



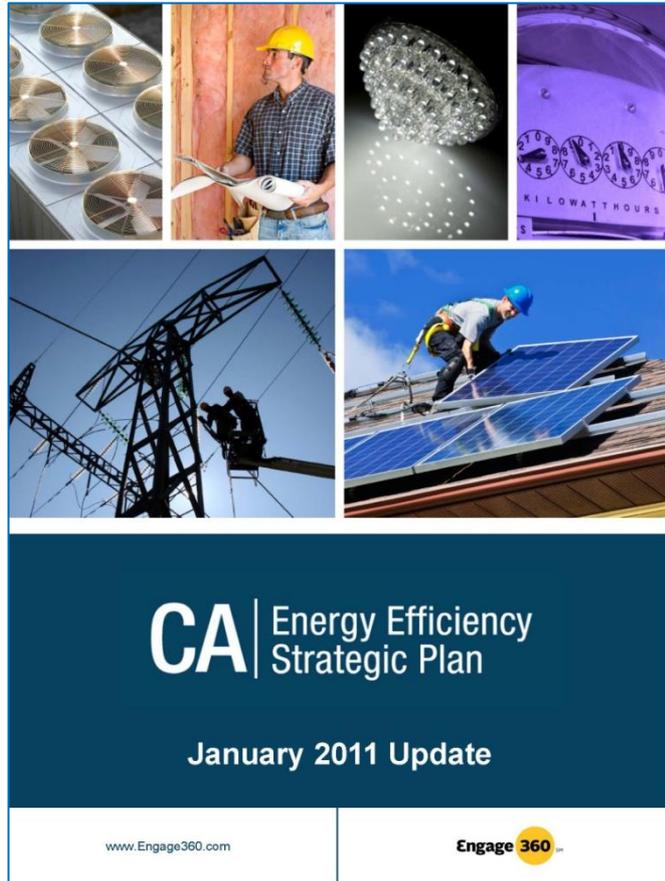
# 2013 Title 24, Part 6 Energy Standards

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Statewide C&S Team



# When, Where and Why



## ■ When (current schedule):

- Any projects that apply for permit on or after January 1, 2014 will be subject to the 2013 Standards.
- Exception: Nonresidential Registry January 1, 2015
- Appliance efficiency update January 1, 2015 (*which is also when PV can be modeled for credit for residential building only*)

## ■ Where can you find? CEC website

- Unmarked Standards:
- [http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/final\\_rulemaking\\_documents/44\\_Final\\_Express\\_Terms/](http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/final_rulemaking_documents/44_Final_Express_Terms/)
- Residential and Nonresidential Manuals:
- [http://www.energy.ca.gov/title24/2013standards/supporting\\_docs.html](http://www.energy.ca.gov/title24/2013standards/supporting_docs.html)

## ■ Why?

- Net Zero goals:
  - Residential: 2020
  - Nonresidential: 2030



# Application of Standards (Table 100.0-A)

TABLE 100.0-A APPLICATION OF STANDARDS

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

- Number system has changed by adding decimal: 100.1 was 101
- New sections
  - 110.1: "Solar Ready" buildings
  - 120.6: NR: "Covered Processes" instead of "Refrigerated Warehouses"
  - 120.7: NR "Mandatory Insulation Requirements"
  - 120.8: NR "Building Commissioning"
  - 120.9: NR "Mandatory Requirements for Commercial Boilers"
  - 130.5: NR "Electrical Power Distribution Systems"
  - 140.9: NR "Prescriptive Requirements For Covered Processes"
  - 141.1: NR "Requirements For Covered Processes In Additions, Alterations To Existing Buildings That Will Be Nonresidential, High-Rise Residential, And Hotel/Motel Occupancies"

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



# Nonresidential Occupancies





# Nonresidential: Solar Ready

15% of total roof area  
excluding skylights,  
EXCEPT:

- Covered occupancy:
  - Hotel/motel and high rise residential: 11 stories or more
  - All other nonresidential: 4 or more stories
  - Roof used for vehicular traffic parking, heliport
- PV system = 1 watt per sq. ft. of roof area
- Solar hot water system with solar savings fraction:
  - 20% = CZ1 through 9
  - 35% = CZ 10-16
- 50% *potential* solar zone area provided
- High Rise Residential:
  - *Demand response thermostats*
  - *High efficacy lights at kitchen, bathrooms (with vacancy sensor), utility rooms, garages and outside (with occupancy and photo sensor)*
  - *Every room has a switched receptacle*



# Nonresidential: Building Commissioning

<b>CERTIFICATE OF COMPLIANCE and DESIGN REVIEW CHECKLIST</b>		<b>DESC-1C</b>
<b>DESIGN REVIEW KICKOFF</b>		<b>(Page x of xx)</b>
Project Name/Address:		
<b>General Information</b>		
Climate Zone:	Building Type:	Conditioned Area (sf):
Reviewer's Name:	Reviewer's Agency:	
Enforcement Agency:	Permit Number:	
Enforcement Agency Use: Checked by	Enforcement Agency Use: Date	
<b>DATE OF DESIGN REVIEW KICKOFF</b>		____/____/____
<b>DESIGN REVIEW CHECKLISTS PROVIDED TO DESIGN TEAM</b>		<b>YES <input type="checkbox"/> NO <input type="checkbox"/></b>
<b>DESIGN REVIEWER QUALIFICATIONS:</b>		
<input type="checkbox"/> <10,000 ft <sup>2</sup> : design engineer		
<input type="checkbox"/> >10,000 ft <sup>2</sup> and <50,000ft <sup>2</sup> : in-house engineer not associated with project or third-party design engineer		
<input type="checkbox"/> >50,000 ft <sup>2</sup> or complex mechanical system: third-party design engineer		
<b>LIST OF MEETING ATTENDEES:</b>		
<input type="checkbox"/> Owner: _____ <input type="checkbox"/> Design Reviewer: _____		
<input type="checkbox"/> Project Manager: _____ <input type="checkbox"/> Design Engineer(s): _____		
<b>DOCUMENTS RECEIVED BY DESIGN REVIEWER FOR DESIGN REVIEW KICKOFF:</b>		
<input type="checkbox"/> Owner's Project Requirements <input type="checkbox"/> Basis of Design or Narrative		
<input type="checkbox"/> Drawing Set (issue & date): _____		
<input type="checkbox"/> Specifications: _____ <input type="checkbox"/> Other: _____		

Moved from Calgreen Title 24 Part 11 to Part 6

- ✓ Owner's project requirements (OPR)
- ✓ Basis of design (BOD)
- ✓ Design Phase Design Review
  - Schematic design: Design Review Kickoff Certificate (DESC-1C) on submitted plans
  - Construction Documents Design Review Checklist Certificate form(s) (DESC-2C through DESC-5C) checked during construction, and included in "Compliance documentation" (register after 1/1/2015 to data registry)
- ✓ Commissioning measures shown on construction documents
- ✓ Commissioning plan
- ✓ Functional performance testing
- ✓ Documentation and training



# Nonresidential: Forms

Forms	Phase of project				
	Schematic	Construction Documents	Permit	Construction	Occupancy
Registered in "repository" after 1/1/2015					
Certificate of Compliance	*DESC-1C	*DESC-2C *DESC-3C or 4C *DESC-5C	*NRCC-ELEC-1C NRCC-ENV-1C NRCC-LTG-1C NRCC-MCH-01 NRCC-PRC-05-08		Copies of all forms to be provided to building owner
Certificate of Installation				NRCI-ENV-01-E NRCI-ILT-01-06-E NRCI-MCH-01-E NRCI-LTG-07-E NRCI-SLT-01-E NRCI-PRC-01-E NRCI-SLT-01-E	Operating and maintenance information to be provided to building owner
Certificate of Acceptance				NRCA-ENV-02-A NRCA-ILT-02-04** NRCA-MCH -02-18** NRCA-LTG-07-E *NRCA-PRC-01-A NRCA-PRC-04-08	*NRCA-CDR-01-E Buildings over 10,000 sf will require documentation and training of staff

**\*New forms**

DESC-1C: Design Review Kickoff Checklist

DESC-2C: Design Review Checklist Construction Documents

DESC-3C: Design Review Checklist: Simple HVAC or DESC-4C: Design Review Checklist: Complex Mechanical

DESC-5C: Design Review Checklist: Signatures

NRCC-ELEC-1C: Disaggregation of Electric Circuits

NRCA-PRC-01-A: Compressed air systems

NRCA-CDR-01-E: Commissioning

**\*\*New qualifications required**

Acceptance Test Lighting Technician (to take effect when CEC believes there are enough people trained per their requirements)

Acceptance Test Mechanical Technician (to take effect when CEC believes there are enough people trained per their requirements)



# Nonresidential: Envelope

## *What's New?*

- New Construction:
  - Mandatory
    - Insulation requirements
  - Prescriptive:
    - Cool roof revised, roof insulation trade-off Table 140.3 for aged solar reflectance
    - Fenestration:
      - Dynamic glazing, window films and VT (visual light transmittance)
- Alterations:
  - Mandatory
    - Insulation requirements
  - Prescriptive:
    - Cool roof: trade-off Table 141.0-B
    - Fenestration: Different prescriptive requirements from new construction.



# NR Envelope: Mandatory Insulation

Nonresidential Mandatory

## Roof

Metal building:	U-factor = 0.098
Wood framed/other:	U-factor = 0.075

## Wall

Metal building:	U-factor = 0.113
Metal framed:	U-factor = 0.105
Light mass:	U-factor = 0.440
Heavy mass:	U-factor = 0.690
Wood framed/other:	U-factor = 0.110
Spandrel/curtain wall:	U-factor = 0.280
Demising:	R-13

## Floor

Raised mass:	U-factor = 0.269
Other:	U-factor = 0.071
Heated slab:	CZ 1-15 = R-5
	CZ 6 = R-10

## Continuous Air Barrier

Air permeance not exceeding 0.004 cfm/sq. ft., under a pressure differential of 0.3 " w.g. per ASTM E2178 or per Table 140.3-A  
(i.e. 3/8" plywood; 1/2" polystyrene; 1/2" gypsum board; precast concrete)



# NR Envelope: Prescriptive (Nonresidential) Opaque Surfaces

TABLE 140.3-B – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)			Climate Zone																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Envelope	Maximum U-factor	Roofs/ Ceilings	Metal Building	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	
			Wood Framed and Other	0.049	0.039	0.039	0.039	0.049	0.075	0.067	0.067	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
		Walls	Metal Building	0.113	0.061	0.113	0.061	0.061	0.113	0.113	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.061
			Metal-framed	0.098	0.062	0.082	0.062	0.062	0.098	0.098	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
			Mass Light <sup>1</sup>	0.196	0.170	0.278	0.227	0.440	0.440	0.440	0.440	0.440	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass Heavy <sup>1</sup>	0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160
		Floors/ Soffits	Wood-framed and Other	0.102	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059
	Mass		0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.092	0.058	
	Roofing Products	Low-sloped	Other	0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039	
			Aged Solar Reflectance	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
		Steep-Sloped	Thermal Emittance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
			Aged Solar Reflectance	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
			Thermal Emittance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
			Thermal Emittance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Air Barrier			NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ		
Exterior Doors, Maximum U-factor		Non-Swinging	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50		
		Swinging	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		



# NR Envelope: Prescriptive (Nonresidential) Fenestration

		All Climate Zones					
			Fixed Window	Operable Window	Curtainwall or Storefront	Glazed Doors	
Envelope Fenestration	Vertical	Area-Weighted Performance Rating	Max U-factor	0.36	0.46	0.41	0.45
			Max RSHGC	0.25	0.22	0.26	0.23
		Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17
		Maximum WWR%	40%				
Skylights			Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted		
		Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88	
			Max SHGC	0.25	0.25	NR	
		Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64	
		Maximum SRR%	5%				

**U-factor**

- NFRC 100
- Default Table 110.6-A
- NA6 COG formula: less than 1,000 sq. ft. site built fenestration

**SHGC**

- NFRC 200
- Default Table 110.6-B
- NA6 COG formula: less than 1,000 sq. ft. site built fenestration



# NR Envelope: Prescriptive (Hotel/Motel and High Rise) Opaque Surfaces

				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Envelope	Maximum U-factor	Roofs/ Ceilings	Metal Building	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	
			Wood Framed and Other	0.034	0.028	0.039	0.028	0.039	0.039	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
		Walls	Metal Building	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.057	0.057	0.057	0.057	0.057
			Metal-framed	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105
			Mass Light <sup>1</sup>	0.170	0.170	0.170	0.170	0.170	0.227	0.227	0.227	0.196	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass Heavy <sup>1</sup>	0.160	0.160	0.160	0.184	0.211	0.690	0.690	0.690	0.690	0.690	0.184	0.253	0.211	0.184	0.184	0.160
			Wood-framed and Other	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059	0.059	0.042	0.042	0.042
Roofing Products	Floors/ Soffits	Mass	0.045	0.045	0.058	0.058	0.058	0.069	0.092	0.092	0.092	0.069	0.058	0.058	0.058	0.045	0.058	0.037	
		Other	0.034	0.034	0.039	0.039	0.039	0.039	0.071	0.039	0.039	0.039	0.039	0.039	0.039	0.034	0.039	0.034	
	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.55	0.55	0.55	NR	0.55	0.55	NR	
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	NR	0.75	0.75	NR	
		Aged Solar Reflectance	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR	
		Thermal Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR	
Steep-Sloped	Aged Solar Reflectance	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR		
	Thermal Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR		
Exterior Doors, Maximum U-factor	Non-Swinging	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50		
	Swinging	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		



# NR Envelope: Prescriptive (Hotel/Motel and High Rise) Fenestration

Envelope	Fenestration		All Climate Zones			
				Fixed Window	Operable Window	Curtainwall/Storefront
Vertical	Area-Weighted Performance Rating	Max U-factor	0.36	0.46	0.41	0.45
		Max RSHGC	0.25	0.22	0.26	0.23
	Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17
	Maximum WWR%	40%				
Skylights	Area-Weighted Performance Rating		Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	
		Max U-factor	0.58	0.46	0.88	
	Max SHGC	0.25	0.25	NR		
	Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64	
	Maximum SRR%	5%				

## U-factor

- NFRC 100
- Default Table 110.6-A
- NA6 COG formula: less than 1,000 sq. ft. site built fenestration

## SHGC

- NFRC 200
- Default Table 110.6-B
- NA6 COG formula: less than 1,000 sq. ft. site built fenestration



# NR Envelope "Alterations": Mandatory

## Roof/Ceiling

None

## Wall

Metal building:	R-13; U-factor = 0.113
Metal framed:	R-13; U-factor = 0.217
Wood framed:	R-11; U-factor = 0.110
Spandrel wall:	R-4; U-factor = 0.280
Demising:	R-13

## Floor

Raised mass:	None
Other:	Wood framed with R-11 U-factor = 0.071
Heated slab:	CZ 1-15 = R-5 CZ 6 = R-10



# NR Envelope "Alterations": Prescriptive

TABLE 140.3-B – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)			Climate Zone																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Envelope	Maximum U-factor	Roofs/ Ceilings	Metal Building	Continuous insulation or U-factor: CZ1, 3-9=R-8 (0.082), CZ2, 10-16=R-14 (0.055), unless Table 141.0-B Trade-off used															
		Walls	Wood Framed and Other	Continuous insulation or U-factor: CZ1, 3-9=R-8 (0.082), CZ2, 10-16=R-14 (0.055), unless Table 141.0-B Trade-off used															
			Metal Building	0.113	0.061	0.113	0.061	0.061	0.113	0.113	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.061
			Metal-framed	0.098	0.062	0.082	0.062	0.062	0.098	0.098	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
			Mass Light <sup>1</sup>	0.196	0.170	0.278	0.227	0.440	0.440	0.440	0.440	0.440	0.170	0.170	0.170	0.170	0.170	0.170	0.170
	Mass Heavy <sup>1</sup>	0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160		
	Wood-framed and Other	0.102	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059		
	Floors/ Soffits	Mass	0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.058		
		Other	0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039		
	Roofing Products	Low-sloped	Aged Solar Reflectance	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63		
Thermal Emittance			0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75		
Steep-Sloped		Aged Solar Reflectance	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20		
		Thermal Emittance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75		

## Cool Roof

50% or more than 2,000 sf . Table 141-0-B Roof insulation trade-off for Aged Solar Reflectance.

Exception: Aged Solar Reflectance of 0.63 if U-factor = Table 141.0-B Trade-off

## Fenestration

Exception: 150 sf or less altered, 50 sf or less added

CZ 1-2, 4, 6-16: U-factor = 0.47

CZ 3 and 5: U-factor = 0.58

CZ 2, 4, 6-15 SHGC = 0.31

CZ 1, 3, 5, 16 SHGC = 0.41

Minimum VT per Table 140.3-B, C and D



# NR Envelope "Alterations": Performance

Altered Component	Standard Design Without 3 <sup>rd</sup> Party Verification	Standard Design WITH 3 <sup>rd</sup> Party Verification
Roof	Table 141.0-C (CZ 1, 3-9 = U-factor of 0.082; CZ 2, 10-16 = U-factor of 0.055)	
Cool Roof	Prescriptive (NR Bldg: low slope = 0.63 /steep sloped = 0.20) or Aged Solar Reflectance of 0.63 if U-factor = Table 141.0-B Trade-off	
Wall	Metal Building = U-factor of 0.113; metal framed U = 0.217; wood framed and other U = 0.110 and spandrel/curtain walls U = 0.28	
Floor	Raised framed floors U=0.071; raised mass NR bldg =no minimum	
Fenestration: <u>New windows</u> Allowed area to be smaller of either: a. Proposed area OR b. Larger of 1. Existing area OR 2. Prescriptive allowance of 40%	CZ 1-2, 4, 6-16: U-factor = 0.47 CZ 3 and 5: U-factor = 0.58 CZ 2, 4, 6-15: SHGC = 0.31 CZ 1, 3, 5, 16: SHGC = 0.41	Existing condition
<u>Window Film</u>	U-factor = 0.40 / SHGC = 0.35	Default values of Table 110.6-A / 110.6-B
HVAC and ducts	Prescriptive alteration requirements Section 141.0 (b)2C, D and E	
Lighting	Prescriptive alteration requirements Section 141.0 (b)2F through K	
Service Water heating	Per Section 140.5 without solar water heating requirements (High rise and Hotel/Motel)	
All others	Proposed efficiency levels	



# Nonresidential: Mechanical

## What's New?

HVAC DRY SYSTEM REQUIREMENTS	
PROJECT NAME:	
Equipment Tags and System Description <sup>1</sup>	
<b>MANDATORY MEASURES</b>	<i>T-24 Sections</i>
Heating Equipment Efficiency <sup>3</sup>	110.1 or 110.2(a)
Cooling Equipment Efficiency <sup>3</sup>	110.1 or 110.2(a)
HVAC or Heat Pump Thermostats	110.2(b), 110.2(c)
Furnace Standby Loss Control	110.2(d)
Low leakage AHUs	110.2(f)
Ventilation <sup>4</sup>	120.1(b)
Demand Control Ventilation <sup>5</sup>	120.1(c)4
Occupant Sensor Ventilation Control <sup>6</sup>	120.1(c)5, 120.2(e)3
Shutoff and Reset Controls <sup>7</sup>	120.2(e)
Outdoor Air and Exhaust Damper Control	120.2(f)
Isolation Zones	120.2(g)
Automatic Demand Shed Controls	120.2(h)
Economizer FDD	120.2(i)
Duct Insulation	120.4

Title 20 efficiencies to be updated 1/1/2015. Many added and updated equipment types.

If using in performance calculations, must meet HERS verification requirements.

Required in:  
Multipurpose rooms less than 1,000 sf, classrooms greater than 750 sf, conference, convention, auditorium and meeting centers greater than 750 sf.

VAV systems: dynamic controls to maintain outside air rates within 10% of required rate at full and reduced supply airflow conditions. Constant volume: measured outside air rates within 10% of required outside air.

Air cooled unitary DX units with economizers and cooling capacity 54,000 BTUH or higher, must include fault detection and diagnostic system.

Features added: Facility operators can disable, and manually control adjustment of set points globally from single point in EMCS, and upon receipt of a demand response signal conduct a centralized demand shed.



# NR Mechanical: HVAC Dry Systems Prescriptive

## PRESCRIPTIVE MEASURES

Equipment is sized in conformance with 140.4 (a & b)	140.4(a & b)
Supply Fan Pressure Control	140.4(c)
Simultaneous Heat/Cool <sup>8</sup>	140.4(d)
Economizer	140.4(e)
Heat and Cool Air Supply Reset	140.4(f)
Electric Resistance Heating <sup>9</sup>	140.4(g)
Duct Leakage Sealing and Testing. <sup>10</sup>	140.4(l)

Fan less than 1 hp or less, and 1/12HP or greater shall be electronically-commutated motors or have efficiency of 70% rated at full load conditions (brushless DC motors).

Required when total cooling capacity over 54,000 BTUH (Or trade off with higher efficiency per Table 140-1-A, which is 65% for CZ4).

Dew Point, Fixed Enthalpy, Electronic Enthalpy and Differential Enthalpy Controls not allowed (only Fixed and Differential Dry Bulb and Fixed Enthalpy/drybulb) .

**Air Economizer Construction**  
If cooling fan system over 45,000 BTUH, factory warranty, testing, minimized air and return damper leakage, fixed controls to have adjustable setpoint , calibration, high limit sensor location correct, relief air to not over-pressurize building.

**Minimum compressor unloading**  
100% open for mechanical cooling, not close until leaving temp less than 45°F  
DX Constant volume system: 2 stage control ≥75,000 BTUH  
DX Variable volume system: 3 stage control ≥65,000 & <240,000 BTUH  
4 stage control ≥240,000 BTUH



# NR Mechanical: Built Up System Form DESC-4C Example

HEAT REJECTION EQUIPMENT	
110.2(e)	Open and closed circuit cooling towers have conductivity or flow-based controls and are equipped with a Flow Meter, Overflow Alarm and Efficient Drift Eliminators.
140.4(h)2	Tower fans powered by motors greater than 7.5 hp have controls that automatically change fan speed to control the leaving fluid temperature or condensing temperature or pressure of the heat rejection device.
140.4(h)3	Open cooling towers with multiple condenser water pumps are designed so that all cells can run in parallel with the larger of A) flow this is produced by the smallest pump or B) 50% of the design flow for the cell.
140.4(h)5	Multiple cell heat rejection equipment with variable speed fan drives shall operate the maximum number of fans and control all operating fans to the same speed.
CHILLERS AND BOILERS	
120.9	Boilers meet the requirements of this section, as required: (a) combustion air positive shut-off for boilers with input capacity of 2.5 MMBtu/y and above, (b) combustion air fan motors 10 hp or larger have variable speed drive or controls to limit fan motor demand to no more than 30% of total design wattage at 50% of design air volume, and (c) boilers with input capacity of 5 MMBtu/h and greater maintain excess oxygen concentrations at less than or equal to 5.0%.
140.4(i)	Chilled water plants have no more than 300 tons provided by air-cooled chillers.
140.4(k)2	When a chilled water system includes more than one chiller, flow through any chiller is automatically shut off when that chiller is shut off while still maintaining flow through other operating chiller(s).
140.4(k)3	When a hot water plant includes more than one boiler, provisions shall be made so that flow through any boiler is automatically shut off when that boiler is shut off while still maintaining flow through other operating boiler(s).
140.4(k)4	Systems with a design capacity exceeding 500,000 Btu/hr supplying chilled or heated water shall include controls that automatically reset supply water temperatures as a function of representative building loads or outside air temperature.
HYDRONIC SYSTEMS - PUMPING	
140.4(k)1	Chilled and hot water pumping are designed for variable flow and are capable of reducing pump flow rates to no more than the larger of a) 50% or less of design flow rate or b) minimum flow required by equipment manufacturer.
140.4(k)6.A	Individual pumps serving variable flow systems with motor horsepower greater than 5 hp have controls or devices that result in pump motor demand of no more than 30% of design wattage at 50% of design water flow. Pumps shall be controlled as a function of required differential pressure.
140.4(k)6.B	For systems without DDC, differential pressure shall be measured at the most remote heat exchanger or at the heat exchanger requiring greatest differential pressure. For systems with DDC, static pressure set point shall be reset based on valve requiring most pressure and the set point shall be no less than 80% open.

New Mandatory: Over 150 tons. Documentation of max. achievable cycles of concentration with calculator approved by CEC, then approved and signed by P.E. of record.

Prescriptive: Used to be 33%

New Mandatory

New prescriptive efficiency methods (Path B required), with *both* full load (EER) and IPLV minimums required.

140.4(m):  
Indoor Fan Airflow Control (variable speed drive):  
DX Cooling:  $\geq 75,000$  BTUH  
 $\geq 65,000$  BTUH after 1/1/2016  
Chilled Water/evaporative:  
 $\geq 1$  HP  
 $\geq 1/4$  HP after 1/1/2016



# NR Indoor Lighting: Mandatory Controls

## What's New?

LIGHTING	
<b>LIGHTING CONTROLS</b>	
130.1(a)	Accessible, independent switching or a control device is included for all areas enclosed by ceiling height partitions.
130.1(a)4	General lighting is controlled separately from all other lighting systems.
130.1(b)	General lighting of enclosed spaces 100 sf or larger with a lighting load that exceeds 0.5 W/sf, have multi level lighting controls from at least one of the following methods: manual dimming, lumen maintenance, tuning, automatic daylighting controls, demand responsive lighting controls. Control steps are in accordance with Table 130.1-A.
130.1(c)	Shut off controls are controlled with occupant sensing controls, automatic time-switch control, signal from another building system or other control and are shown for all indoor lighting systems.
130.1(c)5	Offices 250 square feet or smaller; multipurpose rooms of less than 1000 square feet, and classrooms and conference rooms of any size, shall be equipped with occupant sensor(s) to shut off the lighting.
130.1(c)6	Lighting in corridors and stairwells shall be controlled by occupant sensing controls that separately reduce lighting power in each space by at least 50% when the area is unoccupied.
130.1(e)	For buildings greater than 10,000 sf, demand response controls should be included to reduce total building lighting power by a minimum of 15%.
<b>DAYLIGHT AREA</b>	
140.3(c)	Daylight areas required for conditioned or unconditioned spaces greater than 5,000 ft <sup>2</sup> of roof area and with ceiling height greater than 15 feet are shown on building plans and meet requirements of this section.
<b>DAYLIGHT CONTROLS</b>	
130.1(d)2	All skylit daylit zones, primary sidelit daylit zones and secondary sidelit daylit zone are shown on plans. Controls of skylit and sidelit zones are independent and provide multi-level lighting in accordance with Table 130.1-A. Plans should indicate that general lighting power is reduced by a minimum of 65% when daylit illuminance is 150% of

Display, ornamental and special effects: separate circuit of 20 amps or less

Was 0.8 w/sf or more, now 0.5 w/sf. Table 130.1-A on "Multi-Level" slide

Separate automatic controls for building; each floor; space not exceeding 5,000 sf

Partial ON/OFF occupant sensing controls

2008 required sales area only at 50,000 sf

2008 trigger 8,000 sf

2008 trigger was 8,000 sf space. Current exceptions:

1. Installed wattage less than 120 watts
2. Total glazing area less than 24 sf



# NR Indoor Lighting: Mandatory Multi-Level Controls

**TABLE 130.1 - A**

MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS		
Luminaire Type	Minimum Required Control Steps (Percent of Full Rated Power)	Uniform Level of Illuminance Shall Be Achieved by:
Line-voltage sockets except GU-24	Continuous dimming 10–100%	
Low-voltage incandescent systems		
LED luminaires and LED source systems		
GU-24 rated for LED		
GU-24 sockets rated for fluorescent > 20 W	Continuous dimming 20–100%	
Pin-based compact fluorescent > 20 W		
GU-24 sockets rated for fluorescent ≤ 20 W		
Pin-based compact fluorescent ≤ 20 W	Minimum one step between 30–70%	<ul style="list-style-type: none"> <li>• Stepped dimming or</li> <li>• Continuous dimming or</li> <li>• Switching alternate lamps in a luminaire</li> </ul>
Linear fluorescent and U-bent fluorescent ≤ 13 W		
Linear fluorescent and U-bent fluorescent > 13 W		
Linear fluorescent and U-bent fluorescent > 13 W	Minimum one step in each range:	<ul style="list-style-type: none"> <li>• Stepped dimming or</li> <li>• Continuous dimming or</li> <li>• Switching alternate lamps in each luminaire, having a minimum of 4 lamps per luminaire, illuminating the same area and in the same manner</li> </ul>
	20–40% 50–70% 80–85% 100%	
Track Lighting	Minimum one step between 30–70%	<ul style="list-style-type: none"> <li>• Step dimming or</li> <li>• Continuous dimming or</li> <li>• Separately switching circuits in multi-circuit track with a minimum of two circuits</li> </ul>
HID > 20 W	Minimum one step between 50–70%	<ul style="list-style-type: none"> <li>• Stepped dimming or</li> <li>• Continuous dimming or</li> <li>• Switching alternate lamps in each luminaire, having a minimum of 2 lamps per luminaire, illuminating the same area and in the same manner</li> </ul>
Induction > 25 W		
Other light sources		

Control options:

1. Manual dimming
2. Lumen Maintenance
3. Tuning
4. Automatic daylighting controls
5. Demand responsive lighting controls



**WHAT'S NEW IN THE 2013 CODE?**  
Changes to mandatory Title 24 lighting requirements

California's new Building Energy Efficiency Standards take effect in 2014. They improve the energy efficiency of homes by 25 percent and make nonresidential buildings 30 percent more efficient than the previous 2008 standards. This brief guide offers an overview of important requirements and major updates to the lighting code.

This guide is not intended to replace the code itself or the California Energy Commission's 2013 Residential and Nonresidential Compliance Manuals. It is meant to serve as a quick reference for those familiarizing themselves with the code requirements.

All lighting control systems with two or more components—in both residential and non-residential spaces—must meet the requirements of 2013 Title 24 standards. Section 110.9 Stand-alone lighting controls, such as vacancy sensors and photocell controls, must now comply with Title 24 regulations.

**NON-RESIDENTIAL INTERIOR LIGHTING REQUIREMENTS**

All interior luminaires in non-residential buildings must have manual on/off controls, and each area must be independently controlled. Dimmer switches must allow manual on/off functionality, with the exception of public restrooms, which do not need a switch.

**MULTI-LEVEL LIGHTING CONTROLS**

In areas larger than 100 ft<sup>2</sup>, installed luminaires must:

- Have at least four steps of control, or continuous dimming, depending on the lamp type (manual dimming controls must be provided for continuous dimming luminaires)
- Meet the uniformity requirements in Table 130.1-A
- Have at least one of the following types of controls for each luminaire:
  - Manual continuous dimming and on/off control, per Section 130.1(a)
  - Lumen maintenance, as defined in Section 100.1
  - Tuning, as defined in Section 100.1
  - Automatic daylighting controls, per Section 130.1(d)
  - Demand responsive controls, per Section 130.1(e)

Classrooms with a connected general lighting load < 0.7 W/ft<sup>2</sup> must have at least one control step between 30% and 70% of full rated power.



# NR Indoor Lighting: Area Category Table 140.6-C

PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER (W/ft <sup>2</sup> )	PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER (W/ft <sup>2</sup> )
Auditorium Area		1.5 <sup>3</sup>	Library Area		Reading areas 1.2 <sup>3</sup>
Auto Repair Area		0.9 <sup>2</sup>			Stack areas 1.5 <sup>3</sup>
Beauty Salon Area		1.7	Lobby Area		Hotel lobby 1.1 <sup>3</sup>
Civic Meeting Place Area		1.3 <sup>3</sup>			Main entry lobby 1.5 <sup>3</sup>
Classroom, Lecture, Training, Vocational Areas		1.2 <sup>3</sup>	Locker/Dressing Room		0.8
Commercial and Industrial Storage Areas (conditioned and unconditioned)		0.6	Lounge Area		1.1 <sup>3</sup>
Commercial and Industrial Storage Areas (refrigerated)		0.7	Malls and Atria		1.2 <sup>3</sup>
Convention, Conference, Multipurpose and Meeting Center Areas		1.4 <sup>3</sup>	Medical and Clinical Care Area		1.2
Corridor, Restroom, Stair, and Support Areas		0.6	Office Area		> 250 square feet 0.75
Dining Area		1.1 <sup>3</sup>			≤ 250 square feet 1.0
Electrical, Mechanical, Telephone Rooms		0.7 <sup>2</sup>	Parking Garage Area		Parking Area 0.14
Exercise Center, Gymnasium Areas		1.0			Dedicated Ramps 0.3
Exhibit, Museum Areas		2.0			Daylight Adaptation Zones <sup>2</sup> 0.6
Financial Transaction Area		1.2 <sup>3</sup>	Religious Worship Area		1.5 <sup>3</sup>
General Commercial and Industrial Work Areas		Low bay 0.9 <sup>2</sup>	Retail Merchandise Sales, Wholesale Showroom Areas		1.2 <sup>6 and 7</sup>
		High bay 1.0 <sup>2</sup>	Theater Area		Motion picture 0.9 <sup>3</sup>
		Precision 1.2 <sup>4</sup>			Performance 1.4 <sup>3</sup>
Grocery Sales Area		1.2 <sup>8 and 9</sup>	Transportation Function Area		1.2
Hotel Function Area		1.5 <sup>3</sup>	Videoconferencing Studio		1.2 <sup>8</sup>
Kitchen, Food Preparation Areas		1.6	Waiting Area		1.1 <sup>3</sup>
Laboratory Area, Scientific		1.4 <sup>1</sup>	All other areas		0.6
Laundry Area		0.9			

## Removed:

- ❑ Public and Common housing areas (dwelling units covered as a low-rise residential space)
- ❑ Tenant Lease Space (must use “all other areas” now)

Footnotes for this table are listed below.

### FOOTNOTES FOR TABLE 140.6-C:

See Section 140.6(c)2 for an explanation of additional lighting power available for specialized task work, ornamental, precision, accent, display, decorative, and white boards and chalk boards, in accordance with the footnotes in this table. The smallest of the added lighting power listed in each footnote below, or the actual design wattage, may be added to the allowed lighting power only when using the Area Category Method of compliance.

Footnote number	Type of lighting system allowed	Maximum allowed added lighting power. (W/ft <sup>2</sup> of task area unless otherwise noted)
1	Specialized task work	0.2 W/ft <sup>2</sup>
2	Specialized task work	0.5 W/ft <sup>2</sup>
3	Ornamental lighting as defined in Section 100.1 and in accordance with Section 140.6(c)2.	0.5 W/ft <sup>2</sup>
4	Precision commercial and industrial work	1.0 W/ft <sup>2</sup>
5	Per linear foot of white board or chalk board.	5.5 W per linear foot
6	Accent, display and feature lighting - luminaires shall be adjustable or directional	0.3 W/ft <sup>2</sup>
7	Decorative lighting - primary function shall be decorative and shall be in addition to general illumination.	0.2 W/ft <sup>2</sup>
8	Additional Videoconferencing Studio lighting complying with all of the requirements in Section 140.6(c)2G.vii.	1.5 W/ft <sup>2</sup>
9	Daylight Adaptation Zones shall be no longer than 66 feet from the entrance to the parking garage	



# NR Indoor Lighting: Power Adjustment Table 140.6-A

*TABLE 140.6-A LIGHTING POWER DENSITY ADJUSTMENT FACTORS (PAF)*

TYPE OF CONTROL		TYPE OF AREA	FACTOR
a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2 b. Only one PAF may be used for each qualifying luminaire unless combined below. c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF			
1. Partial-ON Occupant Sensing Control		Any area $\leq$ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, conference or waiting room.	0.20
2. Occupant Sensing Controls in Large Open Plan Offices		In open plan offices > 250 square feet: One sensor controlling an area that is:	No larger than 125 square feet
			From 126 to 250 square feet
			From 251 to 500 square feet
3. Dimming System	Manual Dimming	Hotels/motels, restaurants, auditoriums, theaters	0.10
	Multiscene Programmable		0.20
4. Demand Responsive Control		All building types less than 10,000 square feet. Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF	0.05
5. Combined Manual Dimming plus Partial-ON Occupant Sensing Control		Any area $\leq$ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, conference or waiting room	0.25



# NR Indoor Lighting "Alterations": <10%

**TABLE 141.0-E Requirements for Luminaire Alterations**

Quantity of existing affected luminaires per Enclosed Space <sup>1</sup>	Resulting Lighting Power for Each Enclosed Space	Applicable Mandatory Control Provisions for Each Enclosed Space	Multi-level Lighting Control Requirements for Each Altered Luminaire
<b>Alterations that do not change the area of the enclosed space or the space type</b>			
Sum total < 10% of existing luminaires	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted
Sum total ≥ 10% of existing luminaires	≤ 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c)	Two level lighting control <sup>2</sup> or §130.1(b)
	> 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c), (d) <sup>3</sup>	§130.1(b)
<b>Alterations that change the area of the enclosed space or the space type or increase the lighting power in the enclosed space</b>			
Any number	Comply with Section 140.6	§130.0(d) <sup>3</sup> §130.1(a), (c), (d) <sup>3</sup> , (e)	§130.1(b)

1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated, or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to Section 141.0(b)2iii:  
 2. Two level lighting control shall have at least one control step between 30 and 70% of design lighting power in a manner providing reasonably uniform illuminations  
 3. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are altered.

**Alterations include:**

Existing lighting system is:

1. Modified
2. Replaced
3. Moved

Per Table 141.0-E.

Exception: Qualify as Luminaire Modification-in-Place

**TABLE 141.0-F-Requirements for Luminaire Modifications-in-Place**

For compliance with this Table, building space is defined as any of the following:

1. A complete single story building
2. A complete floor of a multi floor building
3. The entire space in a building of a single tenant under a single lease
4. All of the common, not leasable space in single building

Quantity of affected luminaires per Building Space per annum	Resulting Lighting Power per Each Enclosed Space Where ≥ 10% of Existing Luminaires are Luminaire Modifications-in-Place	Applicable mandatory control provisions for each enclosed space <sup>1</sup>	Applicable multi-level lighting control requirements for each modified luminaire <sup>2</sup>
Sum total < 40 Luminaire Modifications-in-Place	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted
Sum total ≥ 40 Luminaire Modifications-in-Place	≤ 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c)	Two level lighting control <sup>3</sup> Or §130.1(b)
	> 85% of allowed lighting power per Section 140.6 Area Category Method	§130.0(d) <sup>4</sup> §130.1(a), (c), (d) <sup>4</sup>	§130.1(b)

1. Control requirements only apply to enclosed spaces for which there are Luminaire Modifications-in-Place.  
 2. Multi-level controls are required only for luminaires for which there are Luminaire Modifications-in-Place.  
 3. Two level lighting control shall have at least one control step between 30% and 70% of design lighting power in a manner providing reasonably uniform illuminations  
 4. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are modified-in-place.

**Luminaire Modification-in-place:**

1. Replacing lamps and ballasts with like type that preserves original luminaire listing.
2. Changing # or type of light source including: socket renewal, removal or relocation of sockets, wiring.
3. Changing the optical system of the luminaire.
4. Replacement of whole luminaire.

Cannot be part or result of any general remodeling of the enclosed space in which they are located; or changes to panelboard or branch circuit wiring.



# NR Outdoor Lighting: Mandatory

OUTDOOR LIGHTING CONTROLS AND EQUIPMENT	
130.2(a)	Outdoor incandescent lighting rated over 100 watts is controlled by a motion sensor.
130.2(c)1	All outdoor lighting is controlled by photocontrol or outdoor astronomical time-switch control.
130.2(c)3	Outdoor lighting where bottom of luminaire is mounted 24 feet or less above the ground is controlled by motion sensors or other controls that are capable of reducing the lighting power of each luminaire by 40 to 80% in response to the area being vacated.
130.2(c)4	Automatic lighting controls shown on plans for building façade, ornamental hardscape or outdoor dining lighting includes part-night lighting control, motion sensor control, or time-based control.

High efficacy lamp and lighting associated with water features are no longer an exception

New

TABLE 130.2-A Uplight Ratings (Maximum Zonal Lumens)

Secondary Solid Angle	Maximum Zonal Lumens per Outdoor Lighting Zone			
	OLZ 1	OLZ 2	OLZ 3	OLZ 4
Uplight High (UH) 100 to 180 degrees	10	50	500	1,000
Uplight Low (UL) 90 to ~100 degrees	10	50	500	1,000

## Luminaire Cutoff Requirements

Lamp greater than 150 watts:

1. No backlight requirements
2. Max. zonal lumens for Uplight (Table 130.2-A)
3. Max. zonal lumens for Glare (Table 130.2-B)

TABLE 130.2-B Glare Ratings (Maximum Zonal Lumens)

Glare Rating for Asymmetrical Luminaire Types (Type I, Type II, Type III, Type IV)				
Secondary Solid Angle	Maximum Zonal Lumens per Outdoor Lighting Zone			
	OLZ 1	OLZ 2	OLZ 3	OLZ 4
Forward Very High (FVH) 80 to 90 degrees	100	225	500	750
Backlight Very High (BVH) 80 to 90 degrees	100	225	500	750
Forward High (FH) 60 to ~80 degrees	1,800	5,000	7,500	12,000
Backlight High (BH) 60 to ~80 degrees	500	1,000	2,500	5,000

Glare Rating for Quadrilateral Symmetrical Luminaire Types (Type V, Type V Square)				
Secondary Solid Angle	Maximum Zonal Lumens per Outdoor Lighting Zone			
	OLZ 1	OLZ 2	OLZ 3	OLZ 4
Forward Very High (FVH) 80 to 90 degrees	100	225	500	750
Backlight Very High (BVH) 80 to 90 degrees	100	225	500	750
Forward High (FH) 60 to ~80 degrees	1,800	5,000	7,500	12,000
Backlight High (BH) 60 to ~80 degrees	1,800	5,000	7,500	12,000



# NR Outdoor Lighting: General Hardscape

## Lighting Zone 1

- Area allowance: *0.035 w/sq. ft.*
- Linear allowance: *0.25 w/sq. ft.*
- Initial allowance: 340 watts

## Lighting Zone 2

- Area allowance: *0.045 w/sq. ft.*
- Linear allowance: *0.45 w/sq. ft.*
- Initial allowance: 510 watts

## Lighting Zone 3

- Area allowance: *0.090 w/sq. ft.*
- Linear allowance: *0.85 w/sq. ft.*
- Initial allowance: 770 watts

## Lighting Zone 4

- Not currently approved for any location





# NR Electrical: New Mandatory Form NRCC-ELEC-01-E



## B. Disaggregation of Electrical Circuits (continued)

Table 130.5-B - MINIMUM REQUIREMENTS FOR SEPARATION OF ELECTRICAL LOAD

Table 130.5 – B sets the upper limit on how many load(s) of each type can be supplied by each feeder. A feeder may not supply loads of more than one type unless the service is rated at 50 kVA or less. For instance, on the fifth row of the table, one feeder on a service >50 kVA could be used to supply all the plug loads on a floor of a building, provided that there are no areas in which more than 25kVA of plug load is supplied to a space less than 5000sf

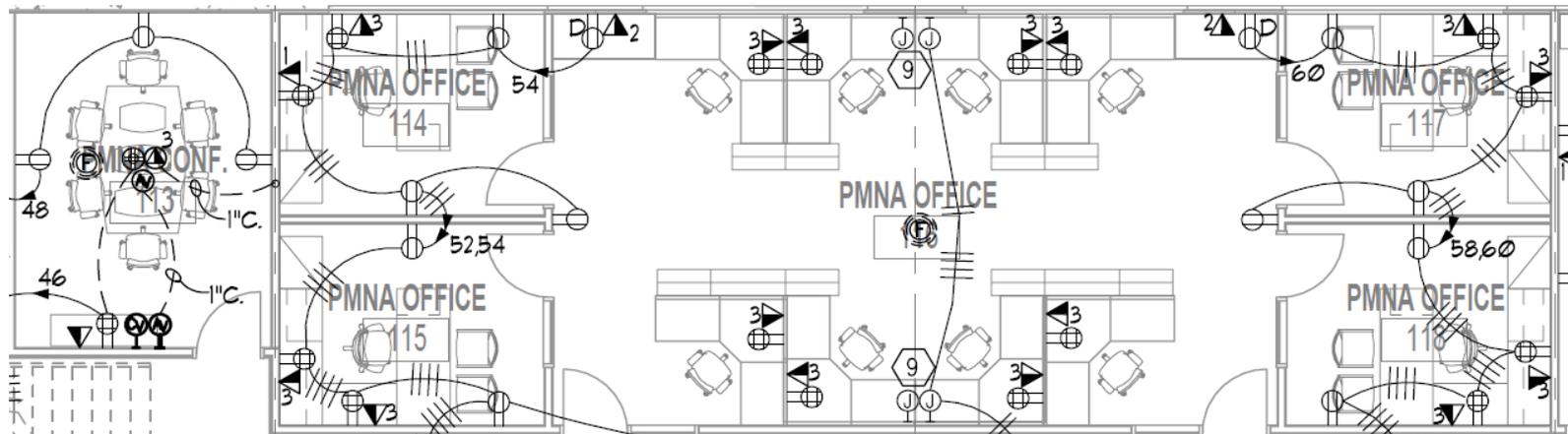
Load Type	Services rated 50 kVA or less	Services rated more than 50kVA and less than or equal to 250 kVA	Services rated more than 250 kVA and less than or equal to 1000kVA	Services rated more than 1000kVA
Lighting including exit and egress lighting and exterior lighting	Not required	All lighting in aggregate	All lighting disaggregated by floor, type or area	All lighting disaggregated by floor, type or area
HVAC systems and components including chillers, fans, heaters, furnaces, package units, cooling towers, and circulation pumps associated with HVAC	Not required	All HVAC in aggregate	All HVAC in aggregate and each HVAC load rated at least 50 kVA	All HVAC in aggregate and each HVAC load rated at least 50kVA
Domestic and service water system pumps and related systems and components	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Plug load including appliances rated less than 25 kVA	Not required	All plug load in aggregate Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load separated by floor, type or area Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug loads separated by floor, type or area. All groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf
Elevators, escalators, moving walks, and transit systems	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Other individual non-HVAC loads or appliances rated 25kVA or greater	Not required	All	Each	Each
Industrial and commercial load centers 25 kVA or greater including theatrical lighting installations and commercial kitchens	Not required	All	Each	Each
Renewable power source (net or total)	Each group	Each group	Each group	Each group
Loads associated with renewable power source	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Charging stations for electric vehicles	All loads in aggregate	All loads in aggregate	All loads in aggregate	All loads in aggregate



# NR Electrical: Mandatory 120 Volt Circuit Controls

## D. Circuit Controls for 120-Volt Receptacles

- Controlled 120 volt receptacles shall be provided in each private office, open office area, reception lobby, conference room, kitchenette in office spaces, and copy room. Controlled receptacles shall meet the following requirements.
- In open office areas, controlled circuit receptacles are not required if, at time of final permit, workstations are installed, and each workstation is equipped with an occupant sensing control that is permanently mounted in each workstation, and which controls a hardwired, nonresidential-rated power strip. Plug-in strips and other plug-in devices that incorporate an occupant sensor shall not be used for this exception.
- Receptacles that are only for the following purposes are exempt:
  - Receptacles specifically for refrigerators and water dispensers in kitchenettes.
  - Receptacles located a minimum of six feet above the floor that are specifically for clocks.
  - Receptacles for network copiers, fax machines, A/V and data equipment other than personal computers in copy rooms.





# NR Covered Processes: Parking Garage



## **Mandatory: Lighting**

1. General lighting to be controlled by occupancy sensing controls having at least one control step between 20% and 50% of design lighting power.
2. Combined total of 36 sf or more openings, luminaires for general lighting in primary and secondary sidelite zones to be controlled independently by multi level (continuous dimming or on/off) automatic controls.
3. When primary sidelite zone illuminance level greater than 150% of that provided by electric lighting, controls must reduce controlled power to zero.

## **Mandatory: HVAC**

1. Automatically detect contaminant levels and stage fans or modulate fan airflow rates to 50% or less of design capacity provided acceptable contaminant levels are maintained.
2. Have controls and/or devices that will result in fan motor demand of no more than 30% of design wattage at 50% of design airflow.
3. CO sensor for every 5,000 sf, at least 2 sensors per proximity zone.
4. CO concentration maintained at 25 ppm or less at all times.
5. Ventilation rate be at least 0.15 cfm/sf when garage occupied.
6. System shall maintain the garage at negative or neutral pressure relative to other occupied spaces when garage occupied.



# NR Covered Processes: Computer Rooms



## **Prescriptive:**

### Economizers

- A. Integrated air economizer capable of providing 100% of the expected system cooling load at outside temperatures of 55°F and below; OR
- B. Integrated water economizer capable of providing 100% of the expected system cooling load at outside temperatures of 40°F and below.

*Exception: Individual computer room under 5 tons in a building that has no economizers.*

- 2. Reheat: Controls that prevent reheating, recooling, and simultaneous provisions of heating and cooling to the same zone.
- 3. Humidification: Non-adiabatic humidification (steam, infrared) prohibited. Only adiabatic humidification permitted (direct evaporation, ultrasonic)
- 4. Fan power: Not to exceed 27 w/kBtuh of net sensible cooling capacity.
- 5. Fan control: 2-speed or variable speed control that will result in fan motor demand of no more than 50% of design wattage at 66% of design fan speed.
- 6. Containment: if air-cooled, design load exceeding 175 kW/room, air barriers to prevent discharge air to recirculate back to computer inlets through cooling system.



# Residential Occupancies





# Residential: New Performance Software

- New simulation engine CSE (California Simulation Engine)
- Compliance Manager software from CEC to provide Standard/Proposed rules for modeling
- All software vendors will use same plug in to Compliance Manager software
- Creation of CF-1R will require internet access to CEC's Compliance Manager.
- HERS registration process will include uploading the CF-1R from the CEC for registration and signatures per current procedures.
- PV credit allowed after 1/1/2015.

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD  
 Project Name: Pleasant Hills at Lincoln Shores - Plan01  
 Calculation Description: Base+RCV-15SEER-LLAH-0.42FanEff-400cfm/t-22shgc  
 Calculation Date/Time: 2012-11-14; 08:13  
 Page 1 of 15  
 Input File Name: Phls-p01-023.ext

A GENERAL INFORMATION			
01	Project Name:	Pleasant Hills at Lincoln Shores - Plan01	
02	Calculation Description	Base+RCV, 15SEER, LLAH, 0.42FanEff, 400cfm/t, 22shgc	
03	Multifamily/Subdivision Name	Pleasant Hills at Lincoln Shores	04
05	Project Location:	Plan 01	06
07	CA City :	A City Name	08
09	Zip code	99999	10
11	Climate Zone:	12	12
13	Building Type:	Multifamily	14
15	Construction Type:	Newly Constructed Building	16
17	Total Cond. Floor Area (FT2):	7,000	18
19	Slab Area (FT2):	4,000	20
21	Addition Cond. Floor Area:	0	22
23	Addition Slab Area (FT2)	0	24
		Input File Name:	Phls-p01-023.ext
		Rule Set Filename:	CA Res 2013.bin
		Compliance Method:	2013 Standards v1.0
		Special Programs:	NSHP
		Bldg Front Orientation (deg or cardinal):	0 (N)
		Number of Dwelling Units:	4
		Number of Zones:	7
		Number of Stories:	2
		Average Ceiling Height (FT):	8 Ft
		Fuel Type:	Natural Gas
		Glazing Percentage (%):	16.5

B Compliance Results				
01 Building Complies with Computer Performance				
02 Special Features are Required				
03 HERS Verification is Required				
ENERGY USE SUMMARY				
4	5	6	7	8
Energy Use (kTDU/ft <sup>2</sup> -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	24.22	19.34	4.88	20.1%
Space Cooling	15.22	6.14	9.08	59.7%
IAQ Ventilation	0.88	0.88	0.00	0.0%
Water Heating	21.19	20.22	0.97	4.6%
Photovoltaic Offset	---	-2.12	---	---
<b>TOTAL</b>	<b>61.51</b>	<b>44.46</b>	<b>14.93</b>	<b>24.3%</b>

Detailed help on using the CF-1R Certificate of Compliance is available via the Internet by either scanning the QR code or browsing to <http://www.title24energycode.org/t24help/cfr.aspx>.



Registration Number: CA Building Energy Efficiency Standards - 2013 Residential Compliance  
 Registration Date/Time: HERS Provider: January 2014

This form is an example of CF-1R-PRF-01.  
 Actual form still under construction.



# Residential: HERS Registration Procedures

HERS registration process will include uploading the CF-1R registration and signatures per current procedures.

Certificate of Compliance - Residential Prescriptive Compliance Method		CF-1R-PRSC-NCB-01
Newly Constructed Buildings and Additions Greater Than 1,000 ft <sup>2</sup>		(Page 3 of 5)
Project Name:	Date:	

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES											
1	2	3	4	5	6	7	8	9	10	11	12
Fenestration Type	Frame Type	Azimuth	Proposed Non West Facing Area ft <sup>2</sup>	Proposed West Facing Area ft <sup>2</sup>	Total Proposed All Orientations	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
a	Total Proposed Fenestration Area										
b	Maximum Allowed Fenestration Area										
c	if exterior shading devices are used, what is the calculated value from WS-03										

J. HVAC SYSTEMS – HEATING/COOLING/DUCTS								
1	2	3	4	5	6	7	8	9
Heating Equipment Type	Heating Efficiency	Cooling Equipment Type	Cooling Efficiency	Distribution System Type	Duct Location	Duct R-value	Thermostat Type	Comments
<ul style="list-style-type: none"> <li>Central gas furnaces have a minimum efficiency of 78% AFUE, heat pumps 7.7 HSPF. Any gas heating appliance sold in California will meet the minimum appliance efficiency standard and is allowed. Heat pumps and mini-split heat pumps are the only type of electric heating system allowed.</li> <li>Central cooling systems and heat pumps have a minimum efficiency of 13 SEER. Any cooling appliance sold in California will meet the minimum appliance efficiency standard and is allowed.</li> <li>The prescriptive requirements preclude the use of bypass ducts in association with zonally controlled systems. A HERS Rater shall verify that zonally controlled systems have no bypass ducts.</li> </ul>								

K. VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12	
1	2
Required ≥ CFM per ft <sup>2</sup> of Conditioned Floor Area	Minimum Attic Vent Free Area (column 1 / 375 CFM)
<ul style="list-style-type: none"> <li>Homeowners shall be provided a one-page fact sheet on the efficient operation of a whole house fan.</li> </ul>	



# Residential Forms: Certificate of Compliance **CF-1R**

## ***Appendix A Compliance Documents***

#	Doc Type	Doc Category	Category Description	Document Description	Pages
<b>Performance Certificate of Compliance</b>					
1	CF1R-	PRF-01-E	Newly Constructed Buildings; Additions; Alterations	performance compliance method for newly constructed buildings (N), Additions (A), and Alterations (A) => (NAA)	
<b>Prescriptive Certificate of Compliance</b>					
2	CF1R-	NCB-01-E	Newly Constructed Buildings	Newly Constructed Buildings and Additions Greater Than 1000 ft <sup>2</sup> ? (Prescriptive)	
3	CF1R-	ADD-01-E	Additions	Additions less than 1,000 ft <sup>2</sup> ? (Prescriptive)	
4	CF1R-	ALT-01-E	Alterations	Non-HVAC Alterations (Prescriptive) Break Out by Type	
5	CF1R-	ALT-02-E	Alterations-HVAC	HVAC Alterations, Climate Zones 1, 3-7, and 16 (Duct Leakage, Airflow and Fan Watt Draw) (Prescriptive)	
6	CF1R-	ALT-03-E	Alterations-HVAC	HVAC Alterations, Climate Zones 2 and 8-15 (Duct Leakage, Airflow and Fan Watt Draw, Refrigerant Charge) (Prescriptive)	
7	CF1R-	WKS-01-E	Work Sheet	worksheet for EZ-frame - opaque	
8	CF1R-	WKS-02-E	Work Sheet	Area Weighted Average Calculation Worksheet	
9	CF1R-	WKS-03-E	Work Sheet	Solar Heat Gain Coefficient (SHGC) Worksheet	
10	CF1R-	WKS-04-E	Work Sheet	Cool Roof and SRI Worksheet	
11	CF1R-	WKS-05-E	Work Sheet	OG 300 Solar Water Heating System Worksheet	
12	CF1R-	WKS-06-E	Work Sheet	OG 100 Solar Water Heating System Worksheet	



# Residential Forms: Certificate of Installation **CF-2R**

Certificate of Installation - Envelope				
13	CF2R-	ENV-01-E	Envelope-NonHERS	Fenestration; and Site-built Fenestration
14	CF2R-	ENV-02-E	Envelope-NonHERS	Envelope Air Sealing Requirements
15	CF2R-	ENV-03-E	Envelope-NonHERS	Insulation Installation
16	CF2R-	ENV-04-E	Envelope-NonHERS	Additional Attic Ventilation
17	CF2R-	ENV-05-E	Envelope-NonHERS	Roofing; Cool Roofs
18	CF2R-	ENV-20a-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Manual Meter
19	CF2R-	ENV-20b-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Automatic Meter
20	CF2R-	ENV-20c-H	Envelope-HERS	Building Envelope Air Leakage - Multi-Point Test
21	CF2R-	ENV-20d-H	Envelope-HERS	Building Envelope Air Leakage - Repeated Single Point with Manual Meter
22	CF2R-	ENV-20e-H	Envelope-HERS	Building Envelope Air Leakage - Repeated Single Point with Automatic Meter
23	CF2R-	ENV-21-H	Envelope-HERS	High Quality Insulation Installation (QII)-Framing Stage
24	CF2R-	ENV-22-H	Envelope-HERS	High Quality Insulation Installation (QII)-Insulation
Certificate of Verification - Envelope				
25	CF3R-	ENV-20a-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Manual Meter
26	CF3R-	ENV-20b-H	Envelope-HERS	Building Envelope Air Leakage - Single-Point Test with Automatic Meter
27	CF3R-	ENV-20c-H	Envelope-HERS	Building Envelope Air Leakage - Multi-Point Test
28	CF3R-	ENV-20d-H	Envelope-HERS	Building Envelope Air Leakage - Repeated Single Point with Manual Meter
29	CF3R-	ENV-20e-H	Envelope-HERS	Building Envelope Air Leakage - Repeated Single Point with Automatic Meter
30	CF3R-	ENV-21-H	Envelope-HERS	High Quality Insulation Installation (QII)-Framing Stage
31	CF3R-	ENV-22-H	Envelope-HERS	High Quality Insulation Installation (QII)-Insulation
Certificate of Installation - Lighting				
32	CF2R-	LTG-01-E	Lighting-NonHERS	Single Family Dwellings
33	CF2R-	LTG-02-E	Lighting-NonHERS	Multi Family Dwellings
Certificate of Installation - Photovoltaic				
34	CF2R-	PHV-01-E	Photovoltaic	PV Systems

Certificate of Installation - Mechanical				
35	CF2R-	MECH-01-E	Mechanical-NonHERS	Space Conditioned System Information
36	CF2R-	MECH-02-E	Mechanical-NonHERS	Whole House Fan
37	CF2R-	MECH-03-E	Mechanical-NonHERS	Evaporatively Cooled Condensing Units
38	CF2R-	MCH-04-E	Mechanical-NonHERS	Evaporative Coolers
39	CF2R-	MCH-05-E	Mechanical-NonHERS	Ice Storage Air Conditioning (ISAC) Units
40	CF2R-	MCH-06-E	Mechanical-NonHERS	Verification of Air Filtration
41	CF2R-	MCH-20a-H	Mechanical-HERS	<b>Duct Leakage Measurement - New System</b>
42	CF2R-	MCH-20b-H	Mechanical-HERS	<b>Duct Leakage Measurement - Low Leakage Ducts in Conditioned Space – Compliance Credit</b>
43	CF2R-	MCH-20c-H	Mechanical-HERS	<b>Duct Leakage Measurement - Low Leakage Air-Handling Units</b>
44	CF2R-	MCH-20d-H	Mechanical-HERS	<b>Duct Leakage Measurement - – Altered (Existing) System</b>
45	CF2R-	MCH-21-H	Mechanical-HERS	Ducts located entirely in conditioned space, less than 12 ft ducts in conditioned space, supply ducts in con space
46	CF2R-	MCH-22-H	Mechanical-HERS	Forced Air System Fan Efficacy (Watt/cfm)
47	CF2R-	MCH-23-H	Mechanical-HERS	Forced Air System Fan Airflow Rate (cfm/ton)
48	CF2R-	MCH-24-H	Mechanical-HERS	Forced Air System Airflow Rate - Alternative Compliance For Existing Buildings
49	CF2R-	MCH-25a-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Superheat method</b>
50	CF2R-	MCH-25b-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Subcooling method</b>
51	CF2R-	MCH-25c-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Weigh-in Procedure</b>
52	CF2R-	MCH-25d-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Charge Indicator Display (CID)</b>
53	CF2R-	MCH-25e-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Winter Setup for Standard Charge Verification</b>
54	CF2R-	MCH-25f-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Packaged System Manufacturer Refrigerant Charge</b>
				Certification
55	CF2R-	MCH-26-H	Mechanical-HERS	Verified EER or SEER
56	CF2R-	MCH-27a-H	Mechanical-HERS	<b>Mechanical Ventilation (ASHRAE 62.2) - Continuous Whole-Building Mechanical Ventilation Airflow - Fan Vent Rate Method</b>
57	CF2R-	MCH-27b-H	Mechanical-HERS	<b>Mechanical Ventilation (ASHRAE 62.2) - Continuous Whole-Building Mechanical Ventilation Airflow - Total Vent Rate Method</b>
58	CF2R-	MCH-27c-H	Mechanical-HERS	<b>Mechanical Ventilation (ASHRAE 62.2) - Intermittent Fan Ventilation Rate</b>
59	CF2R-	MCH-27d-H	Mechanical-HERS	<b>Mechanical Ventilation (ASHRAE 62.2) - Intermittent Total Ventilation Rate</b>
60	CF2R-	MCH-28-H	Mechanical-HERS	Alternative to Fan Air Flow and Fan Efficacy – Return Duct And Filter Grille Design
61	CF2R-	MCH-29a-H	Mechanical-HERS	Supply Duct Surface Area and R-Value
62	CF2R-	MCH-29b-H	Mechanical-HERS	Buried Ducts and Deeply Buried Ducts
63	CF2R-	MCH-30-H	Mechanical-HERS	Ventilation cooling compliance credit
64	CF2R-	MCH-31-H	Mechanical-HERS	Zonally Controlled Forced Air Systems



# Residential Forms:

# Certificate of Verification **CF-3R**

Certificate of Verification - Mechanical				
65	CF3R-	MCH-20a-H	Mechanical-HERS	<b>Duct Leakage Measurement - New System</b>
66	CF3R-	MCH-20b-H	Mechanical-HERS	<b>Duct Leakage Measurement - Low Leakage Ducts in Conditioned Space – Compliance Credit;</b>
67	CF3R-	MCH-20c-H	Mechanical-HERS	<b>Duct Leakage Measurement - Low Leakage Air-Handling Units</b>
68	CF3R-	MCH-20d-H	Mechanical-HERS	<b>Duct Leakage Measurement - – Altered (Existing) System</b>
				Ducts located entirely in conditioned space, less than 12 ft ducts in conditioned space, supply ducts in con space
69	CF3R-	MCH-21-H	Mechanical-HERS	
70	CF3R-	MCH-22-H	Mechanical-HERS	Forced Air System Fan Efficacy (Watt/cfm)
71	CF3R-	MCH-23-H	Mechanical-HERS	Forced Air System Fan Airflow Rate (cfm/ton)
72	CF3R-	MCH-24-H	Mechanical-HERS	Forced Air System Airflow Rate - Alternative Compliance For Existing Buildings
73	CF3R-	MCH-25a-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Superheat method</b>
74	CF3R-	MCH-25b-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Subcooling method</b>
75	CF3R-	MCH-25c-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Weigh-in Procedure</b>
76	CF3R-	MCH-25d-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Charge Indicator Display (CID)</b>
77	CF3R-	MCH-25e-H	Mechanical-HERS	<b>Refrigerant Charge Verification - Winter Setup for Standard Charge Verification</b>
				<b>Refrigerant Charge Verification - Packaged System Manufacturer Refrigerant Charge Certification</b>
79	CF3R-	MCH-25f-H	Mechanical-HERS	
80	CF3R-	MCH-26-H	Mechanical-HERS	Verified EER or SEER
				<b>Mechanical Ventilation (ASHRAE 62.2) - Continuous Whole-Building Mechanical Ventilation Airflow - Fan Vent Rate Method</b>
81	CF3R-	MCH-27a-H	Mechanical-HERS	
				<b>Mechanical Ventilation (ASHRAE 62.2) - Continuous Whole-Building Mechanical Ventilation Airflow - Total Vent Rate Method</b>
82	CF3R-	MCH-27b-H	Mechanical-HERS	
	CF3R-	MCH-27c-H	Mechanical-HERS	<b>Mechanical Ventilation (ASHRAE 62.2) - Intermittent Fan Ventilation Rate</b>
				<b>Mechanical Ventilation (ASHRAE 62.2) - Intermittent Total Ventilation Rate</b>
83	CF3R-	MCH-27d-H	Mechanical-HERS	
				Alternative to Fan Air Flow and Fan Efficacy - Return Duct And Filter Grille Design
84	CF3R-	MCH-28-H	Mechanical-HERS	
85	CF3R-	MCH-29a-H	Mechanical-HERS	Supply Duct Surface Area and R-Value
86	CF3R-	MCH-29b-H	Mechanical-HERS	Buried Ducts and Deeply Buried Ducts
87	CF3R-	MCH-30-H	Mechanical-HERS	Ventilation cooling compliance credit
88	CF3R-	MCH-31-H	Mechanical-HERS	Zonally Controlled Forced Air Systems

Certificate of Installation - Plumbing				
89	CF2R-	PLB-01-E	Plumbing-DHW-NonHERS	Water Heating System - General Information
90	CF2R-	PLB-02-E	Plumbing-DHW-NonHERS	Single Dwelling Unit Hot Water System Distribution
91	CF2R-	PLB-03-E	Plumbing-DHW-NonHERS	Multifamily Central Hot Water System Distribution
92	CF2R-	PLB-04-E	Plumbing-DHW-NonHERS	Solar Water Heating Systems
93	CF2R-	PLB-06-E	Plumbing-DHW-NonHERS	Pool and Spa Systems
94	CF2R-	PLB-20-H	Plumbing-DHW-HERS	HERS - Single Dwelling Unit Hot Water System Distribution
95	CF2R-	PLB-21-H	Plumbing-DHW-HERS	HERS - Multifamily Central Hot Water System Distribution
Certificate of Verification – Existing Conditions				
96	CF3R-	EXC-20-H	Existing Conditions-EXC-HERS	<b>HERS Verification for Existing Conditions</b> for performance compliance for alterations. Required as prerequisite to registration of a CF-1R-PERF-ALT doc. Note there is no Certificate of Installation version for this required.



# Residential: Solar Ready

Single family (Subdivisions  
10 homes or more) 250 sf.  
ft. minimum area, OR

- PV system = 1000 watts or more
- Solar hot water system with 0.50 solar fraction
- 50% *potential* solar zone area provided
- 150 sq. ft. if meets one of the many exceptions listed, such as:
  - *3-story, but less than 2,000 sq. ft.*
  - *CZ 8-14 in fire area, whole house fan*
  - *Demand response thermostats installed*
- No solar zone if:
  - *Demand response thermostats*
  - *High efficacy lights at kitchen, bathrooms (with vacancy sensor), utility rooms, garages and outside (with occupancy and photo sensor)*
  - *Every rooms has a switched receptacle*



# Residential: Prescriptive Package "A" (Previously "D"): Envelope

		Climate Zone																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
Building Envelope	Insulation <sup>1</sup>	Roofs / Ceilings	U 0.025 R 38	U 0.031 R 30	U 0.025 R 38														
		Walls	Above Grade	2x4 Framed <sup>2</sup>	U 0.065 R 15+4 or R 13+5														
				Mass Wall Interior <sup>3</sup>	U 0.070 R 13	U 0.059 R 17													
			Mass Wall Exterior <sup>3</sup>	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 <sup>3</sup>	U 0.070 R 13	U 0.066 R 15													
		Below Grade Exterior <sup>3</sup>		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	U 0.58 R 7.0														
			Raised	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 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0								
		Radiant Barrier		NR	REQ	NR													
Roofing Products	Low-sloped	Aged Solar Reflectance	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	0.75	NR	0.75	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 <sup>4</sup>		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 <sup>5</sup>		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		
	Maximum Total Area		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%		



# Residential: Prescriptive Package A: HVAC and Water Heating

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>HVAC SYSTEM</b>	<b>Space Heating</b>	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 <sup>d</sup>	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	<b>Space cooling</b>	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	NR							
		Whole House Fan <sup>7</sup>	NR	NR	NR	NR	NR	NR	NR	REQ	NR	NR						
	<b>Central System Air Handlers<sup>8</sup></b>	Central Fan Integrated Ventilation System Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
<b>Ducts</b>	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	
<b>Water Heating</b>	All Buildings	System Shall meet Section 150.1(c)8																



# Residential Mandatory and Prescriptive: Roofs

## New Mandatory

**Roof :** *Ceilings and Rafter (wood framed)*

- ✓ R-30 (U-factor 0.031)

**Vapor Retarder:**

- ✓ CZ 14 and 16: Class II on conditioned side for walls and attics
- ✓ CS 1-16: Class I or II on earth floor for unvented crawlspaces

## New Package "A"

**Roof:** *Ceilings and Rafter (wood framed):*

- ✓ CZ 1, 11-16 R-38 (U-factor 0.025)
- ✓ CZ 2-10 R-30 (U-factor 0.031)

**Radiant Barrier** (ventilation 1/150; 30% high):

- ✓ CZ 2-15

**Cool Roof:**

- ✓ *Low sloped:* CZ 13 and 15
  - ✓ Aged Solar Reflectance = 0.6
  - ✓ Thermal emittance = 0.75
  - ✓ SRI = 75
- ✓ *Steep Sloped:* CZ 10-15
  - ✓ Aged Solar Reflectance = 0.2
  - ✓ Thermal emittance = 0.75
  - ✓ SRI = 16



# Residential Mandatory and Prescriptive: Walls

## New Mandatory

### Walls:

- ✓ 2 x 4 R-13 (U-factor = 0.102)
- ✓ 2 x 6 R-19 (U-factor = 0.074)

### Vapor Retarder:

- ✓ CZ 14 and 16: Class II on conditioned side for walls and attics.
- ✓ CS 1-16: Class I or II on earth floor for unvented crawlspaces.

## New Package "A"

### Walls :

- ✓ 2 x 4 R-13+5 (U-factor = 0.065)
- ✓ Mass CZ 1-15:
  - ✓ Interior R-13 (U-0.070)
  - ✓ Exterior R-8 (U-0.125)
  - ✓ Below grade interior R-13 (U-0.070)
  - ✓ Below grade exterior R-5 (U-0.20); CZ 14 and 15 R-10 (U-0.10)
- ✓ Mass CZ 16:
  - ✓ Interior R-17 (0.059)
  - ✓ Exterior R-13 (0.070)
  - ✓ Below grade interior R-15 (U-0.066)
  - ✓ Below grade exterior R-19 (U-0.053)



# Residential Mandatory and Prescriptive: Floors

## New Mandatory

### Raised Floors:

- ✓ *Wood framed with R-19 (Weighted average U-factor = 0.037)*

### Vapor Retarder:

- ✓ *CZ 14 and 16: Class II on conditioned side for walls and attics*
- ✓ *CS 1-16: Class I or II on earth floor for unvented crawlspaces*

## New Package "A"

### Raised Floors:

- ✓ *Wood framed with R-19 (Weighted average U-factor = 0.037)*

### Raised concrete:

- ✓ *CZ 1, 2, 11, 13, 14, 16 = R-8 (U-0.092)*
- ✓ *CZ 3-10 = none*
- ✓ *CZ 12 and 15 = R-4 (U-0.138)*



# Residential Mandatory and Prescriptive: Fenestration

## New Mandatory

Maximum U-factor = 0.58

**OR**

Weighted U-factor = 0.58 except 10 sq. ft., or 0.5% of CFA, whichever is greater.

## New Package "A"

Maximum U-factor = 0.32

Maximum SHGC

✓ CZ 2, 4, 6-16 = 0.25

✓ CZ 1, 3, 5 = none

Total Area = 20%

✓ 5% west facing restriction:

✓ CZ 2, 3, 6-16

✓ CZ 1, 3, 5 = none



# Residential Mandatory and Prescriptive: Heating and Cooling Equipment

## New Mandatory

- ✓ Outdoor condensing unit: at least 5' from the outlet of any dryer vent
- ✓ Ducted system exceeding 10 ft must be designed with MERV 6 air filtration system that is accessible and labeled
- ✓ Ducted cooling systems to meet HERS airflow and fan watt draw requirements
- ✓ Zonally controlled systems to meet HERS airflow and fan watt draw requirements

### **After January 1, 2015:**

- ✓ DX air conditioners <65,000 BTUH: 14 SEER or better
- ✓ Central furnaces <225,000 BTUH: 81% AFUE
- ✓ Package heat pumps: 8.0 HSPF
- ✓ Split heat pumps: 8.2 HSPF

## New Package "A"

- ✓ Supplemental heating allowed with sizing and timing controls
- ✓ Refrigerant charge HERS tested and verified CZ 2, 8-15 (similar to 2008), weigh-in approach for systems added
- ✓ Central forced air system fans used in central fan integrated ventilation system to be HERS tested and verified for 350 CFM/ ton and 0.58 watts per CFM (similar to 2008)
- ✓ Higher than minimum SEER ratings to be HERS verified.



# Residential Mandatory and Prescriptive: IAQ Ventilation

## New Mandatory

- ✓ Continuous operation of central forced air system not allowed as IAQ approach
- ✓ Whole building IAQ ventilation airflow performance to be HERS tested and verified

## New Package "A"

- ✓ Night Ventilation: Whole house fan
  - ✓ CZ 8-14



# Residential Mandatory and Prescriptive: Ducts

## New Mandatory

- ✓ Minimum R-6 duct insulation
- ✓ HERS duct testing in all CZ
- ✓ Air filtration devices for mechanical systems that supply air through 10 sf or more of duct work
- ✓ Hole for static pressure probe (HSPP), or permanently installed static pressure probe (PSPP) in supply plenum, HERS tested and verified
- ✓ Return ducts sized per Table 150.0-C and 150.0-D, *or* HERS tested and verified for 350 CFM/ton and 0.58 watts per CFM.

## New Package “A”

- ✓ Duct R-values:
  - ✓ CZ 1-10, 12-13 = R-6
  - ✓ CZ 11, 14-16 = R-8
- ✓ HVAC system bypass ducts not allowed prescriptively
- ✓ Ducts not insulated because in conditioned space to be HERS verified with duct leakage to outside procedure



# Residential Mandatory and Prescriptive: Water Heating

## New Mandatory

- ✓ **Gas/Propane water heaters**
  - ✓ 120V outlet within 3 feet
  - ✓ Category III, IV or Type B vent to outside
  - ✓ Condensate drain without pump
  - ✓ Gas sized for 200,000 BTUH or more
- ✓ **Pipe insulation**
  - ✓ First 5 feet hot and cold
  - ✓ All piping  $\frac{3}{4}$ " or larger
  - ✓ Hot water recirculation piping
  - ✓ Between storage/tanks
  - ✓ Below grade
  - ✓ All piping to kitchen fixtures

## New Package "A"

- ✓ If using recirculation pump, demand controls required.
- ✓ Electric resistance requires solar hot water system at 0.50 solar savings fraction with no recirculation pump installed within building (when natural gas not available).



# Residential Mandatory: Indoor Lighting

## Kitchen

- No change: 50% high efficacy/50% low efficacy
- *Changed: Recessed light fixtures in uninsulated to meet mandatory requirements, not just in insulated ceilings.*

## Bathrooms

- *Changed: One fixture MUST be high efficacy (no control requirements)*
- No Change: Vacancy sensor required for low efficacy fixtures

## Garages, Laundry and Utility Rooms

- *Changed: High efficacy light fixture with vacancy sensor required*

## Other rooms / Outdoors

- No change: Vacancy sensor or dimmer control for low efficacy fixtures
- No change: Manual switch, motion sensor and photocontrol for low efficacy fixtures



# Residential Performance HERS: Water Heating

Table 5-5 – Applicability of Distribution Systems Options within a Dwelling Unit

Distribution System Types	Assigned Distribution System Multiplier	Systems Serving a Single Dwelling Unit	Multi-family with central recirculation systems
<b>No HERS Inspection Required</b>			
Trunk and Branch -Standard (STD)	1.0	Yes	Yes
Pipe Insulation (PIA)	0.9	Yes	Yes
Parallel Piping (PP)	1.05	Yes	
Insulated and Protected Pipe Below Grade (IPBG)	1.4	Yes	
Recirculation: Non-Demand Control Options (R-ND)	7.0	Yes	
Recirculation with Manual Demand Control (R-Dman)	1.15	Yes	Yes
Recirculation with Motion Sensor Demand Control (R-DAuto)	1.3	Yes	
<b>Optional Cases: HERS Inspection Required</b>			
Pipe Insulation (PIC-H)	0.8	Yes	*
Parallel Piping with 5' maximum length (PP-H)	0.95	Yes	
Compact Design (CHWDS-H)	0.7	Yes	
Point of Use (POU-H)	0.3	Yes	
Recirculation with Manual Demand Control (R-Drmc-H)	1.05	Yes	
Recirculation with Motion Sensor Demand Control (RDRsc-H)	1.2	Yes	
Non Compliant Installation Distribution Multiplier	1.2	Yes	Yes

Note: any system that does not meet the installation requirements listed in RA-3 and RA-4 for the specific system type in any way must either have the installation corrected or have the compliance run redone using the non compliance installation distribution multiplier.





# Residential Prescriptive: Additions

Component	≤ 400 sf	> 400 sf and ≤700 sf	> 700 to 1,000 sf	>1,000 sf
<b>Ceiling Insulation</b> CZ 1, 11-16 CZ 2-10	Pkg A (R-38) Pkg A (R-30)	Pkg A Pkg A	Pkg A Pkg A	Pkg A Pkg A
<b>Cool Roof</b>	≤300 = none >300 = cool roof	Pkg A	Pkg A	Pkg A
<b>Radiant Barrier</b>	Pkg A (CZ 2-15)	Pkg A	Pkg A	Pkg A
<b>Fenestration</b> CZ 2,4, 6-16 CZ 1,3,5	<u>U- Factor</u> 0.32 0.32 <u>SHGC</u> 0.25 None	Pkg A Pkg A	Pkg A Pkg A	Pkg A Pkg A
<b>Glazing area :</b> Max. total area Max. West facing	Up to 75 sf or 30% Up to 60 sf	Up to 120 sf or 25% Up to 60 sf	Up to 175 sf sf or 20% Up to 70 sf or 5%	Pkg A Pkg A
<b>Wall Insulation</b>	R-13 (2x4)/R-19 (2x6)	R-13 (2x4)/R-19 (2x6)	Pkg A	Pkg A
<b>Floor</b> Raised Slab	Pkg A (R-19) Pkg A (CZ 16 = R-7)	Pkg A Pkg A	Pkg A Pkg A	Pkg A Pkg A
<b>Whole House Fan</b>	None	None	None	Pkg A



# Residential Prescriptive: Alterations **CF-1R-ALT**

Component	Mandatory	Prescriptive	Exception(s)
<b>Ceiling Insulation:</b> W/attic roof Rafter roof	R-30  R-19	CZ 1, 11-16 = R-38 CZ 2-10 = R-30	none
<b>Cool Roof:</b>  <b>Alterations:</b> ≤50% of roof=none >50% of roof=cool roof	none	<u>Steep Sloped CZ 10-15</u> Aged Solar Reflectance = 0.20 Thermal Emittance = 0.75 SRI = 16  <u>Low Sloped CZ 13 &amp; 15</u> Aged Solar Reflectance = 0.63 Thermal Emittance = 0.75 SRI = 75	<u>Steep Sloped</u> 1" air space Profile ratio of rise to width 1:5 for >50% width of roof Ducts HERS tested (existing at 15%) and insulated per Pkg A R-38 roof insulation Radiant Barrier No ducts in the attic CZ 10-15 >R-4 above roof deck  <u>Low Sloped</u> No ducts in the attic Aged Solar Reflectance Insulation Trade Off Table 150.2-A
<b>Radiant Barrier</b>	none	CZ 2-15	CZ 1 & 16
<b>Fenestration:</b>  <b>Skylights</b> <b>Vertical</b> <b>Greenhouse</b>	<u>Weighted U-Factor</u> <0.58 <0.58 <0.58  <u>SHGC</u> None None None	<u>U-factor</u> 0.32 0.32 0.32  <u>SHGC</u> 0.25 (CZ2,4,6-16) 0.25 (CZ2,4,6-16) 0.25 (CZ2,4,6-16)	<u>Exempt from Mandatory U-factor / Prescriptive U-factor</u>  Up to 10 sf or 0.5% CFA/Altered up to 16 sf if U=0.55/SHGC=0.30 Up to 10 sf or 0.5% CFA/Altered up to 75 sf if U=0.40/SHGC=0.35 CZ2,4,6-16 Up to 10 sf or 0.5% CFA/Altered up to 75 sf if U=0.40/SHGC=0.35 CZ2,4,6-16
<b>Area</b> <b>West Facing</b> <b>Skylights</b> <b>Vertical</b>		Total area 20% CFA  CZ 2,4,6-16 cannot exceed 5% CZ 2,4,6-16 cannot exceed 5%	Adding up to 75 sf **replacement = altered and removed at same wall and orientation Altered up to 16 sf if U=0.55 / SHGC = 0.30 Altered up to 75 sf if U=0.40 / SHGC = 0.35 CZ2,4,6-16
<b>Wall Insulation</b>	R-13 (2x4)/R-19 (2x6)	Same as mandatory	Already insulated with R-11 (taking performance penalty)
<b>Floor Insulation:</b> <b>Raised</b>	R-19	Same as mandatory	Controlled ventilated or unvented crawlspace



# Residential Performance: E+A

Component Condition	Standard Design without HERS Verification	Standard Design WITH HERS Verification
<u>Existing</u> (to remain unchanged)	Existing	Existing
<u>Altered (at least 2 components)</u>	Altered but <i>do not model</i> existing ( <u>limited performance credit</u> )	Altered and do model existing ( <u>full performance credit</u> )
<u>Component type</u>		
<b>Opaque surfaces</b>	150.0 (a) (c) (d)	Existing R-value
<b>Roof</b>	R-30, cool roof per Pkg A	existing R-value and roofing product
<b>Wall</b>	R-13	existing R-value
<b>Floor</b>	R-19	existing R-value
<b>Fenestration</b>	U-factor = 0.40 / SHGC = 0.35	U-factor ≤0.40/SHGC ≤0.35 = existing
<b>Area</b>	same as existing building	same as existing building
<b>Window film</b>	U-factor = 0.40 / SHGC = 0.35	existing = default values (Tables 110.6-
<b>HVAC</b>	Pkg A	A/B)
<b>Duct sealing</b>	HERS duct testing > 40 ft	Existing efficiency
<b>Duct insulation</b>	Pkg A	HERS duct testing > 40 ft
<b>Water heating</b>	“Standard” with no solar credits	Existing R-values
<b>“All” other measures</b>	Proposed	Existing efficiency Existing efficiency levels
<u>New</u>	New	New
<u>Removed</u>	Omitted from model (no longer allowed)	Omitted from model (no longer allowed)

3<sup>rd</sup> party: HERS rater verifying existing conditions prior to registering CF-1R for permit submittal.  
Existing + Alteration performance method: 2 components or more being improved



# Residential HVAC: Additions and Alterations

## HVAC Equipment

- If existing system extended, equipment need not comply with Part 6. Heating capacity must be adequate to meet CBC Section 1204.1
- If refrigerant-containing system components altered, setback thermostat required.

## IAQ Ventilation

- Addition less than 1,000 sf are exempt from whole-building airflow requirements, all other applicable requirements still apply.
- Greater than 1,000 sf, all apply

## Ducts

- Ducts extended from existing system that are less than 40 linear feet: Mandatory R-6 duct insulation.
- Over 40 linear feet, new AND existing ducts must meet mandatory and prescriptive requirements.

## HERS

- New equipment (not a repair) must meet all applicable measures as for new construction, including all HERS measures.
- Existing and new ducts of new/altered system to be HERS tested and verified.



# Statewide C&S Team's *Standards Essentials* Training

Live Seminars (Standard Essentials for Title 24, Part 6)	Nonresidential	Residential
Plans Examiner and Building Inspector	X	X
Energy Consultant (and Designer)	X	X
Modeling Essentials	X	X
HVAC, Quality Installation for Contractors	X	X
Lighting & Technology Update	X	X

*Offered on site in your jurisdictions. Contact Wendy Donaldson at (707) 320-2500 to schedule a course in your area.*

Factsheets	Nonresidential	Residential
2008 Title 24, Part 6, HVAC Change Outs		X
2008 Title 24, Part 6, HVAC Triggers	X	X
2013 Title 24, Part 6, HVAC Triggers (coming soon)	X	X
2008 Title 24, Part 6, Fenestration		X
2008 Title 24, Part 6, Cool Roof (coming soon)		X

*Available as PDF documents*



# Thank you

**We welcome your feedback, and have provided our contact information for after today's presentation.**

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