Prescriptive Measures/Approach



- ✦ Challenge C:
  - ✦ Performance Approach



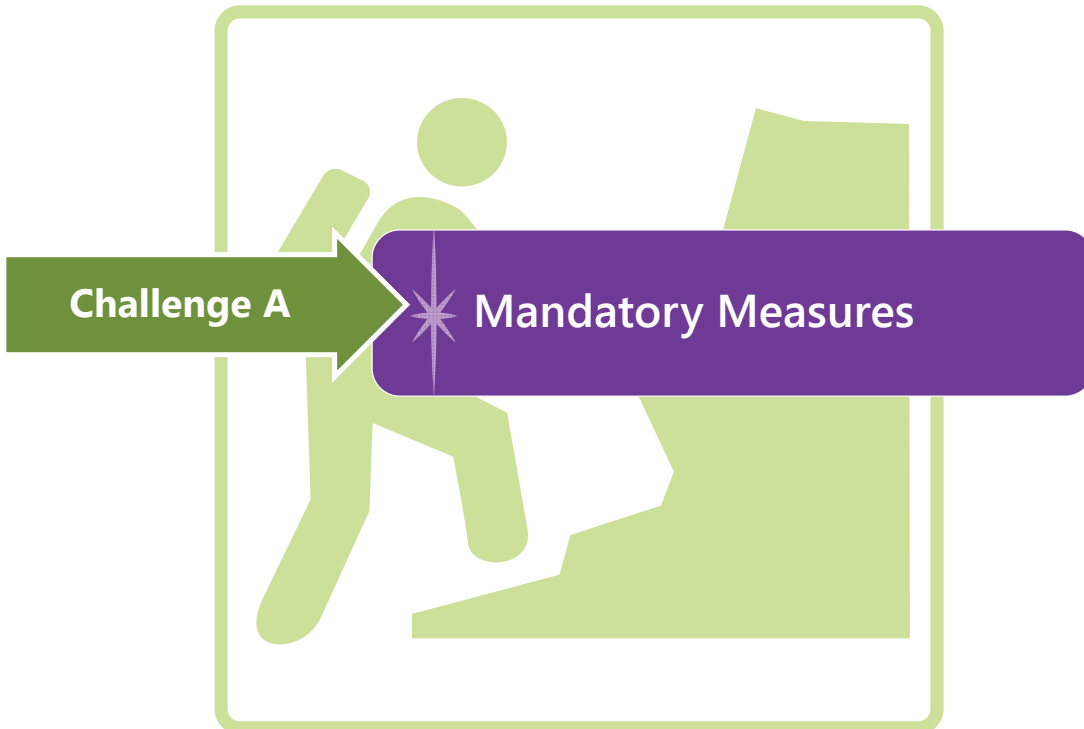
- ✦ Challenge D:
  - ✦ How To Stay Current

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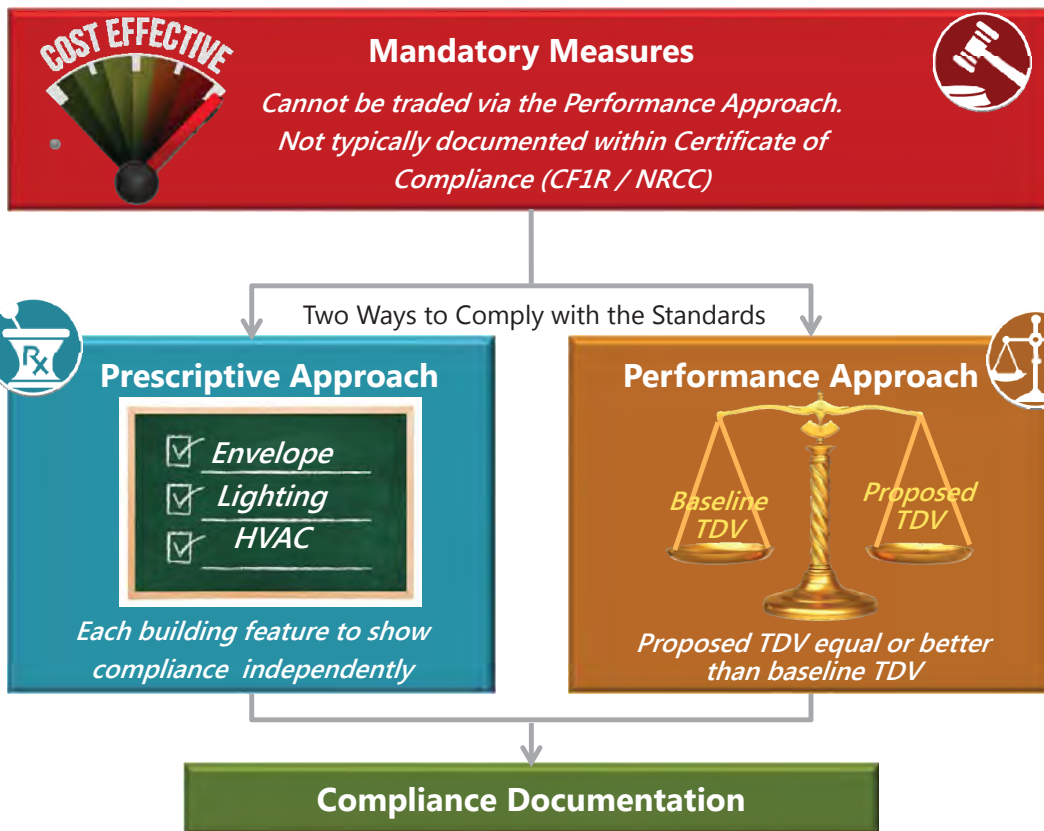


## Challenge A

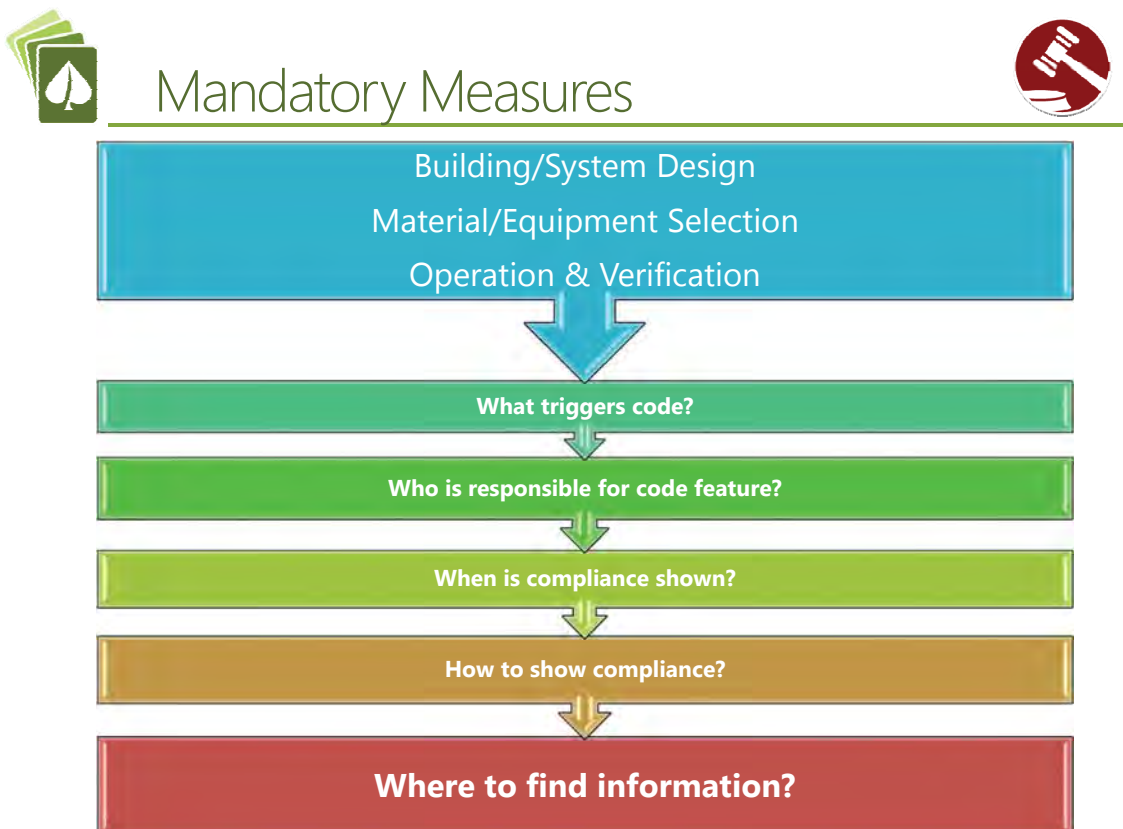
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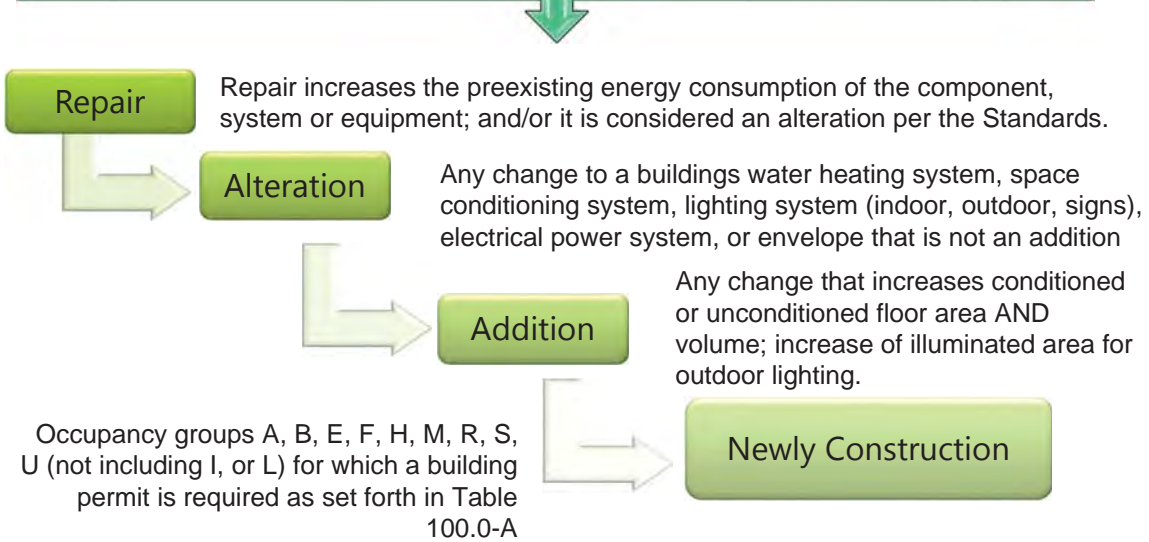
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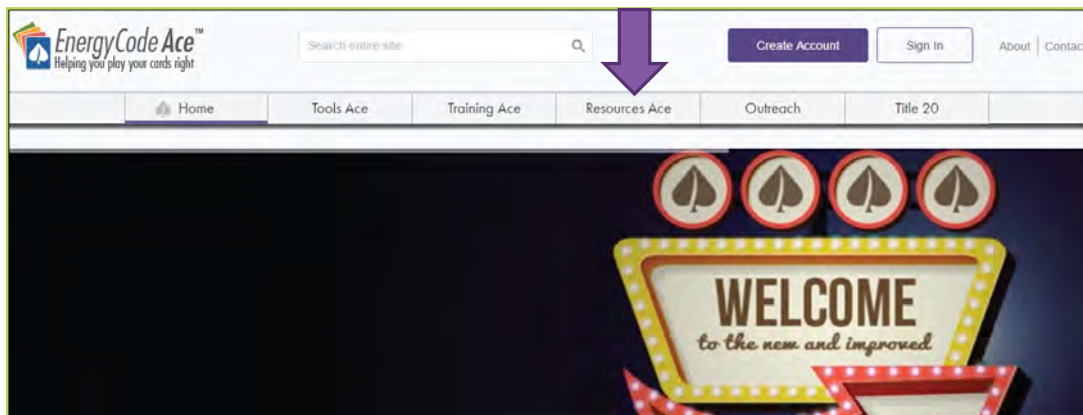
# Mandatory Measures



## What triggers code?



# Energy Code Ace



## Resources

- ✦ **Trigger Sheets:** Alterations that trigger code
- ✦ **Factsheets:** Includes **mandatory measures** of the alteration, addition and new construction.
- ✦ **Quick Reference:** Overview of code requirements



# Trigger Sheet: Residential HVAC Alteration

Change This (and nothing else)	Mandatory Requirements					Prescriptive Requirements	
	Setback Thermostat §110.2(c), §150.2(b)1F	Cooling Load Calcs §150.0(h), §150.2(b)1C	Heating Load Calcs §150.0(h), §150.2(b)1C	HERS: Duct Seal and Test §150.0(m)1-3 & 11 §150.2(b)1C, D, & E	Air Filtration and HERS: Cooling Coil Airflow and Fan Watt Draw §150.2 (b)1C, D	Duct Insulation §150.2(b)1D	HERS: Refrigerant Charge §150.2(b)1F
Whole Split or Packaged System (no ducts added or replaced)	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>h, i</sup>
Evaporator Coil (cooling coil), Condenser Coil, or Outdoor Condensing Unit	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>h, i</sup>
Furnace (air handler)	YES	no	no <sup>c</sup>	YES <sup>d</sup>			
Compressor, Refrigerant Metering Device	YES	no	no <sup>c</sup>	no	no	no	YES <sup>h, i</sup>
Some Ducts >40 feet of new or replacement	no	maybe <sup>B</sup>	maybe <sup>C, B</sup>	YES <sup>e</sup>	no	YES <sup>g</sup>	no
*All New* Ducts <sup>A</sup>	no	maybe <sup>B</sup>	maybe <sup>C, B</sup>	YES <sup>e</sup>	YES <sup>f</sup>	YES <sup>g</sup>	no
Whole Split or Packaged System and All New Ducts	YES	YES <sup>B</sup>	YES <sup>C, B</sup>	YES <sup>e</sup>	YES <sup>f</sup>	YES <sup>g</sup>	YES <sup>h, i</sup>

Note:   
 • Replacing the blower wheel fan is considered a repair and does NOT trigger the Energy Standards.   
 • All new HVAC equipment must meet minimum federal efficiency requirements   
 • Cooling line insulation is triggered if the line set (cooling system, suction line) is replaced or repaired. Line sets ≤ 1.5" in diameter must have 0.75" thick insulation.

<sup>D</sup> Duct system leakage must be ≤ 15% in total, or ≤ 10% to the outside. Or, if unable to meet the sealing requirements, all accessible leaks must be sealed and verified by a HERS rater. §150.2(b)1E applies.

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## Trigger Sheets

Always Being Added To!



- ✦ Residential:
  - ✦ HVAC
- ✦ Nonresidential:
  - ✦ Small Commercial HVAC Systems
  - ✦ Built-Up HVAC Systems
  - ✦ Refrigeration Systems
  - ✦ Interior Lighting
  - ✦ Fenestration

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# Quick Reference: HERS Measures



HERS Measure	Mandatory	Prescriptive	Performance <sup>A</sup>	Reference Appendices
<b>MECHANICAL</b>				
<b>Duct sealing (maximum leakage)</b>				RA 3.1
<b>2016 Building Energy Efficiency Standards - Reference Ace</b>	\$150.0(m)11			

**MECHANICAL**

**Duct sealing (maximum leakage)**

**2016 Building Energy Efficiency Standards - Reference Ace**

Flexible ducts having porous inner cores shall not be used.

**11. Duct System Sealing and Leakage Testing.**

When space conditioning systems utilize forced air duct systems to supply conditioned air to an occupied space, the ducts shall be sealed, as confirmed through field verification and diagnostic testing, in accordance with all applicable provisions specified in Reference Residential Appendix RA.3.1, and the leakage compliance criteria specified in Reference Residential Appendix 150.0, RA.3.1, and conforming to one of the following Subsections A, B, or C, as applicable.

**A. For single family dwellings and townhouses with the air handling unit installed and the ducts connected directly to the air handler, the total leakage of the duct system shall not exceed 5 percent of the nominal system air handler airflow, as determined utilizing the procedures in Reference Residential Appendix Section RA.3.1.4.3.1.**

**B. For single family dwellings and townhouses at the rough-in stage of construction prior to installation of the dwelling's exterior finishing:**

- If the air-handling unit is installed and the ducts are connected directly to the air handler, the total leakage of the duct system shall not exceed 6 percent of the nominal system air handler airflow as determined utilizing the procedures in Reference Residential Appendix Sections RA.3.1.4.3.2, RA.3.1.4.3.3, and RA.3.1.4.3.4.
- An air-handling unit not yet installed.
- If an air-handling unit is not yet installed, the total leakage of the duct system shall not exceed 4 percent of the nominal system air handler airflow as determined utilizing the procedures in Reference Residential Appendix Sections RA.3.1.4.3.2, RA.3.1.4.3.3, and RA.3.1.4.3.4.

**C. For multifamily dwellings with the air-handling unit installed and the ducts connected directly to the air handler, regardless of duct system location:**

- The total leakage of the duct system shall not exceed 12 percent of the nominal system air handler airflow as determined utilizing the procedures in Reference Residential Appendix Section RA.3.1.4.3.1, or
- The duct system leakage to outside shall not exceed 6 percent of the nominal system air handler airflow as determined utilizing the procedures in Reference Residential Appendix Section RA.3.1.4.3.4.

**12. Air Filtration.**

Mechanical systems that supply air to an occupiable space through ductwork exceeding 10 ft (3 m) in length and through a thermal conditioning component, except evaporative coolers, shall be provided with air filter devices in accordance with the following:

**A. System Design and Installation.**

- The system shall be designed to ensure that all recirculated air and all outdoor air supplied to the occupiable space is filtered before passing through the system's thermal conditioning component.
- The system shall be designed to accommodate the clean-filter pressure drop imposed by the system air filter device(s). The design airflow rate and maximum allowable clean-filter pressure drop at the design airflow rate applicable to each air filter device shall be determined.
- All system air filter device(s) shall be located and installed in such a manner as to allow access and regular service by the system owner.
- All system air filter device location shall be labeled to disclose the applicable design airflow rate and the maximum allowable clean-filter pressure drop as determined according to subsection (a) above. The labels shall be permanent, affixed to the air filter device readily, legible, and visible to a person replacing the air filter media.

**B. Air Filter Media Efficiency.**

The system shall be provided with air filter media having a designated efficiency equal to or greater than (MERV-8) when tested in accordance with ASHRAE Standard 52.2, or a particulate efficiency rating equal to or greater than 50 percent in the 3.0-10 µm range when tested in accordance with AHRI Standard 69.

**C. Air Filter Media Pressure Drop.**

The system shall be provided with air filter media that conforms to the maximum allowable clean-filter pressure drop determined according to Section 150.0(m)(1)CAI, when labeled using ASHRAE Standard 52.2, or as stated using AHRI Standard 69, for the applicable design airflow rate(s) for the system air filter device(s). If the alternative to 150.0(m)(1)B is utilized for compliance, the design clean-filter pressure drop for the system air filter media shall conform to the requirements given in TABLE 150.0-B.

**D. Air Filter Media Product Labeling.**

The system shall be provided with air filter media that has been labeled by the manufacturer to disclose the efficiency and pressure drop ratings that demonstrate a compliance with Sections 150.0(m)(2) and 150.0(m)(3C).

**13. Duct System Sealing and Air Filter Galle Sizing.**

Space conditioning systems that utilize forced air ducts to supply cooling to an occupiable space shall:

**A. Static Pressure Probe.** Have a field for the placement of a static pressure probe (SPSP) or a permanently installed static pressure probe (PSPSP) in the supply plenum downstream of the air conditioning evaporator coil. The size, location, and labeling of the SPSP or PSPSP shall conform to the requirements specified in Reference Residential Appendix RA.3.2.1.1 as confirmed by field verification and diagnostic testing; and

**EXCEPTION to 150.0(m)(1)A:** Systems that cannot conform to the specific static probe locations for static probes in Reference Residential Appendix 150.0, RA.3.1, shall use the nearest alternative location as described in Figure RA.3.1.1.

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# Quick Reference

## Always Being Added To!



**2016 ENERGY CODE**

**Ace Resources**

**Title 24, Part 6**

**Climate Zone Quick Reference**

**2016 ENERGY CODE**

**Ace Resources**

**Title 24, Part 6**

**Climate Zone Quick Reference**

**Compliance Baseline (Package A)**

**Climate Zones 1 & 16**

	CLZ 1	CLZ 16	Comments
Roofs	Single-Family Residential	0.15	0.15
	Multi-Family Residential	0.15	0.15
	Commercial	0.15	0.15
	Industrial	0.15	0.15
Walls	Single-Family Residential	0.15	0.15
	Multi-Family Residential	0.15	0.15
	Commercial	0.15	0.15
	Industrial	0.15	0.15
Floors	Single-Family Residential	0.15	0.15
	Multi-Family Residential	0.15	0.15
	Commercial	0.15	0.15
	Industrial	0.15	0.15
Roofing Products	Asphalt/Flt Shingles	0.15	0.15
	Clay Tiles	0.15	0.15
	Concrete Tiles	0.15	0.15
	Other	0.15	0.15
Fenestration	Minimum U-Factor	0.15	0.15
	Maximum SHGC	0.15	0.15
	Minimum Solar Heat Gain Coefficient	0.15	0.15
	Minimum Visible Light Transmittance	0.15	0.15
Space Heating	Efficiency	0.15	0.15
	Minimum AFUE	0.15	0.15
	Minimum COP	0.15	0.15
	Minimum SEER	0.15	0.15
Space Cooling	Efficiency	0.15	0.15
	Minimum EER	0.15	0.15
	Minimum COP	0.15	0.15
	Minimum SEER	0.15	0.15
Control System	Control System	0.15	0.15
	Control System	0.15	0.15
	Control System	0.15	0.15
	Control System	0.15	0.15
Ducts	Leakage	0.15	0.15
	Leakage	0.15	0.15
	Leakage	0.15	0.15
	Leakage	0.15	0.15
Water Heating	Efficiency	0.15	0.15
	Efficiency	0.15	0.15
	Efficiency	0.15	0.15
	Efficiency	0.15	0.15

- Residential:
  - Minimum HVAC and DHW Efficiencies
  - Climate Zone Quick Reference

- Nonresidential and Residential:
  - HERS Measures
  - Short Glossary of Terms

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## Online Resource Center

- ✦ Building Energy Efficiency Standards: 2013, 2016, past years
- ✦ Factsheets: Common questions answered
- ✦ Guides: Guidance on how code is applied (CLTC, ECA)



## California Energy Commission: Online Resource Center



### Energy Standards Information and Training Materials



Overview



Commissioning



Covered Processes



Electrical Power Distribution



Envelope



HVAC



Lighting



Solar Ready



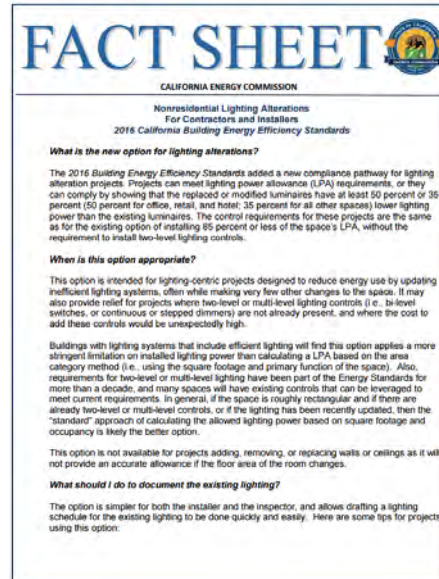
Water Heating



# Nonresidential Lighting Alterations Fact Sheet



- For Contractors and Installers and Building Departments
- Serves as a tool to:
  - Identify triggers for lighting alterations
  - Guidance on when methodology is appropriate
- Provide documentation requirements



## Fact Sheets

- Residential:
  - JA8 Compliance for Test Laboratories
  - Zonal Control Systems
- Nonresidential:
  - NR Lighting Alterations for Building Officials
  - NR Lighting Alterations for Contractors and Installers
  - ATT Certification Program

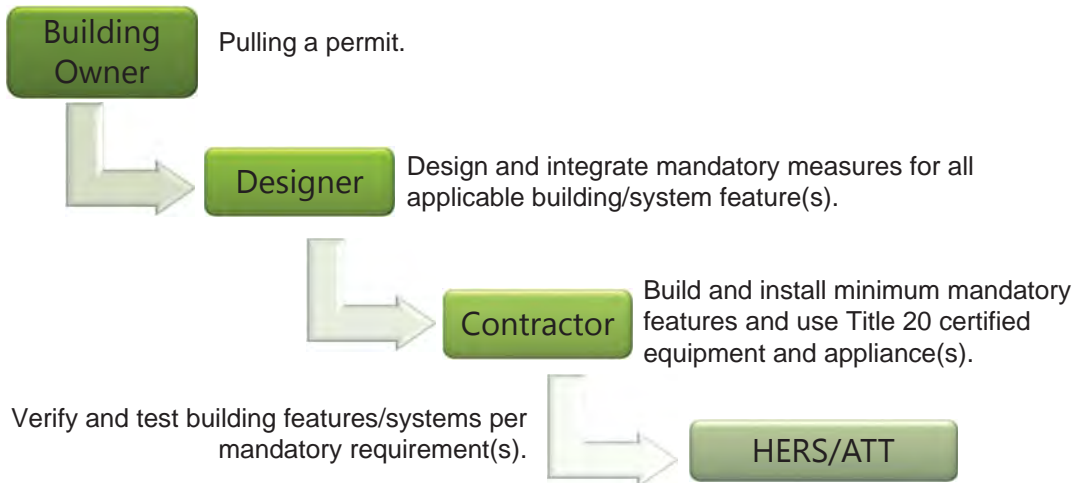




# Mandatory Measures



## Who is responsible for code feature?



# Fact Sheets



**2016 ENERGY CODE**

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



## Acceptance Testing and Home Energy Rating System



Acceptance Test Technician  
Certification Provider  
(ATTCP)



Home Energy Rating System  
(HERS)



# HERS Counter Card



Home Energy Rating System  
(HERS)

- Available now online
- CEC will print soon and provide copies
- Intended to assist counter staff/permit techs
- Inform applicants about HERS testing and verification

**RESIDENTIAL**

### HERS TESTING

**When is HERS testing/verification required?**

- Home Energy Rating System (HERS) testing is mandatory for all newly constructed buildings and is prescriptively required for most HVAC alterations.
- Some mechanical, envelope, and water heating systems require HERS testing when modeled for compliance credit under the performance approach.
- Any HERS testing that is required for a project will be specified on the CTR.

**Who can conduct HERS testing?**

- Only a HERS Rater who is certified by a HERS Provider may perform HERS testing required under the Energy Standards.
- A HERS Rater can be certified to complete HERS testing for new construction (including additions) and/or alteration projects.

**How do I find a HERS Rater?**

- HERS Providers approved by the Energy Commission maintain a directory of certified HERS Raters on their respective websites, provided on the back of this card.
- Search filters, like project type and county, are available to make finding a HERS rater in your area easier.

NOTE: Duct leakage testing by a HERS Rater is prescriptively required for certain residential HVAC systems (see 51C-903).



Acceptance Test Technician Certification Provider (ATTCP)

# ATTCP Counter Card



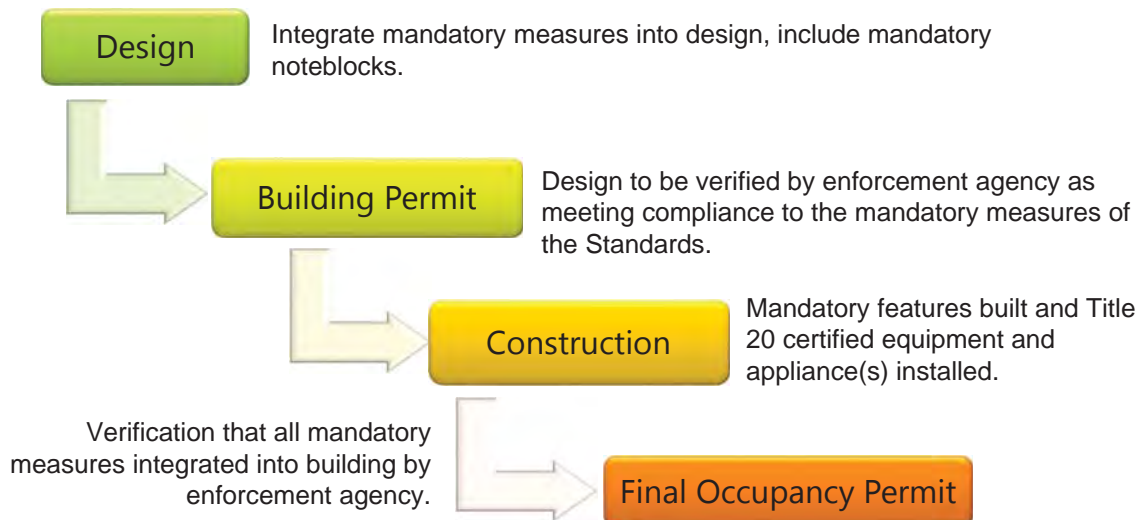
- Under development
- CEC will print soon and provide copies
- Also intended to assist counter staff/permit techs
- Inform applicants about Acceptance Testing

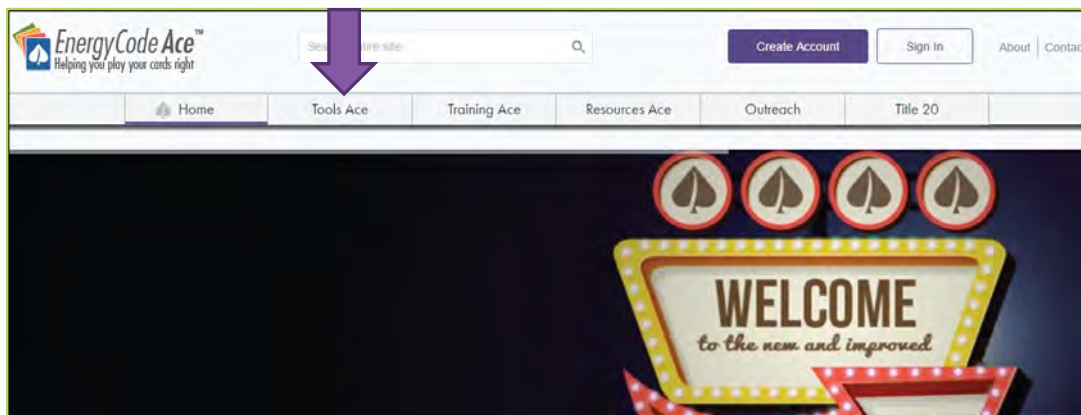


## Mandatory Measures



### When is compliance shown?

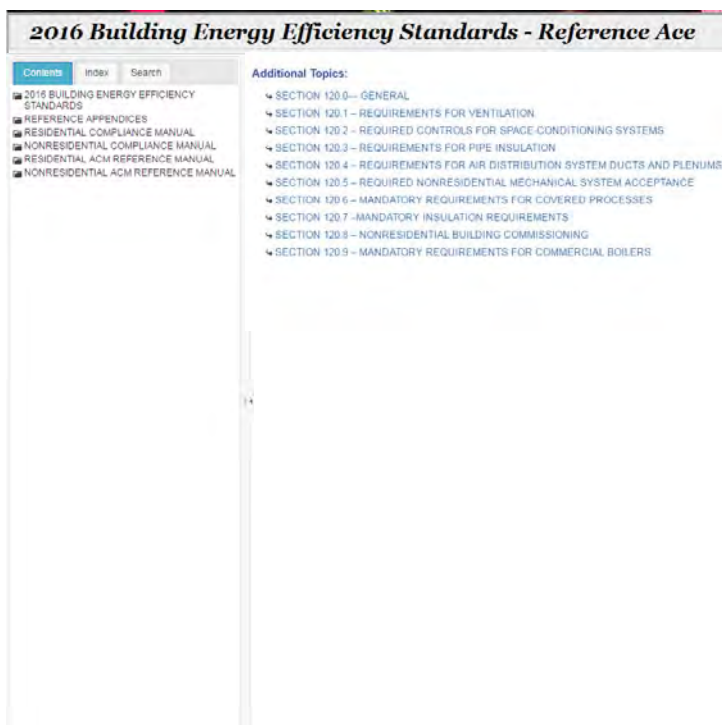




## Tools

- ✦ **Installation Ace:** Field Guide of energy features
- ✦ **Navigation Ace:** Flowchart of compliance process
- ✦ **Reference Ace:** Online code resource with hyperlinks
- ✦ **Forms Ace:** Find the forms you need based on scope of work

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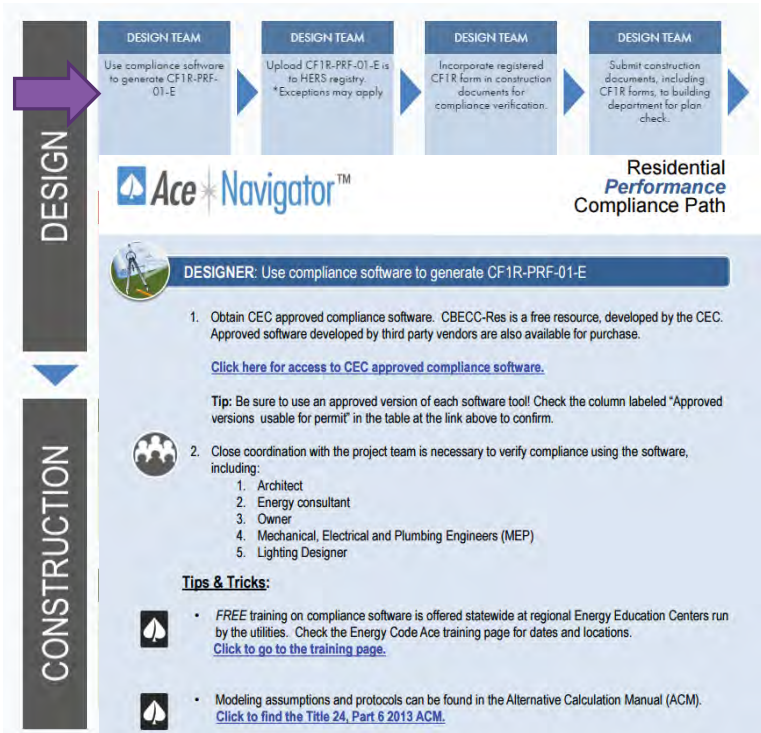
## Search Engine

- ✦ Key word search capabilities:
  - ✦ Along with hyperlinks allow you to jump directly to related sections
  - ✦ Available online or offline!

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# Navigation Ace



## Step-by-Step Guide

Laid out in an easy-to-follow flowchart, each step in the process is described in detail for the responsible party

- including links to resources, code language and
- tools to assist with compliance



# California Energy Commission: Online Resource Center



## Energy Standards Information and Training Materials





Overview

# Res Mandatory Measures Summary

- 2016 update available now
- Not a form – note block
- Summary of res mandatory measures
- Designers can chose to include on plans
- Enforcement agencies may require on plans

2016 Low-Rise Residential Mandatory Measures Summary	
4.110.000	Energy Conservation Requirements for Residential Buildings
4.110.010	Energy Conservation Requirements for Residential Buildings
4.110.020	Energy Conservation Requirements for Residential Buildings
4.110.030	Energy Conservation Requirements for Residential Buildings
4.110.040	Energy Conservation Requirements for Residential Buildings
4.110.050	Energy Conservation Requirements for Residential Buildings
4.110.060	Energy Conservation Requirements for Residential Buildings
4.110.070	Energy Conservation Requirements for Residential Buildings
4.110.080	Energy Conservation Requirements for Residential Buildings
4.110.090	Energy Conservation Requirements for Residential Buildings
4.110.100	Energy Conservation Requirements for Residential Buildings
4.110.110	Energy Conservation Requirements for Residential Buildings
4.110.120	Energy Conservation Requirements for Residential Buildings
4.110.130	Energy Conservation Requirements for Residential Buildings
4.110.140	Energy Conservation Requirements for Residential Buildings
4.110.150	Energy Conservation Requirements for Residential Buildings
4.110.160	Energy Conservation Requirements for Residential Buildings
4.110.170	Energy Conservation Requirements for Residential Buildings
4.110.180	Energy Conservation Requirements for Residential Buildings
4.110.190	Energy Conservation Requirements for Residential Buildings
4.110.200	Energy Conservation Requirements for Residential Buildings
4.110.210	Energy Conservation Requirements for Residential Buildings
4.110.220	Energy Conservation Requirements for Residential Buildings
4.110.230	Energy Conservation Requirements for Residential Buildings
4.110.240	Energy Conservation Requirements for Residential Buildings
4.110.250	Energy Conservation Requirements for Residential Buildings
4.110.260	Energy Conservation Requirements for Residential Buildings
4.110.270	Energy Conservation Requirements for Residential Buildings
4.110.280	Energy Conservation Requirements for Residential Buildings
4.110.290	Energy Conservation Requirements for Residential Buildings
4.110.300	Energy Conservation Requirements for Residential Buildings
4.110.310	Energy Conservation Requirements for Residential Buildings
4.110.320	Energy Conservation Requirements for Residential Buildings
4.110.330	Energy Conservation Requirements for Residential Buildings
4.110.340	Energy Conservation Requirements for Residential Buildings
4.110.350	Energy Conservation Requirements for Residential Buildings
4.110.360	Energy Conservation Requirements for Residential Buildings
4.110.370	Energy Conservation Requirements for Residential Buildings
4.110.380	Energy Conservation Requirements for Residential Buildings
4.110.390	Energy Conservation Requirements for Residential Buildings
4.110.400	Energy Conservation Requirements for Residential Buildings
4.110.410	Energy Conservation Requirements for Residential Buildings
4.110.420	Energy Conservation Requirements for Residential Buildings
4.110.430	Energy Conservation Requirements for Residential Buildings
4.110.440	Energy Conservation Requirements for Residential Buildings
4.110.450	Energy Conservation Requirements for Residential Buildings
4.110.460	Energy Conservation Requirements for Residential Buildings
4.110.470	Energy Conservation Requirements for Residential Buildings
4.110.480	Energy Conservation Requirements for Residential Buildings
4.110.490	Energy Conservation Requirements for Residential Buildings
4.110.500	Energy Conservation Requirements for Residential Buildings



# Guides

- Residential:
  - Minimum Water Heater Energy Factor Reference Guide
  - Low-Rise Residential Mandatory Measures Summary
  - Energy Standards Infographic
  - Frequently Asked Questions
  - What’s New for 2016
  - Cool Roofs Brochure
  - CLTC Residential Lighting: What’s New in 2016 Title 24 Part 6
- Nonresidential:
  - Minimum Water Heater Energy Factor Reference Guide
  - Energy Standards Infographic
  - Frequently Asked Questions
  - What’s New for 2016
  - Cool Roofs Brochure
  - CLTC Nonresidential Lighting: What’s New in 2016 Title 24 Part 6



# Mandatory Measures



## How to show compliance?

Design

Integrate mandatory measures into design, **include mandatory noteblocks.**



Construction

Document with Certificate of Installation forms (CF2R/NRCI).



Final Occupancy Permit

Document with Certificate of Verification/Acceptance (CF3R/NRCV/NRCA)



# Installation Ace



**HVAC EQUIPMENT**

**CODE**  
  
**Equipment Efficiencies**  
 Space-conditioning equipment may be installed only if the manufacturer has certified to the Commission that the equipment complies with all the applicable requirements, including efficiencies. Check the CF-2R for the minimum efficiencies for each project. Check the CF-2R for certification of efficiencies. Use AHRI information, not the yellow EnergyGuide label.  
 Code Reference: 2016 Title 24, Part 6 Standards §110.2(a)

**CODE**  
  
**Equipment Sizing - Load Calculations**  
 Building heating and cooling loads shall be determined using a method based on: The ASHRAE Handbook, the SMACNA Residential Comfort System Installation Standards Manual, or ACCA Manual J.  
 NOTE: Under-sizing of heating system is not allowed by the CBC. Over-sizing of the heating system and under- or over-sizing of the cooling system should be documented and explained by the designer.  
 Code Reference: 2016 Title 24, Part 6 Standards §150.0(1)

**CODE**  
  
**Fireplaces**  
**REQUIRED FEATURES**  
 If a masonry or factory-built fireplace is installed, it shall have the following:  
 • Closeable metal or glass doors covering the entire opening  
 • An outside air intake at least 6 square inches in area and equipped with a readily accessible, operable, and tight-fitting damper or combustion-air control device, unless the fireplace will be installed over concrete slab flooring and not on an exterior wall.  
 • A flue damper with a readily accessible control.

**CODE**  
  
**PROHIBITED FEATURES**  
 Masonry or factory-built fireplaces:  
 • Continuous burning pilot lights are prohibited.  
 • The use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building is prohibited.  
 Code Reference: 2016 Title 24, Part 6 Standards §150.0(b)

#M-E1: B Pierre Building Science, Inc.  
 #M-E2: B Pierre Building Science, Inc.  
 #M-E3: B Architecture Energy Corporation  
 #M-E4: B Pierre Building Science, Inc.  
 Ace + Installation<sup>™</sup>  
 Residential  
 DOCUMENT DATE 2026.10.31

## Field Guide

- ★ Designed to help you visualize and demonstrate correct installation of a number of residential and nonresidential energy efficiency measures required by Title 24, Part 6.
- ✧ Array of photographs
  - With easy-to-understand text



This stamp shows which installation practices are required by code. The code reference is included for more detail.



This stamp shows which installation practices are Best Practices, above and beyond code requirements.



This stamp shows items that are purely informational. These are intended to help broaden your understanding of the topic.



### Nonresidential:

- ✦ HVAC
  - Equipment
  - Ducts
- ✦ Envelope
  - Insulation
  - Curtain Walls
  - Concrete Walls
  - Metal Buildings
  - Attic and Roof Deck
  - Air Sealing
  - Moisture Management

### Residential:

- ✦ HVAC
  - Equipment
  - Ducts
  - Filtration
  - Air Flow
  - Ventilation
- ✦ Envelope
  - Insulation
  - Fenestration
  - Air Barriers
  - Air Sealing
  - Moisture Management
- ✦ Plumbing
  - Equipment
  - High Efficiency Equipment
  - Hot Water Distribution
  - Mandatory Pipe Insulation
  - Performance Compliance



### 2016 Residential Forms Ace

Instructions: Complete all the questions on these screens based upon the project you are plan project specific Title 24 Building Energy Forms required during Plan Check and Inspection w/ final screen. You will be able to print or email the summary.

Basic Info | Additional Info | Project Components

**AI-1 Which Energy Code Compliance Option will you use?**

Prescriptive | Performance

**Prescriptive AI-2 Project Type**

Existing | New Construction

**Prescriptive AI-4 Are you performing an alteration, addition, or combination**

Alteration | Addition | Both

**Prescriptive AI-5 What type of system are you altering? [Click all that apply]:**

- HVAC
- Lighting
- Pool/Spa
- Water Heating
- Envelope

[Next](#)

<a href="#">PHASE 1</a>
<b>GENERAL</b>
CF1R-ALT-02-E-PrescriptiveAlterationsHVAC.pdf CF1R-ALT-04-E-PaperVersionOFALT-HVAC-CZ_2_8-15.pdf
<a href="#">PHASE 2</a>
<b>HVAC</b>
CF2R-MCH-01b-E.pdf CF2R-MCH-20d-H-DuctLeakageTest-ExistingConst.pdf CF2R-MCH-22a-H-FanEfficacy-AllZonesCallingOnly.pdf CF2R-MCH-23a-H-AirflowRate-AllZonesCallingOnly.pdf CF2R-MCH-25c-H-RefrigerantCharge-WeighIn.pdf
<a href="#">PHASE 3</a>
<b>HVAC</b>
CF3R-MCH-20d-H-DuctLeakageTest-ExistingConst.pdf CF3R-MCH-22a-H-FanEfficacy-AllZonesCallingOnly.pdf CF3R-MCH-23a-H-AirflowRate-AllZonesCallingOnly.pdf CF3R-MCH-25c-H-RefrigerantCharge-WeighInObservation.pdf





## Energy Standards Information and Training Materials



Overview



Commissioning



Covered Processes



Electrical Power  
Distribution



Envelope



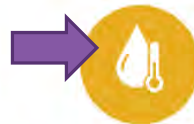
HVAC



Lighting



Solar Ready



Water Heating



## CALIFORNIA ENERGY COMMISSION



# Water Heater Reference Guide



Water Heating

- Serves as a tool to:
  - Quickly identify minimum energy factor (EF) req.
  - Includes all water heater types
- Also includes info. for water heater alterations:
  - Cannot replace with electric
  - Can replace with heat pump water heater meeting EF reqs.

California Energy Commission  
2016 Building Energy Efficiency Standards  
Minimum Water Heater Energy Factor  
Reference Guide

To be used for prescriptive alterations only. The energy factor is climate zone-dependent.

Heat Pump	
Climate Zone	Minimum Required Energy Factor
1	2.75
2	2.75
3	2.75
4	2.80
5	2.75
6	2.85
7	3.50
8	2.85
9	2.85
10	2.85
11	2.80
12	2.80
13	2.50
14	2.50
15	2.85
16	3.00
18	3.00 Plus a heat water heating system with water savings features (0.5)

Per Section 150.201(5)(ii) of the Energy Standards, the California Energy Commission used the performance compliance approach to determine the minimum energy factor (EF) needed to be able to proactively replace an existing water heater with a heat pump water heating system. A heat pump water heating system, meeting these minimum EFs, can replace an existing water heater regardless of original fuel type (natural gas, LPG, or electric).

The EFs listed for heat pump water heating systems can only be used for residential single dwelling unit alterations.

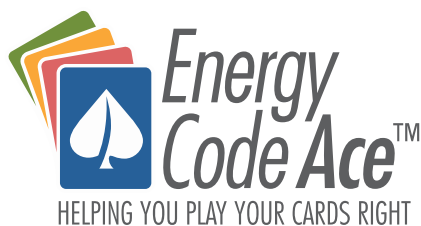
www.cedc.ca.gov



The screenshot shows the California Energy Commission website. At the top, there is a navigation bar with 'HOME' and 'SEARCH' links. Below this is a 'Quick Search' section with instructions on how to use the search function. A search form is visible with tabs for 'Model Number', 'Appliance Type', 'Company', 'Brand', and 'Appliance Status'. The 'Appliance Type' tab is selected, and a dropdown menu is open, listing various categories such as 'AirFilters', 'Central Air Conditioners', 'Central Heat Pumps', 'Cooking and Washing Products', 'Electronics', 'Fans and Dehumidifiers', 'Heating Products', 'Lighting Products', 'Motor Products', 'Non-Central AC & HP Products', 'Plumbing Products', 'Pool Products', 'Refrigeration Products', 'Transformer Products', and 'Water Heater Products'. There are 'Search' and 'Clear' buttons next to the dropdowns. At the bottom of the page, there is a footer with links for 'Accessibility', 'Conditions of Use', and 'Privacy Policy', and a copyright notice for 2016 State of California.



## Where to find information?



- ✦ **Reference Tools**
  - ✦ Reference Ace:
    - Look things up
  - ✦ Installation Ace:
    - Guidance on correct installation practice
  - ✦ Navigator Ace:
    - Who does what and when
  - ✦ Forms Ace:
    - What forms are needed and when
- ✦ **Resources**
  - ✦ Trigger Sheets:
    - What triggers code for alterations
  - ✦ Factsheets:
    - What is required, and how to document
  - ✦ Quick Reference:
    - Overview of compliance requirements



## Mandatory Measures



### ✦ Reference Tools

- ✦ 2016 Title 24 Part 6 Standards:
  - Standards language
- ✦ Residential and Nonresidential Manuals:
  - Guidance how to read standards, with examples on how to apply code
- ✦ MAEDBS (Appliance Efficiency Database):
  - Title 20 database, find certified equipment/appliances

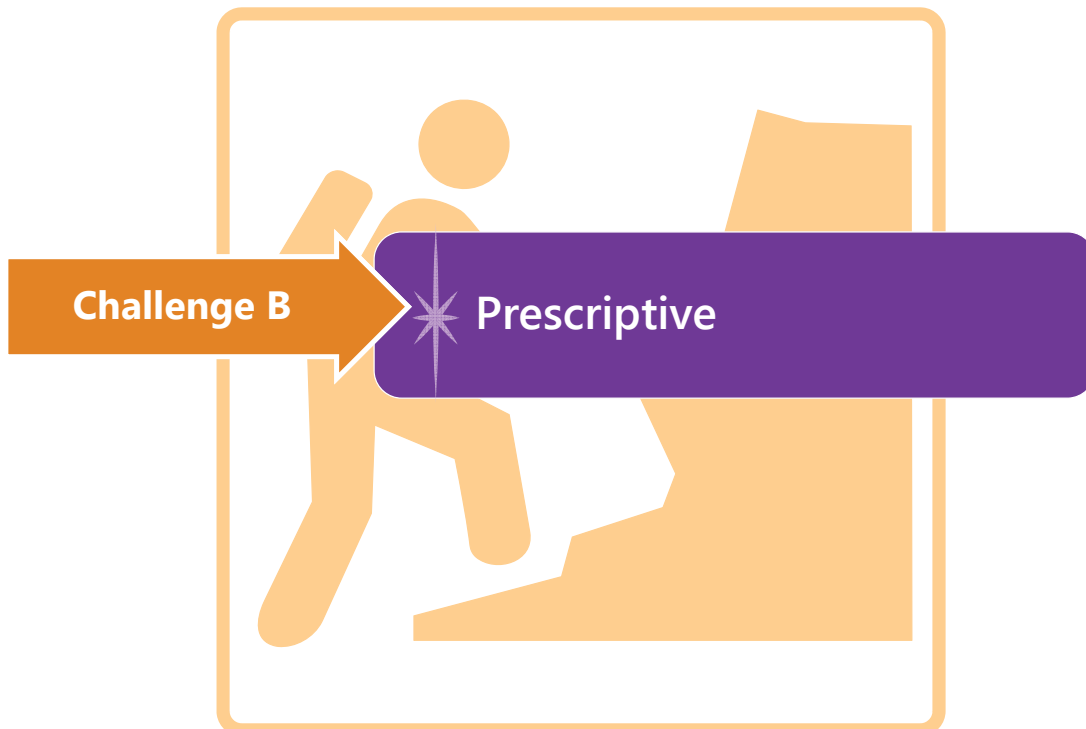
### ✦ Resources

- ✦ Forms (Compliance Manual):
  - Appendix A: Compliance forms
- ✦ Factsheets:
  - Typically comes from FAQ of Hotline
- ✦ Guides:
  - Standard's resources condensing code

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## Challenge B

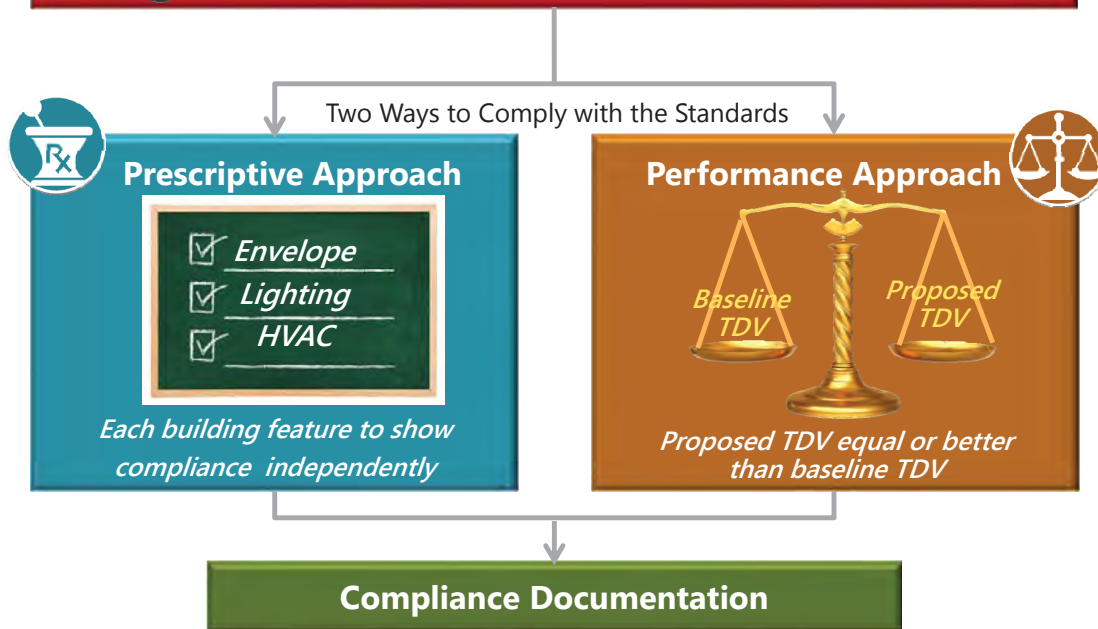


54

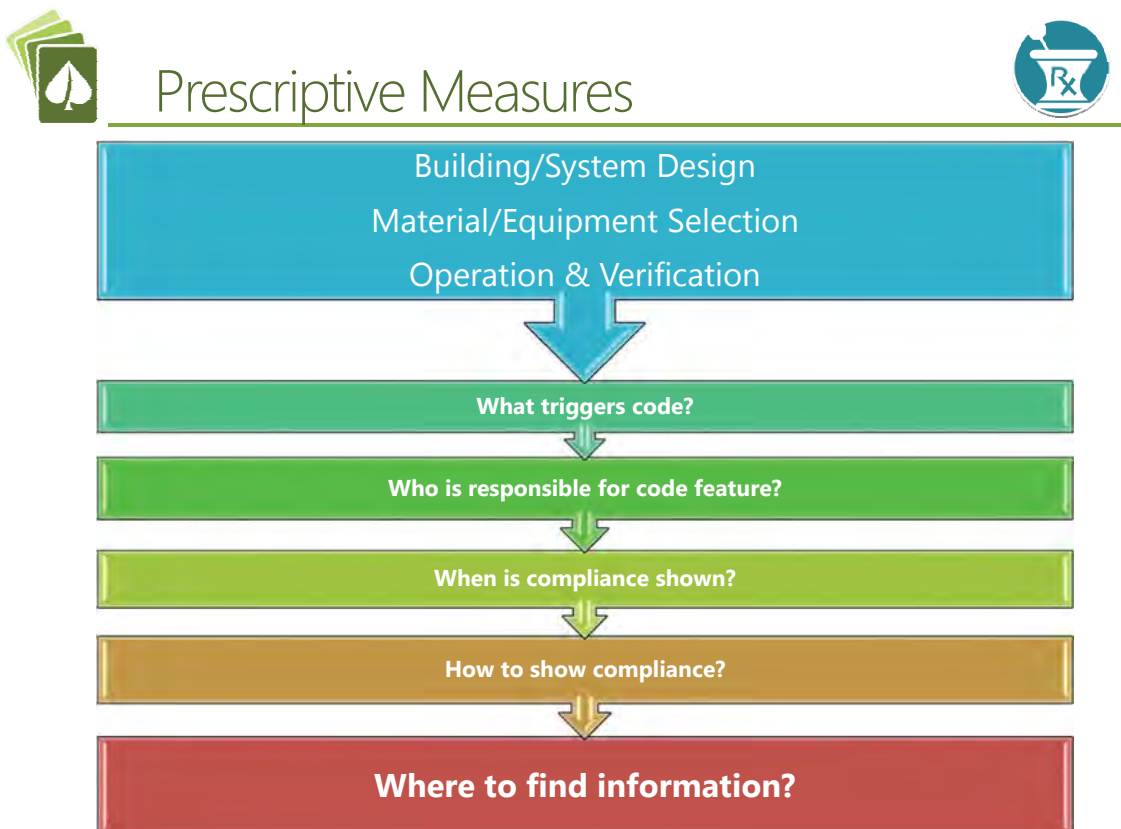
**COST EFFECTIVE**

## Mandatory Measures

*Cannot be traded via the Performance Approach.  
Not typically documented within Certificate of Compliance (CFIR / NRCC)*

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# Prescriptive Measures



## What triggers code?

### Permit Type

Not all code triggers require permits, check with your local building department. Anything that triggers code, must be built per code requirements. Scope of permit, determines what must meet code.



### Building Type

Be aware of your building type! Single family residential; multi-family residential (low-rise, high-rise, duplex, townhome?); applicable nonresidential occupancy?



### Climate Zone

Prescriptive requirements are based on cost effectiveness of that particular climate zone and building type.

Prescriptive (for all building features)?  
Performance (for all building features)?



### Compliance Method

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# Scenario 1



## Does My Permit Trigger Title 24 Part 6?

✦ My project is an existing office building in Sacramento (CZ 12) and I am replacing 1,200 sq. ft. of windows, do I trigger Title 24 Part 6?

- ✦ Occupancy:
- ✧ Occupancy: Group B

**Yes, that building occupancy is covered by Title 24 Part 6**

**2016 Building Energy Efficiency Standards - Reference Act**

2016 BUILDING ENERGY EFFICIENCY STANDARDS / Efficiency Standards, California Code of Regulations, Title 24, Part 6 / Subchapter 1 - All Occupancies - General Provisions / SECTION 100.0 - SCOPE

**SECTION 100.0 - SCOPE**

**(a) Buildings Covered.**  
The provisions of Part 6 apply to all buildings:

1. That are of Occupancy Group A, B, E, E.H, M, R, S, or U; and

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# Climate Zone Map



BuildingClimateZonesByZIPCode - Excel

Updated: 10/17/2016

ZIP Code	Building Climate Zone
00012	16
00016	16
00017	16
00018	16
00019	16
00020	16
00022	2
00026	16
00028	16
00029	16
00031	5
00032	16
00033	16
00034	16
00035	16
00037	16
00038	16
00039	16
00040	16
00044	16
00047	2
00048	16
00049	16
00050	16
00051	16
00052	1
00054	16
00055	16
00058	16
00065	16
90001	8
90002	8
90003	8
90004	9
90006	9



# Scenario 1



Did my scope of work trigger Title 24 Part 6?

Yes, I am replacing more than 150 sq. ft.

What is triggered?

- U-factor = 0.47
- SHGC = 0.31
- VT = 0.32 (operable window)

		Fixed Window	Operable Window	Curtainwall / Storefront	Glazed Door
Vertical	Max U-factor	0.36	0.46	0.41	0.45
	Max RSHGC	0.25	0.22	0.26	0.23
	Min VT	0.42	0.32	0.46	0.17
		Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	
Skylight	Max U-factor	0.58	0.46		0.88
	Max SHGC	0.25	0.25		NR
	Min VT	0.49	0.49		0.64

Table 1 - Fenestration Performance Requirements: New Construction and Additions

	CZ 3,5	CZ 1,16	All Others
U-factor	0.58	0.47	0.47
SHGC	0.41	0.41	0.31
VT	Same as New Construction requirement		

Table 2 - Vertical Fenestration Performance Requirements: Alterations



# Scenario 1



## Forms – Which & When

In addition to a Permit, you will need the following.

### During Design:

- NRCC-ENV-01-E: Envelope Component Approach
  - Completed and signed by the design professional
- NRCC-ENV-02-E: Fenestration Worksheet
  - Document thermal performance of fenestration construction (U-factor, SHGC, VT)
  - Completed and signed by the design professional

**Why?:** To document all fenestration (windows and skylights) specified on plans that will be installed in the building.

- NRCC-ENV-06-E: Area Weighted Average Calculation Worksheet (optional)
  - Completed and signed by the design professional

**Why?:** If some fenestration products do not meet prescriptive requirements on their own, this form must be completed to show that the area-weighted average U-factor, solar heat gain coefficient and visible transmittance comply.

### During Construction:

- NRCI-ENV-01-E: Envelope Certificate of Installation
  - Completed and signed by the installing contractor
- NRCA-ENV-02-F: Fenestration Acceptance
  - Completed and signed by the installing contractor

**Why?:** To verify that the field installation meets code and matches information on the certification of compliance documents. Documentation of NFRC certificates is field-verified, and where applicable, special procedures for verification of window films or electrochromic glazing must be followed and documented on this form.

## What forms do I use to show compliance?

- ✦ For building permit:
  - ✧ NRCC-ENV-01-E and
  - ✧ NRCC-ENV-02-E
- ✦ For final permit:
  - ✧ NRCI-ENV-01-E
  - ✧ NRCA-ENV-01-E



# New NR Dynamic Prescriptive Forms



STATE OF CALIFORNIA ENVELOPE COMPONENT APPROACH CERTIFICATE OF COMPLIANCE Envelope Component Approach										STATE OF CALIFORNIA FENESTRATION WORKSHEET CERTIFICATE OF COMPLIANCE Fenestration Worksheet																																																									
Project Name: _____										Project Name: _____																																																									
Project Location: _____										Project Location: _____																																																									
CA City and Zip Code: _____										CA City and Zip Code: _____																																																									
Climate Zone: _____										Climate Zone: _____																																																									
Total Conditioned Floor Area: _____										Total Conditioned Floor Area: _____																																																									
Building Type: _____										Building Type: _____																																																									
Compliance Mark: _____										Compliance Mark: _____																																																									
Phase of Construction: _____										Phase of Construction: _____																																																									
Building Decision: _____										Building Decision: _____																																																									
Scheds (Public School) <input type="checkbox"/> Rescheds (Public School) <input type="checkbox"/> Conditions <input type="checkbox"/> Skylight Area for Large Enclosed Space <input type="checkbox"/> $\geq 5000 \text{ ft}^2$ (if checked include the table)										Scheds (Public School) <input type="checkbox"/> Rescheds (Public School) <input type="checkbox"/> Conditions <input type="checkbox"/> Skylight Area for Large Enclosed Space <input type="checkbox"/> $\geq 5000 \text{ ft}^2$ (if checked include the table)																																																									
<b>A. ENVELOPE DETAILS - FRAMED</b> <table border="1"> <thead> <tr> <th>01</th> <th>02</th> <th>03</th> <th>04</th> <th>05</th> <th>06</th> <th>07</th> <th>08</th> </tr> <tr> <th>Tag/ID</th> <th>Assembly Type</th> <th>Frame Material</th> <th>Frame Depth</th> <th>Frame Spacing</th> <th>Cavity R-value</th> <th>Continuous Insulation R-value</th> <th>Appendix Reference Table</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>										01	02	03	04	05	06	07	08	Tag/ID	Assembly Type	Frame Material	Frame Depth	Frame Spacing	Cavity R-value	Continuous Insulation R-value	Appendix Reference Table									<b>A. WINDOWS DETAILS WORKSHEET - §110.6(a)(6), Code D</b> NOTE: Newly installed fenestration shall have a certified NFRC Label Certificate or use the CCC default tables found in Table 110.6-A and Table 110.6-B. Site-built fenestration less than 1,000 ft <sup>2</sup> , or more than or equal to 1,000 ft <sup>2</sup> see Reference <a href="#">Non-Standard Appendix WAS</a> . Prescriptively, skylights shall have a glazing material or diffuser that has a measured haze value greater than 60%, determined according to ASTM D1003, or other test method approved by the Energy Commission. <table border="1"> <thead> <tr> <th rowspan="2">01</th> <th rowspan="2">02</th> <th rowspan="2">03</th> <th colspan="3">Fenestration</th> <th colspan="3">Overhang</th> </tr> <tr> <th>U-factor</th> <th>SHGC</th> <th>VT</th> <th>H</th> <th>V</th> <th>H/V</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>										01	02	03	Fenestration			Overhang			U-factor	SHGC	VT	H	V	H/V									
01	02	03	04	05	06	07	08																																																												
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			U-factor	SHGC	VT	H	V	H/V																																																											
<b>B. WEST WINDOW AREA CALCULATION - See §110.6(a)(5)</b> 01. Gross Exterior Wall Area $\text{ft}^2$ $\text{ft}^2 =$ 0 $\text{ft}^2$ 40% of Gross West Facing Exterior Wall Area; or 02. West Display Linear Perimeter $\text{ft}$ $\text{ft} =$ 0 $\text{ft}^2$ West Display Perimeter Area 03. Enter the Larger of 01 or 02 0 $\text{ft}^2$ Maximum Standard West Area 04. Enter Proposed West Window Area $\text{ft}^2$ Proposed West Window Area Note: If the PROPOSED WEST WINDOW AREA is greater than the MAXIMUM STANDARD WEST AREA then the envelope component approach may not be used.										<b>C. WINDOW AREA CALCULATION - See §110.6(a)(5)</b> 01. Gross Exterior Wall Area $\text{ft}^2$ $\text{ft}^2 =$ 0 $\text{ft}^2$ 40% of Gross Exterior Wall Area or 02. Linear Display Perimeter $\text{ft}$ $\text{ft} =$ 0 $\text{ft}^2$ Display Perimeter Area 03. Enter the Larger of 01 or 02 0 $\text{ft}^2$ Maximum Standard Area 04. Enter Proposed Window Area $\text{ft}^2$ Proposed Window Area Note: If the PROPOSED WINDOW AREA is greater than the MAXIMUM STANDARD AREA then the envelope component approach may not be used.																																																									



# Scenario 1



## What type of products can I use?

- ✦ NFRC rated using either a certified product or the NFRC Component Modeling Approach.
- ✧ Default cannot be used since the performance approach is NOT being used.

Method	Manu- factured Windows	Manu- factured Skylights	Site-Built Fenestration (windows, skylights)	Field- Fabricated Fenestration	Glass Block
NFRC-Certified Products	Y	Y	N	N	N
NFRC's Component Modeling Approach (CMA)	Y	Y	Y	N	N
Energy Standards Table 110.6-A, 110.6-B	Y	Y	Y	Y	Y
Nonresidential Appendix Manual NAG	N	N	Y*	N	N

\* Applicable only for site-built fenestration with total area 1,000 ft² or lower.

Table 3 - Methods for Determining Fenestration Performance



www.NFRC.org



Directory Search

Back    New Search

Product Type	
<a href="#">Window</a>	Find ratings for window products.
<a href="#">Door</a>	Find ratings for door products.
<a href="#">Skylight</a>	Find ratings for skylight products.
<a href="#">Applied Film</a>	Find ratings for film-attachment products.
Alternate Search Methods	
<a href="#">CPD Number</a>	Find a product by CPD Number.
<a href="#">Label Verification</a>	Verify the ratings of an NFRC-certified product.
Helpful NFRC Links	
<a href="#">Fenestration Facts</a>	What is Fenestration?
<a href="#">FAQ</a>	FAQ about Certification and Commercial/Site Built Programs.
<a href="#">Helpful Links</a>	Helpful Links for Consumers and Technical Organizations.

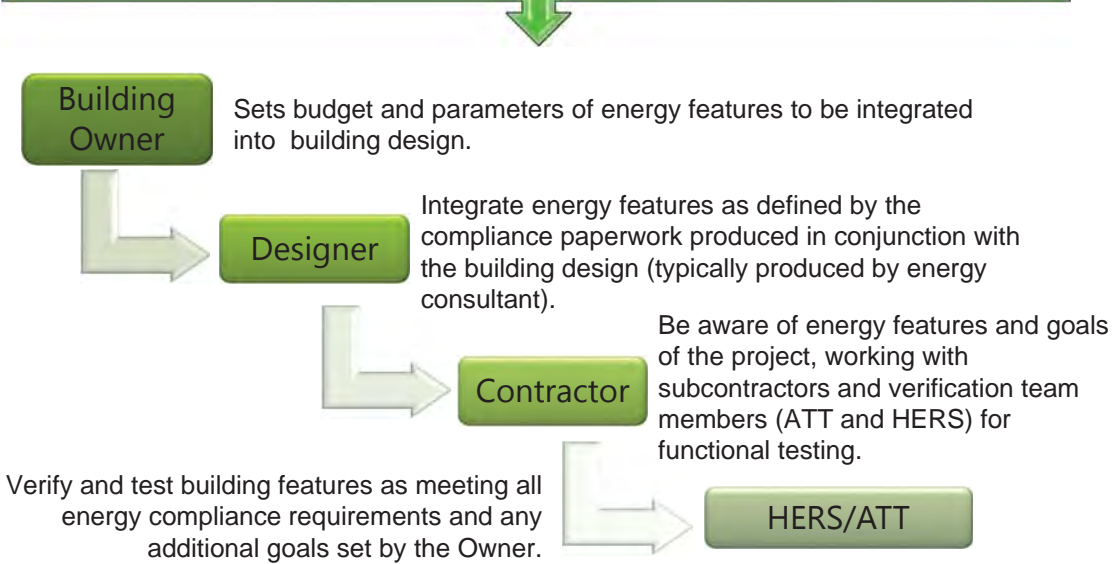




# Prescriptive Measures



## Who is responsible for code feature?



# Scenario 2



2016 ENERGY CODE  
Ace Resources Triggers

Residential  
HVAC – Alterations

Split Systems and Packaged Systems

Change This (and nothing else)	Mandatory Requirements				Prescriptive Requirements		
	Setback Thermostat \$110.2(c), \$150.2(b)1F	Cooling Load Calcs \$150.0(h), \$150.2(b)1C	Heating Load Calcs \$150.0(h), \$150.2(b)1C	HERS: Duct Seal and Test \$150.2(b)1C, D, & E	Air Filtration and HERS: Cooling Coil Airflow and Fan Watt Draw \$150.2(b)1C, D	Duct Insulation \$150.2(b)1D	HERS: Refrigerant Charge \$150.2(b)1F
Whole Split or Packaged System (no ducts added or replaced)	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>a,1</sup>
Evaporator Coil (cooling coil), Condenser Coil, or Outdoor Condensing Unit	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>a,1</sup>
Furnace (air handler)	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>a,1</sup>
Compressor, Refrigerant Metering Device	YES	no	no <sup>c</sup>	no	no	no	YES <sup>a,1</sup>
Some Ducts > 40 feet of new or replacement	no	may <sup>e</sup>	may <sup>e</sup>	YES <sup>d</sup>	no	YES <sup>d</sup>	no
All New Ducts <sup>a</sup>	no	may <sup>e</sup>	may <sup>e</sup>	YES <sup>d</sup>	YES <sup>d</sup>	YES <sup>d</sup>	no

I am the contractor replacing the furnace in a single family home, does my project trigger Title 24 Part 6?

- Minimum efficiency
- Setback Thermostat
- HERS duct testing

Change This (and nothing else)	Mandatory Requirements				Prescriptive Requirements		
	Setback Thermostat \$110.2(c), \$150.2(b)1F	Cooling Load Calcs \$150.0(h), \$150.2(b)1C	Heating Load Calcs \$150.0(h), \$150.2(b)1C	HERS: Duct Seal and Test \$150.2(b)1C, D, & E	Air Filtration and HERS: Cooling Coil Airflow and Fan Watt Draw \$150.2(b)1C, D	Duct Insulation \$150.2(b)1D	HERS: Refrigerant Charge \$150.2(b)1F
Whole Split or Packaged System (no ducts added or replaced)	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>a,1</sup>
Evaporator Coil (cooling coil), Condenser Coil, or Outdoor Condensing Unit	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>a,1</sup>
Furnace (air handler)	YES	no	no <sup>c</sup>	YES <sup>d</sup>	no	no	YES <sup>a,1</sup>



# Scenario 2



**Project Phases - Residential**

**Phase 1: Permit Application** Permit Application and Plan Review Process: All applicable Certificates of Compliance must be signed and submitted with construction documents. If more than one person has responsibility for building design, each person must sign the Certificate of Compliance document(s) applicable to that portion of the design for which

## What do I need to provide at final inspection?

**PHASE 2**

**HVAC** CF2R-MCH-01b-E.pdf  
CF2R-MCH-20d-H-DuctLeakageTest-ExistingConst.pdf

**PHASE 3**

**HVAC** CF3R-MCH-20d-H-DuctLeakageTest-ExistingConst.pdf

- ★ CF2R forms:
  - ✦ CF2R-MCH-01b-E and CF2R-MCH-20d-H
    - Signed
    - Registered with HERS provider
- ★ CF3R forms:
  - ✦ CF3R-MCH-20d-H
    - Signed and provided by HERS rater
    - Registered by HERS provider

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# Scenario 2



**2016 ENERGY CODE**  
**Ace Resources** The 34 Best Climate Zone Quick Reference

**Residential Heating & Cooling Equipment Minimum Efficiencies**

**Gas- and Oil-Fired Central Furnaces - Minimum Heating Efficiencies**

Appliance	Rated Input (Btu/h)	AFUE	Minimum Efficiency (%)
Weatherized gas central furnaces with single phase electrical supply	<25,000	81%	81%
Non weatherized gas and oil central furnaces with single phase electrical supply	<25,000	80%	80%
Weatherized oil central furnaces with single phase electrical supply	<25,000	79%	79%
Non weatherized oil central furnaces with single phase electrical supply	<25,000	78%	78%
Gas central furnaces	≥25,000	—	80%
Oil central furnaces	≥25,000	—	81%

Table 4-1 of 2016 Residential Compliance Manual (based on the California Appliance Efficiency Requirements, Part 30, Tables 1-4 and 6-2)

**Heat Pump - Minimum Heating Efficiencies**

Single-phase air source heat pumps

Configuration	Size (Btu/h)	Minimum Heating Efficiency
Packaged	<88,000 Cooling Capacity	8.0 HSPF
Split	<65,000 Cooling Capacity	8.2 HSPF
Space-constrained packaged	<88,000 Cooling Capacity	7.4 HSPF
Space-constrained split	<88,000 Cooling Capacity	7.4 HSPF
Small Duct High Velocity	<65,000 Cooling Capacity	7.7 HSPF
Mini- >HSPF Heating Season Performance Factor	<65,000 Cooling Capacity	7.7 HSPF

Adapted from Table 4-2 of 2016 Residential Compliance Manual (based on Table 11B-10)

**EnergyCode Ace** helping you stay green and tight

2016 Title 24 Part 6 - Residential Heating & Cooling Equipment Minimum Efficiencies

Page 1 of 2  
2016.11.01

## What is the minimum efficiency?

- ★ 80% AFUE

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# Scenario 2



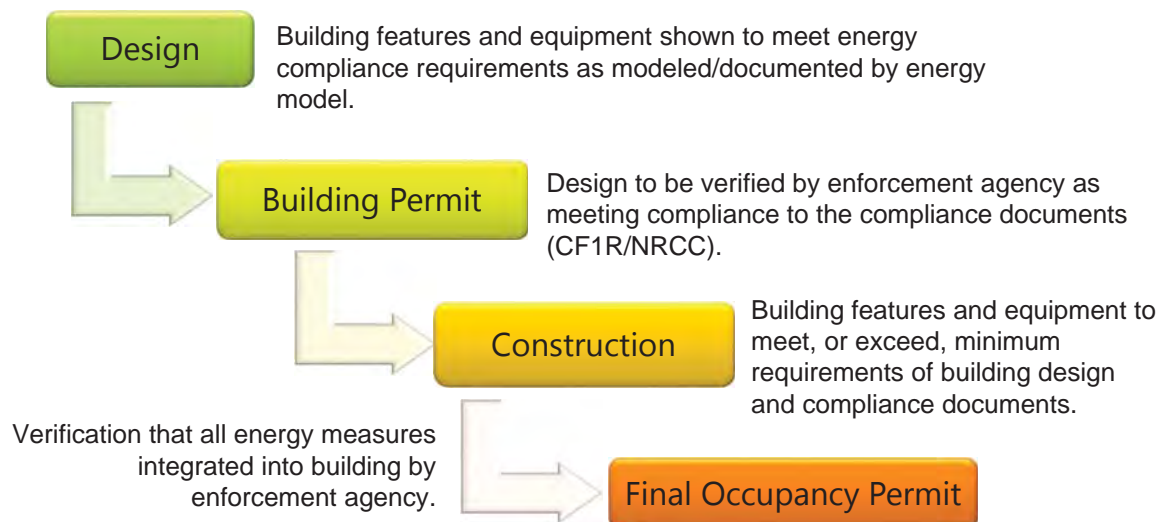
	Manufacturer Brand	Model Number	Energy Source	Pilot Light? (T/F)	Outdoor Install	Electrical Phase	Mobile Home?	Air Flow Direction	Fan Motor HP	Rated Output BTUH	Annual Fuel Utilization Efficiency (AFUE)	Standby Watts	Regulatory Status	Add D	
Select <input type="checkbox"/>	Bryant Heating & Cooling Systems	Bryant Heating & Cooling Systems	577EPWA48130N***	LPG	False	True	3	False	Down	1	103	80	8	Non Federally-Regulated	04/26
Select <input type="checkbox"/>	Bryant Heating & Cooling Systems	Bryant Heating & Cooling Systems	577EPWA60130A***	LPG	False	True	3	False	Down	1	103	80	8	Non Federally-Regulated	04/26
Select <input type="checkbox"/>	Bryant Heating & Cooling Systems	Bryant Heating & Cooling Systems	577EPWA60130N***	LPG	False	True	3	False	Down	1	103	80	8	Non Federally-Regulated	04/26
Select <input type="checkbox"/>	Bryant Heating & Cooling Systems	Bryant Heating & Cooling Systems	577EPWA60130A****	LPG	False	True	3	False	Horizontal	1	103	80	8	Non Federally-Regulated	04/26
Select <input type="checkbox"/>	Bryant Heating & Cooling Systems	Bryant Heating & Cooling Systems	577EPWA60130N****	Natural Gas	False	True	3	False	Horizontal	1	103	80	8	Non Federally-Regulated	04/26
Select <input type="checkbox"/>	Bryant Heating & Cooling Systems	Bryant Heating & Cooling Systems	577EPWA48130N****	Natural Gas	False	True	3	False	Horizontal	1	103	80	8	Non Federally-Regulated	04/26



# Prescriptive Measures



## When is compliance shown?





# Scenario 3



Home → 2015publications → CEC-400-2015-032 → appendices → forms

2016 Residential Compliance Manual - Appendix A, Single Forms

[Parent Directory](#)

Name	last modified <small>Color dates added today</small>	Size
Alterations and Additions Non HERS Verified Forms	Apr 14, 2016	4 kb
CF1R	Apr 14, 2016	4 kb
CF2R	Apr 14, 2016	4 kb
CF3R	Dec 01, 2015	4 kb
Quality Insulation Installation (QII) Instructions	Aug 12, 2016	4 kb

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# Prescriptive Measures



## How to show compliance?



**Design**

Design features to meet, or exceed, energy model as documented in Certificate of Compliance (CF1R/NRCC).



**Construction**

Building features documented with Certificate of Installation forms (CF2R/NRCI).



**Final Occupancy Permit**

Testing of energy features documented with Certificate of Verification/Acceptance (CF3R/NRCV/NRCA)

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# Scenario 4



**Ace Resources** 2016 Residential - Title 24, Part 6 **Energy Plans Review** **EnergyCode Ace** Helping you play your cards right

Envelope (applicable to prescriptive forms CF1R-NCB/ADD/ALT or performance form CF1R-PRF) YES NO\*

**Ace Resources** 2016 Residential - Title 24, Part 6 **Energy Plans Review** **EnergyCode Ace** Helping you play your cards right

**Example Part 6 Plan Check Correction Comments**

G5	One or more CF1R (Certificate of Compliance) form indicates that a HERS measure is required and has not been registered with a HERS provider. Please resubmit the applicable CF1R forms registered by an approved HERS provider per §10-103.
G8	The total conditioned floor area shown on the CF1R forms is not consistent with the areas shown on the plans. Please resubmit either the plans or CF1R forms showing the corrected conditioned floor area per §100.1(b).
E2	Roof/ceiling insulation or radiant barrier indicated on CF1R-NCB/ADD/ALT/CF1R-PRF-01 does not match what's shown on plans and/or is not compliant with Title 24, Part 6. <i>Prescriptive only: R-values and radiant barrier must comply with Table 150.1-A (newly constructed) or §150.2(a) (additions) or §150.2(b) (alterations).</i>
I6	Outdoor lighting controls are either not indicated on the plans or are not compliant with Title 24, Part 6. Please correct and resubmit the plans demonstrating compliance with §150.0(k)3.

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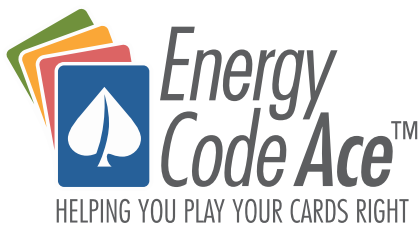


# Prescriptive Measures



## Where to find information?

### ★ Gina's Tips:

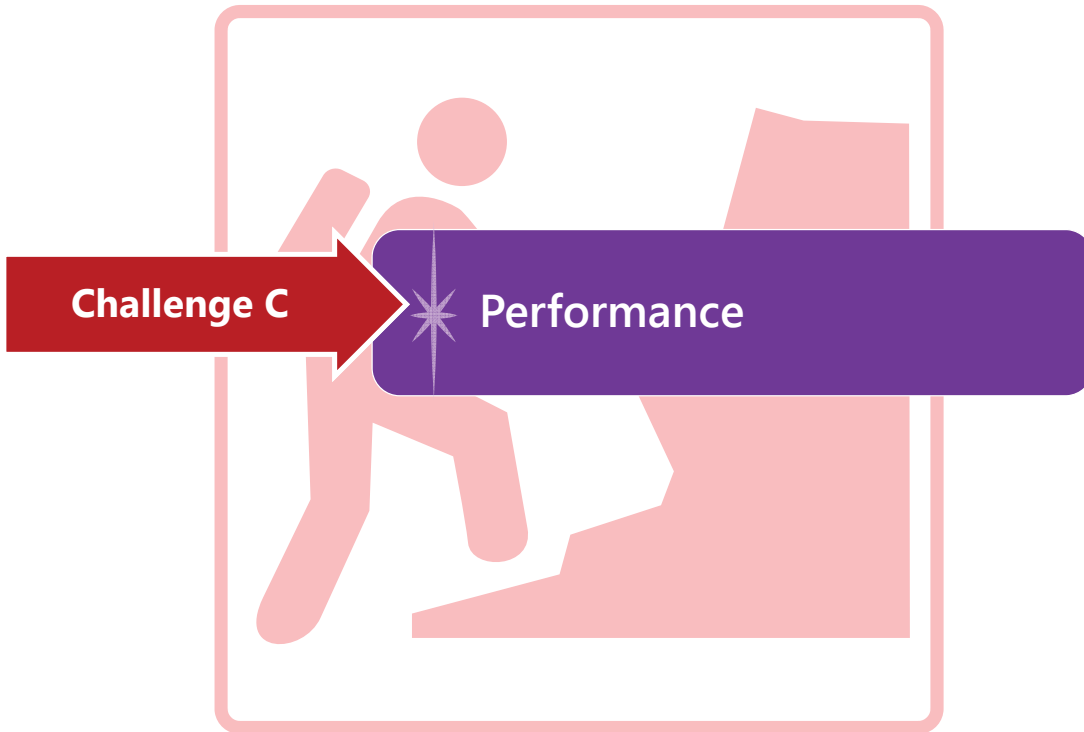


- ◇ 1<sup>st</sup>: Look it up in Reference Ace
- ◇ 2<sup>nd</sup>: If an alteration, use a Trigger Sheet
- ◇ 3<sup>rd</sup>: Always look at any applicable Fact Sheet
- ◇ 4<sup>th</sup>: If you still cannot figure out what forms you need, use Forms Ace
- ◇ 5<sup>th</sup>: Building Department and Energy Consultants, use a Checklist!
- ◇ 6<sup>th</sup>: Contractors, use a HERS rater to help with code triggers, forms and registration to HERS provider site
- ◇ 7<sup>th</sup>: Contractors, know how to use the Appliance Database

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# Challenge C



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**COST EFFECTIVE**

**Mandatory Measures**

*Cannot be traded via the Performance Approach.  
Not typically documented within Certificate of Compliance (CF1R / NRCC)*

Two Ways to Comply with the Standards

**Prescriptive Approach**

- Envelope
- Lighting
- HVAC

*Each building feature to show compliance independently*

**Performance Approach**

*Baseline TDV*      *Proposed TDV*

*Proposed TDV equal or better than baseline TDV*

**Compliance Documentation**

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# California Energy Commission: Online Resource Center



## Additional Tools and Information



Approved  
Compliance Software



Blueprint Newsletter



Climate Zones

## 2016 Approved Compliance Software

### Residential

- Presentations

### Nonresidential

*Energy Standards educational resource materials will be posted as they become available.*

### Residential

#### Presentations

- » [CBECC Residential 2016 Software Demonstration](#)

### Nonresidential

*Resources will be posted as they become available.*

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# California Energy Commission: Online Resource Center



## Nonresidential Buildings, 2016 Standards

Program Name	Approved versions usable for permit	Contact Information	Additional Information
CBECC-Com	<p>CBECC-Com 2016.2.1 (868) was approved <u>9/14/2016</u> for demonstrating performance compliance with the nonresidential provisions of the 2016 California Building Energy Efficiency Standards.</p> <p>CBECC-Com 2016.2.0 (861) was approved <u>6/14/2016</u> and shall continue to be valid for demonstrating compliance with the nonresidential provisions of the 2016 California Building Energy Efficiency Standards until 12/19/2016.</p> <p>CBECC-Com 2016.1.0 (803) was approved <u>11/12/2015</u> and shall continue to be valid for demonstrating compliance with the nonresidential provisions of the 2016 California Building Energy Efficiency Standards until 9/27/2016.</p> <p>All permit applications on or after 12/19/2016 must use CBECC-Com 2016.2.1.</p> <p><a href="#">All CBECC-Com 2016 resolutions can be found here.</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><a href="#">CBECC-Com Website</a></p> <p><a href="#">Approval/Expiration Dates</a></p> <p><a href="#">Reported Software Issues</a></p> <p>Support: <a href="mailto:cbec.com@gmail.com">cbec.com@gmail.com</a></p>
EnergyPro	<p>EnergyPro Version 7.1, using the simplified geometry two-dimensional (2D) option of the CBECC-COM API, was approved <u>9/27/2016</u> as an alternative calculation method for demonstrating performance compliance with the nonresidential provisions of the 2016 California Building Energy Efficiency Standards.</p> <p><a href="#">All 2016 EnergyPro (Residential) 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="#">Approval/Expiration Dates</a></p> <p><a href="#">FAQs</a></p> <p>Support: <a href="mailto:support@energysoft.com">support@energysoft.com</a></p>

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CBECC-Com uses EnergyPlus to perform simulations using a Simplified Geometry Method or Detailed Geometry Method with SketchUp and OpenStudio SketchUp Plugin for Detailed Geometry Input. Instructions and links for downloading the compliance software and the associated supporting software are listed below.

## 1. DOWNLOAD/INSTALL CBECC-Com 2016.2.1 - APPROVED BY CALIFORNIA ENERGY COMMISSION

[Click here to download and install CBECC-Com 2016.2.1 \(build 868\)](#)

[Click here to download and install CBECC-Com 2016.2.1 \(build 868\)](#) (Google Drive shared link)

### New in this version:

- For zones where there is no cooling, modified the baseline to also not have cooling.
- Added efficiency modifiers for zone systems that will not be tested for duct leakage and meet the criteria in Section 140.4(l).

### Bugs fixed in this version:

- Corrected DHW internal calculations for High-rise Residential and Hotel/Motel Guest Rooms
- Fixes to opaque envelope UA-value checks
- Updates to EnergyPlus service hot water heating rules to better align with the Appliance Efficiency Standards
- Fix issue with baseline models not getting exhaust fan if proposed is 'Forced' mechanical ventilation
- Add warning to user when proposed res zone has 'Forced' ventilation from Pri/Sec system, but also has exhaust fan defined. In this case, it is assumed the exhaust is intermittent exhaust, and therefore should not be modeled for compliance since it can't be matched in the baseline
- Other bug-fixes - see Quick Start guide.

### Note:

- CBECC-Com 2016.2.1 has been approved by the California Energy Commission for Title 24 compliance.
- CBECC-Com 2016.2.1 is not compatible with Windows Operating System XP or earlier

## 2. GETTING STARTED WITH CBECC-Com

Please read the [Quick-Start Guide \(2016.2.1\)](#) / [User Manual \(2016.2.1\)](#) to get started with CBECC-Com. Several example files are included with CBECC-Com and can be found in the C:\Users\{your username}\Documents\CBECC-Com 2016 Projects\ folder for a typical installation. These examples demonstrate how to assemble various building and HVAC system types.



CBECC NR Term	CBECC NR Term Sh	CBECC NR F Properties	Properties Short Form
BuildingStory	Story	Bldg FloorToCeilingHeight FloorToFloorHeight Multiplier Name Z	FlrToCeilingHgt FlrToFlrHgt Mult Name Z
Compliance Component	Definition	Standards Reference	
Required	Spc The portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above. It is measured as the vertical distance from top to top of two successive tiers of beams or finished floor surfaces. Source: definition in CBC  ASHRAE: portion of a building that is between one finished floor level and the next higher finished floor level or the roof, provided, however, that a basement or cellar shall not be considered a story.	2013 T24: The number of stories is used to differentiate between low rise residential and high rise residential which uses the nonresidential standards for the most part.	

## 5. STANDARDS DATA DICTIONARY (SDD)

The Standards Data Dictionary (SDD) defines the terminology and data model for compliance software and can be downloaded by clicking on the link below.

[Download the latest 2016 SDD Workbook \(10/05/2016\)](#)







# California Energy Commission: Online Resource Center



**Nonresidential Buildings, 2016 Standards**

**2016 Building Energy Efficiency Standards  
Approved Computer Compliance Programs**  
(Revised 10/19/16)

CALIFORNIA ENERGY COMMISSION

Nonresidential Buildings, 2016 Standards			
Program Name	Version	Approval	Expiration*
CBECC-Com	2016.1.0	11/12/2015	09/27/2016
	2016.2.0	06/14/2016	12/19/2016
	2016.2.1	09/14/2016	
		<b>CBECC Engine</b>	
EnergyPro (Nonresidential)	7.0	02/10/2016	2016.1.0 09/27/2016
	7.1	09/27/2016	2016.2.1

\*New permit applications made on or after the listed date must be made using approved software.

**Additional Information**

[CBECC-Com Website](#)

[Approval/Expiration Dates](#)

[Reported Software Issues](#)

Support:  
[cbec.com@gmail.com](mailto:cbec.com@gmail.com)

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[EnergyPro Website](#)

[Approval/Expiration Dates](#)

[FAQs](#)

Support:  
[support@energysoft.com](mailto:support@energysoft.com)

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# California Energy Commission: Online Resource Center



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Resources
Newsletters
Cloud Storage Providers
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Internet Speed Test
Call Center Providers

Home / Browse / CBECC-Com / Tickets

**CBECC-Com**

Nonresidential California Energy Commission Performance Compliance

Brought to you by: davidreddy, dcontoyannis, larryfroess, nkapur, and 3 others

Summary
Files
Reviews
Support
Wiki
Discussion
Code
Tickets

Search Tickets

Create Ticket

View Stats

---

Milestone

None 762

Com2016C 14

Com2016.3.0 0

---

Searches

All Tickets 2016

Closed Tickets 1880

EnergyPlus 10

Enhancement 27

Open Tickets 69

Owned DR 23

To Be Verified 91

---

Help

Formatting Help

Tickets Maximize

Create new tickets by sending e-mail (with all pertinent attachments) to: [cbec.com@gmail.com](mailto:cbec.com@gmail.com)

Showing 25 results of 136

#	Summary	Mile	Stat	Ownr	Creat	Upda	Type	SubTyp	Priority	Version
2024	Request for PRF-01 pdf from AnalysisResults.xml	None	New	Nikhil Kapur	3 days ago	3 days ago	Defect	CBECC-Com	Medium	CBECC-Com 2013-3c
2023	CBECC-Com Issue - Other	None	New	Nikhil Kapur	3 days ago	3 days ago	Defect	CBECC-Com	Medium	CBECC-Com 2013-3c
2022	Need assistance in setting up airside	None	New	Nikhil Kapur	4 days ago	4 days ago	Defect	CBECC-Com	Medium	CBECC-Com 2013-3c
2021	Please Generate Compliance Report	None	New	Nikhil Kapur	2016-11-18	2016-11-18	Defect	CBECC-Com	Medium	CBECC-Com 2013-3c
2020	DHW Error	None	New	Nikhil Kapur	2016-11-17	2016-11-17	Defect	CBECC-Com	Medium	CBECC-Com 2013-3c
2019	Request for PRF-01 pdf from AnalysisResults.xml	None	New	Nikhil Kapur	2016-11-17	2016-11-17	Defect	CBECC-Com	Medium	CBECC-Com 2013-3c

**Additional Information**

[CBECC-Com Website](#)

[Approval/Expiration Dates](#)

[Reported Software Issues](#)

Support:  
[cbec.com@gmail.com](mailto:cbec.com@gmail.com)

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[EnergyPro Website](#)

[Approval/Expiration Dates](#)

[FAQs](#)

Support:  
[support@energysoft.com](mailto:support@energysoft.com)

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## EnergySoft

World Class Building Energy Analysis Software

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Support > Frequently Asked Questions

### Frequently Asked Questions

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#### 1. Sales Information (3)

- Can I return my copy of EnergyPro software?
- How can I determine what modules I currently have installed?
- Can I use EnergyPro on my Apple computer?

#### 2. Installation (15)

- Why do I keep having to input the license key each time?
- How do I uninstall a license key from a computer?
- EnergyPro Installation Video
- How do I enter a digital signature to my reports?
- How do I enter a company logo to the report?
- How do I enter a stamp to my reports?
- If I Uninstall EnergyPro, will I lose the files I have worked on and saved?
- How do I get my name to show up on the cover page and as the documentation author?



Search

#### Recent Posts

- ZNE Ready
- EnergyPro 7.1
- EnergyPro V6.8.0.2 Update
- EnergyPro 6.8 Update
- EnergyPro 6.8 for the 2013 Code

#### FAQ's

- Why are my Standard and Proposed Lighting numbers Different?
- Error 1105
- Error 1101

#### Additional Information

- [CBCECC-Com Website](#)
- [Approval/Expiration Dates](#)
- [Reported Software Issues](#)
- Support: [cbcecc.com@gmail.com](mailto:cbcecc.com@gmail.com)

- [EnergyPro Website](#)
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- [FAQs](#)
- Support: [support@energysoft.com](mailto:support@energysoft.com)



## CBECC-RES COMPLIANCE SOFTWARE PROJECT

HOME CBECC-RES 2013 CBECC-RES 2016 CBECC-RES 2019 FAQ/HELP REFERENCE DOCUMENTS SOFTWARE ARCHIVE

### DOCUMENTATION

If you have questions about the software or run into a problem, you can get help here:

- [CBECC-Res Quick Start Guide](#). Provides brief descriptions of the program's main features.
- [CBECC-Res FAQ](#). Frequently Asked Questions (and Answers) about CBECC-Res, updated September 6, 2016.
- CBECC-Res [2016 User Manual](#) and [2013 User Manual](#). These User Manuals can also be accessed through the program's Help menu.
- [2013 Residential Alternative Calculation Method Reference Manual](#). Revised December 2015.
- [2016 Residential Alternative Calculation Method Reference Manual](#). Revised September 2016.

The Quick Start Guide, FAQ, and User Manual are also available in the Software's Help menu.

### TECHNICAL SUPPORT/REPORT AN ISSUE

If you have a question that is not covered by one of these documents or if you think CBECC-Res is not operating correctly, send an email to [CBECC-Res Support](mailto:CBECC-Res Support) and we'll answer your question as soon as possible.

If you are reporting a CBECC-Res crash or error, please include as much of the following as possible (copy and paste this template into your email):

CBECC-Res version (Help: About): CBECC-Res 2013-?? (???)  
 Describe the error, using as much detail as possible.  
 List the steps taken to produce the error, using as much detail as possible.  
 1.  
 2. etc.

If there is an error message, what is the message? If possible, take a screenshot of the error message and attach it to the email as a file. Please attach your <ProjectName>.r1bd file. This is the file you open and save from inside CBECC-Res. By default, this file is located in the C:\Users\<your username>\My Documents\CBECC-Res-2013-??\Projects directory.

SIGN UP to be notified about new versions of CBECC-Res



# California Energy Commission: Online Resource Center



## 2016 Building Energy Efficiency Standards Approved Computer Compliance Programs (Revised 9/28/16)

CALIFORNIA ENERGY COMMISSION



Residential Buildings, 2016 Standards				
Program Name	Version	Approval		Expiration*
CBECC-Res	2016.1.0	11/12/2015		09/27/2016
	2016.2.0	06/14/2016		12/19/2016
	2016.2.1	09/14/2016		
			<b>CBECC-Res Engine</b>	
EnergyPro (Residential)	7.0	01/13/2016	2016.1.0	09/27/2016
	7.1	09/27/2016	2016.2.1	
Right Energy Title 24	2.0	04/13/2016	2016.1.0	09/27/2016

\*New permit applications made on or after the listed date must be made using approved software.

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## CBECC-Res



sourceforge

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**CBECC-Res**  
Residential California Energy Commission Performance Compliance  
Brought to you by: bruceawilcox, kennittler, larryfroess, pcwilcox, scriwellwsf

Summary Files Reviews Support Wiki Tickets Code

Search Tickets

Create Ticket View Stats

Milestone

- TBD: 20
- 2016Winter: 26
- User: 22
- XMLFall: 5
- ErrMsgWinter: 6
- OtherWinter: 1
- Cleanup: 9

Searches

- 1-Open: 89
- 2-New: 74
- 3-Accepted: 7
- 4-Started: 4

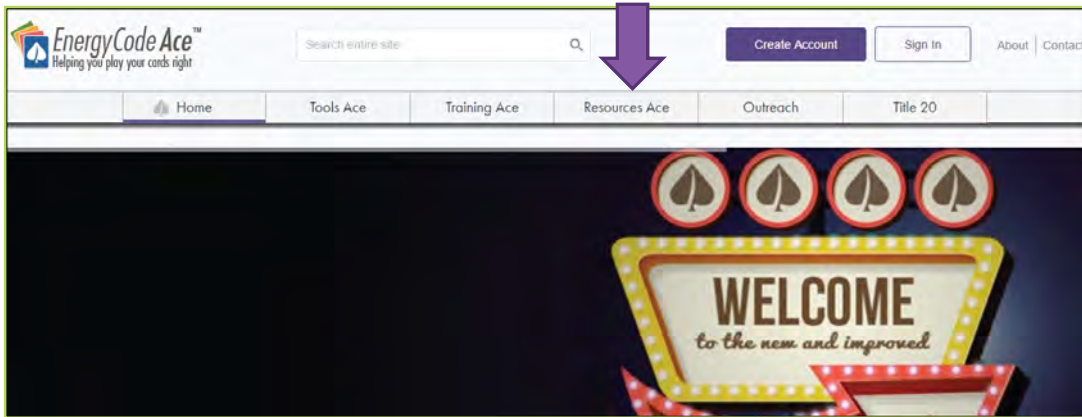
Tickets

Create new tickets by sending e-mail (with all pertinent attachments) to: cbecc.res@gmail.com

Showing 25 results of 83

#	Summary	Milestone	Status	Owner	Created	Updated	Priority	Type	Version	Component
785	Program operation quirks	User	New	Ken Nittler	3 days ago	3 days ago	Medium	Comp. Error	2016	CBECCr
784	Better reporting of ducts in multiple locations needed	TBD	New	Robert Scott	3 days ago	3 days ago	High	Enhancement	2013&2016	CBECCr
783	Input files missing CRLF at end of lines causes a crash	User	New	Scott Criswell	2016-11-18	2016-11-18	Medium	Enhancement	2013&2016	CBECCr
782	Run scope of "new" should be applied to ducts also	2016Winter	New	Scott Criswell	2016-11-18	2016-11-18	High	Comp. Error	2013&2016	CBECCr
780	Altered Verified Wall to Garage error	2016Winter	New	Scott Criswell	2016-11-17	2016-11-17	Medium	Comp. Error	2013&2016	CBECCr

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## Resources

### \* Application Guides

These guides are designed to help builders, designers, contractors, and others involved in the compliance process become more familiar with California's 2016 Title 24, Part 6 residential and nonresidential standards as they apply to projects. They include compliance requirements and recommendations for implementing the Energy Standards in new construction, addition and renovation projects.



# New! Application Guides



All seven guides can be found at [EnergyCodeAce.com](http://EnergyCodeAce.com)

APPLICATION GUIDE	WHAT'S COVERED
NONRESIDENTIAL ENVELOPE AND SOLAR READY	<ul style="list-style-type: none"> <li>Climate specific design</li> <li>Insulation</li> <li>Cool Roofs</li> <li>Solar Zone</li> <li>Fenestration</li> <li>Compliance documentation details</li> </ul>
NONRESIDENTIAL LIGHTING AND ELECTRICAL POWER DISTRIBUTION <sup>1</sup>	<ul style="list-style-type: none"> <li>Lighting design strategies</li> <li>Controls</li> <li>Electrical power distribution</li> </ul>
NONRESIDENTIAL HVAC AND PLUMBING	<ul style="list-style-type: none"> <li>Mechanical Systems and Plumbing Systems</li> <li>Commissioning, HERS Process &amp; Acceptance Testing</li> </ul>
NONRESIDENTIAL COVERED PROCESS	<ul style="list-style-type: none"> <li>Process loads</li> <li>Applicable products and systems such as kitchen hoods, parking garage ventilation, laboratory fume hoods, elevators and moving walkways, escalators, and compressors</li> </ul>
RESIDENTIAL ENVELOPE AND SOLAR READY (Low-Rise and Single Family)	<ul style="list-style-type: none"> <li>Single Family Homes, including duplexes</li> <li>Low-rise residential building envelope</li> <li>Climate specific design</li> <li>Insulation</li> <li>Cool Roofs</li> <li>Single Family Solar-Ready including Solar Zones</li> <li>Fenestration</li> <li>Prescriptive vs. Performance compliance</li> <li>Compliance documentation details</li> </ul>
RESIDENTIAL LIGHTING <sup>1</sup> (Low-Rise and Single Family)	<ul style="list-style-type: none"> <li>Lighting design strategies</li> <li>Compliant Products</li> <li>Controls</li> </ul>
RESIDENTIAL HVAC AND PLUMBING (Low-Rise and Single Family)	<ul style="list-style-type: none"> <li>HVAC terminology</li> <li>Heating and cooling system types</li> <li>Hot Water system types</li> </ul>

<sup>1</sup> Created by the California Lighting Technology Center (CLTC) in collaboration with Energy Code Ace.

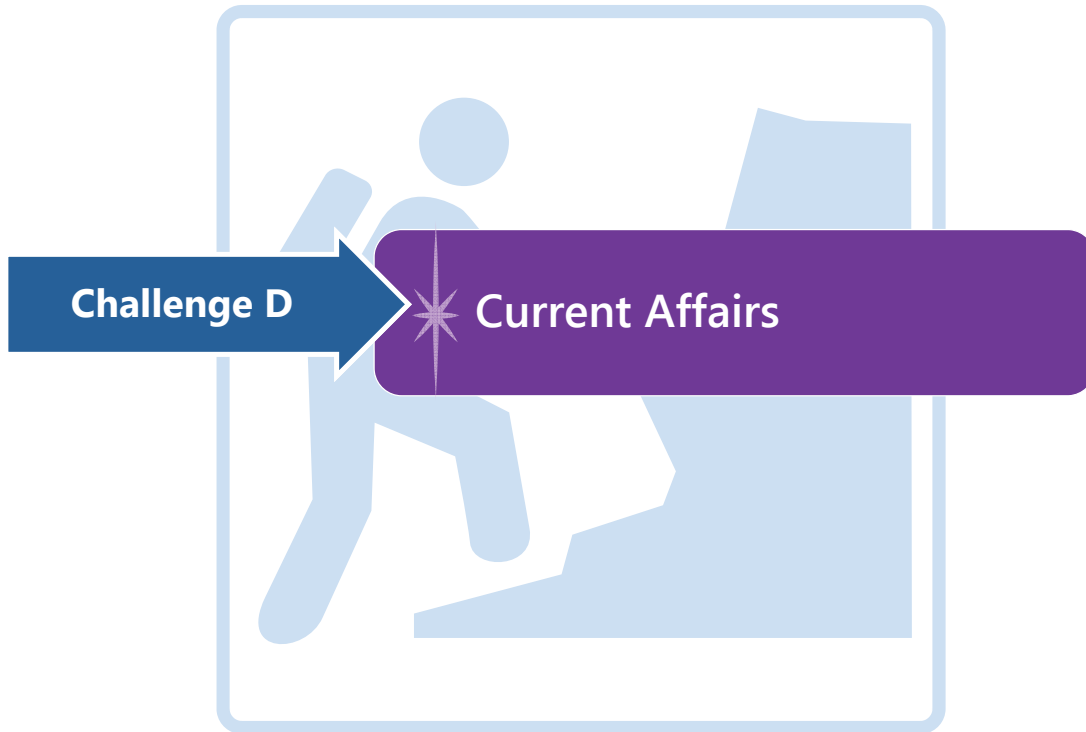


Case Study: Phocus Office and Warehouse

	CASE STUDY	PRESCRIPTIVE	PERFORMANCE
Nonresidential Buildings	Nonresidential office and warehouse building	Climate Zone (C2) 9	2016 Residential ACM Reference Manual (Sections 7.5 to 7.7)
Total Conditioned Floor Area (CFA)	2,370 ft <sup>2</sup>	2,370 ft <sup>2</sup>	2,370 ft <sup>2</sup>
Unconditioned Area	1,830 ft <sup>2</sup>	1,830 ft <sup>2</sup>	1,830 ft <sup>2</sup>
Fenestration	Dual pane top-hung, stormfront and glass door fenestration with thermally broken metal frames and manufacturer's selection, NFRC rated, clear glass with thermally broken metal frame		
Area	<ul style="list-style-type: none"> <li>Total west-facing area = 0 ft<sup>2</sup></li> <li>West-facing WWR = 0%</li> <li>Total fenestration area = 511 ft<sup>2</sup></li> <li>WWR = 20.5%</li> </ul>	Total West-facing WWR = 40%	The Standard Design is identical to the Proposed Design with exception when the WWR (west-facing or total) exceeds 40%, then: Total West-facing WWR = 40%
U-factor	<ul style="list-style-type: none"> <li>Storefront U-factor = 0.28 (COG) (0.46 calc)</li> <li>Glass door U-factor = 0.28 (COG) (0.46 calc)</li> <li>Manufactured Operable Window = 0.34 (NFRC)</li> </ul>	All C2: ≤ 0.41	All C2: ≤ 0.41
SHGC	<ul style="list-style-type: none"> <li>Storefront SHGC = 0.27 (0.31 calc) (0.18 w/overhang)</li> <li>Glass door SHGC = 0.27 (0.31 calc) (0.18 w/overhang)</li> <li>Manufactured Operable Window = 0.27 (NFRC)</li> </ul>	All C2: ≤ 0.26	Same as Prescriptive
		All C2: ≤ 0.23	Same as Prescriptive
		All C2: ≤ 0.22	Same as Prescriptive



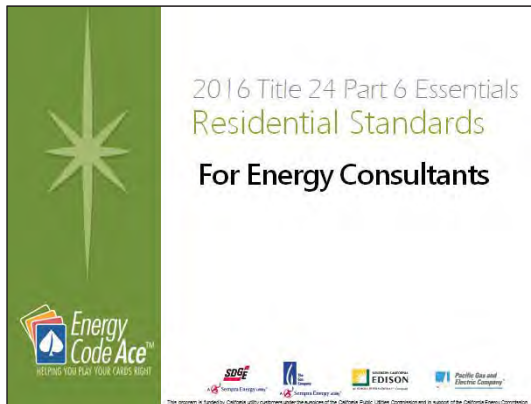
## Challenge D



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## Traditional Classroom



### ★ Software


- ❖ IES-VE Software Training for Title 24 Compliance for Nonresidential Buildings
- ❖ Beginning and Advanced EnergyPro - Residential
- ❖ Beginning and Advanced EnergyPro - Nonresidential

### ★ Title 24 Part 6 Essentials –

- ❖ Residential Standards for Plans Examiners and Building Inspectors
- ❖ Residential Standards for Energy Consultants
- ❖ Residential Standards for AC Quality Installation Contractors
- ❖ Nonresidential Standards for Plans Examiners and Building Inspectors
- ❖ Nonresidential Standards for Energy Consultants
- ❖ Nonresidential Standards for Architects NEW
- ❖ Nonresidential Standards for Small Commercial AC Quality Installation Contractors
- ❖ Standards & Technology for Retail Lighting
- ❖ Standards & Technology for Residential Lighting
- ❖ Standards & Technology for Office Lighting




## Updated and New Trainings for 2016



### Ace Training™

Targeted classroom and online training on Title 24, Part 6 and Title 20 addressing a variety of stakeholders and measures

**Ace it**



- ⊕  **Ace Training** \* **Decoding Talks™**
- ⊕  **Ace Training** \* **Virtual Classroom™**
- ⊕  **Ace Training** \* **Online Self-Study™**
-  **Ace Title 20 Training** \* **On-Demand Video™**

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## Decoding Talk – Archived Events

### Archives

Below you'll find recordings of prior Decoding Talks you can access anytime and anywhere you like. Simply click on the title of the session you'd like to view.

- ⊕  **Decoding** \* **Forms™**
- ⊕  **Decoding** \* **CXR™**
- ⊕  **Decoding** \* **CBECC-COM™**
- ⊕  **Decoding** \* **Electrical Distribution™**
- ⊕  **Decoding** \* **Multifamily™**
- ⊕  **Decoding** \* **2016 Title 24, Part 6™**
- ⊕  **Decoding** \* **Attics and Walls™**
- ⊕  **Decoding** \* **2016 Nonresidential Lighting™**

✦ Recordings and handouts available:

- ✦ 2 hours each
- ✦ ONLINE! No travel time
- ✦ 2016 Title 24 Part 6 appropriate



## Virtual Classroom

- Title 24 Part 6 Essentials – Residential Standards for Energy Consultants
  - Classes are delivered in 3 parts, 1 each day in a series.
  - Upcoming Classes:
    - 10/25/16 - 10/27/16: **Registration**
    - 11/15/16 - 11/17/16: *Registration Coming Soon*
- Title 24 Part 6 Essentials – Nonresidential Standards for Energy Consultants
  - Classes are delivered in 3 parts, 1 each day in a series.
  - Upcoming Classes:
    - 11/8/16 - 11/10/16: **Registration**
    - 12/6/16 - 12/8/16: *Registration Coming Soon*
- Title 24 Part 6 Essentials – Residential Modeling
  - Classes are delivered in 3 parts, 1 each day in a series.
  - Upcoming Classes:
    - 10/18/16 - 10/20/16: **Registration**
    - 11/29/16 - 12/1/16: *Registration Coming Soon*
- Title 24 Part 6 Essentials – Nonresidential Modeling
  - Classes are delivered in 3 parts, 1 each day in a series.
  - Upcoming Classes:
    - 12/13/16 - 12/15/16: *Registration Coming Soon*
    - 12/20/16 - 12/22/16: *Registration Coming Soon*
- Title 24 Part 6 Essentials – Standards for Refrigeration in Retail Food Storage

- ✦ Taught by “live” instructor real time
  - ✧ (3) Classes over the 3 days (3 hours each day)
  - ✧ ONLINE! No travel time
  - ✧ Highly interactive with “hands-on” activities



## Online Self-Study

- Title 24 Part 6 Essentials – Residential Standards for AC Quality Installation Contractors**
  - Course
  - Post Test
- Title 24 Part 6 Essentials – Nonresidential Standards & Technology for Indoor Lighting Prescriptive Compliance**
  - Course
  - Post Test
- Title 24 Part 6 Essentials – Residential Standards & Technology for Lighting**
  - Course
  - Post Test
- Title 24 Part 6 Essentials – Nonresidential Standards & Technology for Indoor Lighting Mandatory Measures**
  - Course
  - Post Test
- Title 24 Part 6 Essentials – Residential Standards for Ventilation**
  - Course
  - Post Test

- ✦ Whenever and wherever it is most convenient – for YOU!
  - ✧ At your own pace
  - ✧ ONLINE! No travel time
  - ✧ System will “remember” you and where you left off
  - ✧ Activities to verify your understanding and make just a little more interesting 😊





# Title 20 Training

Title 20 **Essentials** \* Using MAEDBS for Manufacturers
Steps to Adding Appliances

**Contacts**

Contact the Energy Commission  
For questions and comments about Title 20 and MAEDBS

Subscribe to the Title 20 Compliance Assistance List Server  
or automated email on issues related to Title 20 Compliance

Subscribe to the Appliances List Server  
or automated email on new standards and rule making (scroll down on the page to find)

Contact the Energy Code Ace Title 20 Team  
For questions and comments about Energy Code Ace and Title 20 training

## Module Focus

This module explores the considerations and processes for adding appliances to MAEDBS:

- + Using the online form
- + Uploading via the Excel template
- + Identifying and correcting errors

Related module: "Demonstrations of Adding Appliances" shows you in action the procedures discussed in this module



# Blueprint Newsletter



Blueprint Newsletter

**Subscribe**

**Blueprint List Serve**  
Automated Email Notifications

First name:

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Email address:

You will receive an email requesting that you confirm your subscription.

Issue 116 | September - October 2016

## BLUEPRINT

California Energy Commission  
Efficiency Division

**In This Issue**

- Are You Ready for January 1, 2017?
- 2016 Mandatory Measures Summary Now Available
- New Project Status Report Available!
- Dynamic Compliance Documents for 2016 Residential Non-HERS Projects
- Residential Early Adopters
- Master Plan Permit Applications
- Online Resource Center
- Lighting ATTCP Training Approved for 2016
- 2016 High Efficacy Requirements for Ceiling Recessed and Enclosed Luminaires
- Deep-Dimming Fluorescent Lamp Ballast Efficiency Standards
- Overlapping Requirements for Residential Hot Water Pipe Insulation
- New Mechanical ATTCP
- ATTCP and HERS Reference Cards Now Available
- Q&A
  - 2016 Nonresidential Lighting Alterations
  - 2016 Residential Water Heating Options

**Are You Ready for January 1, 2017?**  
The 2016 Building Energy Efficiency Standards (Energy Standards) go into effect January 1, 2017. Many great resources are already available to help with implementation, including:

- **2016 Residential and Nonresidential Compliance Manuals**
- **2016 Compliance Software**
- **2016 Mandatory Measures Summary**
- **Online Resource Center**

**2016 Mandatory Measures Summary Now Available**  
The California Energy Commission (Energy Commission) has just released the **2016 Low-Rise Residential Mandatory Measures Summary**. The Mandatory Measures Summary is a tool designed to quickly identify mandatory measures at the design phase. This tool is not a compliance document and is not required to be registered with a Home Energy Rating System (HERS) provider. Designers may incorporate this summary into building plans to specify the mandatory measures.

**New Project Status Report Available!**  
The Energy Commission has developed the Project Status Report for residential compliance documents. This report summarizes the status of all compliance documents for a given project, including the Certificates of Compliance (CF1R), Installation (CF2R), and Verification (CF3R). The Project Status Report is available for any project that is registered with an approved HERS Provider.

Enforcement agencies can access the Project Status Report directly through the HERS registries. This provides enforcement agencies the opportunity, at their discretion, to verify the completion of the CF1R, CF2R, and CF3R documents via the web. To determine if a project is ready for a final inspection, both the "Overall" and "HERS Compliance Documents" status should be marked "complete." If the project is marked complete, this indicates that all of the compliance documents have been completed and signed. Currently, CalCERTS and OHERS registries have this report available.



Above Dec		Supplemental Programs		
Organization	Description	Program Name	Description	Website
EternaTile	Insulation	California Advanced Homes Program (CAHP)	Utility funded incentive program assisting builders statewide with meeting and exceeding Title 24 Energy Efficiency standards in new residential construction.	<a href="http://www.trcsolutions.com/projects/utilities/pg-e-california-advanced-homes-program">http://www.trcsolutions.com/projects/utilities/pg-e-california-advanced-homes-program</a>
GAF Cornell	National	The ABC Green Home Challenge	Pilot program supporting Zero-Net Energy (ZNE) LEED and high efficiency homebuilding. Case studies of above-code new homes using advanced construction practices and high performance materials.	<a href="http://abcgreenhome.com">http://abcgreenhome.com</a>
GreenHybrid Roofing	Insulation	Department of Energy Zero Energy Home Program	National program supporting high performance and Zero-Net Energy ready home construction with several California and sunbelt specific case studies.	<a href="http://energy.gov/eere/buildings/zero-energy-ready-home">http://energy.gov/eere/buildings/zero-energy-ready-home</a>
Johns Manville	Roofing	Energy Code Ace	Training program for Title 24 code compliance offered by several California utilities.	<a href="http://energycodeace.com">http://energycodeace.com</a>
Premier R-Max Wedg	Organization	California Statewide Utility Codes and Standards Program	Codes and Standards Enhancement (CASE) reports workshops and stakeholder scoping for proposed updates to 2019 Title 24 building codes.	<a href="http://title24stakeholders.com">http://title24stakeholders.com</a>
		APA Engine Association	Product solutions	<a href="#">Beebe</a>
		BASF	HP+ Wall Systems	<a href="http://www2.basfconstruction.us/HPwallsystem">http://www2.basfconstruction.us/HPwallsystem</a> <a href="#">Chris Rosemond</a>
		Insulated Concrete Forms Association	Insulating Concrete Forms (ICF)	<a href="http://www.forms.org/index.cfm/buildingicf">http://www.forms.org/index.cfm/buildingicf</a> <a href="#">Contact ICF-A</a>
		Premier SIPS	Structural Insulated Panels (SIPs)	<a href="http://premiersips.com/residential-sips-framing-systems">http://premiersips.com/residential-sips-framing-systems</a> <a href="#">Phil Ligon</a>
		R-Max	Continuous Insulation Wall Solution	<a href="http://www.rmax.com/products/wall-products/ecomaxci-wall-solution">http://www.rmax.com/products/wall-products/ecomaxci-wall-solution</a> <a href="#">Steve Dubin</a>
		Structural Insulated Panel Association	Structural Insulated Panels (SIPs)	<a href="http://www.sips.org/about/what-are-sips">http://www.sips.org/about/what-are-sips</a> <a href="#">Jack Armstrong</a>



## CLTC through UC Davis



[Who We Are](#) [Focus Areas](#) [Affiliates](#) [Publications](#) [News & Events](#)

### Policy, Codes & Standards



CLTC is committed to ensuring that our state and national policy makers have access to the latest and best information on energy-efficient lighting technologies and strategies. CLTC hosts meetings and facilitates collaboration between regulators, utilities, researchers, and industry leaders to achieve our common energy goals. The center also produces a variety of resources, like its lighting design guides for Title 24 and Title 20, created to help building professionals and end-users meet—or exceed—state codes and standards.

#### PROJECT PORTFOLIO

- Title 20 Lighting Appliance Efficiency Regulations
- Light-RITE California: The Lighting Retrofit Information, Training and Education Program
- Title 24: Residential Lighting

#### RELATED PUBLICATIONS

- California's Energy Codes and Standards Now and Next
- Lighting Appliance Efficiency Regulations: What's New in the Title 20 Code?
- Nonresidential Lighting: What's New in the

#### RELATED NEWS

- CLTC at LIGHTFAIR International 2016
- Announcing CLTC's Lighting Best Practices Series
- New Lighting Technology Overview Now Available

# CLTC: Title 20 Resources

## Title 20 Lighting Appliance Efficiency Regulations



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**PUBLICATIONS**

Lighting Appliance Efficiency Regulations  
What's New in the Title 20 Code?

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**PROJECT CATEGORY**

Policy, Codes & Standards

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**TADS**

Codes & Standards: Title 20

**Abstract:**  
The California Energy Commission adopted new standards updating the 2015 Appliance Efficiency Regulations (Title 20) for lighting appliances. Updates will roll out in two tiers with Tier 1 effective July 1, 2018 and Tier 2 effective July 1, 2019. Notably, this update adds standards for small diameter lamps. The updated regulations incorporate elements of lighting product quality for both general service lamps and small diameter directional lamps in addition to the traditional lighting appliance standards previously included in the regulations. The addition of these new standards will require revisions to the California Appliance Efficiency Database product certification process, as well as update product labeling requirements for lamp marking, marketing material, and product packaging.

**Major changes include:**

- Updates to Lamp Regulations & Categories:**  
**General service LED lamps** are now regulated as a separate category from other light general service lamp category. New requirements include specific performance metrics a test methods to quantify product performance in an industry-recognized manner. **Small directional lamps** with a diameter of 2.25 inches or less that are equipped with ANSI d types or the E26 base type are now regulated. New requirements apply to both low- and lamps. **Portable luminaires** that are equipped with a socket requiring a general service packaged with a compact fluorescent lamp or LED lamp that adheres to the updated in
- California Appliance Efficiency Database:**  
 The appliance database filing structure that manufacturers use to submit products for the California Energy Commission will include new product categories and performance metrics starting January 1, 2018.
- Product Labeling:**  
 Manufacturers must test and certify their products with the updated regulations before including claims of dimmability, encapsulated lamp equivalence, wattage equivalence, descriptive lamp lumen output, or compliance with the Voluntary California Quality LED Lamp Specification in their lamp marking, marketing material, and package labeling.

WHAT'S NEW IN THE TITLE 20 CODE?  
**LIGHTING APPLIANCE EFFICIENCY REGULATIONS**  
Changes to California's lighting appliance requirements

The California Energy Commission adopted new standards updating the 2015 Appliance Efficiency Regulations (Title 20) for lighting appliances. Updates will roll out in two tiers with Tier 1 effective January 1, 2018 and Tier 2 effective July 1, 2019. Notably, this update adds standards for small diameter lamps. The updated regulations incorporate elements of lighting product quality for both general service LED lamps and small diameter directional lamps in addition to the traditional lighting appliance efficiency standards previously included in the regulations. The addition of these new standards will require revisions to the California Appliance Efficiency Database product certification process, as well as update to product labeling requirements for lamp marking, marketing material, and product packaging.

**MAJOR CHANGES**

- UPDATES TO LAMP REGULATIONS AND CATEGORIES**  
 General service LED lamps are now regulated as a separate category from other light sources in the general service lamp category. New requirements include specific performance metrics and corresponding test methods to quantify product performance in an industry-recognized manner. Small diameter directional lamps with a diameter of 2.25 inches or less that are equipped with ANSI compliant base types or the E26 base type are now regulated. New requirements apply to both low- and line-voltage lamps. Portable luminaires that are equipped with a socket requiring a general service lamp must be packaged with a compact fluorescent lamp or LED lamp that adheres to the updated lamp requirements.
- CALIFORNIA APPLIANCE EFFICIENCY DATABASE**  
 The appliance database filing structure that manufacturers use to submit products for listing with the California Energy Commission will include new product categories and performance metrics starting January 1, 2018.
- PRODUCT LABELING**  
 Manufacturers must test and certify their products with the updated regulations before including claims of dimmability, encapsulated lamp equivalence, wattage equivalence, descriptive lamp lumen output, or compliance with the Voluntary California Quality LED Lamp Specification in their lamp marking, marketing material, and package labeling.

This guide is not intended to be used in lieu of California's Appliance Efficiency Regulations, and it is not a substitute for the code book. Please visit [energy.ca.gov/Title20](http://energy.ca.gov/Title20) to download the updated 2016 Title 20 Building Energy Efficiency Standards, Codes, Reference Appendices, and the Reference Compliance Manual.

CALIFORNIA LIGHTING TECHNOLOGY CENTER · UNIVERSITY OF CALIFORNIA, DAVIS · CLTC.UCDAVIS.EDU

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# CLTC: Title 24 Part 6 Resources

## Title 24: Residential Lighting



**PROJECT CATEGORY**

Advanced Controls Daylighting

Indoor Lighting Lighting Education

Policy, Codes & Standards

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**TADS**

California Quality Standards

**Abstract:**  
The Residential Lighting Design Guide outlines the California's 2018 Title 24 energy code requirements.

**Topics include:**

- Explanation of the code
- Technical and compliance information
- Lighting design examples

The lighting design guide will cover code explanation and floor plan examples of the following areas:

- Kitchens
- Bathrooms, garages, laundry rooms, closets, utility rooms
- Other spaces (Bedrooms, living rooms, dining rooms, attics, enclosed patios, hallways)
- Outdoor spaces

WHAT'S NEW IN THE 2016 CODE?  
**RESIDENTIAL LIGHTING**  
Changes to mandatory lighting requirements in California's 2016 Building Energy Efficiency Standards

California's new residential Building Energy Efficiency Standards take effect on January 1, 2017. The 2016 Standards focus on several key areas to improve the energy efficiency of newly constructed buildings, additions and alterations to existing buildings. The most significant efficiency improvements address atriums, walls, water heating and lighting. The California Energy Commission estimates that the 2016 standards will deliver approximately 281 gigawatt-hours of electricity savings annually and reduce statewide greenhouse gas emissions by 160,000 metric tons. This is enough electricity to power 500,000 California homes each year. These standards represent a major step towards meeting California's residential Zero Net Energy (ZNE) goal by the year 2020. Updates enhance and simplify previous requirements and lay the foundation for additional efficiency improvements slated for 2019 code. This publication offers an overview of important requirements and major updates to the 2016 residential lighting energy efficiency code.

**MAJOR CHANGES**

- ALL HIGH-EFFICIENCY LIGHTING**  
 Indoor and outdoor lighting for new homes must be high efficacy.
- JAB UPDATES**  
 Joint Approver JAB regulations now contain requirements for more types of residential high efficacy lamps and luminaires. In the 2013 Standards, JAB regulations only applied to LED sources.
- SIMPLIFIED CONTROL REQUIREMENTS**  
 Lighting control requirements for indoor spaces are now simpler. Control requirements are based, in nearly all cases, on the type of lamp or luminaire installed, not the space.

This guide is not intended to be used in lieu of California's Building Energy Efficiency Standards, and it is not a substitute for the code book. Please visit [energy.ca.gov/Title24](http://energy.ca.gov/Title24) to download the updated 2016 Title 24 Building Energy Efficiency Standards, Codes, Reference Appendices, and the Reference Compliance Manual.

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## CABEC: Certified Energy Analyst (CEA)

### Core Competencies for the 2013 & 2016 Standards

This (free) video is part 1 of a 6-part series entitled: **CEA Core Competencies**

This particular video provides a brief overview of the CEA's existence as well as the five core competencies.

- Click the following link to view the CEA Core Competencies
- Click the following link to view the CEA Core Competencies (PDF)

Further videos in the **CEA Core Competencies** series include:

- **CEA Competency 1 (2013)**
- **CEA Competency 2 (2013)**
- **CEA Competency 3 (2013)**
- **CEA Competency 4 (2013)**
- **CEA Competency 5 (2013)**

<ul style="list-style-type: none"> <li>▶ <b>Welcome</b> <ul style="list-style-type: none"> <li>□ CEA History</li> <li>□ The "New" 2013 CEA Exam</li> </ul> </li> <li>■ Value and Benefits</li> <li>■ Overview of the Exam</li> <li>■ About Presentations Two through Six</li> <li>■ Wrap Up</li> </ul>
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# Energy Saver 101 Infographics

**ENERGY.GOV**  
PUBLIC SERVICES SCIENCE & INNOVATION ENERGY SAVER ABOUT ENERGY

Home » Energy Saver 101 Infographic: Home Heating

**Energy Saver 101 Infographic: Home Heating**

December 16, 2013 - 10:48am

ENERGY SAVER

**Energy Saver 101: EVERYTHING YOU NEED TO KNOW ABOUT HOME HEATING**

**Home Cooling**

- 6%** The percentage of the average household's energy use that goes to space cooling.
- 2/3** of all U.S. homes have air conditioners.
- \$29B** The amount it costs homeowners every year to power their air conditioners.

**#DidYouKnow:**

**20-50%** You can reduce air conditioning energy use by 20-50 percent by switching to **high-efficiency air conditioners** and taking other actions to lower your home cooling costs.

**How an Air Conditioner Works:**  
Similar to how a refrigerator works, air conditioners transfer heat from a home's interior to the warm outside environment.

**101 Infographic: Landscaping**

**New Infographic and Projects to Keep Your Energy Bills Out of Hot Water**

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# DOE Building America Solutions Center

**Building America Solution Center**

**Solution Center Home**

**Help**

**FIND YOUR TOPIC BY:**

- Building Components
- Guides A-Z
- ENERGY STAR Certified Homes
- Zero Energy Ready Home
- EPA Indoor airPLUS

**FIND RESOURCES:**

- Sales Tool
- CAD Files
- Image Gallery
- Case Studies
- Videos
- Optimized Climate Solutions
- Code Briefs

**FIND PUBLICATIONS:**

- Library

The Building America Solution Center provides access to expert information on hundreds of high-performance construction topics, including air sealing and insulation, HVAC components, windows, indoor air quality, and much more. Click on the links below to explore the Solution Center.

As a community driven tool, we welcome your [comments](#) on how to continuously improve the Solution Center. If you are interested in submitting content, please become a [registered user](#) and see the [criteria for submissions](#).

**Program Checklists**

Access guides directly from checklists for Zero Energy Ready Home, ENERGY STAR Certified Home, and Indoor airPLUS

**Building Components**

Access guides for new and existing homes based on building components of interest.

**Sales Tool**

Translate building science technical terms into a new language of value.

**Climate Packages**

Review new home energy efficiency specifications and case studies that exceed 2009 IECC by 30%.

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# DOE Building America Solutions Center

Image Gallery				CAD Files			
Items per page: 100 <input type="button" value="Apply"/>				Items per page: 50 <input type="button" value="Apply"/>			



## Wrap Up



HELPING YOU PLAY YOUR CARDS RIGHT