2013

California Energy Code

Living Homes-Zero Energy
Prefabricated Home

Presented by:

Charles “Russ” Russell

Learning Objectives

- What is Title 24 and Part 6
- Difference between performance & prescriptive
- What are the mandatory measures?
- How to comply with the different measures
- Interaction with other codes

Learning Objectives

- Issues at design
- Plan check submittal
- Construction challenges
- Architects tasks
- Contractor tasks
- Sub-contractor tasks

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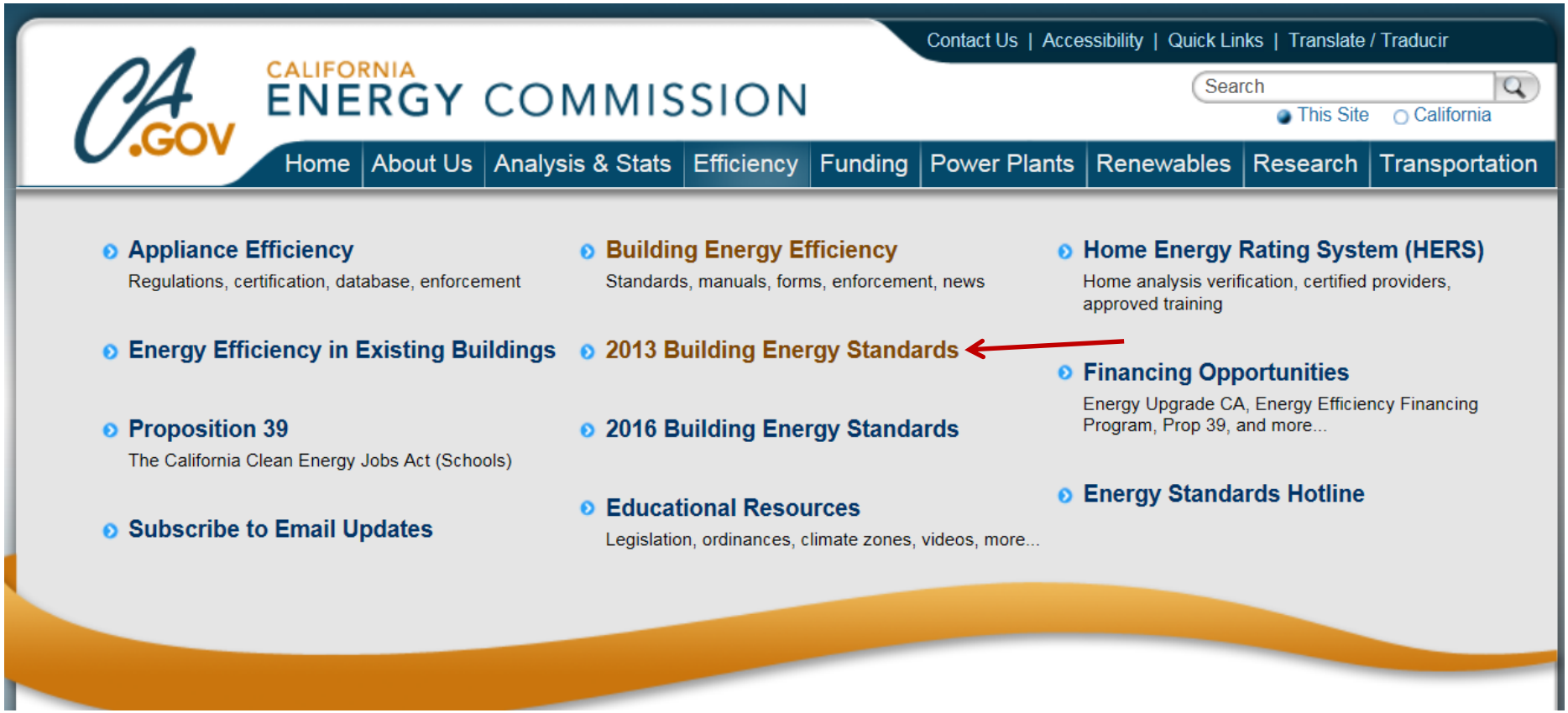

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BUILDING ENERGY EFFICIENCY STANDARDS

FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

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RESIDENTIAL COMPLIANCE MANUAL

FOR THE 2013 BUILDING ENERGY EFFICIENCY STANDARDS

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REFERENCE APPENDICES

THE BUILDING ENERGY EFFICIENCY STANDARDS
FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

Residential Appendix RA
Appendix RA1 - Special Case Residential Field Verification and Diagnostic Test Protocols

Note: The HVAC Sizing procedures previously assigned to the 2008 version of RA1 have been moved to the 2013 ACM reference manual.

Table of Contents

Major Points
Of
2013 Energy Code

Residential
2013 Energy Code

New Residential Standards

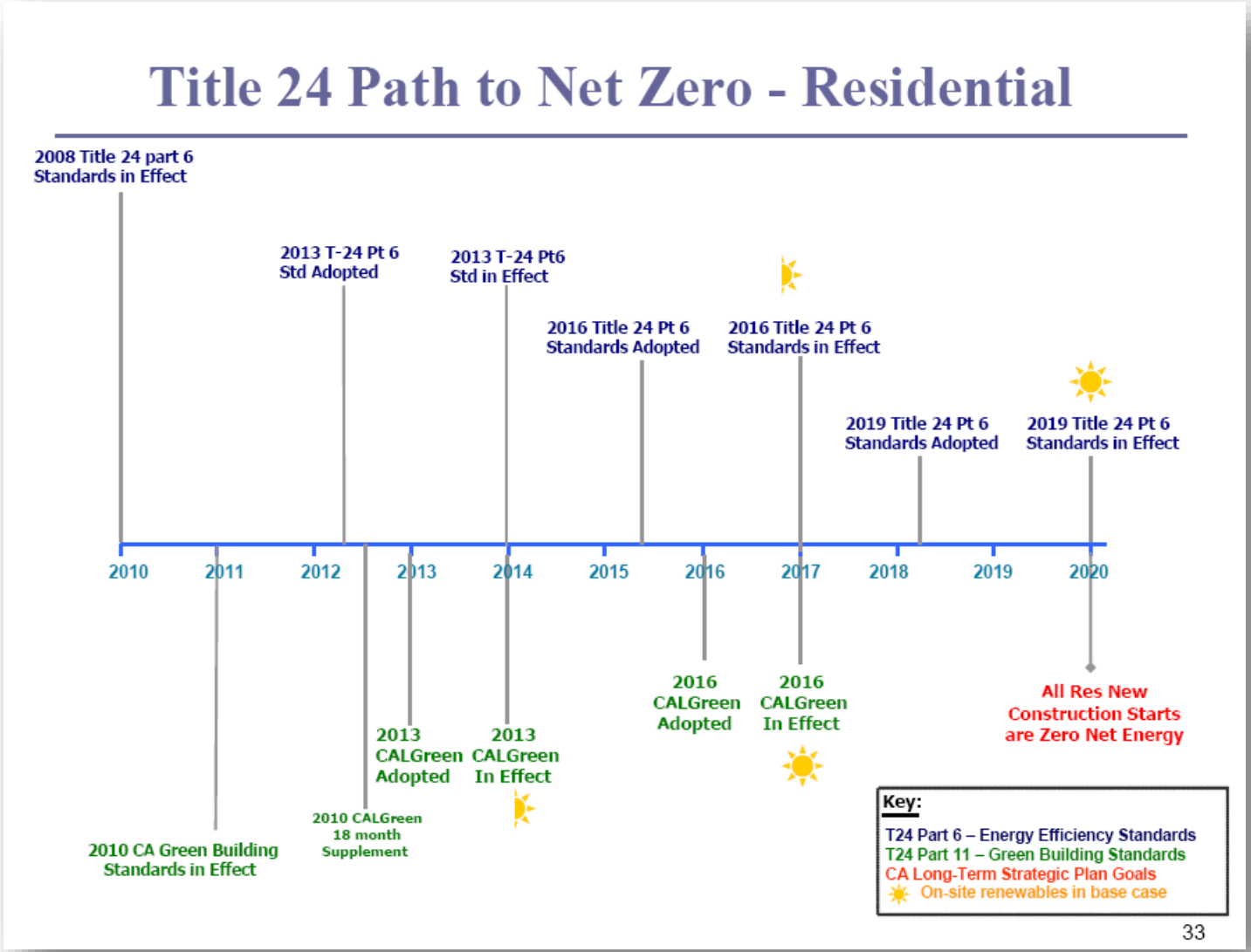
- 25% More Efficient
- Solar ready roofs
- Increase U-factors and SHGC
- Hot water piping ¾ inch and larger insulated
- Whole house fans for cool house and attics
- Verification of air conditioner installation
- Package “D” replace with Package “A”

Residential
2013 Energy Code

New Residential Standards

- Duct sealing in all climate zones
- Return duct size or fan power per
- High efficacy and controls
- R-19 for 2X6 framing
- U-factor .58 for skylights
- HERS third party verification of ASHREA 62.2

2020 CALGreen and CEC



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2013 Approved Computer Compliance Programs

The following list of energy analysis computer programs includes all Alternative Calculation Methods approved by the California Energy Commission. These programs are in accordance with the California Code of Regulations: Title 24, Part 1, Article 1, Section 10-109 (2013 Standards).

The individual programs are listed below under specific categories. These are the only programs that should be used under the performance approach (energy budget) method of compliance for the 2013 Standards.

Note: Price listings of proprietary programs are available from the vendors at addresses and telephone numbers listed.

Residential Buildings, 2013 Standards		
Program Name	**Approved versions usable for permit**	**Contact Information**
CBECC-Res ver. 3 www.bwilcox.com/BEES/BEES.html	Public domain software for complying with the 2013 Residential Energy Efficiency Standards for newly constructed buildings and additions/alterations. Version 3 must be used for permit applications made on or after October 13, 2014. Version 2 or 3 may be used until that date. Please report any issues using instructions from the Quick Start Guide included with the software. Approved 8/27/2014.	California Energy Commission Building Standards Office 1516 9th Street, MS 37 Sacramento, CA 95814 ATTN: Dee Anne Ross 916-654-6560 deeanne.ross@energy.ca.gov
EnergyPro V6.3 www.energysoft.com	Approved 9/5/2014 for compliance with the 2013 Residential Energy Efficiency Standards for newly constructed buildings and additions/alterations. Version 6.3 must be used for permit applications made on or after October 13, 2014. Version 6.2 or 6.3 may be used until that date.	EnergySoft, LLC. 1025 5th Street, Suite A Novato, CA 94945-2413 Phone: (415) 897-6400
Right-Energy Title 24 v1.1 www.wrightsoft.com	Approved 9/5/2014 for compliance with the 2013 Residential Energy Efficiency Standards for newly constructed single family buildings. This is a module for Right-Suite Universal. Version 1.1 must be used for permit applications made on or after October 13, 2014. Version 1.0 or 1.13 may be used until that date.	Wrightsoft Corporation 131 Hartwell Avenue Lexington, MA 02421 Phone: (800) 225-8697 sales@wrightsoft.com

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Nonresidential Buildings, 2013 Standards		
Program Name	**Approved versions usable for permit**	**Contact Information**
CBECC-Com http://bees.archenergy.com/software.html	CBECC-Com V3 is valid for demonstrating compliance with the nonresidential provisions of the 2013 California Building Energy Efficiency Standards. CBECC-Com V2 and V2b are valid for demonstrating compliance with the nonresidential provisions of the 2013 California Building Energy Efficiency Standards until 5:00 p.m. on November 1, 2014. Latest version of CBECC-Com and CBECC-Com Compliance Manager were approved on 08/27/2014. Please review the resolution for details of the public domain Compliance Software (CBECC-Com V3) and associated Compliance Manager (CM).	California Energy Commission Building Standards Office 1516 9th Street, MS 37 Sacramento, CA 95814 ATTN: Sabaratnam Thamilseran 916-651-2927 Sabaratnam Thamilseran@energy.ca.gov
EnergyPro Nonresidential http://www.energysoft.com/download/energypro-6/	EnergyPro V6.2 is valid for demonstrating compliance with the nonresidential provisions of the 2013 California Building Energy Efficiency Standards until 5:00 p.m. on December 31, 2014. EnergyPro V6.2 was conditionally approved on July 22, 2014. Further details can be found in the approval notice. Please contact ENERGYSOFT at support@energysoft.com for support.	EnergySoft, LLC. 1025 5th Street, Suite A Novato, CA 94945-2413 Phone: (415) 897-6400 mart@energysoft.com
IES Virtual Environment http://www.iesve.com/software/title24	IES Virtual Environmental 2014 Feature Pack 1, version 2014.1.0, is valid for demonstrating compliance with the nonresidential provisions of the 2013 California Building Energy Efficiency Standards. IES Virtual Environmental 2013 Title-24 Feature Pack 1 is valid for demonstrating compliance with the nonresidential provisions of the 2013 California Building Energy Efficiency Standards until 5:00 p.m. on November 1, 2014. IES Virtual Environment 2013 Title-24 Feature pack 1 was approved on 5/14/2014 and updated version (IES Virtual Environment 2014 Feature pack 1 version 2014.1.0) was approved under Streamlined Approval process on July 07, 2014.	Integrated Environmental Solutions 101 Federal Street 19th Floor Boston, MA 02110 +1 617 426 1890 Title24@iesve.com

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CA.GOV The California ENERGY COMMISSION News Release

For Immediate Release: October 29 2014
Media Contact: Michael Ward, 916-654-4989

Energy Commission Approves Construction of Huntington Beach Power Plant

SACRAMENTO - The California Energy Commission approved the Application for Certification for the Huntington Beach Energy Project in Huntington Beach, Calif., during a special business meeting today.

The Commission accepted the Revised Presiding Member's Proposed Decision (RPMPD) and Errata, issued October 9 and October 28, 2014 respectively, which found that the project "will, as mitigated, have no significant impacts on the environment and will comply with all applicable laws, ordinances, regulations, and standards."

The 939-megawatt natural-gas fired project will be developed by AES Southland Development, LLC. It will replace the older AES Huntington Beach Generating Station (HBGS). The new plant will be built within the existing facility footprint. Demolition of the old plant and construction of the new one will be done in phases. The first unit is expected to be completed in about 30 months.

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Single Family House Example 1 - Climate Zone 8

	Sample House 19.5% Above 2008 Code / 1.9% Above 2013 Code	2008 Component Package D (Performance Compliance Baseline) Climate Zone 8	2013 Component Package A (Performance Compliance Baseline) Climate Zone 8
Roof/Ceiling Insulation	R-30	R-30	R-30
Wall Insulation - 2x4 Above Grade	R-13	R-13	R-15 + R-4 rigid -OR- R-13 + R-5 rigid
Slab Perimeter Insulation	None	No Requirement	No Requirement
Raised Floor	R-19	R-19	R-19
Radiant Barrier	Yes	Required	Required
Roof - Steep Slope Reflectance	0.3	0.15	Not Required
Roof - Steep Slope Emittance (>5 lbs/sf)	0.75	0.75	Not Required
Window U-factor	0.34	0.40	0.32
Window SHGC	0.22	0.40	0.25
Window - Total Area (sf/CFA)	20.5%	20%	20%
Window - West Facing (sf/CFA)	8.7%	5%	5%
Space Heating - Gas AFUE	0.82	0.67 (Mandatory Requirement)	0.67 (Mandatory Requirement)
Space Cooling - SEER	13.0	13.0 (Mandatory Requirement)	13.0 (Mandatory Requirement)
Refrigerant Charge Verification	No	Required	Required
Whole House Fan	Yes	Required	Required
Duct Insulation	R-8	R4.2	R-6
Solar Water Heating	No	No Requirement	No Requirement

2112 square feet

Sample House exceeds baseline requirements

Sample House is designed to baseline requirements

Sample House does not meet baseline requirements

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Single Family House Example 2 - Climate Zone 3

	Sample House 27.3% Above 2008 Code / 0.1% Below 2013 Code	2008 Component Package D (Performance Compliance Baseline) Climate Zone 3	2013 Component Package A (Performance Compliance Baseline) Climate Zone 3
Roof/Ceiling Insulation	R-22	R-30	R-30
Wall Insulation - 2x6 Above Grade	R-21	R-13	R-19
Slab Perimeter Insulation	None	Not Required	Not Required
Raised Floor	R-19	R-19	R-19
Radiant Barrier	None	Not Required	Required
Roof - Low-Slope Reflectance	None	No Requirement	No Requirement
Roof - Low-Slope Emittance	None	No Requirement	No Requirement
Window U-factor	0.35	0.40	0.32
Window SHGC	0.28	No Requirement	No Requirement
Window - Total Area (sf/CFA)	22.3%	20%	20%
Window - West Facing (sf/CFA)	1.8%	No Requirement	No Requirement
Space Heating - Gas AFUE	0.962	0.67 (Mandatory Requirement)	0.67 (Mandatory Requirement)
Space Cooling - SEER	13.0	13.0 (Mandatory Requirement)	13.0 (Mandatory Requirement)
Refrigerant Charge Verification	No	Not Required	Not Required
Whole House Fan	No	Not Required	Not Required
Duct Insulation	R-6	R-6	R-6
Solar Water Heating	No	Not Required	Not Required
Quality Insulation Inspection (HERS)	Yes	Not Required	Not Required
Duct Leakage Testing (HERS)	Yes	Not Required	Not Required
Building Leakage Testing (HERS)	Yes	Not Required	Not Required

1377 square feet

Sample House exceeds baseline requirements

Sample House is designed to baseline requirements

Sample House does not meet baseline requirements

2013 Energy Code

CEC Non-residential Application Table

Table 1-1 – Nonresidential vs. Residential Standards

Nonresidential Standards	**Residential Standards**
These Standards cover all nonresidential occupancies (Group A, B, E, F, H, M, R, S or U), as well as high-rise residential (Groups R-1 and R-2 with four or more habitable stories), and all hotel and motel occupancies.	These Standards cover all low-rise residential occupancies including:
Offices Retail and wholesale stores Grocery stores Restaurants Assembly and conference areas Industrial work buildings Commercial or industrial storage Schools and churches Theaters Hotels and motels Apartment and multi-family buildings, and long-term care facilities (Group R-2), with four or more habitable stories	All single family dwellings of any number of stories (Group R-3) All duplex (two-dwelling) buildings of any number of stories (Group R-3) All multi-family buildings with three or fewer habitable stories above grade (Groups R-1 and R-2) Additions and alterations to all of the above buildings
Note: The Standards define a habitable story as one that contains space in which humans may live or work in reasonable comfort, and that has at least 50% of its volume above grade.	

2013 Energy Code

Section 10-103-All Buildings

- **Certificate of Compliance**
  - **CF1R-PFR-01(New)**
  - **CF1R-ADD-02**
  - **CF1R-ALT-02**
- **Signed by**
  - **Person in charge of building design(all persons)**
  - **Document author**
  - **Wet or electronic signatures**
  - **Submitted to CALCERTS**

Questions

Project; new single family residence

- Design meeting
- Best friend-MODELER
- When to call
- How often to call

Building Energy Efficiency Standards Section 150

Package “D”

Package “A”

TABLE 150.1-A COMPONENT PACKAGE-A Standard Building Design

					Climate Zone														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope	Insulation[1]	Roofs /Ceilings			U 0.025 R 38	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38
		Walls	Above Grade	2x4 Framed[2]	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U-0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5
				Mass Wall Interior[3]	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.059 R 17
				Mass Wall Exterior[3]	U 0.125 R 8.0	U 0.125 R 8.	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.1025 R 8.0	U 0.125 R 8.0	U 0.070 R 13
			Below Grade	Below Grade Interior[3]	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.066 R 15
				Below Grade Exterior[3]	U-0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19
		Floors	Slab Perimeter		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
			Raised		U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
			Concrete Raised		U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
	Radiant Barrier				NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
	Roofing Products	Low-sloped		Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.6	NR	0.6	NR
				Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
		Steep Sloped		Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
				Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0. 75	0.75	0.75	0.75	0.75	0.75	NR
	Fenestration	Maximum U-factor[4]			0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
		Maximum SHGC[5]			NR	0.25	NR	0.25	NR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		Maximum Total Area			20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
		Maximum West Facing Area			NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

TABLE 150.1-A COMPONENT PACKAGE-A Standard Building Design (continuation)

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HVAC SYSTEM	Space Heating	Electric-Resistance Allowed	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
		If gas, AFUE	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		If Heat Pump, HSPF[6]	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	Space cooling	SEER	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		Refrigerant Charge Verification or Charge Indicator Display	NR	REQ	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
		Whole House Fan[7]	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	NR
	Central System Air Handlers[8]	Central Fan Integrated Ventilation System Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
	Ducts	Duct Insulation	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-8	R-6	R-6	R-8	R-8	R-8
Water Heating	All Buildings		System Shall meet Section 150.1(c)8															

Package “D” replaced by Package “A”

Prescriptive method for complying with the energy code

Use as a guide for minimum requirements

Newport Beach

Ace Resources

Title 24 Part 6
Package A Quick Reference

Zones 5, 6, 7, 8, 9, 10

				cz 5	cz 6	cz 7	cz 8	cz 9	cz 10	Comments
Insulation (1) [A]	Roofs /Ceilings			U 0.031	U 0.031	U 0.031	U 0.031	U 0.031	U 0.031	or Lower
				R 30	R 30	R 30	R 30	R 30	R 30	or Higher
	Walls	Above Grade	2x4 Framed (2)	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	U 0.065	or Lower
				R 15+4 or R 13+5	R 15+4 or R 13+5	R 15+4 or R 13+5	R 15+4 or R 13+5	R 15+4 or R 13+5	R 15+4 or R 13+5	or Higher
			Mass Wall Interior (3)	U 0.070	U 0.070	U 0.070	U 0.070	U 0.070	U 0.070	or Lower
				R 13	R 13	R 13	R 13	R 13	R 13	or Higher
			Mass Wall Exterior (3)	U 0.125	U 0.125	U 0.125	U 0.125	U 0.125	U 0.125	or Lower
				R 8	R 8	R 8	R 8	R 8	R 8	or Higher
		Below Grade	Below Grade Interior (3)	U 0.070	U 0.070	U 0.070	U 0.070	U 0.070	U 0.070	or Lower
				R 13	R 13	R 13	R 13	R 13	R 13	or Higher
			Below Grade Exterior (3)	U 0.200	U 0.200	U 0.200	U 0.200	U 0.200	U 0.200	or Lower
				R 5	R 5	R 5	R 5	R 5	R 5	or Higher
	Floors	Slab Perimeter		NR	NR	NR	NR	NR	NR	
		Raised		U 0.037	U 0.037	U 0.037	U 0.037	U 0.037	U 0.037	or Lower
				R 19	R 19	R 19	R 19	R 19	R 19	or Higher
		Concrete Raised		U 0.269	U 0.269	U 0.269	U 0.269	U 0.269	U 0.269	or Lower
				R 0	R 0	R 0	R 0	R 0	R 0	or Higher
Radiant Barrier				REQ	REQ	REQ	REQ	REQ	REQ	

R-15

Shear Panel

R-4

Building paper and stucco wire on top

Roofing Products	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	
		Thermal Emittance	NR	NR	NR	NR	NR	NR	
	Steep-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	0.20	or Higher
		Thermal Emittance	NR	NR	NR	NR	NR	0.75	or Higher
Fenestration	Maximum U-factor (4)		0.32	0.32	0.32	0.32	0.32	0.32	or Lower
	Maximum SHGC (5)		NR	0.25	0.25	0.25	0.25	0.25	or Lower
	Maximum Total Area		20%	20%	20%	20%	20%	20%	or Lower
	Maximum West Facing Area		NR	5%	5%	5%	5%	5%	or Lower
Space Heating (8) (9)	Electric-Resistance Allowed		No	No	No	No	No	No	
	If gas, AFUE		MIN	MIN	MIN	MIN	MIN	MIN	Central furnace with output capacity **<225,000 Btuh: 78% AFUE** or Higher[B]
	If Heat Pump, HSPF (6)		MIN	MIN	MIN	MIN	MIN	MIN	Single-phase air source with cooling capacity **<65,000 Btuh: 7.7 HSPF** or Higher[B]
Space cooling	SEER		MIN	MIN	MIN	MIN	MIN	MIN	Central air conditioner or Central Air Source Heat Pump with capacity **<65,000 Btuh: 13.0 SEER or** Higher[B]
	Refrigerant Charge Verification or Charge Indicator Display		NR	NR	NR	REQ	REQ	REQ	Central Air Conditioner or Central Air Source Heat Pump with capacity **≥65,000 Btuh but <135,000 Btuh: 8.9 EER** or Higher[B]
	Whole House Fan (7)		NR	NR	NR	REQ	REQ	REQ	
Central System Air Handlers	Central Fan Integrated Ventilation System Fan Efficacy		REQ	REQ	REQ	REQ	REQ	REQ	
Ducts (10)	Duct Insulation		R 6	R 6	R 6	R 6	R 6	R 6	or Higher
Water Heating	All Buildings		Gas Storage **≤55 gallons; ≤75 Btuh** Jan 1, 2014: **0.67-(0.0019*V)**[C] **EF** or Higher Apr 16, 2015: **0.675-(0.0015*V)**[C] **EF** or Higher						

SEER 14 after 1/1/2015

A For numbered notes (#), see the pages at the end of this quick reference.

B Information for other common HVAC system types and configurations is in the tables at the end of the quick reference. For information about other HVAC equipment efficiency requirements, refer to Chapter 4 of the *2013 Residential Compliance Manual*.

C V= rated storage volume of water heater

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Document Category

PRF	= Performance approach	ENV	= Envelope
NCB	= New construction & additions >1,000 ft²	MCH	= Mechanical
		LTG	= Lighting
ADD	= Additions (≤ 1,000 ft²)	PLB	= Plumbing (DHW)
ALT	= Alterations	PHV	= Photovoltaic
EXC	= Existing Conditions	WKS	= Worksheet
SRA	= Solar Ready		

(Residential)
Compliance Form

Document Type

Certificates of...

1R = Compliance

2R = Installation

3R = HERS Verification

Primary user

E = Enforcement agency

H = HERS

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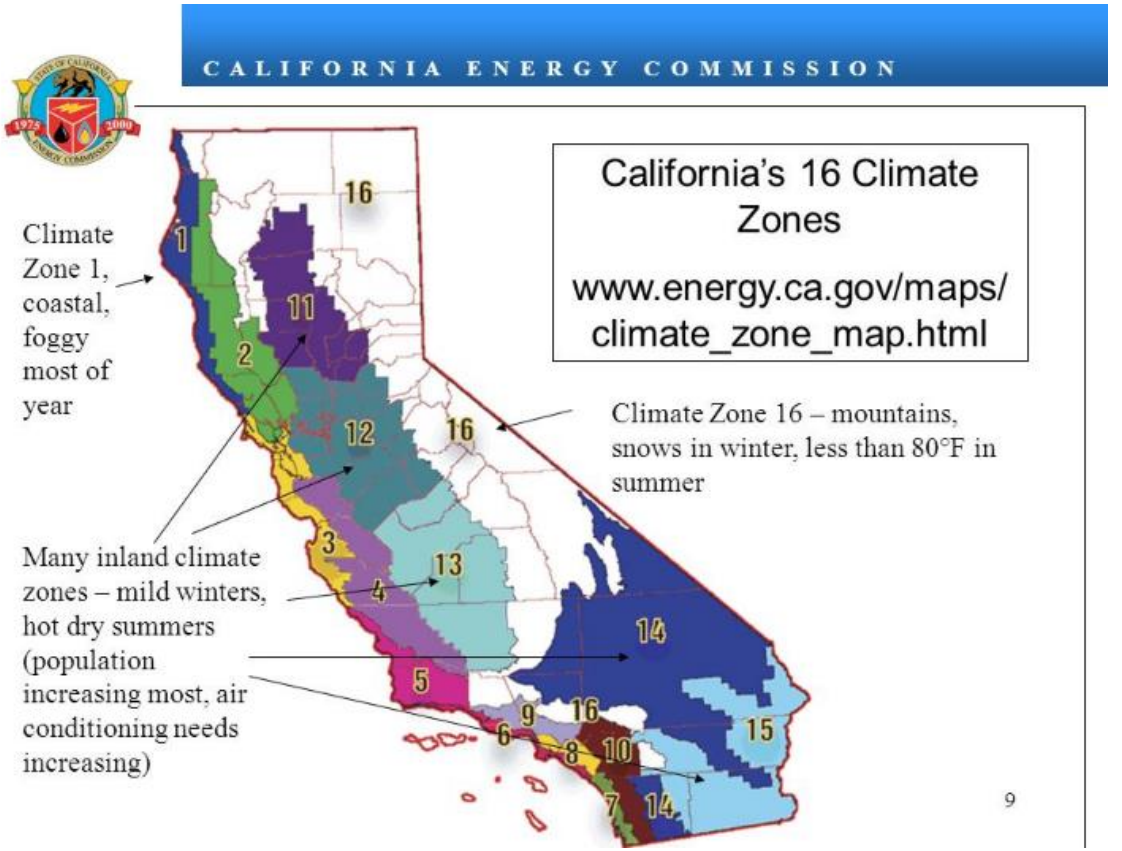
California Energy Commission

New

CF1R Form



2013

Energy Code Residential Applications

SUBCHAPTER 7
LOW-RISE RESIDENTIAL BUILDINGS – MANDATORY FEATURES AND DEVICES

SECTION 150.0 – MANDATORY FEATURES AND DEVICES

2013 Energy Code

Mandatory Measures

A. Duct sealing in all climate zones (CZs) (defined in Section 1.7 of this chapter). (Section 150.0(m)11)

B. Return duct design or fan power, airflow testing, and grill sizing requirements (Residential HVAC Quality Installation Improvements). (Section150.0(m)13)

C. Lighting – Improving and clarifying the mandatory lighting requirements for all residential buildings including kitchens, bathrooms, dining rooms, utility rooms, garages, hall ways, bedrooms, and outdoor lighting. (Section150.0(k)

D. New luminaire efficacy levels in Table 150.0-B

E. Hot water pipe insulation - Requires insulation on pipes ¾ inch and larger. (Section150.0(j)2Aii)

F. Solar Ready Measure – 250 square feet of solar ready zone on single family roofs in subdivisions of 10 or more swelling units. (Section150.0(r))

G. Walls with 2x6 framing and larger must have at least R-19 insulation (Section 150.0(c)2).

H. New mandatory U-factor of 0.58 for vertical fenestrations products and skylights, Section 150.0(q).

I. New third party HERS verifications requirement for Ventilation for Indoor Air Quality, ASHRAE 62.2 requirements, Section 150.0(o).

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CLTC
CALIFORNIA LIGHTING TECHNOLOGY CENTER

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Accelerating the development and commercialization of energy-efficient lighting and daylighting technologies.

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Title 24: Retail Lighting Class Presentations

Adaptive Lighting for Exterior Applications

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Connected: How Networked Control Systems (and codes and standards) Will Drive LED Adoption

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UPCOMING EVENTS

OFFICE LIGHTING: TITLE 24 AND TECHNOLOGY UPDATE

11/12/2014
8:30 a.m. – 3:00 p.m. November, October 12 Energy Education Center - Irwindale 6090 N. Irwindale Ave. Irwindale, CA 91702

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TITLE 24, PART 6 ESSENTIALS – STANDARDS & TECHNOLOGY FOR

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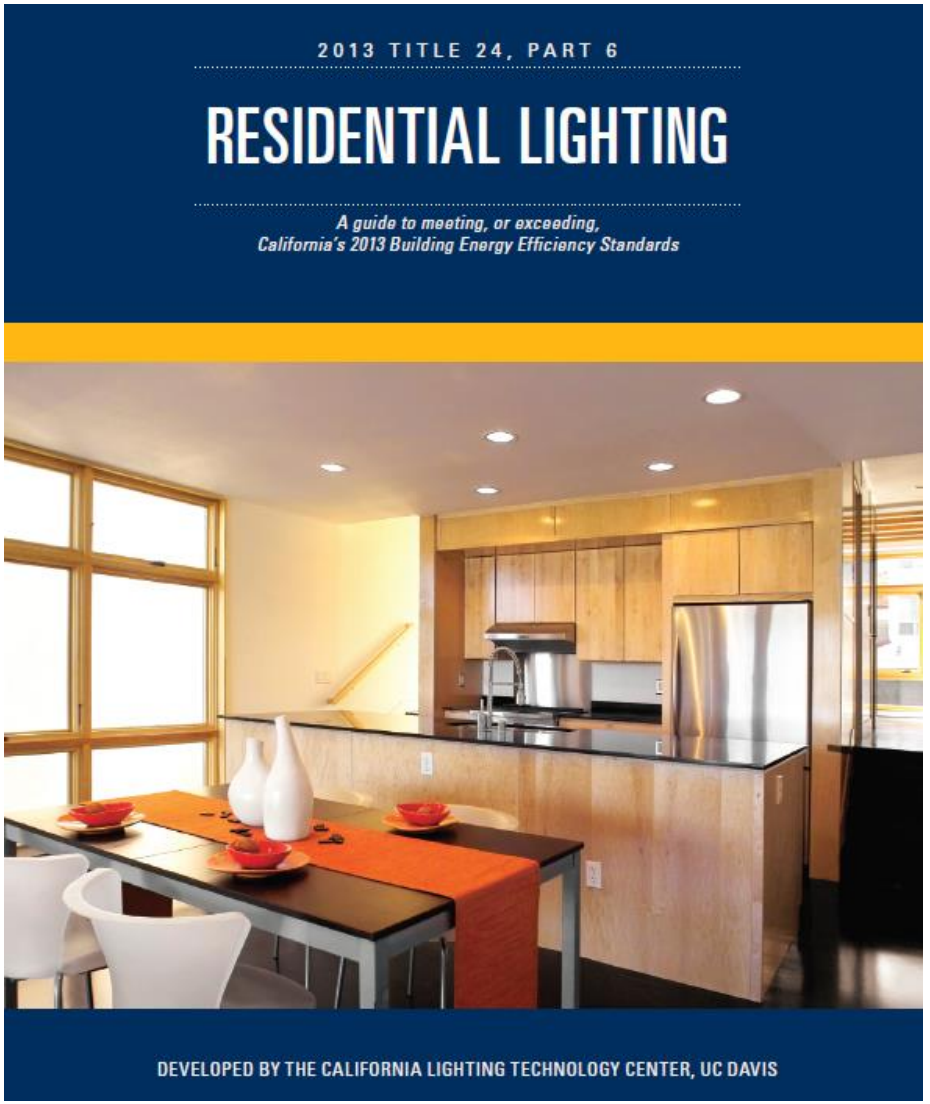
www.cltc.ucdavis.edu



2013 Residential

Mandatory Switching Devices and Controls

- High-efficacy switched separately from low-efficacy
- Exhaust fans switched separately from lighting system
- Switches must be readily accessible
- Controls required by Sec 150.0(K)
  - Dimmer
  - Vacancy sensor
  - May not be bypassed

2013 Residential

Kitchen lighting includes all permanently installed lighting in:

- Kitchens (note: interior cabinet lighting has a separate lighting power allotment)
- Adjacent spaces that are not separately switched, such as nooks and dining areas

Compliance Requirements

1. **At least 50% high-efficacy (controls optional):** High-efficacy luminaires must constitute at least 50% of the total rated lighting power in kitchens. Because high-efficacy luminaires typically consume less power than other luminaires, about three-quarters of the luminaires in the kitchen are likely to be high efficacy. When switched separately from kitchen lighting, the lighting for dining areas, breakfast nooks or other adjacent spaces is not included in the 50% high-efficacy calculation.

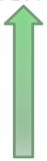
   For both low-efficacy and high-efficacy luminaires, the installed lighting power is the maximum rated power (watts) of the luminaire, including power used by ballasts. This rating must be listed on the luminaire following UL standards.

   Undercabinet or cabinet lighting that projects light primarily outside the cabinetry is considered permanently installed lighting and counts toward the 50% high-efficacy requirement. This includes permanently installed, high-efficacy undercabinet luminaires that are not hard-wired but plug in to kitchen wall outlets.

   Blank electrical boxes for future installations: Each electrical box with a blank cover or where no luminaire, surface-mounted ceiling fan or other electrical equipment has been installed, is counted as 180 watts of low-efficacy lighting power.

2013 Residential

2. **Low-efficacy lighting must be controlled:** After the 50% high-efficacy requirement has been met, any low-efficacy lighting must be equipped with dimmers, vacancy sensors or a lighting control system that provides one or both of these functions.
3. **Earn more low-efficacy lighting:** If all lighting, both high-efficacy and low-efficacy, is controlled by dimmers, vacancy sensors or a lighting control system, the standards allow additional controlled low-efficacy lighting to be installed in kitchens beyond the 50% maximum: up to 50 watts in units 2,500 ft² or smaller, and up to 100 watts in units larger than 2,500 ft². There is no limit to how much high-efficacy lighting may be installed.



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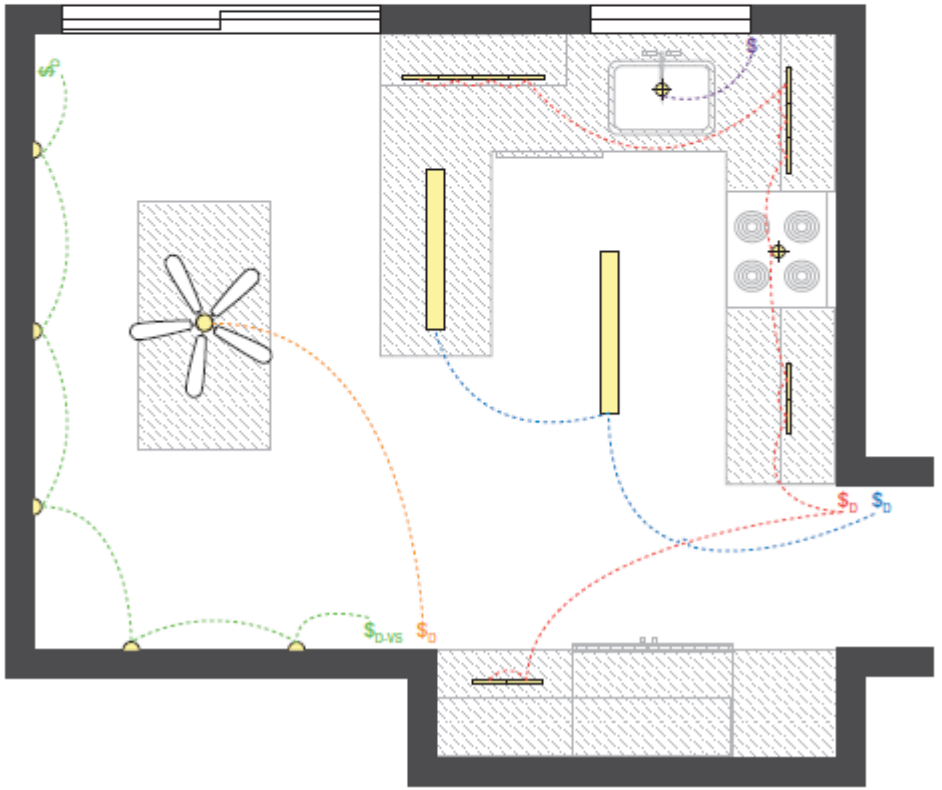
Kitchen & Dining Room Lighting Plan

Symbol	Luminaire Type	Lamp	Qty.	Watts	Total Watts	Efficacy (lm / W)
	Linear suspended pendant	Integrated LED	2	35	70	91
	Recessed downlight	GU-24 base LED	2	16	32	67
	Undercabinet	Integrated LED	11	8.5	93.5	51
	Ceiling fan with light kit	Integrated LED	1	20	20	75
	Wall sconce	GU-24 base LED	5	9.7	48.5	93

CONTROLS S_D Dimmer switch $S_{D\text{-}VS}$ Dimmer switch with vacancy sensor



VCA Green

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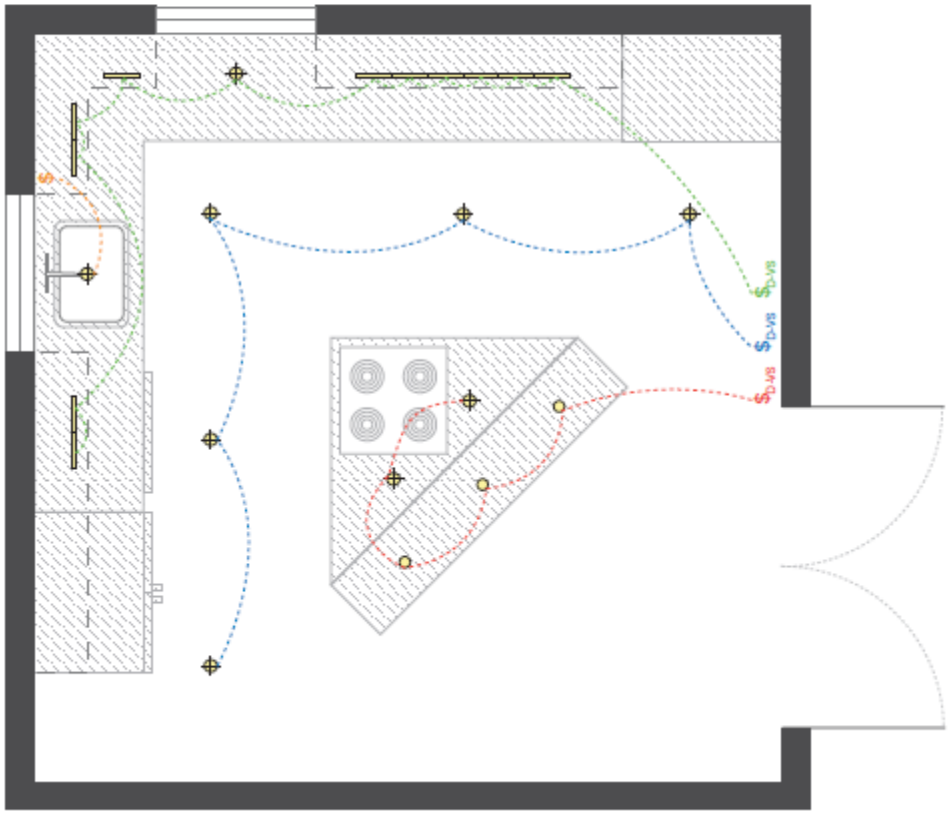
Large Kitchen Lighting Plan

Symbol	Luminaire Type	Lamp	Qty.	Watts	Total Watts	Efficacy (lm / W)
⊕	**Recessed downlight**	GU-24 base LED	9	12	108	67
○	**Pendant**	Integrated LED	3	16	48	60
▬	**Undercabinet**	Integrated LED	11	8.5	93.5	51

CONTROLS $S_{D\text{-}VS}$ Dimmer switch with vacancy sensor



2013 Residential

BATHROOMS

Section 150.0(k)5

Compliance Requirements

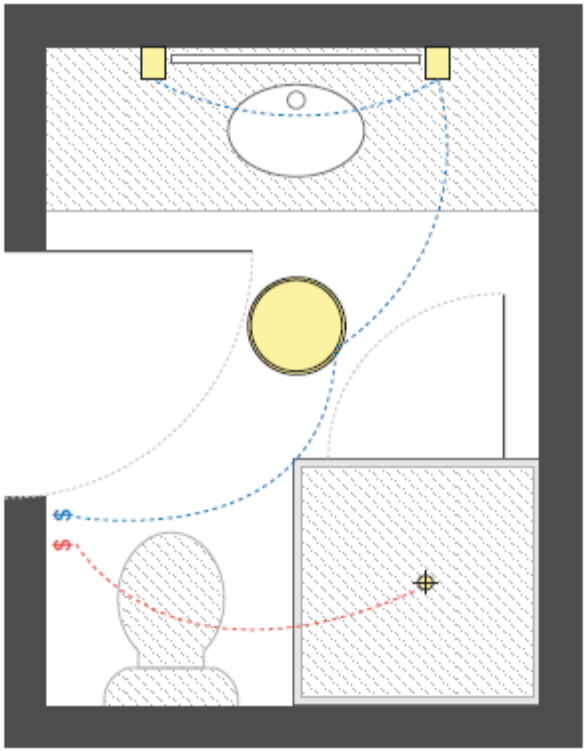
1. **One high-efficacy luminaire:** Each bathroom must have at least one high-efficacy luminaire.
2. **Vacancy sensors:** Low-efficacy lighting in bathrooms must be controlled by vacancy sensors.
3. **Switch separately:** Control lighting that is integral to ceiling fans separately from the ventilation.

VCA Green

Bathroom Lighting Plan

Symbol	Luminaire Type	Lamp	Qty.	Watts	Total Watts	Efficacy (lm / W)
◯	**Flush mount ceiling light**	GU-24 base LED	1	15	15	60
⌖	**Recessed downlight**	GU-24 base LED	1	12	12	67
▯	**Vertical bath bar**	Integrated LED	2	15	30	60

CONTROLS $ Switch



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2013 Residential

GARAGES, LAUNDRY ROOMS & UTILITY ROOMS

Section 150.0(k)6

Compliance Requirements

1. **High efficacy and controls:** High-efficacy luminaires are required in garages, laundry rooms and utility rooms, and these must be controlled by a vacancy sensor.
2. **Garage door openers:** Lighting integral to garage door openers does not have to be high efficacy when there are no more than two screw-base sockets integrated by the manufacturer and the lights automatically turn ON and OFF.

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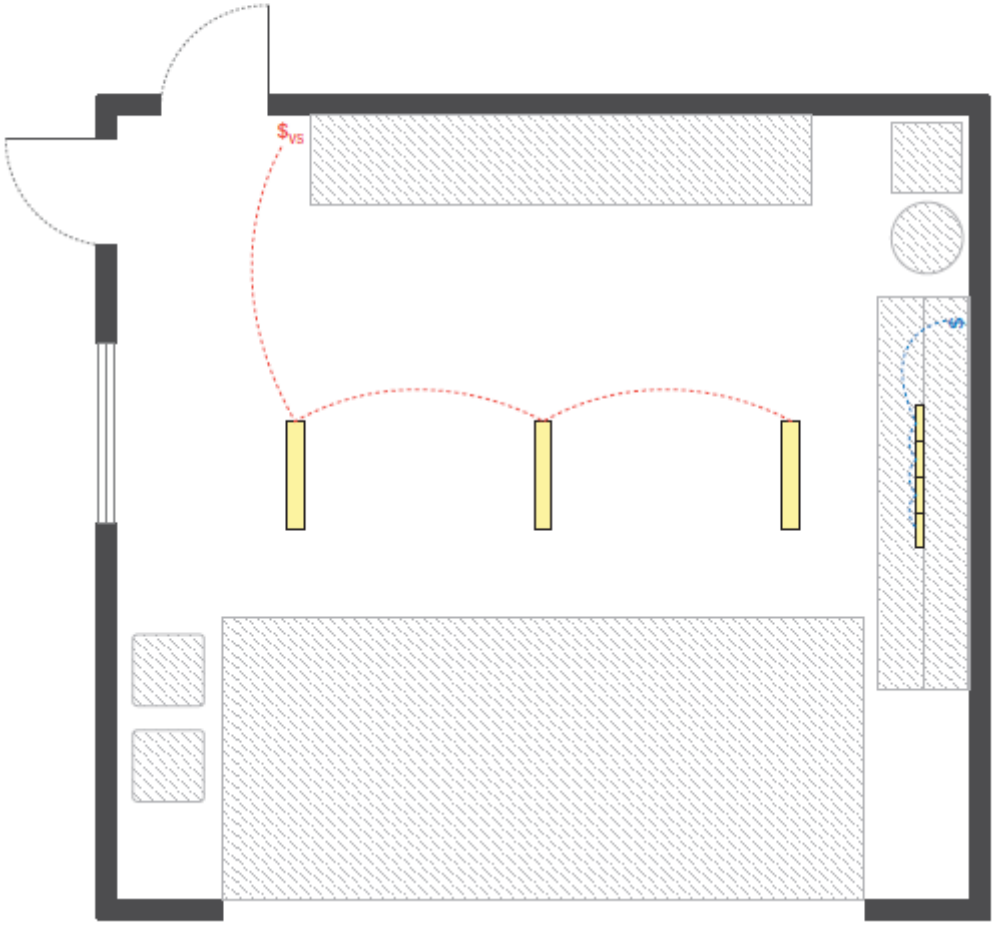
Garage Lighting Plan

Symbol	Luminaire Type	Lamp	Qty.	Watts	Total Watts	Efficacy (lm / W)
	Linear surface mount	Integrated LED	3	51	154	77
	Undercabinet (not permanently installed)	Integrated LED	4	11	42	61

CONTROLS $ Switch $VS Switch with vacancy sensor



2013 Residential

Kitchens

- 50% to be high-efficacy/switched separately
- 20W per linear foot for cabinets/switched separately

Garages, Laundry rooms, and Utility rooms

- High-efficacy
- Controlled by vacancy sensor

Other rooms

- High-efficacy

  or

- Controlled by vacancy sensor

Exceptions, closets less than 70sq.ft./ 1000sq.ft or less detached utility bldg

2013 Residential

OTHER ROOMS

Section 150.0(k)7

This category covers any room or area that is not a kitchen, bathroom, laundry room, garage, or utility room, including:

- Bedrooms
- Living rooms
- Home offices
- Dining rooms (if switched separately from kitchens)
- Nooks, if switched separately from kitchen lighting
- Hallways
- Attic spaces
- Closets 70 ft² and larger

Compliance Requirements

Three compliance options are available for permanently installed lighting in this residential space category:

1. High-efficacy lighting
2. Low-efficacy lighting controlled by a vacancy sensor
3. Low-efficacy lighting controlled by a dimmer switch

These options may be used in combination with one another; for example, high-efficacy downlights and dimmable low-efficacy track lights—both on separate dimmer switches—may be installed in the same living room.

Choose high-efficacy luminaires AND dimmer switches to exceed code requirements, improve efficiency and make lighting adjustable in areas like bedrooms, living rooms and dining rooms, where different activities call for varying light levels.

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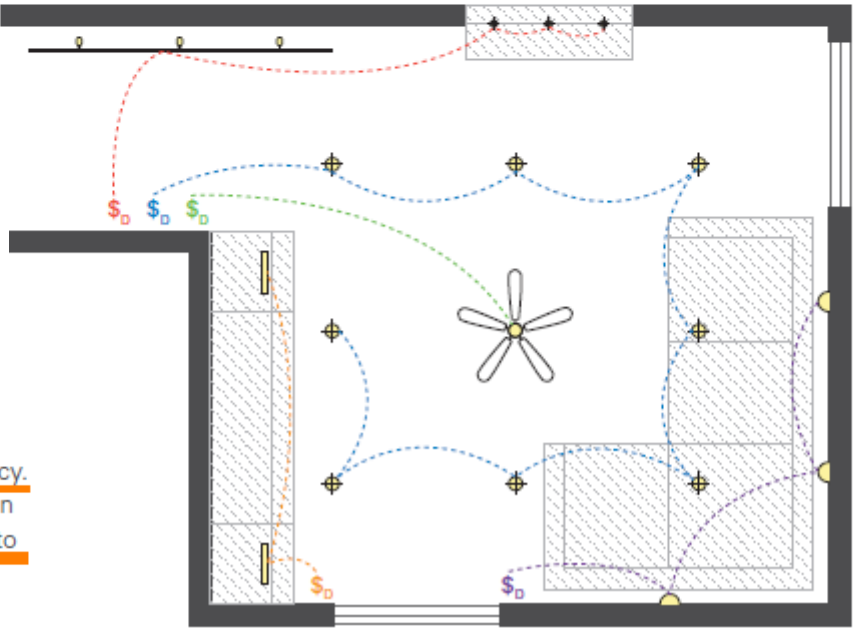
Living Room Lighting Plan

Symbol	Luminaire Type	Lamp	Qty.	Watts	Total Watts	Efficacy (lm / W)
	Recessed downlight	GU-24 base LED	8	12	96	67
	Track light	Integrated LED	3	18	54	69
	Spot downlight	Integrated LED	3	10	30	70
	Inside cabinet	Integrated LED	2	8.5	17	51
	Ceiling fan with light kit	Integrated LED	1	20	20	75
	Wall sconce	GU-24 base LED	3	9.7	29.1	93

CONTROLS $_D$ Dimmer switch

Hallways

1. Use high-efficacy luminaires with three-way switching.
2. Lighting should be controllable from all points of entrance.
3. Combine high-efficacy luminaires with vacancy sensors to maximize efficiency.



Living Rooms

1. Track lighting is typically considered low-efficacy. Be sure to install low-efficacy track lights on a dimmer switch, or use a vacancy sensor, to comply with code requirements.

GOOD

BAD

SECTION 150.2 – ENERGY EFFICIENCY STANDARDS FOR ADDITIONS AND ALTERATIONS IN EXISTING BUILDINGS THAT WILL BE LOW-RISE RESIDENTIAL OCCUPANCIES

Lighting. Luminaire power and luminaire classification shall be determined in accordance with Section 130.0(c)

EXCEPTION to Section 150.2(b)1I: For only residential lighting alterations, Light Emitting Diode (LED) modules may be hardwired into luminaire housings manufactured for use with incandescent lamps, provided all of the following conditions are met:

a. The luminaire has been previously used and is in an existing installation; and,

b. The LED modules are not LED lamps, integrated or non integrated type, as defined by ANI/IES RP-16-2010; and;

c. The LED modules comply with all other requirements in Section 130.0(c); and

d. The LED modules are certified as high efficacy to the Commission in accordance with Section 110.9; and

e. The LED modules are not connected using screw-based sockets or screw-base adaptors.

2013 Residential

Outdoor lighting Requirements

High-efficacy lighting

- All buildings on the lot
- High-efficacy

Low-efficacy lighting controls

- Manual on/off, no override to on
- No override of a motion sensor or
- Max 6 hr. override that resets motion sensor

2013 Residential

Mandatory Measures

- Duct sealing in all climate zones (sec 150.0(m)11)

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 6 percent of the nominal system air handler airflow as determined utilizing the procedures in Reference Residential Appendix Section RA3.1.4.3.1.

2013 Residential

Mandatory Measures

- Return duct design or fan power, airflow testing, and grill sizing

Demonstrate, in every control mode, airflow greater than 350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy less than or equal to 0.58 W/CFM as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.

CALGreen section 4.507 Environmental Comfort

- **System designed per ACCA manuals:**
  - **Manual "J" Heat loss and Heat gain**
  - **Manual "D" Duct sizing**
  - **Manual "S" Equipment selection**

TABLE 150.0-C: Return Duct Sizing for Single Return Duct Systems

Return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.

Return grille devices shall be labeled in accordance with the requirements in Section 150.0(m)12A to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 12.5 Pa (0.05 inches water) for the air filter media as rated in accordance with AHRI Standard 680 for the design airflow rate for the return grille.

System Nominal Cooling Capacity (Ton)*	Minimum Return Duct Diameter (inch)	Minimum Total Return Filter Grille Gross Area ($inch^2$)
1.5	16	500
2.0	18	600
2.5	20	800

*Not applicable to systems with nominal cooling capacity greater than 2.5 tons or less than 1.5 ton

TABLE 150.0-D: Return Duct Sizing for Multiple Return Duct Systems

Each return duct length shall not exceed 30 feet and shall contain no more than 180 degrees of bend. If the total bending exceeds 90 degrees, one bend shall be a metal elbow.

Return grille devices shall be labeled in accordance with the requirements in Section 150.0(m)12A to disclose the grille's design airflow rate and a maximum allowable clean-filter pressure drop of 12.5 Pa (0.05 inches water) for the air filter media as rated in accordance with AHRI Standard 680 for the design airflow rate for the return grille.

System Nominal Cooling Capacity (Ton)*	Return Duct 1 Minimum Diameter (inch)	Return Duct 2 Minimum Diameter (inch)	Minimum Total Return Filter Grille Gross Area ($inch^2$)
1.5	12	10	500
2.0	14	12	600
2.5	14	14	800
3.0	16	14	900
3.5	16	16	1000
4 .0	18	18	1200
5 .0	20	20	1500

*Not applicable to systems with nominal cooling capacity greater than 5.0 tons or less than 1.5 tons.

2013 Residential

Mandatory Measures

- Hot water pipe insulation ¾ inch and larger

- Review section 150.0(j)

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Water piping and cooling system line insulation thickness and conductivity. Piping shall be insulated to the thicknesses as follows:

A. All domestic hot water system piping conditions listed below, whether buried or unburied, must be insulated and the insulation thickness shall be selected based on the conductivity range in TABLE 120.3-A and the insulation level shall be selected from the fluid temperature range based on the thickness requirements in TABLE 120.3-A:

   i. The first 5 feet (1.5 meters) of hot and cold water pipes from the storage tank.

   ii. All piping with a nominal diameter of 3/4 inch (19 millimeter) or larger.

   iii. All piping associated with a domestic hot water recirculation system regardless of the pipe diameter.

   iv. Piping from the heating source to storage tank or between tanks.

   v. Piping buried below grade..

   vi. All hot water pipes from the heating source to the kitchen fixtures.

B. In addition to insulation requirements, all domestic hot water pipes that are buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation.

C. Pipe for cooling system lines shall be insulated as specified in Subsection A. Piping for steam and hydronic heating systems or hot water systems with pressure above 15 psig (103 kPa) shall meet the requirements in TABLE 120.3-A.

2013 Residential

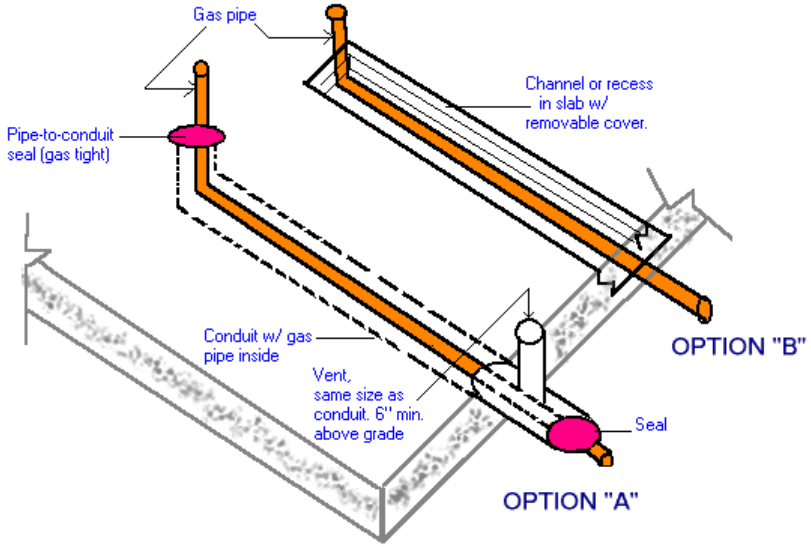
Slab on grade/Residential hot water pipe installation

B. In addition to insulation requirements, all domestic hot water pipes that are buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation.

Insulation Protection. Insulation outside conditioned space shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind. Protection includes but is not limited to the following:

A. Insulation exposed to weather shall either be rated for outdoor use or installed with a cover suitable for outdoor service; e.g., protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

2013 Residential



Gas Piping Under Slab Installation Options

2013 Residential

Mandatory Measures

- HERS verification for indoor air quality (ASHRAE 62.2)
  - Comply with section 150.0(o)

1. **Field Verification and Diagnostic Testing.**

   A. **Airflow Performance**. The Whole-Building Ventilation airflow required by Section 4 of ASHRAE Standard 62.2 shall be confirmed through field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.7.

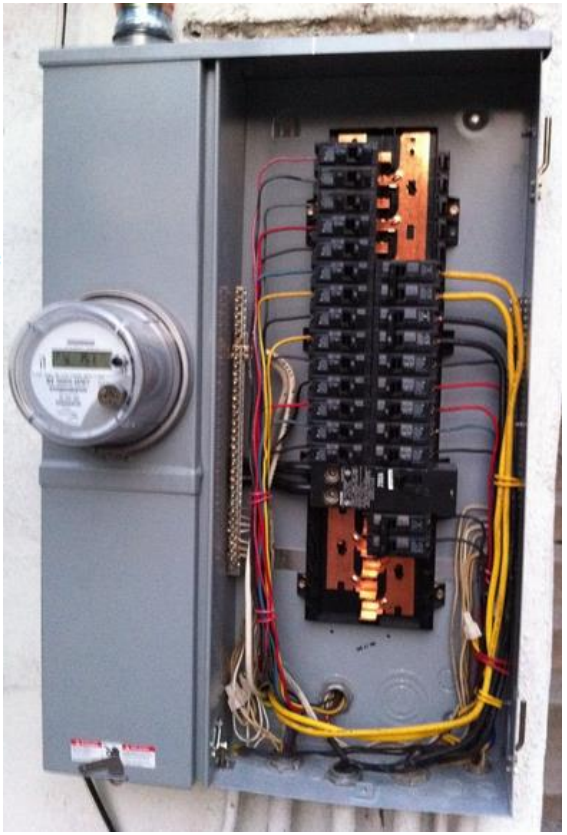
- Housing project 10 or more, solar zones required

2013 Residential

New Residential Service

Main Electrical Service Panel.

1. The main electrical service panel shall have a minimum busbar rating of 200 amps.
2. The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation.
   A. **Location.** The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.
   B. **Marking.** The reserved space shall be permanently marked as "For Future Solar Electric".



2013 Residential

Review CF1R Form

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I am doing my OWN work, but have not Registered with CalCERTS

Only when HERS measures are required

2013 Residential

Version 6.3

Job Number:

M52000

Date:

10/27/2014

The EnergyPro computer program has been used to perform the calculations summarized in this compliance report. This program has approval and is authorized by the California Energy Commission for use with both the Residential and Nonresidential 2013 Building Energy Efficiency Standards.

This program developed by EnergySoft, LLC – www.energysoft.com.

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CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD

CF1R-PRF-01

Project Name: Residential Example

Calculation Date/Time: 10:33, Mon, Oct 27, 2014

Calculation Description: Title 24 Analysis

Input File Name: Res Sample.xml

GENERAL INFORMATION					
01	Project Name	Residential Example			
02	Calculation Description	Title 24 Analysis			
03	Project Location	7188 Pleasant Way			
04	A City	San Bernardino	05	Standards Version	Compliance 2015
06	Zip code	90000	07	Compliance Manager Version	BEMCmpMgr 2013-3 (651)
08	Climate Zone	CZ10	09	Software Version	EnergyPro 6.3
10	Building Type	Single Family	11	Front Orientation (deg/Cardinal)	90
12	Project Scope	Newly Constructed	13	Number of Dwelling Units	1
14	Total Cond. Floor Area (FT^2)	2000	15	Number of Zones	2
16	Slab Area (FT^2)	1200	17	Number of Stories	2
18	Addition Cond. Floor Area	N/A	19	Natural Gas Available	Yes
20	Addition Slab Area (FT^2)	N/A	21	Glazing Percentage (%)	19.5%

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

ENERGY USE SUMMARY

04	05	06	07	08
Energy Use (kTDV/ft)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	7.56	4.67	2.89	38.2%
Space Cooling	31.55	33.80	-2.25	-7.1%
IAQ Ventilation	1.62	1.62	0.00	0.0%
Water Heating	13.38	8.94	4.44	33.2%
Photovoltaic Offset	----	-4.73	4.73	----
Compliance Energy Total	54.11	44.30	9.81	18.1%

REQUIRED SPECIAL FEATURES

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

- **PV System: 2.0 kW**
- **Ducts with high level of insulation**

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building components tables below.

Building-level Verifications:
- **IAQ mechanical ventilation**

Cooling System Verifications:
- **Verified SEER**
- **Refrigerant Charge**
- **Fan Efficacy Watts/CFM**

HVAC Distribution System Verifications:
- **Duct Sealing**
- **Verified low-leakage ducts located entirely in conditioned space**

Domestic Hot Water System Verifications:
- **-- None --**

ENERGY DESIGN RATING

This is the sum of the annual TDV energy consumption for energy use components included in the performance compliance approach for the Standard Design Building (Energy Budget) and the annual TDV energy consumption for lighting and components not regulated by Title 24, Part 6 (such as domestic appliances and consumer electronics) and accounting for the annual TDV energy offset by an on-site renewable energy system.

	Reference Energy Use	Energy Design Rating	Margin	Percent Improvement
Total Energy (kTDV/f2)*	101.79	91.98	9.81	9.6%

* includes calculated Appliances and Miscellaneous Energy Use (AMEU)

BUILDING - FEATURES INFORMATION

01	02	03	04	05	06	07
Project Name	Conditioned Floor Area (sft)	Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems
Residential Example	2000	1	6	2	0	1

Project Name: Residential Example
Calculation Date/Time: 10:33, Mon, Oct 27, 2014
Calculation Description: Title 24 Analysis
Input File Name: Res Sample.xml

ZONE INFORMATION

01	02	03	04	05	06	07
Zone Name	Zone Type	HVAC System Name	Zone Floor Area (ft^2)	Avg. Ceiling Height	Water Heating System 1	Water Heating System 2
1st Floor Zone	Conditioned	Res HVAC1	1200	8	DHW Sys 1	
2nd Floor Zone	Conditioned	Res HVAC1	800	8	DHW Sys 1	

OPAQUE SURFACES

01	02	03	04	05	06	07	08
Name	Zone	Construction	Azimuth	Orientation	Gross Area (ft^2)	Window Area (ft^2)	Tilt(deg)
Front Wall	1st Floor Zone	R-19 Wall	0	Right	320	60	90
Left Wall	1st Floor Zone	R-19 Wall	90	Front	240	40	90
Back Wall	1st Floor Zone	R-19 Wall	180	Left	320	72	90
Right Wall	1st Floor Zone	R-19 Wall	270	Back	240	32	90
R-30 Roof	1st Floor Zone	R-30 Roof Attic			500		
Front Wall 2	2nd Floor Zone	R-19 Wall	0	Right	320	60	90
Left Wall 2	2nd Floor Zone	R-19 Wall	90	Front	240	24	90
BackWall	2nd Floor Zone	R-19 Wall	180	Left	320	70	90
Right Wall 2	2nd Floor Zone	R-19 Wall	270	Back	240	32	90
R-30 Roof 2	2nd Floor Zone	R-30 Roof Attic			800		
Interior Floor	2nd Floor Zone>>1st Floor Zone	R-0 Floor No Crawlspace			700		
Floor over Garage	2nd Floor Zone>>Garage	R-19 Floor No Crawlspace			100		
GarageWallFront	Garage	Garage Ext Wall	0	Right	180	0	90
GarageWallLeft	Garage	Garage Ext Wall	90	Front	198	0	90
GarageWallRight	Garage	Garage Ext Wall	270	Back	108	0	90
GarageRoof	Garage	R-30 Roof Attic			340		

ATTIC

01	02	03	04	05	06	07
Name	Construction	Roof Rise	Roof Reflectance	Roof Emittance	Radiant Barrier	Cool Roof
Attic	Attic Roof Cons	4	0.1	0.85	No	No

WINDOWS

01	02	03	04	05	06	07	08	09	10
Name	Type	Surface (Orientation-Azimuth)	Width(ft)	Height (ft)	Multiplier	Area (ft^2)	U-factor	SHGC	Exterior Shading
Front Windows	Window	Front Wall (Right-0)	----	----	1	60.0	0.34	0.33	Insect Screen (default)
Left Windows	Window	Left Wall (Front-90)	----	----	1	40.0	0.34	0.33	Insect Screen (default)
Back Windows	Window	Back Wall (Left-180)	----	----	1	72.0	0.34	0.33	Insect Screen (default)
Right Windows	Window	Right Wall (Back-270)	----	----	1	32.0	0.34	0.33	Insect Screen (default)
Front Windows 2	Window	Front Wall 2 (Right-0)	----	----	1	60.0	0.34	0.33	Insect Screen (default)
Left Windows 2	Window	Left Wall 2 (Front-90)	----	----	1	24.0	0.34	0.33	Insect Screen (default)
Back Windows 2	Window	BackWall (Left-180)	----	----	1	70.0	0.34	0.33	Insect Screen (default)
Right Windows 2	Window	Right Wall 2 (Back-270)	----	----	1	32.0	0.34	0.33	Insect Screen (default)

DOORS

01	02	03	04
Name	Side of Building	Area (ft^2)	U-factor
Entry Door	Front Wall	21.0	0.50
Back Door	Back Wall	16.7	0.50
GarageCarDoorFront	GarageWallFront	128.0	1.00

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06
Construction Name	**Surface Type**	**Construction Type**	**Framing**	**Total Cavity R-value**	**Assembly Layers**
Attic Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	• *Cavity / Frame: no insul. / 2x4 Top Chrd* • *Roof Deck: Wood Siding/sheathing/decking* • *Roofing: Light Roof (Asphalt Shingle)*
R-30 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 30	• *Inside Finish: Gypsum Board* • *Cavity / Frame: R-9.1 / 2x4* • *Over Floor Joists: R-20.9 insul.*
R-19 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O.C.	R 19	• *Inside Finish: Gypsum Board* • *Cavity / Frame: R-19 / 2x6* • *Exterior Finish: Wood Siding/sheathing/decking*
R-0 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x12 @ 16 in. O.C.	none	• *Floor Surface: Carpeted* • *Floor Deck: Wood Siding/sheathing/decking* • *Cavity / Frame: no insul. / 2x12* • *Ceiling Below Finish: Gypsum Board*
R-19 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x6 @ 16 in. O.C.	R 19	• *Floor Surface: Carpeted* • *Floor Deck: Wood Siding/sheathing/decking* • *Cavity / Frame: R-19 / 2x6* • *Ceiling Below Finish: Gypsum Board*

SLAB FLOORS

01	02	03	04	05	06	07
Name	**Zone**	**Area (ft^2)**	**Perimeter (ft)**	**Edge Insul. R-value& Depth**	**Carpeted Fraction**	**Heated**
Covered Slab	1st Floor Zone	1200	90	None	0.8	No
GarageSlab	Garage	440	54	None	0	No

BUILDING ENVELOPE - HERS VERIFICATION

01	02	03	04
Quality Insulation Installation (QII)	**Quality Installation of Spray Foam Insulation**	**Building Envelope Air Leakage**	**ACH @ 50 Pa**
Not Required	Not Required	Not Required	---

WATER HEATING SYSTEMS

01	02	03	04	05	06
Name	**System Type**	**Distribution Type**	**Water Heater**	**Number of Heaters**	**Solar Fraction (%)**
DHW Sys 1	DHW	Standard	DHW Heater 1	1	.0%

WATER HEATERS

01	02	03	04	05	06	07	08
Name	Heater Element Type	Tank Type	Tank Volume (gal)	Energy Factor or Efficiency	Input Rating	Tank Exterior Insulation R-value	Standby Loss (Fraction)
DHW Heater 1	Natural Gas	Small Instantaneous	0.2	0.83	199000-Btu/hr	0	0

WATER HEATING - HERS VERIFICATION

01	02	03	04	05	06	07
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Point-of Use	Recirculation Control	Central DHW Distribution
DHW Sys 1 - 1/1	N/A	N/A	N/A	N/A	N/A	N/A

HVAC SYSTEMS

01	02	03		04		05	06	07
Name	System Type	Heating System Name	Ducted	Cooling System Name	Ducted	Distribution System	Fan System	Floor Area Served
Res HVAC1	Other Heat/Cool	Heating Component 1	Yes	Cooling Component 1	Yes	Air Distribution System 1		2000

HVAC - HEATING SYSTEMS

01	02	03
Name	Type	Efficiency
Heating Component 1	CntrlFurnace - Fuel-fired central furnace	94.1 AFUE

HVAC - COOLING SYSTEMS

01	02	03	04	05	06	07
Name	System Type	Efficiency EER	SEER	Zonally Controlled	Multi-speed Compressor	HERS Verification
Cooling Component 1	SplitAirCond - Split air conditioning system	11.6	15	No	No	Cooling Component 1-hers-cool

HVAC COOLING - HERS VERIFICATION					
01	02	03	04	05	06
Name	Verified Airflow	Airflow Target	Verified EER	Verified SEER	Verified Refrigerant Charge
Cooling Component 1-hers-cool	Required	350	Not Required	Required	Required

HVAC - DISTRIBUTION SYSTEMS							
01	02	03	04	05	06	07	08
Name	Type	Duct Leakage	Insulation R-value	Supply Duct Location	Return Duct	Bypass Duct	HERS Verification
Air Distribution System 1	Ducts located entirely in conditioned space	Sealed and tested	8	Conditioned Zone	Conditioned Zone	None	Air Distribution System 1-hers-dist

HVAC DISTRIBUTION - HERS VERIFICATION						
01	02	03	04	05	06	07
Name	Duct Leakage Verification	Duct Leakage Target (%)	Verified Duct Location	Verified Duct Design Return	Verified Duct Design Supply	Low-leakage Air Handler
Air Distribution System 1-hers-dist	Required	6.0	Required	Not Required	Not Required	---

HVAC - FAN SYSTEMS			
01	02	03	04
Name	Type	Fan Power (Watts/CFM)	HERS Verification
HVAC Fan 1	Single Speed PSC Furnace Fan	0.58	HVAC Fan 1-hers-fan

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

IAQ (Indoor Air Quality) FANS					
01	02	03	04	05	06
Name	IAQ CFM	IAQ Watts/CFM	IAQ Fan Type	IAQ Recovery Effectiveness(%)	HERS Verification
DwellingUnit	72.5	0.25	Default	0	Required

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD **CF1R-PRF-01**

Project Name: Residential Example **Calculation Date/Time:** 10:33, Mon, Oct 27, 2014

Calculation Description: Title 24 Analysis **Input File Name:** Res Sample.xml

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company: EnergySoft, LLC	Signature Date: 10/27/2014
Address: 1025 5th Street, Suite A	CEA/HERS Certification Identification (If applicable):
City/State/Zip: Novato, CA 94949	Phone: (415) 897-6400

RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California: 1. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design identified on this Certificate of Compliance. 2. I certify that the energy features and performance specifications identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. 3. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.	
Responsible Designer Name: Rob Parker	Responsible Designer Signature:
Company: Bernard Parker & Assoc.	Date Signed:
Address: 573 Oak Drive	License:
City/State/Zip: Sacramento, CA 95000	Phone: (415) 256-5555

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HVAC SYSTEM HEATING AND COOLING LOADS SUMMARY

Project Name	Date
SINGLE HOUSE	9/28/2014
System Name	**Floor Area**
1ST FLOOR PLAN	3,261

ENGINEERING CHECKS	
Number of Systems	2
Heating System	
Output per System	74,000
Total Output (Btuh)	148,000
Output (Btuh/sqft)	45.4
Cooling System	
Output per System	45,000
Total Output (Btuh)	90,000
Total Output (Tons)	7.5
Total Output (Btuh/sqft)	27.6
Total Output (sqft/Ton)	434.8
Air System	
CFM per System	1,600
Airflow (cfm)	3,200
Airflow (cfm/sqft)	0.98
Airflow (cfm/Ton)	426.7
Outside Air (%)	0.0 %
Outside Air (cfm/sqft)	0.00
Note: values above given at ARI conditions	

SYSTEM LOAD

	COIL COOLING PEAK			COIL HTG. PEAK	
	CFM	Sensible	Latent	CFM	Sensible
Total Room Loads	982	20,647	2,424	735	27,068
Return Vented Lighting		0			
Return Air Ducts		661			992
Return Fan		0			0
Ventilation	0	0	0	0	0
Supply Fan		0			0
Supply Air Ducts		661			992
TOTAL SYSTEM LOAD		21,969	2,424		29,052

HVAC EQUIPMENT SELECTION

CARRIER 24ABB348/58MVC-80-20 (4 TON)	64,924	17,570		148,000
Total Adjusted System Output (Adjusted for Peak Design conditions)	64,924	17,570		148,000
TIME OF SYSTEM PEAK	Aug 3 PM			Jan 1 AM

HEATING SYSTEM PSYCHROMETRICS (Airstream Temperatures at Time of Heating Peak)

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HVAC SYSTEM HEATING AND COOLING LOADS SUMMARY

Project Name	Date
SINGLE HOUSE	9/28/2014
System Name	**Floor Area**
2ND FLOOR PLAN	1,913

ENGINEERING CHECKS	
Number of Systems	1
Heating System	
Output per System	74,000
Total Output (Btuh)	74,000
Output (Btuh/sqft)	38.7
Cooling System	
Output per System	45,000
Total Output (Btuh)	45,000
Total Output (Tons)	3.8
Total Output (Btuh/sqft)	23.5
Total Output (sqft/Ton)	510.1
Air System	
CFM per System	1,600
Airflow (cfm)	1,600
Airflow (cfm/sqft)	0.84
Airflow (cfm/Ton)	426.7
Outside Air (%)	0.0 %
Outside Air (cfm/sqft)	0.00
Note: values above given at ARI conditions	

SYSTEM LOAD

	COIL COOLING PEAK			COIL HTG. PEAK	
	CFM	Sensible	Latent	CFM	Sensible
Total Room Loads	532	11,169	1,825	375	13,796
Return Vented Lighting		0			
Return Air Ducts		357			506
Return Fan		0			0
Ventilation	0	0	0	0	0
Supply Fan		0			0
Supply Air Ducts		357			506
TOTAL SYSTEM LOAD		11,884	1,825		14,807

HVAC EQUIPMENT SELECTION

CARRIER 24ABB348/58MVC-80-20 (4 TON)	32,272	9,067		74,000
Total Adjusted System Output (Adjusted for Peak Design conditions)	32,272	9,067		74,000
TIME OF SYSTEM PEAK	Aug 3 PM		Jan 1 AM	

HEATING SYSTEM PSYCHROMETRICS (Airstream Temperatures at Time of Heating Peak)

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MANDATORY MEASURES SUMMARY: Residential (Page 1 of 3) **MF-1R**	
Project Name *Sample Residence*	Date *10/27/2014*

NOTE: Low-rise residential buildings subject to the Standards must comply with all applicable mandatory measures listed, regardless of the compliance approach used. More stringent energy measures listed on the Certificate of Compliance (CF-1R, CF-1R-ADD, or CF-1R-ALT Form) shall supersede the items marked with an asterisk (*) below. This Mandatory Measures Summary shall be incorporated into the permit documents, and the applicable features shall be considered by all parties as minimum component performance specifications whether they are shown elsewhere in the documents or in this summary. Submit all applicable sections of the MF-1R Form with plans.

Building Envelope Measures:

§110.6(a)1: Doors and windows between conditioned and unconditioned spaces are manufactured to limit air leakage.

§110.6(a)4: Fenestration products (except field-fabricated windows) have a label listing the certified U-Factor, certified Solar Heat Gain Coefficient (SHGC), and infiltration that meets the requirements of §10-111(a).

§110.7: Exterior doors and windows are weather-stripped; all joints and penetrations are caulked and sealed.

§110.8(a): Insulation specified or installed meets Standards for Insulating Material. Indicate type and include on CF-2R Form.

§110.8(i): The thermal emittance and solar reflectance values of the cool roofing material meets the requirements of §110.8(i) when the installation of a Cool Roof is specified on the CF-1R Form.

*§150.0(a): Minimum R-30 (R-19 for Additions/Alterations) insulation in wood-frame ceiling or equivalent U-factor.

§150.0(b): Loose fill insulation shall conform with manufacturer's installed design labeled R-Value.

*§150.0(c): Minimum R-13 insulation in 2x4 wood-frame wall (R-19 in 2x6) or equivalent U-factor.

*§150.0(d): Minimum R-19 insulation in raised wood-frame floor or equivalent U-factor.

§150.0(f): Air retarding wrap is tested, labeled, and installed according to ASTM E1677-95(2000) when specified on the CF-1R Form.

§150.0(g): Mandatory Vapor barrier installed in Climate Zones 14 or 16.

§150.0(l): Water absorption rate for slab edge insulation material alone without facings is no greater than 0.3%; water vapor permeance rate is no greater than 2.0 perm/inch and shall be protected from physical damage and UV light deterioration.

§150.0(q) Fenestration Products. Fenestration separating conditioned space from unconditioned space or outdoors shall meet the requirements of either Item 1 or 2 below:
1. Fenestration, including skylight products, must have a maximum U-factor of 0.58.
2. The weighted average U-factor of all fenestration, including skylight products, shall not exceed 0.58.

EXCEPTION to Section 150.0(q)1: Up to 10 square feet of fenestration area or 0.5 percent of the Conditioned Floor Area, whichever is greater, is exempt from the maximum U-factor requirement.

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MANDATORY MEASURES SUMMARY: Residential (Page 2 of 3)	MF-1R
Project Name: *Sample Residence*	Date: *10/27/2014*

§150.0(j)2A: All domestic hot water system piping conditions listed below, whether buried or unburied, must be insulated per TABLE 120.3-A.

i. The first 5 feet (1.5 meters) of hot and cold water pipes from the storage tank.
ii. All piping with a nominal diameter of 3/4 inch (19 millimeter) or larger.
iii. All piping associated with a domestic hot water recirculation system regardless of the pipe diameter.
iv. Piping from the heating source to storage tank or between tanks.
v. Piping buried below grade.
vi. All hot water pipes from the heating source to the kitchen fixtures.

§150.0(j)2: Pipe insulation for steam hydronic heating systems or hot water systems >15 psi, meets the requirements of Standards Table 120.3-A.

§150.0(j)3A: Insulation is protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind.

§150.0(j)4: Solar water-heating systems and/or collectors are certified by the Solar Rating and Certification Corporation.

§150.0(m)1: All air-distribution system ducts and plenums installed, are sealed and insulated to meet the requirements of CMC Sections 601, 602, 603, 604, 605 and Standard 6-5; supply-air and return-air ducts and plenums are insulated to a minimum installed level of R-6 or enclosed entirely in conditioned space. Openings shall be sealed with mastic, tape or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, or UL 181B or aerosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape shall be used

§150.0(m)1: Building cavities, support platforms for air handlers, and plenums defined or constructed with materials other than sealed sheet metal, duct board or flexible duct shall not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms shall not be compressed to cause reductions in the cross-sectional area of the ducts.

§150.0(m)2D: Joints and seams of duct systems and their components shall not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.

§150.0(m)7: Exhaust fan systems have back draft or automatic dampers.

§150.0(m)8: Gravity ventilating systems serving conditioned space have either automatic or readily accessible, manually operated dampers.

§150.0(m)9: Insulation shall be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

§150.0(m)10: Flexible ducts cannot have porous inner cores.

§150.0(n)1: Systems using gas or propane water heaters, whether tank or on-demand, to serve individual dwelling units shall include all the following components :

A. A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions;
B. A Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed;
C. A condensate drain that is no more than 2 inches higher than the base of the installed water heater, and allows natural draining without pump assist,
D. A gas supply line with a capacity of at least 200,000 Btu/hr.

§150.0(o): All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings. Window operation is not a permissible method of providing the Whole Building Ventilation required in Section 4 of that Standard.

Resources

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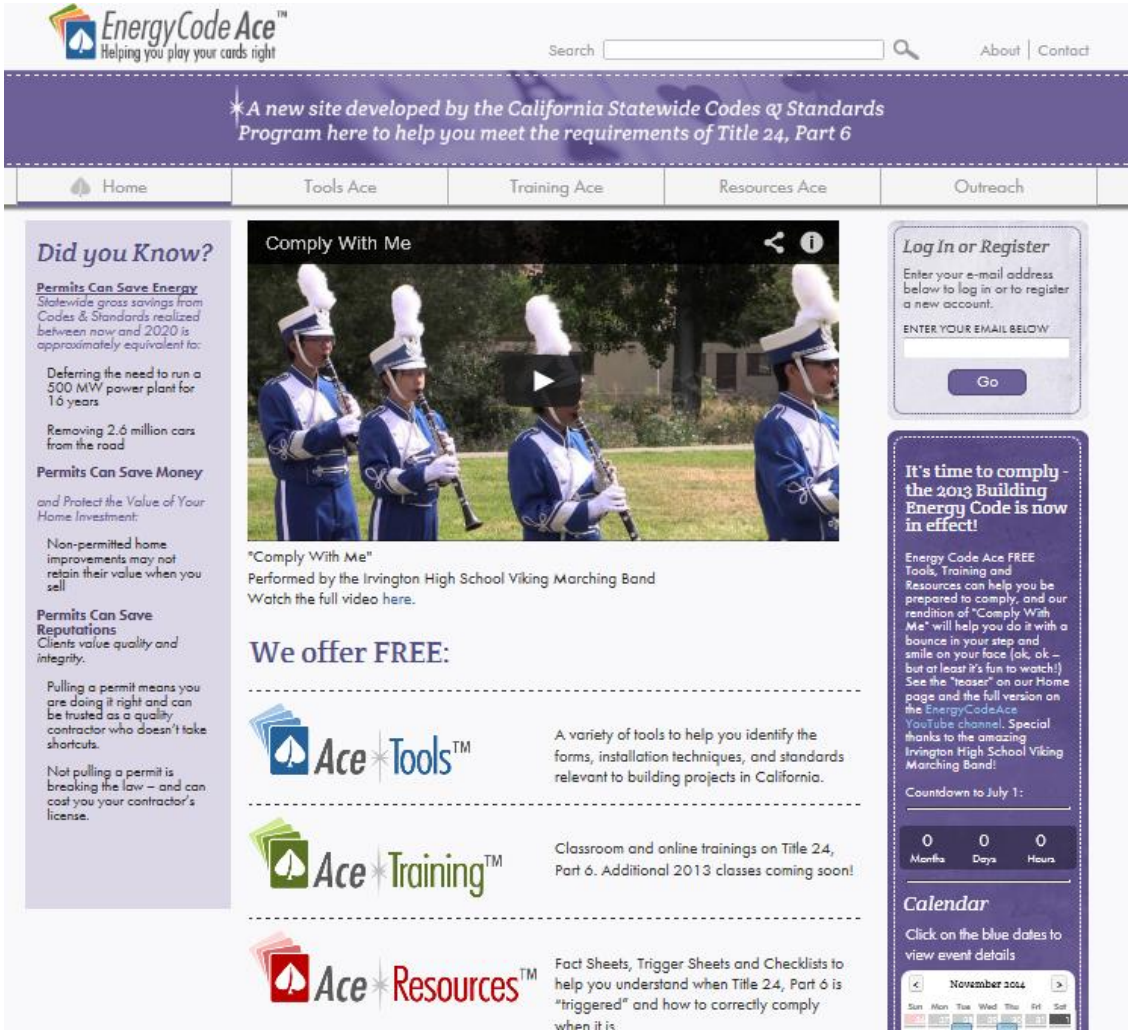
www.energycodeace.com

Energy Commission

Web Site For

Compliance Tools



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Ace Resources

2013 Residential - Title 24, Part 6

Energy Plans Review Checklist

Residential Performance Method

Condensed

New Construction, Addition, and/or Alteration

See complete checklist for more detailed information

Permit Number: _____ **Project Address** _____

_____

COMPLIANCE RESULTS AND REQUIREMENTS	Project Notes	YES	NO*
Do all pages of the CF1R have the same "Report Generated" date and time?	*Date and Time:*	☐	☐
If HERS verification is required, has the CF1R been registered with a HERS provider?	*Registration Number:*	☐	☐
Is the CF1R signed and dated by both required roles? Documentation Author Responsible Building Designer or Owner	*Electronic signature always allowed* *Electronic signature allowed on HERS registered documents*	☐	☐
Is the CF1R filed on the plans?	CF1R-PRF-01 New Construction CF1R-PRF-02 Additions and/or Alterations	☐	☐
Does the CF1R show "Building Complies with Computer Performance"?		☐	☐

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GENERAL INFORMATION (Are the following CF1R inputs confirmed on the plans?)		YES	NO*
Climate Zone		☐	☐
Total Conditioned Floor Area (FT^2)		☐	☐
Building Front Orientation		☐	☐
Principal heating source	Natural Gas / Propane / Electric: natural gas available or not available	☐	☐
ROOFS, ATTICS, CEILINGS Sections 110.8(i), (j) / 150.0(a), (b), (g), (r) / 150.2(a), 150.2(b)1.H, 150.2(b)2			
Roofs {Mandatory Solar Ready Requirements: Section 110.10 applies for single family subdivision with 10 or more, or low-rise multi-family (exceptions may apply)}			
Cool Roof	Yes / No *Pitch:* *Reflectance:* *Emittance:*	☐	☐
Radiant Barrier	Yes / No	☐	☐
Opaque Surface Construction:			
Framing		☐	☐
Insulation R-value	*Cavity:* *Continuous:*	☐	☐
WALLS (Confirm separately as necessary) Sections 150.0(b)(c)(g) / 150.2(a)2 / 150.2(b)2			
Opaque Surface Construction:			
Framing		☐	☐
Insulation R-value	*Cavity:* *Continuous:* 2	☐	☐

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Permit Number: _____

FLOORS (Confirm separately as necessary) Sections 150.0(b)(d)(g)(l) / 150.1(c)1.C & D / 150.2(a)1 / 150.2(b)			YES	NO*
Opaque Surface Construction:				
Framing			☐	☐
Insulation R-value	*Cavity:* *Continuous:*	3	☐	☐
Slab floor(s):	Area:		☐	☐
Slab Edge Insulation	R-value: Depth (in):		☐	☐
Heated	Yes / No	4	☐	☐
FENESTRATION & DOORS (Confirm separately as necessary) Sections 150.0(q) / 150.1(c)3 & 4/ 150.2(a)1 / 150.2(b)1.A & B				
Window Area(s): by name and orientation (side of building)	Area:	5	☐	☐
U-factor		6	☐	☐
Solar Heat Gain Coefficient (SHGC)		7	☐	☐
Shading Components	Insect Screen / Overhangs / Fins / None	8	☐	☐
WATER HEATING SYSTEM				
Distribution: Section 150.0(j)			☐	☐
Equipment: Sections 110.3, 110.5, 150.0(j)(n) / 150.1(c)8 / 150.2(a)1.D / 150.2(b)1.G				
# of water heaters			☐	☐
Tank type	Boiler / indirect / large Instant / large Storage / small Instant / small Storage		☐	☐
Energy factor or efficiency		11	☐	☐

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HERS VERIFICATION FOR BUILDING ENVELOPE (RA3.5 and RA3.8)			
QII	Required / Not Required	☐	☐
Building Envelope Air Leakage	Required / Not Required	☐	☐
HVAC SYSTEMS			
Equipment: Sections 150.0(h) / 150.1(c)8 / 150.2(a)1.D / 150.2(b)1.G			
Heating (# of systems)		☐	☐
Heating Systems: Type	Central furnace / heater / boiler / electric / combined hydronic / heat pump	☐	☐
Heating Efficiency	AFUE / HSPF / Other: **13**	☐	☐
Cooling (# of systems)		☐	☐
Cooling Systems: Type	No cooling / Other	☐	☐
Cooling efficiency	SEER / EER: **14**	☐	☐
Distribution: Sections 150.0(m) / 150.1(c)9 & 13 / 150.2(a)1.D / 150.2(b)1.D & E			
Distribution System Type	Unconditioned Attic / Crawlspace / Garage / Conditioned except <12 ft / Conditioned All / Without Ducts / Outdoors / HERS low leakage In conditioned / Multiple Places	☐	☐
Ventilation Cooling: Section 150.1(c)12 / 150.2(a)			
# of fans		☐	☐

2013 Residential

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Appendix A Compliance Forms

Certificate of Installation

56	CF2R-	MCH-27a-H	Mechanical-HERS	**Mechanical Ventilation** - Continuous Whole-Building Mechanical Ventilation Airflow - Fan Vent Rate Method
57	CF2R-	MCH-27b-H	Mechanical-HERS	**Mechanical Ventilation** - Continuous Whole-Building Mechanical Ventilation Airflow - Total Vent Rate Method
58	CF2R-	MCH-27c-H	Mechanical-HERS	**Mechanical Ventilation** - Intermittent Whole-Building Mechanical Ventilation Airflow

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2013 Energy Code

Appendix A Compliance Forms

Certificate of Verification

80	CF3R-	MCH-27a-H	Mechanical-HERS	**Mechanical Ventilation** - Continuous Whole-Building Mechanical Ventilation Airflow - Fan Vent Rate Method
81	CF3R-	MCH-27b-H	Mechanical-HERS	**Mechanical Ventilation** - Continuous Whole-Building Mechanical Ventilation Airflow - Total Vent Rate Method
82	CF3R-	MCH-27c-H	Mechanical-HERS	**Mechanical Ventilation** - Intermittent Whole-Building Mechanical Ventilation Airflow

2013 Energy Code

STATE OF CALIFORNIA

INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CEC-CF2R-MCH-27a-H (Revised 06/13)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION		CF2R-MCH-27a-H
Indoor Air Quality and Mechanical Ventilation		(Page 1 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

Title 24, Part 6, Section 150.0(o) **Ventilation for Indoor Air Quality.** All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings. ***Equation and table numbering on this compliance document corresponds to the numbering for that information in the published ANSI/ASHRAE Standard 62.2-2010.***

A. Dwelling Mechanical Ventilation - General Information		
01	Building Type	
02	Conditioned floor area of dwelling unit	
03	Number of bedrooms in dwelling unit	
04	Ventilation Operation Schedule	
05	Whole-Building Ventilation Rate Calculation Method.	
06	Whole Building Ventilation System Type	

27a - **Continuous Ventilation Airflow - Fan Vent Rate Method**

B. Whole-Building Continuous Ventilation - **Fan Ventilation Rate Method** - A mechanical supply system, exhaust system, or combination thereof shall provide whole-building ventilation with outdoor air each hour at no less than the rate in equation 4.1a.		
01	Required Continuous Whole-Building Ventilation Rate (Q_{fan})	
02	Installed Continuous Whole-Building Ventilation Rate	

C. Compliance Statement

2013 Energy Code

CERTIFICATE OF INSTALLATION - USER INSTRUCTIONS	CF2R-MCH-27a-H
Indoor Air Quality and Mechanical Ventilation – MCH-27a - Continuous - Fan Ventilation Rate Method	(Page 1 of 1)

User Instructions – MCH-27a:

Section A. General Information

1 This information is automatically pulled from the CF1R Choices are "single family" and "low-rise multifamily"

2 This information is automatically pulled from the CF1R. Value to be entered in the field equals the conditioned floor area of the space, in square feet.

3 This information is automatically pulled from the CF1R. Value to be entered in the field equals the number of bedrooms in the home.

4 Select the Ventilation Operation Schedule method used from the choices provided:
- Continuous
- Intermittent

5 Select the Whole Building Ventilation Rate Calculation Method from the choices provided:
- Fan Ventilation Rate Method
- Total Ventilation Rate Method

6 Select the Whole Building Ventilation System Type from the choices provided:
- Standalone - Exhaust
- Standalone - Supply
- Standalone - Balanced

Section B. Whole Building Continuous Ventilation – Fan Ventilation Rate Method

1 This value is automatically calculated using equation 4.1a. The equation used to calculate this value in the field equals:
   a. If A01= Single Family then [(0.01 x conditioned floor area A02) + 7.5(Number of bedrooms A03 + 1)] = Continuous Whole-Building Ventilation Rate
   b. If A01= Multifamily then [(0.03 x conditioned floor area A02) + 7.5(Number of bedrooms A03 + 1)] = Continuous Whole-Building Ventilation Rate

2 User entered value equals the total mechanical ventilation in CFM

2013 Energy Code

STATE OF CALIFORNIA

INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CEC-CF3R-MCH-27-H (Revised 06/13) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF VERIFICATION		CF3R-MCH-27b-H
Indoor Air Quality and Mechanical Ventilation		(Page 1 of 2)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

Title 24, Part 6, Section 150.0(o) **Ventilation for Indoor Air Quality.** All dwelling units shall meet the requirements of ANSI/ASHRAE Standard62.2. Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings. ***Equation and table numbering on this form corresponds to the numbering for that information in the published ANSI/ASHRAE Standard 62.2-2010.***

A. Dwelling Mechanical Ventilation - General Information		
01	Building Type	
02	Conditioned floor area of dwelling unit	
03	Number of bedrooms in dwelling unit	
04	Ventilation Operation Schedule	
05	Whole-Building Ventilation Rate Calculation Method.	
06	Whole Building Ventilation System Type	

27b - Continuous Ventilation Airflow – Total Ventilation Rate Method

B. Whole-Building Continuous Ventilation - Total Ventilation Rate Method - A mechanical supply system, exhaust system, or combination thereof shall provide whole-building ventilation with outdoor air each hour at no less than the rate in 62.2 equation 4.7.		
01	Total Required Ventilation rate (fan + infiltration), (Qtot)	
02	CFM50 from a registered ENV-20a-d	
03	Equivalent Leakage Area used for ventilation	
04	What is the vertical distance from the lowest above-grade floor to the highest ceiling in feet?	
05	What is the weather and shielding factor (wsf) for the city listed in 62.2 Appendix X Table X1?	
06	Normalized Leakage (NL)	
07	Ventilation provided by infiltration in (Qinf)	
08	Required Continuous Whole-Building Ventilation Rate (Q_{fan})	
09	Installed Continuous Whole-Building Ventilation Rate	

C. Compliance Statement

2013 Energy Code

CERTIFICATE OF VERIFICATION - USER INSTRUCTIONS	CF3R-MCH-27b-H
Indoor Air Quality and Mechanical Ventilation – MCH-27b	(Page 1 of 1)

User Instructions – MCH-27b:

Section A. General Information

1. This information is automatically pulled from the CF-2R-MCH-27b. If building type does not match this entry, it can be overwritten by rater but it will be flagged as a possible fail. Choices are "single family" and "low-rise multifamily"
2. This information is automatically pulled from the CF-2R-MCH-27b. If conditioned floor area does not match this entry, it can be overwritten by rater but it will be flagged as a possible fail. Value to be entered in the field equals the conditioned floor area of the space, in square feet.
3. This information is automatically pulled from the CF-2R-MCH-27b. If number of bedrooms not match this entry, it can be overwritten by rater but it will be flagged as a possible fail. Value to be entered in the field equals the number of bedrooms in the home.
4. This information is automatically pulled from the CF-2R-MCH-27b. If ventilation operation schedule does not match this entry, it can be overwritten by rater from list but it will be flagged as a possible fail. Select the Ventilation Operation Schedule method used from the choices provided:
   - Continuous
   - Intermittent
5. This information is automatically pulled from the CF-2R-MCH-27b. If whole-building ventilation rate calculation method does not match this entry, it can be overwritten by rater from list but it will be flagged as a possible fail. Select the Whole Building Ventilation Rate Calculation Method from the choices provided:
   - Fan Ventilation Rate Method
   - Total Ventilation Rate Method
6. This information is automatically pulled from the CF-2R-MCH-27b. If whole-building ventilation system type does not match this entry, it can be overwritten by rater from list but it will be flagged as a possible fail. Select the Whole Building Ventilation System Type from the choices provided:
   - Standalone - Exhaust
   - Standalone - Supply
   - Standalone - Balanced

Section B. Whole Building Continuous Ventilation – Total Ventilation Rate Method

HERS Measures for Res. And Non-Res.

Energy Performance **25% or 30% above code**. HERS used to improve energy performance, enhances energy model final output. Required by LEED, Energy Star for Homes, Optional for GreenPoint Rated.

Duct Sealing – Test (Required)

Quality Insulation Installation

Questions

TABLE 150.1-A COMPONENT PACKAGE-A Standard Building Design

					Climate Zone														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope	Insulation[1]	Roofs /Ceilings			U 0.025 R 38	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38
		Walls	Above Grade	2x4 Framed[2]	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U-0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5
				Mass Wall Interior[3]	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.059 R 17
				Mass Wall Exterior[3]	U 0.125 R 8.0	U 0.125 R 8.	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.1025 R 8.0	U 0.125 R 8.0	U 0.070 R 13
			Below Grade	Below Grade Interior[3]	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.066 R 15
				Below Grade Exterior[3]	U-0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19
		Floors	Slab Perimeter		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
			Raised		U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
			Concrete Raised		U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
	Radiant Barrier				NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
	Roofing Products	Low-sloped		Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.6	NR	0.6	NR
				Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
		Steep Sloped		Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
				Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0. 75	0.75	0.75	0.75	0.75	0.75	NR
	Fenestration	Maximum U-factor[4]			0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
		Maximum SHGC[5]			NR	0.25	NR	0.25	NR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		Maximum Total Area			20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
		Maximum West Facing Area			NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

TABLE 150.1-A COMPONENT PACKAGE-A Standard Building Design (continuation)

			Climate Zone														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HVAC SYSTEM	Space Heating	Electric-Resistance Allowed	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
		If gas, AFUE	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		If Heat Pump, HSPF[6]	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	Space cooling	SEER	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		Refrigerant Charge Verification or Charge Indicator Display	NR	REQ	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
		Whole House Fan[7]	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	NR
	Central System Air Handlers[8]	Central Fan Integrated Ventilation System Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
	Ducts	Duct Insulation	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-8	R-6	R-6	R-8	R-8	R-8
Water Heating	All Buildings		System Shall meet Section 150.1(c)8															

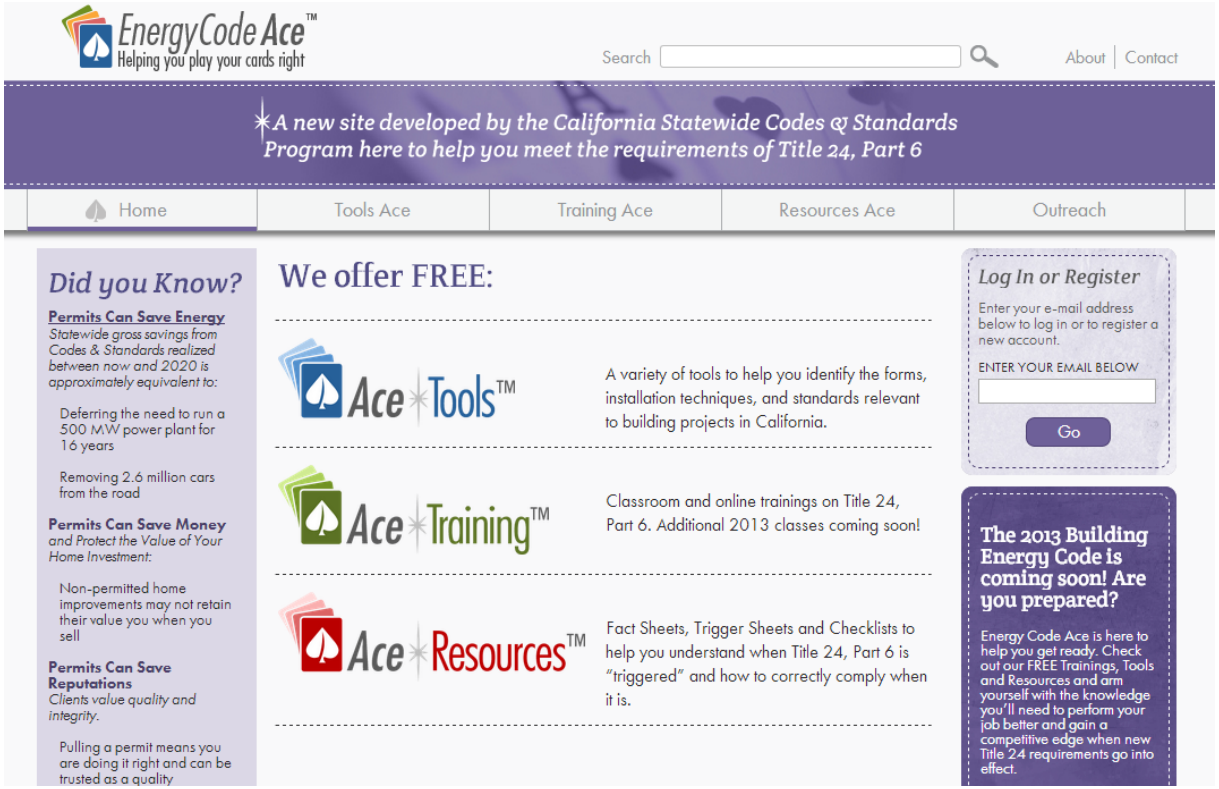
Package “D” replaced by Package “A”

Prescriptive method for complying with the energy code

Use as a guide for minimum requirements

2013 Residential

www.energycodeace.com



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Ace Resources | Title 24 Part 6 Residential Triggers Sheet

HVAC Alterations

Split Systems and Packaged Systems	Mandatory Measures					Prescriptive Requirements	
	Setback Thermostat	Cooling Load Calcs	Heating Load Calcs	HERS: Duct Seal and Test	HERS: Cooling Coil Airflow and Fan Watt Draw	Duct Insulation	HERS: Refrigerant Charge
Change this (and nothing else)	§110.2(c) §150.2(b)F	§150.0(h), §150.2(b)1C	§150.0(h), §150.2(b)1C	§150.0 (m)1-3 & 11 §150.2(b)1C,D, & E	§150.0(m)12, 13 & 15 §150.2 (b)1C, D	§150.1(c)9 §150.2(b)1D	§150.1(f)/ A §150.2(b)1 F
Whole split or packaged system (no ducts added or replaced)	YES	no	no [A]	YES [B]	no	no	YES [C, D]
Evaporator coil (cooling coil), **condenser coil, or outdoor condensing unit**	YES	no	no [A]	YES [B]	no	no	YES [C, D]
Furnace (air handler)	YES	no	no [A]	YES [B]	no	no	YES [C, D]
Compressor, refrigerant metering device	YES	no	no [A]	no	no	no	YES [C, D]
Some ducts	no	maybe [E]	maybe [A, E]	YES [B]	no	YES [F]	no
"All new" ducts [G]	no	maybe [E]	maybe [A, E]	YES [H]	YES [I]	YES [F]	no
Whole split or packaged system and all new ducts	YES	YES [E]	YES [A, E]	YES [H]	YES [I]	YES [F]	YES [C, D]

NOTE:

- Replacing the blower wheel fan is considered a repair and does NOT trigger the 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 0.5" thick insulation.

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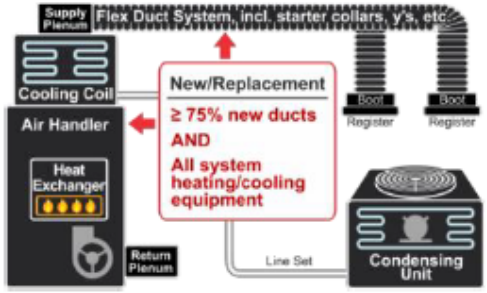
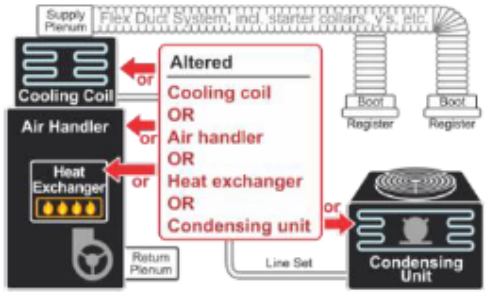
2013 Entirely New or Complete Replacement Space-Conditioning System §150.2(b)1C



A space-conditioning system is considered entirely new or a complete replacement when all of the following are installed or replaced:

- All the system heating/cooling equipment
- ≥75% new duct material [G]

2013 Altered Space-Conditioning System §150.2(b)1E, F



A space-conditioning system is considered altered when it is not a new or replacement system and any of the following components is installed or replaced:

- Evaporator coil (cooling coil)
- Compressor
- Condenser coil
- Air handler
- Outdoor condensing unit
- Refrigerant metering device

Replacing other components is considered a repair — not an alteration. For example, replacing the blower wheel fan, but not the heat exchanger or air handler in the furnace, is a repair.

Required Documentation

For All HVAC Alterations

All HVAC alterations require:

- Permit — for all HVAC changeouts
- CF1R: Certificate of Compliance: Alteration to an HVAC System (CF1R-ALT-02*-E, or CF1R-ALT-03-E or CF1R-ALT-04-E)

  Submitted to the building department by the contractor or the home owner
- CF2R-MCH-01-H: Certificate of Installation for Space Conditioning Systems, Ducts and Fans

  Completed and signed by the installing contractor and made available for final inspection by building department

For HERS Measures

Projects with HERS measures require:

- Registration of the CF1R, via HERS Provider
- CF2R-MCH...H: Certificates of Installation for mechanical system with HERS measures

  Completed and signed by the installing contractor; must be submitted to a HERS Provider Registry after the contractor has signed it, and made available for inspection by the building department
- CF3R-MCH...H: Certificates of Field Verification for mechanical system with HERS measures

  Completed and registered by a HERS Rater for each CF2R-H; the HERS Rater or contractor ensures the relevant CF3Rs are available for final inspection by the building department.

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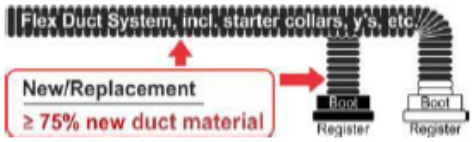
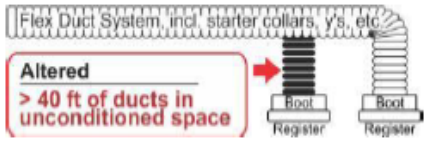
2013 Residential

2013 Altered or Replaced Duct Systems (Duct Sealing) §150.2(b)1D





Entirely New or Complete Replacement Ducts

Entirely new or complete replacement duct systems are those that contain at least 75% new duct material. Existing duct system components (up to 25%) may be reused if they are accessible and can be sealed.[G]

The Duct Sealing and Testing HERS measure must demonstrate a leakage rate less than or equal to 6% of the system air handler airflow.

In addition, verification of Cooling Coil Airflow and Fan Watt Draw (HERS measure) is required. The system must have airflow >350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy ≤0.58 W/CFM.

Alteration or Extension of Existing Ducts

In all climate zones when more than 40 feet of new or replacement system ducts are installed as an extension of an existing duct system, Duct Sealing and Testing (HERS measure) is required, and the measured leakage shall be equal to or less than 15%.

(There are alternatives to meeting the maximum 15% leakage. Consult your Building Department or §150.2(b)1Diib in the Standards.)

- HERS: Duct Leakage Diagnostic Test
  - CF2R-MCH-20*-H and CF3R-MCH-20*-H
- HERS: Fan Efficacy (Fan Watt Draw)
  - CF2R-MCH-22-H and CF3R-MCH-22-H

and

HERS: Space Conditioning System Airflow Rate

- CF2R-MCH-23*-H and CF3R-MCH-23*-H
- HERS: Refrigerant Charge Verification
  - CF2R-MCH-25*-H and CF3R-MCH-25*-H

or

- CF2R-MCH-25f-E (for packaged systems with refrigerant charge certified by manufacturer)

* *Correct version (e.g., "a" or "b" or "c") varies depending upon the project scope and approach used to demonstrate compliance*

For Projects with New or Replacement Duct Systems using Duct and Filter Sizing

Projects that use Duct and Filter Sizing instead of the Cooling Coil Airflow and Fan Watt Draw HERS Measure require:

- CF2R-MCH-28-H and CF3R-MCH-28-H

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2013 Residential

Cool Roofs and Reroofing

Requirements

Roof Style	Climate Zone	Either these reflectance and emittance values: Min. 3-yr Aged Solar Reflectance	Either these reflectance and emittance values: Min. Thermal Emittance	Or this SRI value: Min. SRI
Low-slope [A]	13 & 15	0.55	0.75	64
Steep-slope [A] < 5 lb/ft²	10 thru 15	0.20	0.75	16
Steep-slope [A] ≥ 5 lb/ft²	1 thru 16	0.15	0.75	10

Exceptions… Cool roof is NOT required if:

Any slope	The roof area is covered by building-integrated photovoltaic panels or building-integrated solar thermal panels
Any slope	Building has no ducts in the attic
Any slope	Roof is on addition ≤300 ft²
Any slope	Roof construction has a thermal mass over the roof membrane with a weight of at least 25 lb/ft².[B]
Steep slope	An air-space of 1.0 inch is provided between top of roof deck and bottom of roofing product.
Steep slope	Existing ducts in the attic are insulated and sealed according to §150.1(c)9.
Steep slope	Building has a radiant barrier in the attic meeting the requirements of §150.1(c)2
Steep slope	Building has at least R-38 ceiling insulation
Steep slope	Roofing product profile ratio of rise to width is at least 1:5 for ≥50% of the width of the roofing product.
Steep slope	R-4 or greater insulation above the roof deck.
Low slope	The aged solar reflectance can be traded off with additional insulation added at the roof deck as per Table 150.2-A.

Documentation

- **Permit**
- **CF1R-ALT-01-E**: Certificate of Compliance — Residential Alterations
  - General information (Part A, of Page 1 of 5)
  - Roofing Replacement (Part C, Page 1 of 5)
  - Declaration Statement (Page 5 of 5)

  Submitted to the building department by the contractor or the home owner.
- (Optional) **CF1R-ENV-04-E**: Certificate of Compliance — Solar Reflectance Index Calculation Worksheet
- **CF2R-ENV-05-E:** Installation Certificate for Envelope — Insulation; Roofing; Fenestration
  - Description of Roofing Products (top half of Page 1 of 2)
  - Declaration Statement (Page 2 of 2)

  The CF2R-ENV-05-E must be completed and signed by the installing contractor and made available for final inspection by building department. CRRC label(s), described below, should be attached to the CF2R-ENV-05-E form.
- **Product Labeling:**
  - For all roofs: CRRC label specifying the initial and aged ("weathered") solar reflectance and thermal emittance
  - For liquid-applied roof coatings applied to low-sloped roofs:
    - CRRC label specifying the initial and aged ("weathered") solar reflectance and thermal emittance
    - Label stating the product meets the ASTM requirements specified in Section 110.8(i)4 of the Standards.

  Product labeling must be available for final inspection by building department.

2013 Residential

RE-Roof

STATE OF CALIFORNIA
RESIDENTIAL ALTERATIONS
CEC-CF1R-ALT-01-E (Revised 06/13)
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	CF1R-ALT-01-E
Residential Alterations	(Page 1 of 5)
Project Name:	Date Prepared:

A. GENERAL INFORMATION

01	Project Name:		02	Date:	
03	Project Location:		04	Compliance Method:	
05	CA City:		06	Building Front Orientation (deg or cardinal):	
07	Zip Code:		08	Number of Dwelling Units:	
09	Climate Zone:		10	Fuel Type:	
11	Building Type	☐ Single Family ☐ Multi Family	12	Total Conditioned Floor Area:	
13	Project Type:	☐ Insulation ☐ Roof Replacement ☐ Fenestration/Glazing ☐ Heating System ☐ Cooling System ☐ Duct System ☐ Water Heating	14	Slab Area:	

B. BUILDING INSULATION DETAILS (Section 150.2(b)1)

01	02	03	04	05	06	07	08	09	10	11
					Proposed				Required	
							Appendix JA4 Reference			
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Cavity R-value	Continuous Insulation R-value	U-factor	Table	Cell	U-Factor	Comments

C. ROOF REPLACEMENT (Prescriptive Alteration, Section 150.2(b)1H)

01	02	03	04	05	06	07	08	09	10	11	12
						Proposed			Minimum Required		
Altering > 50% of roof surface	Roof Pitch	Exception	CRRC Product ID Number	Product Type	R-value Deck Insulation	Aged Solar Reflectance	Thermal Emittance	SRI	Aged Solar Reflectance	Thermal Emittance	SRI

NOTES
- Mass roof with 25 lb/ft2 not required to comply with cool roof requirements
- Roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
- Liquid field applied coatings must comply with installation criteria from section 110.8(i)4.

EXCEPTION:

2013 Residential

Declaration Document

STATE OF CALIFORNIA
RESIDENTIAL ALTERATIONS
CEC-CF1R-ALT-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	CF1R-ALT-01-E
Residential Alterations	(Page 5 of 5)
Project Name:	Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA/ HERS Certification Identification (if applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

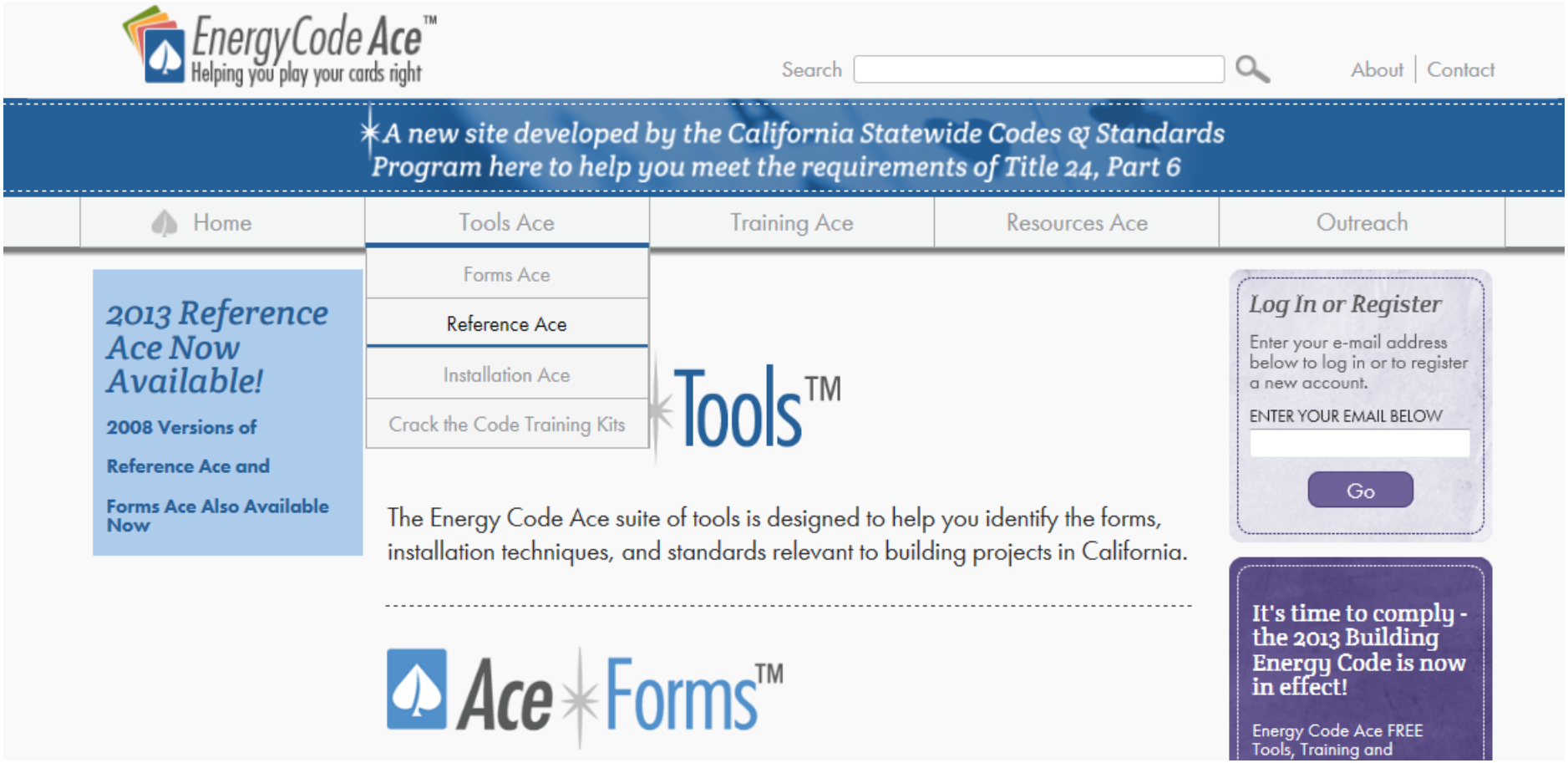
I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. That the energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a registered copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

VCA Green

CALGreen



VCA Green

CALGreen

VCA Green

CALGreen

2013 Building Energy Efficiency Standards - Reference Ace

Contents | Search

- 2013 Title 24, Part 6 Standards
- Residential Compliance Manual
- Nonresidential Compliance Manual

2013 Building Energy Efficiency Standards Reference Tool

Questions

VCA Green

CALGreen

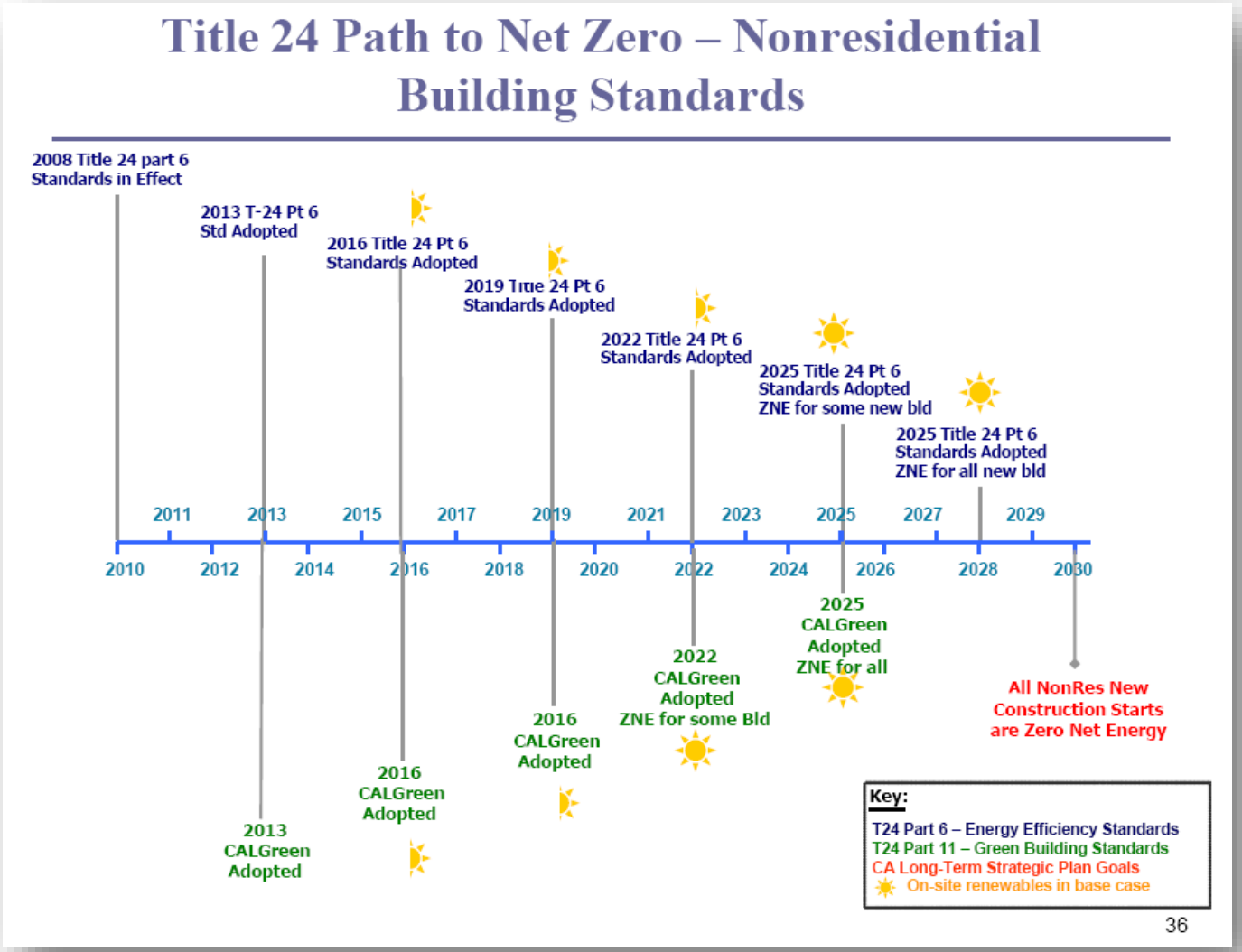
2013

BUILDING ENERGY EFFICIENCY STANDARDS

FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

Acceptance criteria

2030 CALGreen and CEC



Non-residential
2013 Energy Code

New Non-Residential Standards

- 30% More Efficient
- Solar ready roofs
- Increase U-factors and SHGC
- Lighting sensors and controls to allow daylighting
- Lighting levels to be control by new systems when occupied
- New cool roof technology
- Full commissioning for building greater than 10,000sq.ft.

VCA Green

CALGreen

Table 1-1 – Nonresidential vs. Residential Standards

Nonresidential Standards	**Residential Standards**
These Standards cover all nonresidential occupancies (Group A, B, E, F, H, M, R, S or U), as well as high-rise residential (Groups R-1 and R-2 with four or more habitable stories), and all hotel and motel occupancies.	These Standards cover all low-rise residential occupancies including:
Offices Retail and wholesale stores Grocery stores Restaurants Assembly and conference areas Industrial work buildings Commercial or industrial storage Schools and churches Theaters Hotels and motels Apartment and multi-family buildings, and long-term care facilities (Group R-2), with four or more habitable stories	All single family dwellings of any number of stories (Group R-3) All duplex (two-dwelling) buildings of any number of stories (Group R-3) All multi-family buildings with three or fewer habitable stories above grade (Groups R-1 and R-2) Additions and alterations to all of the above buildings
Note: The Standards define a habitable story as one that contains space in which humans may live or work in reasonable comfort, and that has at least 50% of its volume above grade.	

Acceptance Testing

Application:

- Envelope
- Mechanical
- Lighting
  - (indoor & outdoor)
- Process loads

Acceptance Testing and Certification

When required

- New construction or retrofit
- New equipment and systems
- Check test forms for exceptions
- Completed form submitted prior to C of O is issued

Enforcing agency

- Shall not issue a final C of O
- Building Official has the authority to require the field technician to demonstrate competence knowledge

Acceptance testing

SECTION 10-103 – PERMIT, CERTIFICATE, INFORMATIONAL, AND ENFORCEMENT REQUIREMENTS FOR DESIGNERS, INSTALLERS, BUILDERS, MANUFACTURERS, AND SUPPLIERS

(a) **Documentation.** The following documentation is required to demonstrate compliance with Part 6. This documentation shall meet the requirements of Section 10-103(a) or alternatives approved by the Executive Director.

Certificate of Acceptance. For all nonresidential buildings, high-rise residential buildings, and hotels and motels, when designated to allow use of an occupancy group or type regulated by Part 6 the person in charge of the acceptance testing, who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the applicable scope of system design, or construction, or installation of features, materials, components, or manufactured devices regulated by Part 6 or the Appliance Efficiency Regulations (*responsible person*), shall sign and submit all applicable Certificate of Acceptance documentation in accordance with Section 10-103(a)4 and Nonresidential Appendix NA7 to certify conformance with Part 6. If more than one person has responsibility for the acceptance testing, each person shall sign and submit the Certificate of Acceptance documentation applicable to the portion of the construction or installation, for which they are responsible; alternatively, the person with chief responsibility for the system design, construction or installation, shall sign and submit the Certificate of Acceptance documentation for the entire construction or installation scope of work for the project. Subject to the requirements of Section 10-103(a)4, persons who prepare Certificate of Acceptance documentation (*documentation authors*) shall sign a declaration statement on the documents they prepare to certify the information provided on the documentation is accurate and complete. Persons who perform acceptance test procedures in accordance with the specifications in Reference Joint Appendix NA7, and report the results of the acceptance tests on the Certificate of Acceptance (*field technicians*) shall sign a declaration statement on the documents they submit to certify the information provided on the documentation is true and correct. In accordance with applicable requirements of 10-103(a)4, the signatures provided by *responsible persons*, *field technicians*, and *documentation authors* shall be original signatures on paper documents or electronic signatures on electronic documents conforming to the electronic signature specifications in Reference Joint Appendix JA7.

Acceptance criteria

Enforcement Agency

The Certificate of Acceptance must be submitted to the enforcement agency in order to receive the final Certificate of Occupancy. Enforcement agencies shall not release a *final* Certificate of Occupancy unless the submitted Certificate of Acceptance demonstrates that the specified systems and equipment have been shown to be performing in accordance with the applicable acceptance requirements.

The enforcement agency has the authority to require the *Field Technician or Responsible Person* to demonstrate competence, to its satisfaction.

When Are Acceptance Tests Required?

In general the Acceptance Tests apply to new equipment and systems installed in either new construction or retrofit applications. More detailed notes and any specific exceptions to this rule are noted in the following paragraphs. If an acceptance test is required, the appropriate form along with each specific test must be submitted to the enforcement agency before a final occupancy permit can be granted.

Field Technician Responsibilities

JA7.4.5 Field Technician

The Field Technician is responsible for performing the acceptance test procedures and documenting the results of the acceptance tests on a Certificate of Acceptance. The Field Technician shall sign the Certificate of Acceptance to certify that the information he reports on the Certificate of Acceptance is true and correct. When registration of a Certificate of Acceptance is required, the Field Technician shall establish a user account and an electronic signature authority with the Data Registry in order to provide electronic signatures to complete the Certificate of Acceptance. When a Field Technician also performs the data input to prepare the Certificate of Acceptance documentation, the Field Technician shall also provide the documentation author signature on the Certificate of Acceptance. The Field Technician may be, but is not required to be the installer of the system that requires Acceptance Testing.

Who completes and signs the documents?

JA7.4.6 Registration Signer (Responsible Person)

The Registration Signer is the person responsible for the work identified on a compliance document (Certificate of Compliance, Certificate of Installation, Certificate of Acceptance, or Certificate of Verification).

(a) **For Certificate of Compliance documentation**, the Registration Signer shall be eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design.

(b) **For Certificate of Installation documentation**, the Registration Signer shall be eligible under Division 3 of the Business and Professions Code to accept responsibility for the building construction or installation in the applicable classification for the scope of work identified on the document.

(c) **For Certificate of Acceptance documentation**, the Registration Signer shall be eligible under Division 3 of the Business and Professions Code to accept responsibility for the system design, construction or installation in the applicable classification for the scope of work identified on the document.

(d) **For Certificate of Verification documentation**, the Registration Signer shall be a certified HERS Rater.

Plan Check Submittal

13.31 Plan Review

The installing contractor, engineer of record, owner's agent, or the person responsible for certification of the acceptance testing/verification on the Certificate of Acceptance (*Responsible Person*) must review the plans and specifications to ensure that they conform to the acceptance requirements. This is typically done prior to signing a Certificate of Compliance.

In reviewing the plans, the designer will be noting on the NRCC-ENV-01-E, NRCC-MCH-01-E, NRCC-LTI-01-E, NRCC-LTO-01-E, and the NRCC-PRC-06-E code compliance forms, all of the respective envelope, mechanical, lighting, electric resistance underfloor heating, and refrigeration systems that will require acceptance tests, and the parties responsible for performing the tests. An exhaustive list is required so that when the acceptance tests are bid, all parties are aware of the scope of acceptance testing on the project.

What are the duties of the building department?

JA7.4.7 Enforcement Agency

Standards Section 10-103(d) requires the Enforcement Agency to verify that all required compliance documents for a project are completed, signed, and submitted or posted as required by Standards Section 10-103(a). Thus, when Section 10-103(a) requires that a compliance document be registered with a Data

Registry, the Enforcement Agency must verify that compliance documents submitted when applying for a permit, or posted in the field are registered documents. Such enforcement agency verification shall be by any valid means the Enforcement agency considers satisfactory.

Enforcement Agency persons may establish user accounts with data registries to enable viewing the compliance documents for projects for which their jurisdiction has enforcement authority.

Enforcement Agencies may be authorized to enter notations into project records in data registries to communicate plan check and field inspection information to builders, designers, installers and raters.

Acceptance Requirements

Acceptance requirements ensure that equipment, controls and systems operate as required by the Standards. The activities specified in these requirements have three aspects:

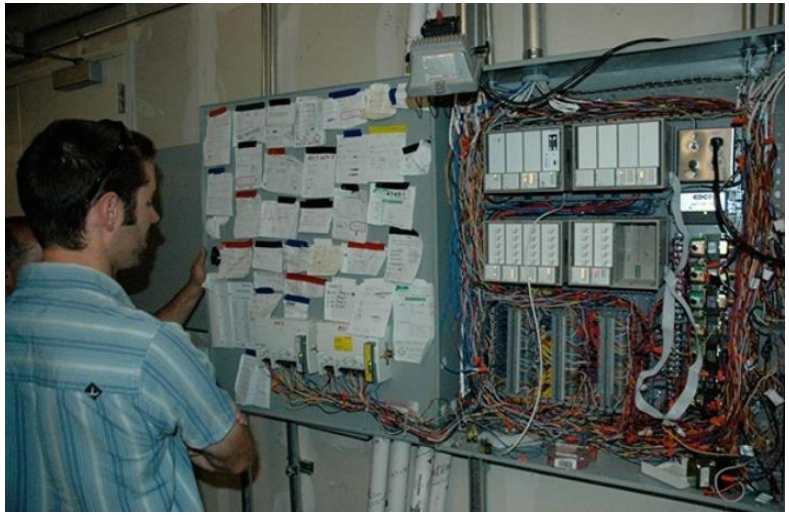
- Visual inspection of the equipment and installation
- Review of the certification requirements
- Functional tests of the systems and controls
- New Acceptance Requirements for 2013
- Building Envelope:
- For Fenestration Acceptance (NRCA-ENV-02-F)
- Mechanical Acceptance Tests:
- Supply Air Temperature Reset Controls Acceptance (NRCA-MCH-16-A),
- Condenser Water Supply Temperature Reset Controls Acceptance (NRCA-MCH-17-A),
- Energy Management Control System Acceptance (NRCA-MCH-18-A)
- Lighting Acceptance Tests:

Acceptance criteria

- Outdoor Lighting Acceptance Tests (NRCA-OLT-02-A)
- Process Spaces and Equipment
- Compressed Air System Acceptance Tests (NRCA-PRC-01-A)
- Commercial Kitchen Exhaust System Acceptance Tests (NRCA-PRC-02-A)
- Enclosed Parking Garage Exhaust System Acceptance Tests (NRCA-PRC-03-F)
- Refrigerated Warehouse – Evaporator Fan Motor Controls (NRCA-PRC-04-A)
- Refrigerated Warehouse – Evaporative Condenser Controls (NRCA-PRC-05-A)
- Refrigerated Warehouse – Air-Cooled Condenser Controls (NRCA-PRC-06-A)
- Refrigerated Warehouse – Variable Speed Compressor (NRCA-PRC-07-A)
- Refrigerated Warehouse – Electric Resistance Underslab Heating System (NRCA-PRC-08-A)

Inspection(s) for Non-residential

- Energy code
  - Acceptance certification
  - Cx compliance
- Third party Cx'
  - Cx
  - Verification
- Building department



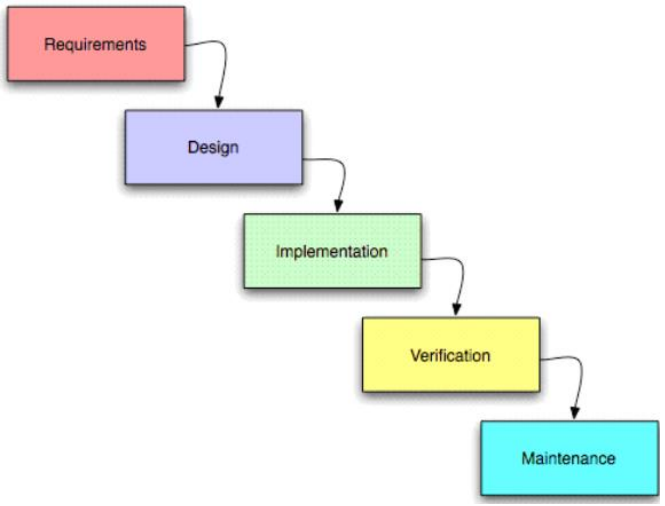
Inspection(s) for Non-residential

- Energy code vs. Third party
  - ATTCP
  - CxA and team
- Building department
  - Referee
  - Collector of document
  - Issue C of O

Acceptance Testing and Certification

Overview

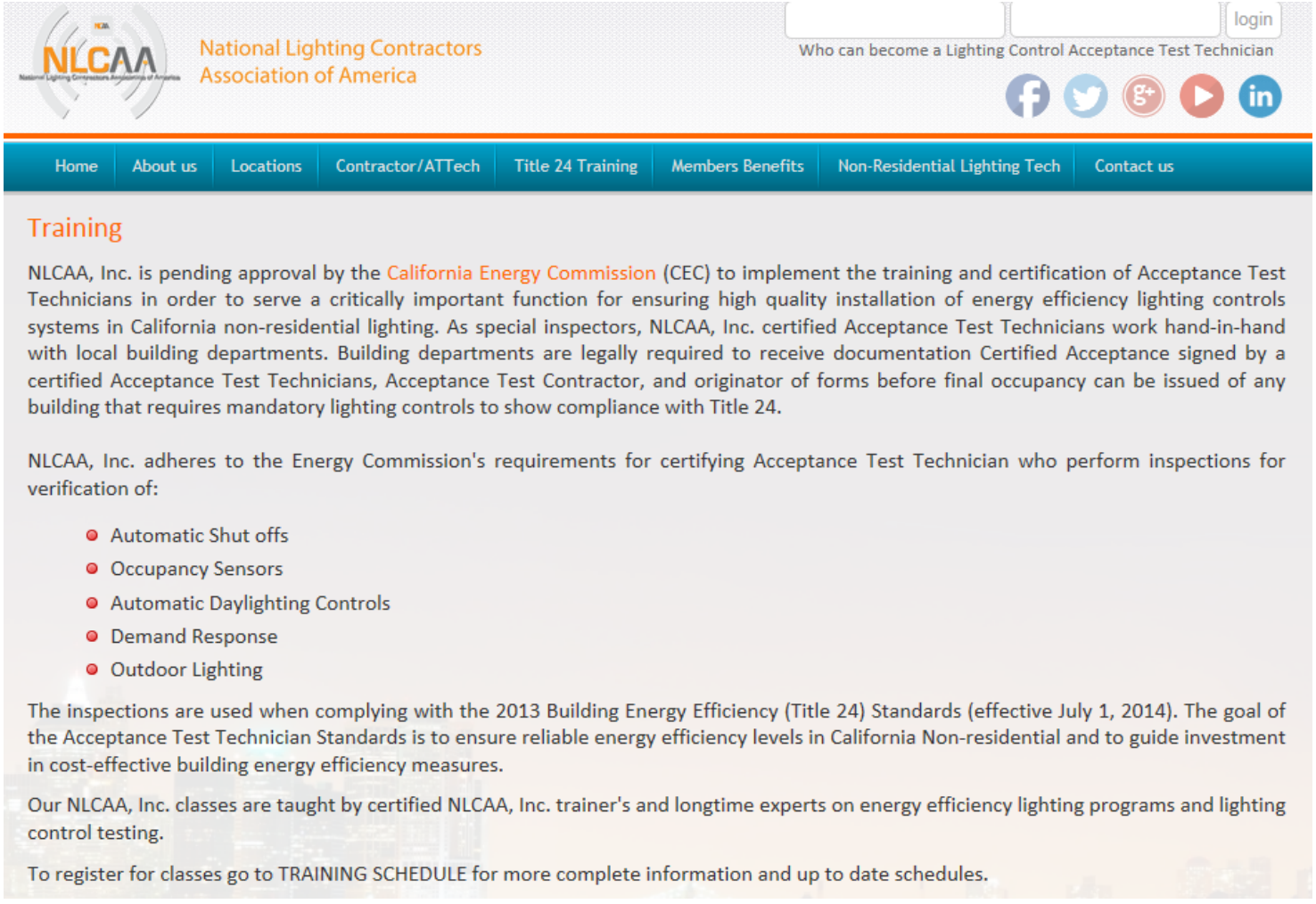
- Specify inspection procedures
- Functional testing
- Interface with all systems
- Appendix NA7
- Promote compliance
- Optimization of system efficiencies and



Acceptance testing

- Does not replace
  - Cx or testing and balancing
  - Additional measure to ensure compliance with the CEC

Certified Technician (Lighting)



National Lighting Contractors Association of America

login

Who can become a Lighting Control Acceptance Test Technician

Home | About us | Locations | Contractor/ATTech | Title 24 Training | Members Benefits | Non-Residential Lighting Tech | Contact us

Training

NLCAA, Inc. is pending approval by the California Energy Commission (CEC) to implement the training and certification of Acceptance Test Technicians in order to serve a critically important function for ensuring high quality installation of energy efficiency lighting controls systems in California non-residential lighting. As special inspectors, NLCAA, Inc. certified Acceptance Test Technicians work hand-in-hand with local building departments. Building departments are legally required to receive documentation Certified Acceptance signed by a certified Acceptance Test Technicians, Acceptance Test Contractor, and originator of forms before final occupancy can be issued of any building that requires mandatory lighting controls to show compliance with Title 24.

NLCAA, Inc. adheres to the Energy Commission's requirements for certifying Acceptance Test Technician who perform inspections for verification of:

- Automatic Shut offs
- Occupancy Sensors
- Automatic Daylighting Controls
- Demand Response
- Outdoor Lighting

The inspections are used when complying with the 2013 Building Energy Efficiency (Title 24) Standards (effective July 1, 2014). The goal of the Acceptance Test Technician Standards is to ensure reliable energy efficiency levels in California Non-residential and to guide investment in cost-effective building energy efficiency measures.

Our NLCAA, Inc. classes are taught by certified NLCAA, Inc. trainer's and longtime experts on energy efficiency lighting programs and lighting control testing.

To register for classes go to TRAINING SCHEDULE for more complete information and up to date schedules.

Classes Required to be Completed for Certification

NLCAA, Inc. 2013 Training Classes:

Code	# of Days	Class Title	Prerequisites, (other requirements)
I	12 hrs.	Introduction to Lighting Controls	LCA Online Classes
II	.5	Fundamentals	Class room or Online classes
III	.5	Introduction to Lighting & Electrical Theory	Class room or Online classes
IV	.5	Technology of Lighting	Class room or Online classes
V	.5	Lamps	Class room or Online classes
VI	1	Lighting Controls	Class room or Online classes
VII	1	Title 20 & Title 24	Class room or Online classes
VIII	2	Title 24 Lighting Systems	Class room or Online classes
IX	2	Title 24 Lighting Controls	Class room or Online classes
X	1	Shut off & Occupancy	Class room or Online classes
XI	3	Automatic Daylighting 1-2-3	Class room or Online classes
XII	1	Demand Response	Class room or Online classes
XIII	.5	Interlock Lighting	Class room or Online classes
XIV	.5	Track Lighting	Class room or Online classes
XV	.5	Electrical Safety in the Work Place	Lab Classes (hands On)
XVI	4	Control Labs	Lab Classes (hands On)
XVII	3	Acceptance Testing	Perform Testing at school and or other location
XVIII	1.5	Quality Assurance and Fees	Class room or Online classes
XVIV	1.5	Final Exam	Final written examination

Acceptance Requirements

Objectives

- Meet three aspect of the process
  - Visual inspection
  - Review certification requirements
  - Functional test

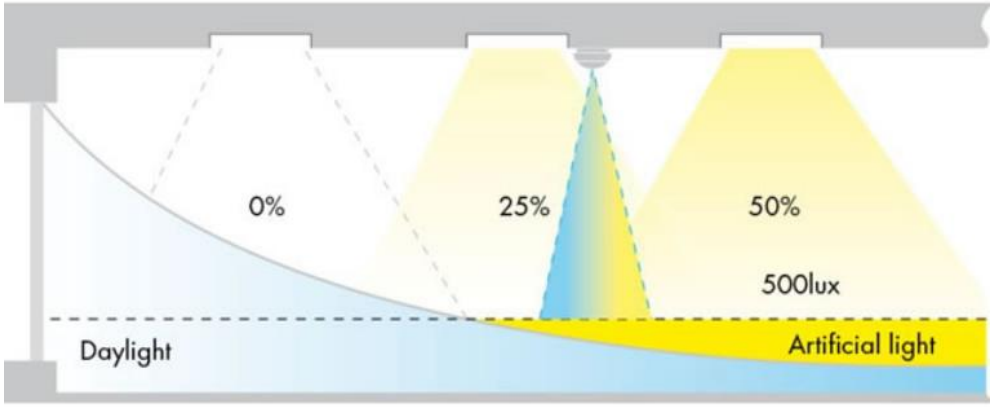
- Categories of building systems to be tested
  - Building envelope
  - Mechanical elements
  - Lighting systems and components
  - Process spaces and equipment

- Ensure; equipment/controls/systems
  - Operate as designed
  - Operate per standards
  - Meet OPR goals

Efficiency Standards Acceptance Testing

Section 130.4 Lighting Control Acceptance and Installation Certificate Requirements

- Before C of O is issue
- Equipment and systems
- Meet acceptance requirements
- Reference appendix NA7
- Certificate of Acceptance
  - Submitted to AHJ
  - Certifies compliance



Acceptance Testing and Certification

Compliance process

- Acceptance requirements incorporated into construction plans
- Details of the test to be performed
- Specification for testing
- List of all systems to be tested

13.18 *NRCA-LTI-02-A: Lighting Control Acceptance*

- ***New Construction and Retrofit***: Applies to Occupant sensor, Acceptance Manual Daylight Controls Acceptance, and Automatic Time Switch Control Acceptance. Functional testing and verification is required.

13.19 *NRCA-LTI-03-A: Automatic Daylight Control Acceptance*

- ***New Construction and Retrofit***: Applies to properly located controls, field calibrated and set to appropriate lighting levels.

Compliance Process

Certificate of Installation

NRCI-LTI-02-E	Lighting - Indoor	Enforce Agency	Certificate of Installation - Energy Management Control System or Lighting Control System

Certificate of Acceptance

NRCA-LTI-02-A	Lighting - Indoor	Accept Tech	Lighting Controls

Certificate of Compliance

NRCC-LTO-02-E	Lighting - Outdoor	Enforce Agency	Certificate of Compliance - Outdoor Lighting Controls

Compliance Process

NA7.6 Lighting Control Acceptance Requirements

Lighting control acceptance testing shall be performed on:

(a) Automatic Daylighting Controls complying with Section 130.1(d)

(b) Shut-off Controls complying with Section 130.1(c)

(c) Demand Responsive Controls in accordance with Section 130.1(e).

NA7.6.1 Acceptance tests for Automatic Daylighting Controls complying with Section 130.1(d)

NA 7.6.1.1 Construction Inspection

Verify that automatic daylighting controls qualify as one of the required control types, are installed, and fully functional in accordance with each applicable requirement in Section 130.1(d), and list each specific exception claimed, from Section 130.1(d).

NA 7.6.1.2 Functional testing

All photocontrols serving more than 5,000 ft² of daylit area shall undergo functional testing. Photocontrols that are serving smaller spaces may be sampled as follows:

For buildings with up to five (5) photocontrols, all photocontrols shall be tested. For buildings with more than five (5) photocontrols, sampling may be done on spaces with similar sensors and cardinal orientations of glazing. If the first photocontrol in the sample group passes the functional test, the remaining building spaces in the sample group also pass. If the first photocontrol in the sample group fails the functional test, the rest of the photocontrols in the group shall be tested. If any tested photocontrol fails the functional test, it shall be repaired, replaced or adjusted until it passes the test.

Certificate of Compliance

STATE OF CALIFORNIA
INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE – USER INSTRUCTIONS	NRCC-LTI-01-E
Indoor Lighting	(Page 1 of 5)
Project Name:	Date Prepared:

Climate Zone:	Conditioned Floor Area :					
	Unconditioned Floor Area :					
General Information						
Building Type:	☐	Nonresidential	☐	High-Rise Residential	☐	Hotel/Motel
☐ Schools	☐	Relocatable Public Schools	☐	Conditioned Spaces	☐	Unconditioned Spaces
Phase of Construction:	☐	New Construction	☐	Addition	☐	Alteration
Method of Compliance:	☐	Complete Building	☐	Area Category	☐	Tailored

LIGHTING COMPLIANCE DOCUMENTS (select yes for each document included)

For detailed instructions on the use of this and all Energy Efficiency Standards compliance documents, refer to the Nonresidential Manual published by the California Energy Commission.

YES	NO	FORM	TITLE
		NRCC-LIT-01-E	Certificate of Compliance. All Pages required on plans for all submittals.
		NRCC-LIT-02-E	Lighting Controls, Certificate of Compliance, and PAF Calculation. All Pages required on plans for all submittals.
		NRCC-LIT-03-E	Indoor Lighting Power Allowance
		NRCC-LIT-04-E	Tailored Method Worksheets
		NRCC-LIT-05-E	Line Voltage Track Lighting Worksheets

Certificate of Installation

STATE OF CALIFORNIA

ENERGY MANAGEMENT CONTROL SYSTEM OR LIGHTING CONTROL SYSTEM

CEC-NRCI-LTI-02-E (Revised 06/13) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION			NRCI-LTI-02-E
Energy Management Control System or Lighting Control System			(Page 1 of 5)
Project Name:	**Enforcement Agency:**		**Permit Number:**
Project Address:	**City:**		**Zip Code:**

GENERAL INFORMATION				
DATE OF BUILDING PERMIT	PERMIT #			
BUILDING TYPE	☐ Nonresidential	☐ High-Rise Res (Common Area)	☐ Hotel/Motel (Common Area)	
PHASE OF CONSTRUCTION	☐ New Construction	☐ Addition	☐ Alteration	☐ Unconditioned

SCOPE OF RESPONSIBILITY	
Enter the date of approval by enforcement agency of the Certificate of Compliance that provides the specifications for the energy efficiency measures for the scope of responsibility for this Installation Certificate.	Date:

Certificate of Acceptance

STATE OF CALIFORNIA

AUTOMATIC DAYLIGHTING CONTROL ACCEPTANCE DOCUMENT

CEC-NRCA-LTI-03-A (Revised 06/13) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE		NRCA-LTI-02-A
Lighting Control Acceptance Document		(Page 1 of 6)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:

Note: For more than 3 spaces attach additional sets of pages 2 through 5, as required.	Enforcement Agency Use: Checked by/Date

Automatic Shut-off Controls: Automatic Time Switch Control and Occupant Sensor	
Intent:	Lights are turned off or set to a lower level when not needed per Section 110.9(a) & 130.1(c).

Guidance

This acceptance test form must be filled out for all newly-installed lighting control systems of the following types:

I. Automatic Time Switch Controls
II. Occupancy Sensors
III. Partial-OFF occupancy sensors
IV. Partial-ON occupancy sensors (only if used to claim a Power Adjustment Factor)
V. Occupancy Sensors serving small zones in large open plan offices (only if used to claim a Power Adjustment Factor)

For automatic daylighting controls use acceptance test form NRCA-LTI-03-A; for demand responsive lighting controls, use acceptance test form NRCA-LTI-04-A.
The tests on this certificate are required by Section 140.6(a)2 and 130.4(a) of the Building Energy Efficiency Standards 2013. The tests themselves are described in Sections 140.6(a)2 and in Reference Appendix NA7.6.

Sub Chapter 4 Lighting (Non-Res, High-Rise, Hotel/Motel)

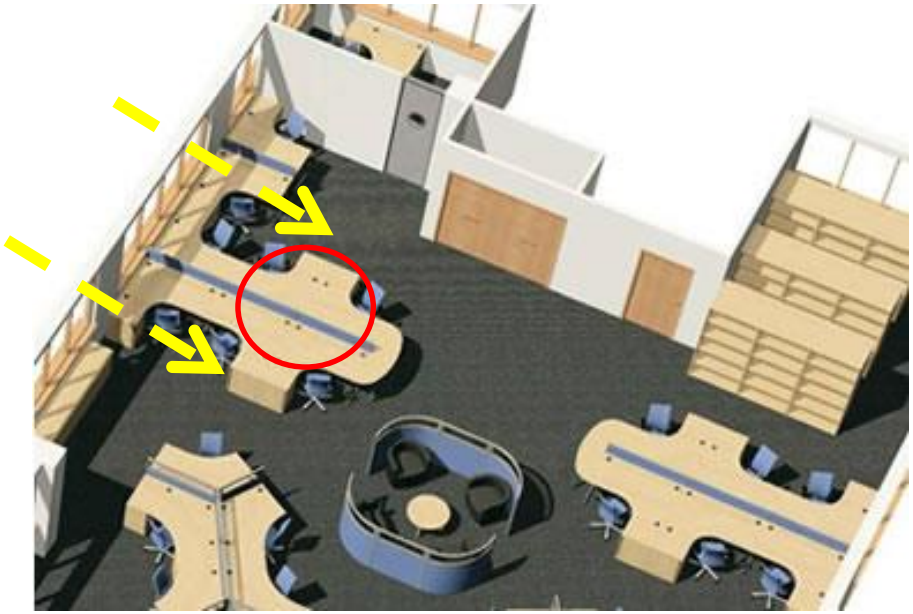
Lighting Mandatory Indoor Controls

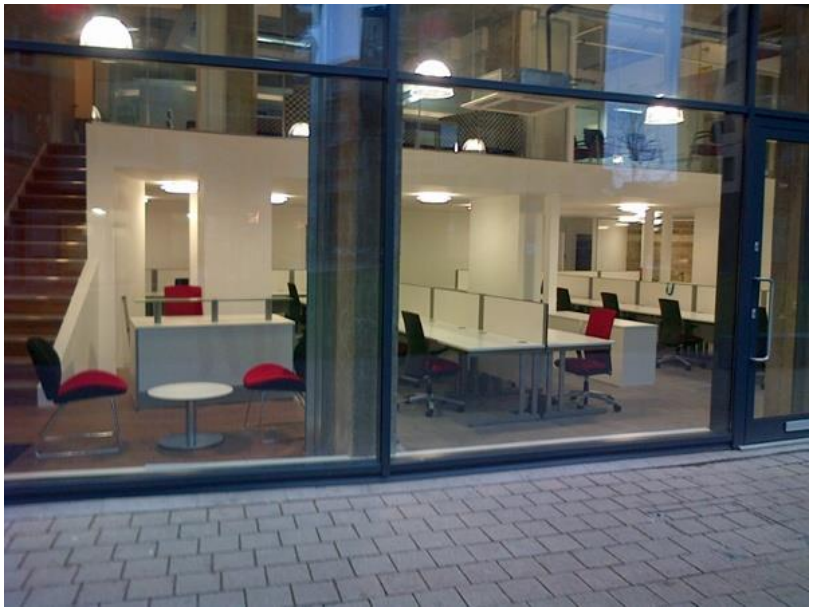
- 130.1(b) – The general lighting of **any enclosed area 100 square feet or larger**, with a connected lighting load that exceeds 0.5 watts per square foot shall meet **one of the following** requirements: Manual dimming, automatic daylighting controls, or demand responsive lighting controls. *Table 130.1-A Multilevel Lighting Controls and Uniformity Requirements*

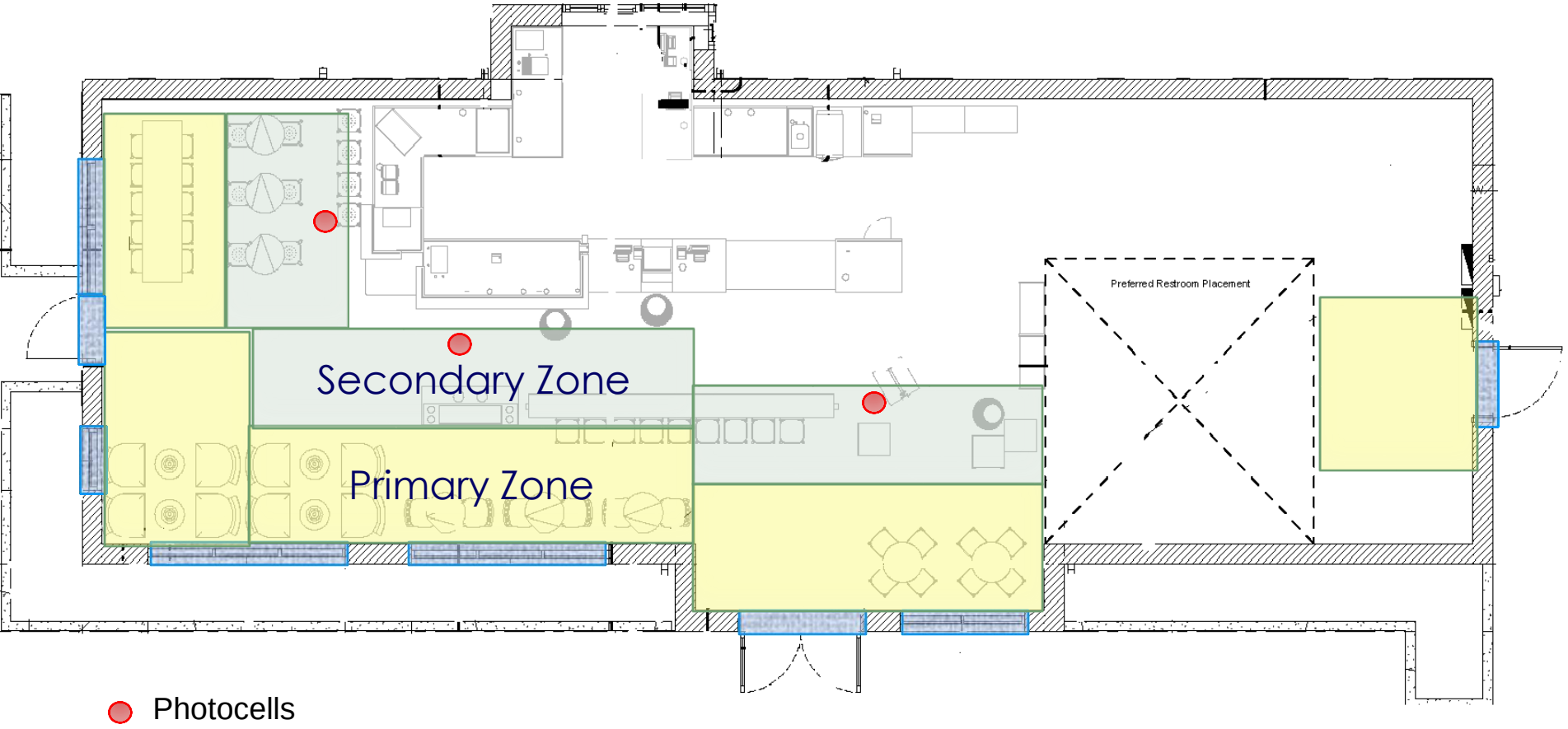
Sub Chapter 4 Lighting (Non-Res, High-Rise, Hotel/Motel)

Lighting Mandatory Indoor Controls

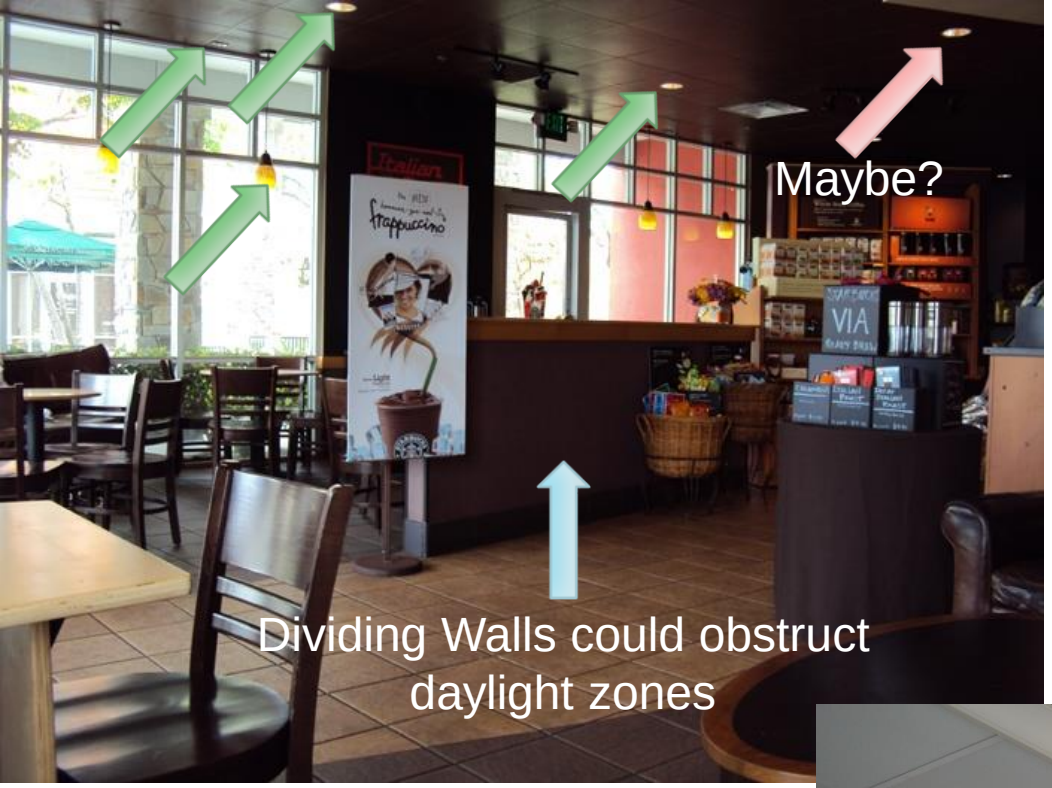
- 130.1(d)2 – Daylight Controls: In areas served by **lighting that is daylight controlled**, when the **illuminance received from the daylight** is greater than 150% of the design illuminance received from the general lighting system at full power, the general lighting power in that daylight zone **shall be reduced** by a minimum of 65%.






Preferred Restroom Placement
Secondary Zone
Primary Zone

Photocells



Below: Separately switch accent lights (**yellow arrow**), and photocells will be required (**green arrows)**

Above: Secondary day lit zone obstructed by dividing wall. New/remodeled lights with **green arrows** would require photocells by July 1st 2014.

130 150 110

What section of the BEES applies to low rise residential?

VCA Green

All CF1R forms with HERS measures must be registered with?

VCA Green

Resources

Sec. 150 Low Rise Mandatory Features

Sec. 150.1 Low Rise Prescriptive and Performance Compliance for New Res Buildings

Sec 150.2 Low Rise Additions and Alterations Requirements

VCA Green

Resources

www.energy.ca.gov

www.energycodeace.com

www.calcerts.com

www.cltc.ucdavis.edu

VCA Green

Questions

THANK YOU!

Russ – crussell@vcacode.com

714-363-4700