

# 2013 Residential Energy Standards Overview

Christopher Olvera California Energy Commission Outreach and Education Unit



#### **Goals of this Course**

- Identify/clarify the major changes in the 2013 Energy Standards for residential newly constructed buildings, additions, and alterations *(in sequential order of §)*
- Simplify compliance and enforcement for the 2013 changes during:
  - > The plan review process (Plans Examiners)
    - $\checkmark$  Identify what to look for on the compliance forms and building plans
  - > The field inspection process (Field Inspectors)
    - $\checkmark$  Identify which building components and forms to verify



## **QUESTIONS...**

- Question sessions
  - ➢ 30 minutes before lunch
  - > 30 minutes before end
    - Raise hand to ask question
- All other questions
  - Type into Q and A box at anytime
    - List of Q and A from webinar will be posted online





# Let's discuss the 2013 Building Energy Efficiency Standards



#### 2013 Residential Energy Savings





\* Will save 23.6 GWH/yr; 1.1 Mtherms/yr; 35 MW (first year)



### 2013 Building Energy Efficiency Standards

#### • Effective on July 1, 2014

- Building permit applications submitted on or after this date
- Master plans for tract homes affected:
  - Need to resubmit if permits pulled on/after effective date



#### **2013 Documents**



- Building Energy Efficiency Standards
- Residential Compliance Manual
- Reference Appendices
- All docs. available online at:

www.energy.ca.gov/title24



#### **Summary of Major Changes**

- Section #s (see cheat sheet handout)
- Forms nomenclature
  - $\succ$  CF-6R → CF2R
  - → CF-4R → CF3R
- Mandatory HERS testing
- Solar Zone ready reqs.
- \* See summary of changes handout

- Prescriptive reqs. more stringent
  - $\succ$  Package D  $\rightarrow$  Package A
  - $\succ$  Package C + E removed
- HERS Testing for Additions
  - Existing conditions Performance Approach



# Let's talk about the changes to the Administrative Regulations §10-103



#### Signatures, Registration, Additions/Alterations

- Doc. Author signature on CF-1R
- Registration req. for HERS related forms
- CF-1R req. for alterations and additions at permit/plan review
- CF-6R req. for alterations and additions at Final

**2013** – §10-103(a)1, 3, 5

- Doc. Author signature on CF2R and CF3R forms
- Registration req. for ALL forms if HERS testing is required (i.e. LTG, ENV, etc. CF2R's)
- Can exempt alterations and additions < 300 ft<sup>2</sup> from CF1R
- Can exempt alterations and additions < 300 ft<sup>2</sup> from CF2R



### §10-103 and the Plans Examiner

- Bldg. Dept. <u>may</u> not require CF1R for alterations ONLY if HERS Testing is not required:
  - Window/skylight replacement/installations
  - Water heating replacements/installations
  - ≻ Re-roofs
- Bldg. Dept. <u>may</u> not require CF1R for additions < 300 ft<sup>2</sup> ONLY if HERS Testing is not required.
- "Shorthand" versions of CF1R available for alterations and additions



#### CALIFORNIA ENERGY COMMISSION

### §10-103 and the Field Inspector

CERTIFICATE OF INSTALLATION - DATA FIEL	D DEFINITIONS AND CALCULATIONS	CF2R- ENV-02-
Envelope Air Sealing		(Page 4 of 4
DOCUMENTATION AUTHOR'S DECLARATION ST	TATEMENT	
I certify that this Certificate of Installation of	documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signate	ure:
Best Doc. Author	Best Doc. Author	
Documentation Author Company Name:	Date Signed:	
Energy Savers Inc.	1/1/2014 CEAMERS Cartilization Identifi	leation of annihable's
1516 9th Street	N/A	carron (n approach).
City/State/Zip:	Phone:	
Sacramento, CA 95814	(916) 363-4719	
RESPONSIBLE PERSON'S DECLARATION STATEM	MENT	
l certify the following under penalty of peri	iury, under the laws of the State of California:	/
	, , ,	
<ol> <li>The Information provided on this Certificat</li> </ol>	e of installation is true and correct.	
<ol><li>I am eligible under Quision 3 of the Busine</li></ol>	ss and Professions Code in the applicable class	sification to accept responsibility for the
system design, construction, or installation	of features, materials, components, or many	factored devices for the scope of work
identified on this Certificate of Installation,	, and attest to the declarations in this stateme	nt (responsible builder/installer),
otherwise I am an authorized representation	ve of the responsible builder/installer.	N . N
3. The constructed or installed features, mate	erials, components or manufactured devices (t	the installation) identified on this
Certificate of Installation conforms to all as	pplicable codes and regulations, and the instal	lation conforms to the requirements
given on the plans and specifications appro	oved by the enforcement agency, 🔘 🔪 🔪	20.
<ol><li>I reviewed a copy of the Certificate of Com</li></ol>	pliance approved by the enforcement agency	that identifies the specific requirements
for the scope of construction or installation	n identified on this Certificate of Installation, a	nd I have ensured that the requirements
that apply to the construction or installation	n have been met.	
<ol><li>I will ensure that a registered copy of this 0</li></ol>	Certificate of Installation shall be posted, or m	ade 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 Install	ation is required to be included with the docu	mentation the builder provides to the
building owner at occupancy.		
Mr. Insulation Contractor	Mr. Insulation Contractor	ICLFS:
Company Name: Installing Subcontractor or General Contra	ctor or Position With Company (Title):	
Builder/Owner)		
Best Insulation Comp.	Owner	
Address: 123 Insulation Street	010113	
City/State/Zip:	Phone	Date Signed:
Sacramento, CA 95814	(916) 461-8528	1/1/2014
- CO. (%)		

- Verify Doc. Author signature on CF2R and CF3R forms
  - Will be captured in Registry for most docs.
- Verify that LTG, ENV, PLMB, etc. CF2R forms are registered when HERS testing required
- Bldg. Dept. <u>may</u> not require CF2R for alterations and additions < 300 ft<sup>2</sup> ONLY if HERS Testing is not required



# Let's talk about the changes to the Energy Standards – Mandatory Measures



### Which § are the Mandatory Measures?

#### **2008 Standards**

- §110 to §119 (res and nonres)
  - Min. HVAC efficiencies
  - ➢ Pool and Spa
  - Fenestration cert./labeling
  - Lighting Controls
  - Cool Roof cert./labeling
- Section 150 (all res)
- § in TABLE 100-A

#### 2013 Standards

- §110.0 to §110.10
  - Solar Ready
  - §150.0
    - Duct Leakage
    - ➢ Airflow/Fan watt draw
    - ➤ ASHRAE 62.2
  - § in TABLE 100.0-A



#### **Solar Ready**

- New Mandatory measures in §110.10
- Applicable to subdivisions ≥ 10 homes and all low-rise multi-family buildings
- Requirements for:
  - ➢ Solar zone (location and area)
  - Orientation and Shading
  - Interconnection pathways
  - Structural Design Loads
  - Main electrical service panel (single family only)



#### §110.10 and the Plans Examiner

#### • CF1R-SRA-01 form

Ident. if meeting solar zone reqs. or exception

CF1R-SRA-02 form

Solar zone worksheet req. if not exempt

• Verify specs. on plans

\* Forms must be registered if HERS req.

CALIFORNIA ENERGY COMMISSION	
(Page 4 of 3)	
(Page 1 013)	
Is Section 113.10(h) finnaugh 110.10(e), rat Section 113.10(h) finnaugh 110.10(e), Dhanly Auliding with two sources of Rever and all other	
MINIMUM SOLAR ZONE AREA WORKSHEET – NEW C	CONSTRUCTION
CEC-CF1R-SRA-02-E (Revised 06/13)	CALIFORNIA ENERGY COMMISSION
CERTIFICATE OF COMPLIANCE	CF1R-SRA-02
Minimum Solar Zone Area Worksheet – New Construction	(Page 1 of
Project Neme: 2013 CALBO Training Sample	Date Prepared: 01/01/14
Solar Zone Area (requirements in §110.10 (b)1A Exception 3, 4, 5, or 6 and §110.10	0 (b)1B)
This worksheet applies to single family residences located in subdivisions with ten or more sin subdivision man for the residences has been deemed complete but	ngle family residences and where the application for a tentative
reduced solar zone area per Exceptions 3, 4, 5 or 6 to the requirements of Section 110.10(b)1	A. Note that Exceptions 1, 2, and 7 exempt a residence from the solar
ready requirements and are documented on the Certificate of Compliance Form CF1R-SRA-01	I-E. Check the exception being used and fill in the relevant details.
This worksheet applies to low-rise multifamily projects that wish to show compliance with a r	reduced solar zone allowed under Exception 3 of Section 110.10(b)18.
E. Check the exception being used and fill in the relevant details.	and accompletes on the certificate of completion round - 14-14-14-14
	10
General Information	AN A
Building Type:	
Single Family The residence shall comply with the requirements of Standards Section 110	0.10(b) through 110.10(e)
Low-rise Multifamily. The low-rise multifamily building shall comply with the requirement	ts of Standards Section 110.10(b) through 110.10(d)
	CY VV
Step 1: Determine Minimum Solar Zone Area	A
Single Family Residences	
Calculate the minimum solar zone area using one of the four options provided below. Use me	ethod 3 if your roofs and overhangs are shaded.
🛛 Method 1. Reduced Solar Zone Area For Small, Tail Residences 🛛 🔪 🔍	
Does the single family residence have three stories or more?	
Does the single family residences have a total floor area less than or equal to 2000 square (	Test Dives Dives
Please check box to right in answered yes to an questions in this section.	C REDUCED SOLAR ZORE AREA OF 150 IT AFFEI
D Method 2. Reduced Solar zone Area for nomes with a whole house Fan in a wildland-out	Voan internace in climate zones a-14
Is the residence located in climate zones 8-14?	🗆 Yes 🗆 No
Is the residence in a designated Wildland-Urban Interface Fire Area as defined in Title 24. P	- NJ -
	Part 2? 🛛 Ves 🗆 No
Does the residence have a whole house fan?	Pairt 2? 🛛 Yes 🖾 No
Does the residence have a whole house fen? Please check box to right if answered yes to all questions in this section.	Pert 2?
Does the residence have a whole house fen? Please check box to right if answered yes to all geestions in this section.	Per 2? Ves 0 No 0 Ves 0 No 0 REDUCED SOLAR ZONE AREA OF 150 R <sup>2</sup> APPUI
Does the residence have a whole Pouse Tim? Please check host to right if anywored yes to all questions in this section: Method 3. Reduced Solar Zone Area for Homes with United Solar Access (requirements The entrocement agency may require addicated Sociametation in the accessible to the tree of	Par 27
Date the residence have a shore focus find Plase duck box to first if simplicity are to all qualifieds in this section; I Method B. Henders Solve joins are for lenging which limited Solar Access (incomparison the entrogenering agency in any require additional documentation) that sociations now the re- lates the theory of the entropy of the entro	Par 2* Uvs U No Vvs U No Uvs U No In EEducED SOLAR ZORE AREA OF 150 R <sup>2</sup> APPLI In 10.10(b)(14) Suced coller zone area was determined.
Does the residence have a whole locale fact Please check hour on pipel rankwards are all appendixed in this section. C Method Is Andread Solarizon Area and the house with United Solar Xeena (incomensation The enforcement agency may require additional documentation that deciditions how the rec List this Administry (unit to quantify service some receipt for example, sponsors, "C 400 Depit"	Ang 27 U Yes C No C Yes C No C 2014 S No In 250.100 John 2014 Alexa of 150 M <sup>2</sup> Anfres In 250.100 John 2014 Alexa of 150 M <sup>2</sup> Anfres Josef John 2014 Alexa of the set of the set of the set of the set of the Josef John 2014 Alexa of the set of
Del tre andreres tres a service faite fait Plasse chech ker to del faite plasse de plasse de la del	A de
Do the relations have a whole bring hard Plans check has in page 15 minutes of the strength o	Comparing the second seco
Design the maintenant terms and section for the " Preservation that the share for the preservation on the preservation that has not terms The share share the terms of the Eleventeen on the distribution of the share of the s	Page 27         Orea
Det De endersche beru ander Seiner Mert Planst check ben in des für filmergend en te nationale anderstein in ihn anerten. Check of the enderstein des formanies and the enderstein anderstein des formations and the enderstein anderstein an	
Desites the indirects there a short brief Please check has the optic Equivalence on a dispetition for this has been too. The short of the indirect of the indirect one of the dispetition for the dispetition. A short one of the dispetition been to the the end of the dispetition of the dispetition of the dispetition been to the check of the dispetition of the dispetition of the dispetition been to the dispetition of the dispetition of the dispetition of the dispetition been to the dispetition of the dispetition of the dispetition of the dispetition of the dispetition been to the dispetition of the dispetition of the dispe	Page 21         Ores         Des         De
Del te exidence tives a version facilità finit Plans check her in plant l'interpret per tra digettion in this avector. Checked a la biologia digitazione are transmissi fili la biole d'ara d'accor filipariamente tra entrementa giore i me que restricita di constructioni di digettione tora tene es- la divetta di accordante que restrictiva que cana constructioni di accordante di constructione di accordante di constructione di constructione di constructione di accordante di constructione di accordante di constructione di constructione di constructione di accordante di	C THE UNIT OF
Desites the indirects there a short plant of a significant bin is include. These and the bin of the following the on a significant bin is include. The short has been a significant bin include the short bin include the short bin is included by the	C 40 3 4     C 40 3     C 40 3 4     C 40 3     C
Dest the registrone tarear a share prime the " Preserve check has the registropy of	
Desite the indirect twee a short being the? Please check has the desite flavore and the desite that has net the? The short has the top off please and the top of please that has the top of please that the top of please the top of please that the top of please that the top of please that the top of please the top of please the top of please that the top of please that the top of please that the top of please the top of	
Data the residence have a sharp benefit. These set to be to sharp the set of the second set of the set of the set of the second set of th	Bit Institution         Bit Institution         Bit Institution           C REDUCTIO SIGNAR TOWER MALL OF LISE IN AVAILUATION IN THE MALL OF LISE IN AVAILUATION IN A AVAILUATIO IN A AVAILUATION IN A AVAILUATION IN A AVAILUATION IN A AVAILUATION IN
Data the an underset have a how be the transmission of the analysis of the analysis of the full full indexet and an analysis of the analysis o	Big 37         Direction         The Direction           D REDUCED DOLAR DOM AREA OF 15 81 <sup>+</sup> APPL           Loss 200,044         Loss 200,044           Loss 200,044         Loss 200,0444           Loss 200,044
Dest the relations have a short beam first? Preserve the base to define the spectra of the photoe final final has been the Preserve the base to define the spectra of the photoe final final has been the entropy of the spectra of the spectra of the spectra of the spectra the entropy of the spectra of the spectra of the spectra of the spectra photoe spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra of the spectra of the spectra of the spectra of the spectra base of the spectra o	Bit Intelligence         Bit Intelligence           Distribution         Distribution           Distribution         Distribution           Distribution         Distribution           Distribution         Distribution           Distribution         Distribution           Distribution         Bit           Distrit         Bit           Distri
	(Page 1 of 3)     (Santyues 6 60014



## §110.10 and the Field Inspector



\* Forms must be registered if HERS req.

• Verify at Final

- Refer to CF1R-SRA for method of compliance
  - Solar zone (unobstructed)
  - Electrical panel (single family only)
- Verify of solar installed
  - ≻ CF2R-SPV form
  - > CF2R-STH form (H<sub>2</sub>O heating)



#### Insulation

$$2008 - \$150(a), (c), (d)$$

- Ceiling insulation
  - Minimum R-19 required
- Wall Insulation
  - ➢ Minimum R-13 required
- Raised floor insulation
  - ➢ Minimum R-13 Required
- Weighted avg. permitted to meet equivalent U-factor

2013 - \$150.0(a), (c), (d)

- Ceiling insulation
  - Minimum R-30 required
- Wall insulation
  - ➢ Minimum R-13 req. in 2 X 4
  - ➢ Minimum R-19 req. in 2 X 6
- Raised floor insulation
  - Minimum R-19 required



### §150.0(a) and the Plans Examiner

- Still verify R-values on CF1R (Section B)
  - > Opaque Surface Details
  - Must meet or exceed mandatory minimums
- Still verify R-values on building plans
  - Structural/Architectural Plans

LEBUELLA	ATE OF COMPLIAN	Æ									CF1R-NCB-01-
Newly Co	Instructed Building	5									(Page 1 of
Project Na	ame: 2013 CALE	O Training S	Sample							Date Prepar	ed: 01/01/14
- <b>'</b>		ž	· ·								
A. GENE	RAL INFORMATIO	NC									
01 Proje	ect Name:	CALBO Ho	me			02	Date:			2	01/01/14
03 Proje	ect Location:	2013 CALB	O Drive			04	Compliance	Method:		0.	Performance
05 CA Ci	ity:	Sacrament	0			06	<b>Building From</b>	nt Orientati	on (deg or	cardinal):	North
07 Zip C	ode:	95814				08	Number of D	welling Uni	its:	V	1
09 Clima	ate Zone:	12				10	Fuel Type:		6	- 18.1	Natural Gas
11 Build	ling Type:	Single Famil	ly □ Multi	Family		12	Total Conditi	ioned Floor	Area:	110	1,500 ft <sup>2</sup>
13 Proje	ect Type:	X Newly Cons	tructed Buildi	ing - 1 000 6 <sup>2</sup>		14	Slab Area:	<u>v</u>	1.5	1.	1,500 ft <sup>2</sup>
		LI NEW Additio	on greater tha	in 1,000 π				4	- 0-		-
							W'73		34		
B. OPAQ	UE SURFACE DEI	AILS - Frame	ed (Section	150.1(c)1)			L 67 (	1.1.65			
01	02	03	04	05			07	08	09	10	11
						0.1	roposeo	<u> </u>	F 144	Required	<u>'</u>
			Frame	Frame		Continuous	. 0. 1	Appen Refer	CENCE		
T (1D	Annual Line Trees	Frame	Depth	Spacing	Cavity	Insulation	22	Table	C-11	U-Factor fr	om Community
138/10	Assembly Type	Wood	(inches)	24 in	R-Value R-30	R-Value	0.031	121	A20	Package /	a comments
2	Wall	Wood	2 X 6	16 in.	R-19	R-0	0.074	4.3.1	A5	0.065	
3	Raised Floor	Wood	2 X 8	16 in.	R-19	R-0	0.037	4.4.1	A4	0.037	
				AV.		, i i i i i i i i i i i i i i i i i i i					
C. OPAQ	UE SURFACE DET	AILS – Non-fr	ramed (Se	ction 150.1	(c)1)						
01	02	0	13	04	05	06	07	08	09	10	11
[		C.(	$\sim$	1.0	<u> </u>		Proposed			Required	
		1	¥	10		Carting		Appen	dix JA4		
		160	X	Thickness	Insulation	Insulation		Refe	rence	U-Factor fr	am
		Assembly	Materials	(inches)	R-value	R-value	U-Factor	Table	Cell	Package	A Comments
Tag/ID	Assembly Type										
Tag/ID	Assembly Type		64.								



## §150.0(a) and the Field Inspector



- Verify installed R-values:
  - Still verify wall and raised floor insulation at Insulation Stage
  - Still verify ceiling insulation at Final
  - Values must meet or exceed mandatory minimums
- Verify R-values on CF2R-ENV-03-E form
  - Must be registered if HERS testing req.



## **Pipe Insulation**

#### **2008** – §150(j)2, 3

- Insulation req. for:
  - Recirc. sections
  - ➢ First 5 ft. of hot and cold
  - Cooling systems lines; etc.
- Insulation thickness in TABLE 150-A and 150-B
- Outside refrigerant line shall include a vapor retardant facing

```
2013 – §150.0(j)2, 3
```

- Insulation req. for:
  - ➢ All piping ⅔ inch or greater
  - Piping from heating source to the kitchen
- Insulation thickness in TABLE 120.3-A
- Outside refrigerant line shall have Class I or Class II vapor retardant



## §150.0(j)2, 3 and the Plans Examiner

• Still verify dist. type on CF1R (Section L)

➤ Water Heating details

- Piping credits may be HERS verified for more credit
- Verify mandatory note block on plans
  - Can req. TABLE 120.3-A on Plans

	Buildings and A	dditions									(Page 4 of
J. SPACE CONDIT	IONING (SC) S	STEMS – HEA	TING/COOLING	G/DUCTS							
01	02	03	04	05	06	07	06			09	
				<b>R</b> 1 <b>C</b>							
Type	Efficiency	Type	Efficiency	System Type	Location	R-value	Type		Co	mments	
-16-		- 11-2					-77-				
<ul> <li>Central gas furn</li> </ul>	aces have a minin	um efficiency of 7	78% AFUE, heat p	umps 7.7 HSPF. An	y gas heating ap	opliance sole	d in California will m	eet the mini	imum appliance	efficiency sta	ndard and is
<ul> <li>Central cooline:</li> </ul>	umps and mini-sp systems and heat	it neat pumps are pumps have a min	the only type of one of the only type of	electric heating sys of 13 SEER. Any col	tem allowed. sline appliance :	sold in Calife	ornia will meet the r	minimum ap	oliance efficien	cy standard an	d is allowed.
<ul> <li>The prescriptive</li> </ul>	requirements pre	clude the use of b	bypass ducts in as	sociation with zon:	ally controlled s	ystems. A H	ERS Rater shall verif	y that zonall	y controlled sy	stems have no	bypass ducts.
											_
K. VENTILATION	COOLING in Cl	imate Zones 8-	-14 Section 15	0.1(c)12							
		01					Minim	02			
Rec	uired 2 CFM per f	t <sup>2</sup> of Conditioned I	Floor Area				(column	ttic vent rree 1 / 375 CFN	e Area A)		
							Testern				
L. WATER HEATIN	NG (Section 15	0.1(c)8)	tic hat water //	NUM heaters a	nd hudronic	razro hoz	ting				
L. WATER HEATIN	NG (Section 15 s and boilers fo	0.1(c)8) or both domest	tic hot water ([ 0	DHW) heaters a	nd hydronic	space hea	iting.		09	10	11
L. WATER HEATII List water heater 01	NG (Section 15 s and boilers fo 02	0.1(c)8) or both domest	tic hot water (E 0 entral Domestic	OHW) heaters a 05	nd hydronic	space hea 07	iting. 08		09	10	11
L WATER HEATH List water heater 01	VG (Section 15 s and boilers fo 02	0.1(c)8) or both domest	tic hot water (E 0 entral Domestic ht Water Heating	OHW) heaters a 05	nd hydronic 06 Number of Water	space hea 07 Water	ting. 08		09	10	11
L. WATER HEATIL List water heater 01	NG (Section 15 s and boilers fo 02	0.1(c)8) or both domest 03 Ce Hor	tic hot water (E 0 entral Domestic It Water Heating Distribution	OHW) heaters a	nd hydronic 06 Number of Water Heaters	space hea 07 Water Heater	iting. 06		09	10 Standby	11 Back-Up Sola
L. WATER HEATII List water heater 01	VG (Section 15 s and boilers fo 02 Water Heating	0.1(c)8) or both domest	tic hot water ([ 0 entral Domestic at Water Heating Distribution System	DHW) heaters a 05 Dwelling Unit	nd hydronic 06 Number of Water Heaters In	space hea 07 Water Heater Volume	ting. 08 Energy Factor	, AFUE or	09 Rated Input	10 Standby Loss (% or	11 Back-Up Sola Savings
L. WATER HEATI List water heater 01 Water Heater Type Gas Storage	VG (Section 15 s and boilers fo 02 Water Heating System Type DHW	0.1(c)8) pr both domest 03 Ce Hor 5 Fuel Type Gas	tic hot water ([ 0 entral Domestic at Water Heating Distribution System N/A	DHW) heaters a 05 Dwelling Unit Distribution Typ Parallel	nd hydronic 06 Number of Water Heaters In e System	space hea 07 Water Heater Volume (gal)	Energy Factor Thermal Eff	, AFUE or liciency	09 Rated Input (Btuh or kW) 60 000	10 Standby Loss (% or Btu) N/A	11 Back-Up Sola Savings Fraction N/A
L. WATER HEATI List water heater 01 Water Heater Type Gas Storage	VG (Section 15 s and boilers fo 02 Water Heating System Type DHW	0.1(c)8) r both domest 03 Ce Hol Type Gas	tic hot water (E 0 entral Domestic et Water Heating Distribution System N/A	DHW) heaters a 05 Dwelling Unit Distribution Typ Parallel	nd hydronic 06 Number of Water Heaters In e System 1	space hea 07 Water Heater Volume (gal) 45	ting. 08 Energy Factor Thermal Eff 0.62	, AFUE or liciency 2	09 Rated Input (Btuh or kW) 60,000	10 Standby Loss (% or Btu) N/A	11 Back-Up Sola Savings Fraction N/A



### §150.0(j)2, 3 and the Field Inspector

ERT ingl	PICATE OF INSTALLATION – DATA FIELD DEFI Dwelling Unit Hot Water System Distributio	NITIONS AND CALCULATIONS	CF2R-PLB-02-E (Page 1 of 4)
		1	
1	Water Heating System Name:		
2	Distribution type:		
м	ANDATORY MEASURES FOR ALL DOMESTIC	OT WATER DISTRIBUTION SYSTEMS	
01	Equipment shall meet the applicable require	ements of the Appliance Efficiency Regulatio	ns (Section 110.3(b)1).
32	Unfired Storage Tanks are insulated with an 110 3/c/4)	external R-12 or combination of R-16 intern	al and external Insulation. (Section
03	All piping with a nominal diameter of 3/4 in (Section 150.0(ii))	ch (19 millimeter) or larger must be insulate	d with R3.6 or 1" of insulation.
04	All hot water piping insulated from the water 150.0(j))	er heater to the kitchen fixture or appliance	with R3.6 or 1" of insulation (Section
05	The first 5 feet of hot and cold water pipes 150.0(j))	shall be insulated from the storage tank with	R3.6 or 1" of insulation. (Section
06	Piping from the heating source to storage to	ank or between tanks must be insulated (Sec	tion 150.0(j))
07	All piping associated with a domestic hot wa (Section 150.0(j))	ater recirculation system regardless of the pi	pe diameter must be insulated
8	Piping from the heating source to storage ta	ank or between tanks must be insulated (Sec	tion 150.0(j))
9	Piping buried below grade must be installed removal, and replacement of the enclosed	in a water proof and non-crushable casing o pipe and insulation. (Section 150.0(j))	or sleeve that allows for installation,
10	All elbows and tees shall be fully insulated.	(RA4.4.1)	
1	Where insulation is required, no piping shall	be visible due to insulation voids. (RA4.4.1)	
2	All insulation shall fit tightly to the pipe (RA	4.4.1)	
3	The maximum length per dwelling unit of 1	inch diameter	
	150.0(j))	4 4 m ()	
	<ol> <li>A 120V electrical receptacle is within 3 fr</li> </ol>	eet from the v	
14	2. A Category III or IV vent, or a Type B ven	t with straigh	and the second sec
	3. A condensate drain no more than 2 inch	es higher thar	100 M
1	4. A gas supply line with capacity of at least	200,000 Btu/	100 M
e n	esponsible person's signature on this compliance	document affi	A STATE OF
15	FDL-Standard Distribution System (trunk and	branch syste	A STATE I
. <u>13</u> 31	Verification of measures B1 through B10 sh	ow complianc	Contraction of the local division of the loc
hen	sponsible person's signature on this compliance	document affi	10000 - 100 - 100
			Re Asia
). (P	IC)- Pipe Insulation Credit (For trunk and bra	nch Hot Wate	
01	All hot water piping 1" and smaller shall be	insulated to R	Contraction of the
_	snall comply with the insulation requirement	its in Table 12	
<u>e</u> n	esponsible person's signature on this compliance	document affi	
			AND STATISTICS
			- COLORING COLORING

- Still verify installed pipe insulation at Rough Frame:
  - > <sup>3</sup>/<sub>4</sub> inch or greater
  - > Piping to the kitchen, etc.
  - Should be 1 inch thick for most piping

#### • CF2R-PLB-02-E form completed

- PLB-20 forms req. if credits HERS verified
- All forms must be registered when HERS testing is req.



## §150.0(j)2, 3 and the Field Inspector cont.

- Verify insulation for outside refrigerant is:
  - Covered with a Class I or Class II vapor retardant
    - Nonperforated aluminum foil
    - Paint with 0.1 < perm rating ≤ 1.0
  - OR, verify thickness is equivalent to Class I or Class II





## Lighting – High efficacy

#### **2008** – §150(k)1

- Efficacy determined by lamp efficacy
  - ≻ TABLE 150-C
- High efficacy must:
  - Be pin based
  - ➢ Have electronic ballast, etc.
- Low efficacy if:
  - Contains medium screw base socket, line-voltage socket, etc.

2013 - \$150.0(k)1A

- SIMPLIFIED
- Efficacy determined by luminaire type:
  - ➤ TABLE 150.0-A
  - Use TABLE 150.0-B (lamp efficacy) if not listed in TABLE 150.0-A
    - Lumens per watt increased

## Lighting – Bathrooms

#### **2008** – §150(k)10

- Grouped with reqs. for garages, laundry rooms, closets, and utility rooms
- Lighting must be:
  - High efficacy
    - OR
  - Low efficacy lighting allowed if controlled by manual-on occupancy sensor

$$2013 - \$150.0(k)5$$

- Solo reqs.
- A minimum of one high efficacy luminaire must be installed
- All other lighting must be:
  - High efficacy
    - OR
  - Controlled by a vacancy sensor



### Lighting – Garages, Laundry, etc.

#### 2008 - \$150(k)10

- Reqs. for bathrooms, garages, laundry rooms, closets, and utility rooms
- Lighting must be:
  - ➢ High efficacy

#### OR

Low efficacy lighting allowed if controlled by manual-on occupancy sensor

#### 2013 - \$150.0(k)6

- Reqs. for bathrooms separate
- Lighting must be:
  - ➢ High efficacy
    - AND
  - Lighting must be controlled by a vacancy sensor
- NO exceptions

## Lighting – IC/AT Rated

#### **2008** – §150(k)12

- Lighting recessed into insulated ceilings must be:
  - ➢ IC rated (zero clearance)
  - ➤ AT rated (airtight leakage)
  - Sealed with a gasket or caulk between the housing and ceiling

$$2013 - \$150.0(k)8$$

- <u>ALL</u> recessed lighting must be IC and AT rated, and sealed
- Ballast for recessed compact fluorescent lighting must be certified to the CEC to qualify as high efficacy



### §150.0(k) and the Plans Examiner



- Still verify lighting and controls on electrical plans:
  - Verify at least one high efficacy fixture in each bathroom
  - Verify high efficacy fixtures and vacancy controls in garages, laundry rooms, and utility rooms



#### CALIFORNIA ENERGY COMMISSION

### §150.0(k) and the Field Inspector

- Verify high efficacy lighting installed at rough frame:
  - Bathroom (at least one)
  - Garages, laundry/utility rooms
- Verify vacancy sensors installed at Final
  - Bathroom (low efficacy)
  - ➢ Garages, laundry/utility rooms

#### • CF2R-LTG-01-E form req.

Must be registered if HERS testing req.

#### \* All recessed cans must be IC and AT rated





### HVAC – Duct Insulation

#### 2008 - \$150(m)1

- Minimum R-4.2 duct insulation required
- Insulation not required if ducts are enclosed entirely in conditioned space:
  - Directly conditioned
  - Indirectly conditioned (attic with roof insulation; not ceiling insulation)

$$2013 - \$150.0(m)1$$

- Minimum R-6 duct insulation required
- Insulation required for ducts located in indirectly conditioned space
- Insulation not required if:
  - Ducts are enclosed entirely in directly conditioned; AND
  - Duct location verified by a HERS rater



## HVAC – Duct Leakage

**2008** – §151(f)10

- Prescriptive requirement
- Allowed leakage applicable across the board (single family, multi-family, etc.)
  - Less than 6% leakage criteria at Final
  - Less than 4% at Rough-In (no air handler)

2013 - \$150.0(m)11

- Mandatory measure
- Allowed leakage project dependent:
  - Single Family/Townhomes
    - 6% or less w/air handler
    - 4% or less w/out air handler
  - Multifamily
    - 12% or less
    - 6% or less to outside



### HVAC – Airflow/Fan Watt

#### **2008** – §151(f)7A

- Prescriptive requirement
  - Climate Zones 10 through 15
- Required only for split A/Cs and heat pumps
- Minimum airflow of 350 CFM/ton
- Fan watt draw of 0.58 W/CFM or less

#### 2013 - §150.0(m)13

- Mandatory measure
  - ALL Climate Zones
- Required for ducted systems, including split <u>AND</u> packaged A/Cs and heat pumps
- Return duct and grille sizing alternative in:
  - $\succ$  TABLE 150.0-C; and
  - ➤ TABLE 150.0-D



#### §150.0(m) and the Plans Examiner

CERTIFICATE OF CO	MPLIANCE									CE	1R-NCB-01-P
Newly Constructed	Buildings									G .	(Page 4 of 6
Project Name: 201	CALBO Dr	ive Sacrame	nto CA 95814					Date Pre	nared: 1/1/20-	14	(rage 4 of 0
Toject Nume. 20 h	ONLOG DI	ive, outraine	1110, 04 00014					Date Fre	parea. In Inzo	14	
SPACE CONDITI	ONING (SC)	SYSTEMS – HE	ATING/COOLIN	G/DUCTS							
01	0141140 (30)	02		05	05	07	08			00	
10	02	03	04	03	00		00	0	-	09	
Heating Equipment	Heating	Cooling Equipr	ment Cooling	Distribution	Dyct	Duct	Thermostat	$\sim$	~~~~		
Туре	Efficiency	Туре	Efficiency	System Type	Location	R-value	vpe 🗌	1 I	Co	mments	
Furnace	80%	Central Air	Split 13 SEER	Ducted	Attic	6.0	Serback	<b>-</b> - <b>K</b>	1.		
	AFUE	System					<u> </u>		μ		
						ياحص		101			
Central gas furna	ces have a min	mum efficiency	of /8% AFUE, heat p	umps 7.7 HSPF. Any	gas heating ap	opliance sold i	n California will m	eet the min	imum appliance	efficiency star	ndard and is
allowed. Heat pu	mps and mini-:	plit heat pumps	are the only type of	electric heating syst	m allowed.	Q					
Central cooling s	ystems and hea	it pumps have a r	minimum efficiency	of 13 SEER. Any cool	ng appliance :	old in Califor	nia will meet the i	ninimum ap	opliance efficien	cy standard an	d is allowed.
The prescriptive	requirements p	reclude the use o	of bypass ducts in as	sociation with zonal	y controlled s	stems. A HE	G Rater shall veri	y that zonal	lly controlled sy	stems have no	bypass ducts.
					1.5.4		16 A				
C. VENTILATION O	OOLING in (	climate Zones	: 8-14 Section 15	0.1(c)12							
		01			P	655		02			
		01			.0	8	Minimum A	02 ttic Vent Fre	e Area		
Req	uired 2 CFM pe	01 r ft <sup>2</sup> of Conditione	ed Floor Area	2	0	8	Minimum A (columr	02 ttic Vent Fre 1/375 CFI	e Area M)		
Req	uired 2 CFM pe	01 r ft <sup>2</sup> of Conditione	ed Floor Area	3	. <u>.</u> (0	8	Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	e Area M)		
Req	uired 2 CFM pe	01 r ft <sup>2</sup> of Conditione	ed Floor Area		. <u>(</u> e	6) 	Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	ee Area M)		
Req • Homeowners shall	uired 2 CFM pe	01 r ft <sup>2</sup> of Conditione one-page fact she	ed Floor Area	peration of a whole	house fan.	310 310	Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	e Area M)		
Req • Homeowners shall	uired 2 CFM pe	01 r ft <sup>2</sup> of Conditione one-page fact she	ed Floor Area	peration of a whole	house fan.	,1 <u>0</u>	Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	te Area M)		
Require Nomeowners shall	uired 2 CFM pe be provided a o	01 r ft <sup>2</sup> of Conditione one-page fact she 50. 1(c)8)	ed Floor Area	peration of a whole	house fan.	, 1 <sup>1</sup> 0	Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	te Area M)		
Req • Homeowners shall L. WATER HEATIN list water basters	uired 2 CFM pe be provided a o IG (Section 1	01 r ft <sup>2</sup> of Conditione one-page fact she 50.1(c)8) for both dome	ed Floor Area	peration of a whole	house fan.		Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	e Area M)		
Req Homeowners shall WATER HEATIN ist water heaters	uired 2 CFM pe be provided a o G (Section 1 and boilers	01 rft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both dome	ed Floor Area	peration of a whole	house fan. d hydronic :	space heati	Minimum A (column	02 ttic Vent Fre 1 / 375 CFI	te Area M)		
Req • Homeowners shall L. WATER HEATIN List water heaters 01	be provided a of G (Section 1 and boilers 02	01 rft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both dome	ed Floor Area eet on the efficient o estic hot water (I 0	peration of a whole OHW) heaters an 05	house fan. d hydronic : 06	space heati	Minimum A (column ing. 08	02 itic Vent Fre 1 / 375 CFI	e Area M) 09	10	11
Req • Homeowners shall L. WATER HEATIN List water heaters 01	be provided a of G (Section 1 and boilers 02	01 rft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both dome 03	ed Floor Area set on the efficient o estic hot water (I 0	peration of a whole DHW) heaters an 05	d hydronic 06 Number	space heati	Minimum A (column ing. 08	02 itic Vent Fre 1 / 375 CFI	e Area M) 09	10	11
Req • Homeowners shall L. WATER HEATIN List water heaters 01	be provided a of G (Section 1 and boilers 02	01 r ft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both doma 03	ed Floor Area eet on the efficient o estic hot water (I 0 Central Domestic	peration of a whole DHW) heaters an 05	house fan. d hydronic: 06 Number of Water	space heati 07 Water	Minimum A (column ing. 08	02 ttic Vent Fre 1 / 375 CFI	e Area M) 09	10	11
Req Momeowners shall L. WATER HEATIN List water heaters 01	be provided a of G (Section 1 and boilers	01 r ft <sup>2</sup> of Conditione one-page fact she 50.1(c)8) for both dome 03	ed Floor Area eet on the efficient o estic hot water (1 0 Central Domestic Hot Water Heating	peration of a whole DHW) heaters an 05	d hydronic 06 Number of Water Heaters	space heati 07 Water Heater	Minimum A (column ing. 08	02 ttic Vent Fre 1 / 375 CFI	e Area M) 09	10 Standby	11 Back-Up Sol
Req Momeowners shall WATER HEATIN L WATER HEATIN List water heaters 01	be provided a of G (Section 1 and boilers 02 02 02 02 02 02 02 02 02 02 02 02 02	01 r ft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both domn 03 For Both domn	ed Floor Area set on the efficient o estic hot water (1 0 Central Domestic Hot Water Heating Distribution	DHW) heaters an 05 Dwelling Unit	d hydronic 06 Number of Water Heaters In	space heati 07 Water Heater Volume	Minimum A (column ng. Energy Factor	02 ttic Vent Fre 1 / 375 CFI	e Area M) 09 Rated Input	10 Standby Loss (% or	11 Back-Up Sol Savings
Req • Homeowners shall L. WATER HEATIN List water heaters 01 Water Heater Type	be provided a of G (Section 1 and boilers 02 Water Hesti System Typ	01 rft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both dome 03 03 rft <sup>2</sup> of Conditions	ed Floor Area ext on the efficient of estic hot water (I 0 Central Domestic Hot Water Heating Distribution System	Develling Unit	d hydronic 06 Number of Water Heaters In System	space heati 07 Water Heater Volume (cal)	Minimum A (column ing. 08 Energy Factor Thermal Eff	02 ttic Vent Fre 1/375 CFI , AFUE or iciency	Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req Momeowners shall WATER HEATIN ist water heaters 01 Water Heater Type	be provided a of G (Section 1 and boilers 02 Water Heati System Typ	01 r ft <sup>2</sup> of Conditione one-page fact she 50.1(c)8) for both dome 03 Fuel Fuel Type	ed Floor Area eet on the efficient o estic hot water (1 0 Central Domestic Hot Water Heating Distribution System	DHW) heaters an 05 Dwelling Unit Distribution Type	d hydronic Number of Water Heaters In System	space heati 07 Water Heater Volume (gal)	Minimum A (column ing. 06 Energy Factor Thermal Eff	02 ttic Vent Fre 1 / 375 CFI , AFUE or iciency	e Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req • Homeowners shall L. WATER HEATIN List water heaters 01 Water Heater Type	uired 2 CFM pe be provided a u G (Section 1 and boilers 02 Water Heati System Typ	01 rft <sup>2</sup> of Conditions one-page fact she 50.1(c)8) for both dome 03 03 55 Fuel e Type	ed Floor Area estic hot water (l 0 Central Domestic Het Water Heating Distribution System	DHW) heaters an 05 Dwelling Unit Distribution Type	d hydronic: 06 Number of Water Heaters System	space heati 07 Water Heater Volume (gal)	Minimum A (column ing. 06 Energy Factor Thermal Eff	02 ttic Vent Fre 1/375 CFI , AFUE or iciency	09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req Momeowners shall L WATER HEATIN List water heaters 01 Water Heater Type	uired 2 CFM pe be provided a o G (Section 1 and boilers 02 Water Heati System Typ	01 rft <sup>2</sup> of Conditione one-page fact she 50.1(c)8) for both dome 03 03 03 03 03 03 03	ed Floor Area estic hot water (f 0 Central Domestic Hot Water Heating Distribution System	DHW) heaters an 05 Dwelling Unit Distribution Type	d hydronic 06 Number Heaters In System	space heati 07 Water Heater Volume (g=1)	Minimum A (column ing. 06 Energy Factor Thermal Eff	02 ttic Vent Fre 1 / 375 CFI , AFUE or iciency	e Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req • Homeowners shall L WATER HEATIN List water heaters 01 Water Heater Type	uired 2 CFM pe be provided a of G (Section 1 and boilers 02 Water Heati System Typ	01 rft <sup>2</sup> of Conditions one-page fact the 50.1(c)8) for both dome 03 03 rg Fuel rype	ed Floor Area	DHW) heaters an 05 Dwelling Unit Distribution Type	d hydronic: 06 Number of Water Heaters In System	space heati 07 Water Heater Volume (gal)	Minimum Ar (column ng. 08 Energy Factor Thermal Eff	02 ttic Vent Fre 1/375 CFI , AFUE or iciency	te Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req Homeowners shall L WATER HEATIN List water heaters 01 Water Heater Type	be provided a c G (Section 1 and boilers 02 Water Heati System Typ	01 rft <sup>2</sup> of Conditione me-page fact she 50.1(c)8) for both domn 03 03 03 04 04 04 04 04 04 04 04 04 04	ed Floor Area	Deeration of a whole DHW) heaters an O5 Dwelling Unit Distribution Type	d hydronic 0 house fan. 0 Norber Heaters System	space heati 07 Water Heater Volume (gal)	Minimum A (column ng. Energy Factor Thermal Eff	02 tic Vent Fre 1 / 375 CFI , AFUE or iciency	re Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req Momeowners shall WATER HEATIN Ist water heaters 01 Water Heater Type	be provided a G (Section 1 and boilers 02 Water Heati System Typ	01 	ed Floor Area	DHW) heaters an 05 Dwelling Unit Distribution Type	Nouse fan. d hydronic 06 Number of Water Heaters In System	space heati 07 Water Heater Volume (gai)	Minimum A (column ng. 08 Energy Factor Thermal Efi	02 tite Vent Fre 1 / 375 CFI	re Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction
Req Homeowners shall WATER HEATIN ist water heaters 01 Water Heater Type	uired 2 CFM pe be provided a ( G (Section 1 and boilers 02 Water Heati System Typ	01 r ft <sup>2</sup> of Condition one-page fact she 50.1(c)8) for both domm 03 rg Fuel Type	ed Floor Area	Develing Unit	d hydronic of Number of Water In System	space heati 07 Water Heater Volume (gal)	Minimum A (column ng. 06 Energy Factor Thermal Eff	02 tic Vent Fre 1/375 CFI	re Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Soi Savings Fraction
Req Momeowners shall , WATER HEATIN ist water heaters 01 Water Heater Type	uired 2 CFM pe be provided a ( G (Section 1 and boilers 02 Water Heati System Typ	01 yr ft <sup>2</sup> of Conditione ane-page fact she 50.1(c)8) for both domn 03 05 Fuel e Type	ed Floor Area estic hot water (I 0 Central Domestic Het Water Heating Distribution System	DHW) heaters an 05 Dwelling Unit Distribution Type	d hydronic 06 Number of Water Heaters In System	space heati 07 Water Heater Volume (g=1)	Minimum A (column ng. Energy Factor Thermal Eff	02 tic Vent Fre 1 / 375 CFI	re Area M) 09 Rated Input (Btuh or kW)	10 Standby Loss (% or Btu)	11 Back-Up Sol Savings Fraction

• Verify on CF1R form:

- Duct insulation is R-6 or greater (Section J)
- Verify mandatory HERS testing (Section M)
- Can require a mechanical schedule on the building plans



### §150.0(m) and the Field Inspector

- Verify R-6 or greater duct insulation installed
  - ➢ Must match/exceed CF1R
  - ≻ Verify on CF2R-MCH-01-H
- Verify CF2R and CF3R forms for mandatory HERS testing
  - Duct leakage (MCH-20)
  - Airflow/Fan Watt (MCH-22 and MCH-23)





#### **Water Heating**

2008 - \$150(n)

- Reqs. for recirc. loops serving multiple dwelling units
  - ➢ Air release valve
  - Backflow prevention
  - Pump priming
  - Isolation valves
  - $\succ$  Etc.

- Gas/propane water heaters shall have:
  - 120V elect. receptacle within 3 ft
  - Category III or IV vent, or Type B vent w/ straight pipe
  - Condensate drain no higher than 2 in. above water heater base
  - Gas supply line with capacity of at least 200,000 Btu/hr.


## §150.0(n) and the Plans Examiner

#### Mandatory Measures Note Block for Water Heating (Title 24, Part 6)

Water heating systems using gas or propane water heaters to serve individual dwelling units shall include the following components:

- A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions; and
- 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; and
- 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 assistance, and
- A gas supply line with a capacity of at least 200,000 Btu/hr.

#### • Verify mandatory measures on building plans

- ≻ Not identified on CF1R
- Can require a water heating schedule

#### OR

Require mandatory measure note block



### §150.0(n) and the Field Inspector

- Verify at Final
  - ▶ 120V elect. receptacle within 3 ft
  - Category III or IV vent, or Type B vent w/ straight pipe
  - Condensate drain no higher than 2 in. above water heater base
  - ➤ Gas supply line with capacity of at least 200,000 Btu/hr.

\* Listed on CF2R-PLB-02-E form





### Ventilation – ASHRAE 62.2

#### **2008** – §150(o)

- Meet ASHRAE Standard 62.2 Indoor Air Quality
- Local exhaust fans req. in:
  - ➢ Bathrooms 50 cfm
  - ➢ Kitchens − 100 cfm
- Whole building exhaust fan req.
- Prescriptive "sizing" alt. may be used for airflow

2013 - \$150.0(o)

- Whole building exhaust fan airflow must be verified by a HERS Rater
- Use of continuously operating central forced air system air handlers in CFI systems for whole-house ventilation prohibited



### §150.0(o) and the Plans Examiner

Ventilation Schedule	
Local Ventilation Rate Summary	
Kitchens	Bathrooms
Fan Flow = $100 \text{ cfm}$	Fan Flow = <u>50 cfm</u>
Sone Rating = $3 \text{ sone}$	Sone Rating = <u>3 sone</u>
Duct Size (diameter) = <u>4 inches</u>	Duct Size (diameter) = <u>4 inches</u>
Duct Length = $10$ feet	Duct Length = $15$ feet
Whole-Building Ventilation	
Location = <u>Master Bathroom</u>	Whole House Fan Calculation = $Q_{fun} = 0.01A_{floor} + 7.5(N_{br} + 1)$
Fan Flow = <u>70 cfm (continuous)</u>	Where: $\Omega_{\rm r} = fan flow cate (cfm)$
Sone Rating = $1 \text{ sone}$	$Q_{fan} = ran flow face, (cfm)$ $A_{floor} = conditioned floor area, ft2 N_{1} = number of bedrooms: not to be less$
Duct Size (diameter) = $4$ inches	than one
Duct Length = <u>20 feet</u>	$\begin{array}{l} Q_{fan} = 0.01(2,500 \ {\rm ft}) + 7.5(5+1) \\ Q_{fan} = 25 + 7.5(6) \\ Q_{fan} = 25 + 45 \\ Q_{fan} = 70 \ {\rm cfm} \end{array}$

• Still verify specifications for ventilation:

- Local exhaust requirements
  - 50 cfm or greater in ALL bathrooms
  - 100 cfm or greater in ALL kitchens
- ➤ Whole building exhaust fan
  - Based on CFA, # of rooms, etc.
- Can require a ventilation schedule on plans



## §150.0(o) and the Field Inspector

- Still verify exhaust fan housings installed at Rough Frame
  - ➢ In bathrooms and kitchens
- Still verify exhaust fan airflow on motor at Final
- Verify CF2R and CF3R forms for mandatory HERS testing
  - ≻ MCH-27 form req.
  - Inspector may rely on HERS rater results for verification





### Fenestration

- New mandatory measure in §150.0(q)
- Windows and skylights must have a U-factor of 0.58 or less
  - Can calculate weighted average U-factor to meet requirement
- EXCEPTION:

➢ Up to 10 ft<sup>2</sup> of fenestration or 0.5% of the CFA, whichever is greater, may be exempt from the maximum U-factor requirement of 0.58



### §150.0(q) and the Plans Examiner

	TE OF COMPLIAN	ICE										CF1R-NCB-01-
ewly Con:	structed Buildin	gs										(Page 3 of 6
oject Nar	me: 2013 CAL	BO Training Sa	mple							Date Pre	epared: 01/01/20	14
ROOFIN	NG PRODUCTS	(COOL ROOF) (	Section 1	50.1(c)11)								
01	02	03		04	05	06	07	08	0	9	10	11
ass Roof						Proposed			Requi	red	-	
ilb ft <sup>2</sup> or		CRRC Product ID			Aged Sola	r Thermal		Aged Sol	ar The	tmal	0	
reater	Roof Pitch	Number	Prod	uct Type	Reflectanc	e Emittance	SRI	Reflectan	ce Emit	tance	SRJ	Comments
			_				_	- N	<u> </u>	- 10	1 m	
								1.0	1.1	100		
TES: Any mon	area covered by I	wilding integrated	nhotovoltai	c panels and s	olar therm	al nanels are ex	emot from ti	he showe Cou		irements		
Liquid for	alea covered by i	r must comply with	installatio	e paneis anu s o criterio from	vection 11	a paries are ex	emperiori	ie auove cou	oi kooi iequ	rements.		
Liquid ne	eio applieo coating	s must comply with	T INSCANALIO	in critteria in on	Section 11	0.0(1)4.	- X G		.0			
							25		<u> </u>			
FENEST	TRATION/GLAT	INC ADDAG ALL	OWED									
LINES	incarion your	LING AREAS ALL	0									
01	02	ING AREAS ALL	011120	04	- T	05		3		0	6	
01	02 Orientation	03	Allowed	04	r la	05 SHGC	- 6	<u>(</u> )		0 Comr	6	
01 ag/ID	02 Orientation	03 Maximum	Allowed	04 U-fact	or 2	05 SHGC		2	_	0 Comr	6 nents	
01 ag/ID	02 Orientation	03 Maximum	Allowed	04 U-fact		05 SHGC	(0 <sup>4</sup>	20	<u></u>	0 Comr	6 nents	
01 Tag/ID	02 Orientation	03 Maximum	Allowed	04 U-fact	or C	05 SHGC	e	20	<u></u>	0 Comr	6 nents	
01 ag/ID	02 Orientation	03 Maximum /	Allowed	04 U-fact	er S	05 SHGC	0	19e	<u></u>	0 Comr	6 nents	
01 Tag/ID	02 Orientation	Maximum /	Allowed D EFFICIE	04 U-fact	• \$	05 SHGC	e	(9e)	<u></u>	0 Comr	6 nents	
01 Fag/ID	Orientation	Maximum A	Allowed D EFFICIE	04 U-fact	or 205	05 SHGC			09	0 Comr	6 nents	12
01 Fag/ID FENESTF	Orientation	Maximum A	Allowed D EFFICIE	04 U-fact NCIES 04 Orientation		05 SHGC 06 Total	07	06	09	0 Comr	6 nents	12
01 ag/ID FENESTR	02 Orientation	DSED AREAS AND	Allowed D EFFICIE 03 Surface	04 U-fact NCIES 04 Orientation N, S, W, E	or OS # of	05 SHGC 06 Total Proposed	07	06	09	0 Comr 10	6 nents 11 Exterior Shading	12
01 ag/ID ENESTR 01 ag/ID	02 Orientation RATION PROPU	OSED AREAS ALL Maximum / DSED AREAS AN	Allowed D EFFICIE 03 Surface Area	04 U-fact NCIES 04 Orientation N, S, W, E or Roof	or OS # of Panes	05 SHGC 06 Total Proposed Area	07 U-factor	08 Source	09 SHGC	0 Comr 10 Source	6 nents 11 Exterior Shading Device	12 Comments
01 ag/ID 01 01 ag/ID 1	02 Orientation RATION PROPI	COSED AREAS AND COSED AREAS AREAS AND COSED AR	D EFFICIE 03 Surface Area 40	04 U-fact NCIES 04 Orientation N. S. W. E or Roof North	or 05 #of Panes 2	05 SHGC 06 Total Proposed Area 40	07 U-factor 0.31	08 Source	09 SHGC 0.23	0 Comr 10 Source NFRC	6 nents 11 Exterior Shading Device Bug Screen	12 Comments
01 ag/ID FENESTF 01 ag/ID 1 2	02 Orientation RATION PROPU G Fenestra Operable Slidin	OSED AREAS AN Maximum.	Allowed DEFFICIE 03 Surface Area 40 80	04 U-fact NCIES 04 Orientation N, S, W, E or Roof North West	or 05 #of Panes 2	05 SHGC 06 Total Proposed Area 40 80	07 U-factor 0.31 0.31	08 Source NFRC NFRC	09 SHGC 0.23 0.23	0 Comr 10 Source NFRC NFRC	6 11 Exterior Shading Device Bug Screen Bug Screen	12 Comments
01 ag/ID 1 ag/ID 1 2 3	02 Orientation RATION PROP Fenestra Operable Slidin Operable	Maximum     Maximum     Maximum     SSED AREAS AN     SED AREAS AN	Allowed D EFFICIE 03 Surface Area 40 80 50	04 U-fact NCIES 04 Orientation N. S. W. E or Reof North West South	or 05 #of Panes 2 2	05 SHGC 06 Total Proposed Area 40 80 50	07 U-factor 0.31 0.31	08 Source NFRC NFRC	09 5HGC 0.23 0.23 0.23	0 Comr 10 Source NFRC NFRC	6 nents 11 Exterior Shading Device Bug Screen Bug Screen Bug Screen	12 Comments
01 ag/ID FENESTF 01 ag/ID 1 2 3 4	02 Orientation RATION PROP Fenestra Operable Slidin Operable	Maximum     Maximum     Maximum     SoseD AREAS AN     SoseD AREAS     Sose	Allowed DEFFICIE 03 Surface Area 40 80 50 25	04 U-fact NCIES 04 Orientation N, S, W, E or Roof North West South East	05 # of Panes 2 2 2 2	05 SHGC 06 Total Proposed Area 40 80 50 25	07 U-factor 0.31 0.31 0.31	08 Source NFRC NFRC NFRC	09 5HGC 0.23 0.23 0.23 0.23	0 Comr 10 Source NFRC NFRC NFRC	6 11 Exterior Shading Device Bug Screen Bug Screen Bug Screen	12 Comments
01 ag/ID 1 2 3 4	02 Orientation RATION PROPU Fenestra Operable Slidin Operable Operable	Areas Artess Art Areas Artess	Allowed D EFFICIE 03 Surface Area 40 80 50 25 Total Proc	04 U-fact 04 Orientation N, S, W, E or Roof North West South East	or 05 # of Panes 2 2 2 2 2 2 1tion Arres	05 SHGC 06 Total Proposed Area 40 80 50 25	07 U-factor 0.31 0.31 0.31 0.31	08 Source NFRC NFRC NFRC NFRC	09 5HGC 0.23 0.23 0.23 0.23	0 Comr 10 Source NFRC NFRC NFRC NFRC	6 11 Exterior Shading Device Bug Screen Bug Screen Bug Screen Bug Screen	12 Comments
01 ag/ID 1 2 3 4 2	02 Orientation RATION PROP G Fenestra Operable Slidin Operable Operable	Areas Att	Allowed D EFFICIE 03 Surface Area 40 80 50 25 Total Prop	04 U-fact NCIES 04 Orientation N, S, W, E orRoof North West South East South	or 05 # of Panes 2 2 2 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2	05 SHGC 06 Total Proposed Area 40 80 50 25	07 U-factor 0.31 0.31 0.31 0.31	08 Source NFRC NFRC NFRC	09 5HGC 0.23 0.23 0.23 0.23	0 Comr 10 Source NFRC NFRC NFRC	6 nents 11 Exterior Shading Device Bug Screen Bug Screen Bug Screen	12 Comments
01 rag/ID FENESTF 01 1 2 3 4 a. b.	02 Orientation RATION PROP Fenestra Operable Slidin Operable Operable	ArcAss Att     ArcAss Att     Assimum     Maximum     DoseD AREAS AN     2     tion Type     Window     Window     Window     Window	Allowed DEFFICIE 03 Surface Area 40 80 50 25 Total Prop ximum Allo	04 U-fact 04 Orientation N, S, W, E or Roof North West South East ozed Fenestra	or 05 # of Panes 2 2 2 2 tion Area tion Area	05 SHGC 06 Total Proposed Area 40 80 50 25	07 U-factor 0.31 0.31 0.31	08 Source NFRC NFRC NFRC	09 SHGC 0.23 0.23 0.23 0.23	0 Comr 10 Source NFRC NFRC NFRC	6 nents 11 Exterior Shading Device Bug Screen Bug Screen Bug Screen Bug Screen	12 Comments
01 ag/ID FENESTF 01 1 2 3 4 2. b. c.	02 02 Orientation RATION PROPPORT Fenestra Operable Operable Operable	Areas Att     Areas	D EFFICIE 03 Surface Area 40 80 50 25 Total Prop. ximum Allo	04 U-fact Orientation N, S, W, E oriRoof North West South East South East Row a.	or 05 # of Panes 2 2 2 2 2 2 tion Area tion Area \$ Row b.)	05 SHGC 06 Total Proposed Area 40 80 50 25	07 U-factor 0.31 0.31 0.31	08 Source NFRC NFRC NFRC NFRC	09 5HGC 0.23 0.23 0.23 0.23	0 Comr 10 Source NFRC NFRC NFRC	6 nents 11 Exterior Shading Device Bug Screen Bug Screen Bug Screen Bug Screen	12 Comments

- Still verify U-factor values on CF1R (Section I)
  - Cannot exceed 0.58 (unless avg. or exempt)
- Still verify U-factor values on Structural or Architectural plans
  - Can require a window schedule on building plans



### §150.0(q) and the Field Inspector

- Still verify U-factor values at Rough Frame
  - ≻ NFRC label
  - Cannot exceed 0.58 (unless avg. or exempt)
- Verify U-factor on CF2R-ENV-01-E form
  - Must be registered if HERS testing req.



# Let's talk about the changes to the Energy Standards – Prescriptive Measures (New construction)



## **Prescriptive Method – Overall Changes**

#### **2008** – §151(f)

- Component Package C
  - Electric home (no gas avail.)
  - ➢ Reqs. in TABLE 151-B
- Component Package D
  - ➤ Gas home
  - ➢ Reqs. in TABLE 151-C
- Component Package E
  - ➢ Gas home w/metal windows
  - ➢ Reqs. in TABLE 151-D

**2013** – §150.1(c)

- Package C removed
  - Performance Approach req. for electric resistance heating
- Component Package D now A
  - Component Package A is the only prescriptive approach
  - ➢ Reqs. in TABLE 150.1-A
- Package E removed



### Insulation

**2008** – §151(f)1

- Package D requirements:
  - Cavity insulation reqs. only for framed assembly types
    - R-value
  - Below grade wall insulation req. only in Cl. Zn. 13

- Package A requirements:
  - Must meet R-value or Ufactor
  - Cavity and continuous insulation requirements for walls
    - 2 X 6 walls must meet U-factor req.
  - Below grade insulation required in ALL Cl. Zns. (interior or exterior)



### §150.1(c)1 and the Plans Examiner



\* Remember mand. insulation reqs.

• Most applicants use Performance Approach

- Penalized if insulation R-values are less, or if assembly U-factor is more
- May see more continuous insulation, OR trade off
- Still verify insulation values on CF1R (Section B, C, D)
- Still verify values match Structural/Architectural plans



### §150.1(c)1 and the Field Inspector



\* CF2R-ENV-02-E req. for env. sealing

• Verify installed R-values:

- Below grade insulation at Foundation Stage
- Continuous insulation at Rough Frame
- Still verify wall, ceiling, raised floor insulation at Insulation Stage
- Verify R-values on CF2R-ENV-03-E form
  - ≻ Registered if HERS req.



### **Radiant Barrier**

**2008** – §151(f)2

- Required in Climate Zones 2, 4, and 8 through 15
- Specified in "Special Features" section on CF-1R
- Verified on CF-6R-ENV-01 form
- Must be installed under roof deck and on gable ends and walls

$$2013 - \$150.1(c)2$$

- Required in Climate Zones
   2 through 15
- Specified in Section F of the CF1R
- Verified separately on CF2R-ENV-04-E form
  - Including free ventilation area requirements



### §150.1(c)2 and the Plans Examiner

ZRIIFIC	CATE OF CO	MPLIANCE												CF1R-N	CB-01-E
lewly O	onstructed	Buildings												(Pa	ge 2 of 6
roject I	Name: 201	3 CALBO	) Training	Sample							Date P	Prepared: 0	1/01/14		
). OPA	QUE SURF	ACE DET	AILS – Mass	Walls (Sec	tion 150.1(c)1	)									
01	02		03	04	05	(	06		37	08	09	N 1	10	1	11
								Propo	sed	-	<b>.</b> O.	·	Requ		
Walls				Mass	Furring Strip	p Interior Insulation		Exterior	Insulation	Apper	dix JA4 rence	Interior Insulation		Exterior	Insulation
Tag/ID	Grade	Mas	Type	(inches)	(inches)	R-value	U-factor	R-value	U-factor	Table	Cell	R-value	U-factor	R-value	U-factor
				,					0	/	100	0			
									SV.		11-				
SLAB	INSULATI	ON (Table	a 150.1-A)												
	01			02			03	NY.		6		04			
				Proposed		Be	ouired	0							
						Insulation	Insula	tion d	2						
	Floor Type		R-value	: U	factor	R-value	U-fai	tor	2			Comment	5		
						20	5 m	alle							
RADIA	ANT BARR	IER (Section	on 150.1(c)	2			112		0~						
			0	1	<u> </u>	111		· O ·			02				
Ra	adiant Barri	er installed	l selow the	roof deck an	i on all gable en	d walls		-			Comm	ent			
			Ye	25	151	З.	$\sim 2$								
<ul> <li>To</li> </ul>	o meet the p minimum ai adiant Barrie	rescriptive r r space betv r shall be in	equirement, o veen the top s stalled to cov	i minimum fre iurface of the i er all gable en	e ventilation area adiant barrier an d walls and other	of not less ti d roof deckin vertical surfe	han one squa og of not less aces in the at	rre foot of vi than 1.5 inc ttic.	int area for e hes at the ce	ach 300 fi nter of th	f of attic f	loor area wit ter span.	h 30 percent	upper vent.	
• A.		ò	04.												

- Most applicants use Performance Approach
  - Penalized if radiant barrier not modeled when req.
- Still verify if modeled on CF1R (Section F)
- Verify specifications on Structural/Architectural plans (footnote for roof)



### §150.1(c)2 and the Field Inspector

- Still verify installation when modeled at Rough Frame
  - Must cover gable ends and walls
- Verify specifications on CF2R-ENV-04-E
  - Must be registered if HERS testing required.





### Fenestration

**2008** – §151(f)3, 4

- Package D requirements:
  - ▶ 0.40 U-factor in all Cl. Zns.
  - 0.40/0.35 SHGC in Cl. Zns.
     2 and 4 through 15
  - ➤ 20% maximum glazing area
  - 5% west facing glazing area in Cl. Zns. 2, 4, and 6 through 15

**2013** – §150.1(c)3, 4

- Package A requirements:
  - ▶ 0.32 U-factor in all Cl. Zns.
  - 0.25 SHGC in Cl. Zns. 2, 4, and 6 through 16
  - 5% west facing glazing area in Cl. Zns. 2, 4, and 6 through 16



### §150.1(c)3, 4 and the Plans Examiner

ewly Cons oject Nar	tructed Buildin										CF1R-NCB-01-E
roject Nar		gs									(Page 3 of 6)
	ne: 2013 CAL	BO Training Sa	mple						Date Pre	pared: 01/01/20	014
. ROOFIN	IG PRODUCTS	(COOL ROOF) (S	ection 150.1(	:)11)							
01	02	03	04	05	06	07	06	0		10	11
Mass Roof					Proposed			Requir	ed	-	
25 lb ft <sup>2</sup> or	D	CRRC Product ID		Aged So	lar Thermal	601	Aged Solar	Ther	mail	0	0
greater	Roof Pitch	Number	Product Typ	xe Reflectar	ice Emittance	SRJ	Reflectance	Emitt	ance	SRI .	Comments
				_	_	-	1	1		÷.	
OTES:						-	- 0.		24		
Any roof	area covered by b	uilding integrated p	hotovoltaic pane	is and solar them	nal panels are ex	empt from t	he above Cool	Roof requi	rements.		
Liquid fie	ld applied coating	s must comply with	installation crite	ria from section 1	10.8(i)4.	2		20			
						24		<u> </u>			
H. FENEST	RATION/GLAZ	ING AREAS ALL	OWED			100					
01	03				<u></u>		100				
	02	03		04	05					•	
Tag/ID	Orientation	03 Maximum A	Allowed	04 U-factor	05 SHGC	~	<u> </u>		Comr	nents	
Tag/ID	Orientation	03 Maximum A	Allowed	04 U-factor	SHGC	e <sup>é</sup>			Comr	nents	
Tag/ID	Orientation	03 Maximum A	Allowed	04 U-factor	05 SHGC	e <sup>d</sup>	201		Com	nents	
Tag/ID	Orientation	03 Maximum A	Allowed	04 U-factor	05 SHGC	e <sup>f</sup>	de'		Comr	o nents	
Tag/ID	Orientation	03 Maximum A	Allowed	04 U-factor	05 SHGC	e <sup>¢</sup>	, de'		Comr	o nents	
Tag/ID	Orientation	03 Maximum A	Allowed	04 U-factor	05 SHGC 06		60	09	Comr	nents	12
FENESTF	Orientation	03 Maximum A	D EFFICIENCIE	04 U-factor S 04 05 Itation	05 SHGC 06 Total	07	<u>.</u>	09	Comr 10	nents 11 Exterior	12
FENESTF	Orientation	03 Maximum A	D EFFICIENCIE	04 U-factor S D4 05 Itation W, E # of	05 SHGC 06 Total Proposed	07	<u>.</u>	09	Comr 10	nents 11 Exterior Shading	12
FENESTR 01 Tag/ID	Orientation RATION PROPO	03 Maximum A DSED AREAS AN 12 tion Type	D EFFICIENCIE D Surface N, S Area or	04 U-factor S 04 05 ttation ,W, E # of Roof Panes	05 SHGC 06 Total Proposed Area	07 U-factor	- 80 Source	09 SHGC	Comr 10 Source	nents 11 Exterior Shading Device	12 Comments
FENESTR 01 Tag/ID 1	Orientation CATION PROP() C Fenestra Operable	03 Maximum / DSED AREAS AN 12 tion Type	D EFFICIENCIE Surface N. S. Area or 40 No	04 U-factor S N4 05 Intation W, E # of Reof Panes Drth 2	05 SHGC 06 Total Proposed Area 40	07 U-factor 0.31	- 00 Source NFRC	09 SHGC 0.23	Comr 10 Source NFRC	11 Exterior Shading Device Bug Screen	12 Comments
FENESTR 01 Tag/ID 1 2	Orientation ATION PROPO Fenestra Operable Slidin	03 Maximum A DSED AREAS AN 12 tion Type 2 Window g Door	DEFFICIENCIE Surface N.S. Area or 40 No 80 W	04 U-factor S O4 05 Itation W, E, # of Read Panes Drth 2 iest 2	05 SHGC 06 Total Proposed Area 40 80	07 U-factor 0.31 0.31	Source NFRC NFRC	09 SHGC 0.23 0.23	10 Source NFRC	11 Exterior Shading Device Bug Screen Bug Screen	12 Comments
. FENESTR 01 Tag/ID 1 2 3	Orientation RATION PROPO C Fenestra Operable Sliding Operable	03 Maximum / DSED AREAS AN 12 tion Type 9 Window 9 Door 9 Window	DEFFICIENCIE Surface N. S. Area or 40 No. 80 W 50 Sc	04 U-factor S M4 05 Intation W, E # of Reof Panes Sorth 2 Lest 2 wuth 2	05 SHGC 06 Total Proposed Area 40 80 50	07 U-factor 0.31 0.31 0.31	80 Source NFRC NFRC NFRC	09 5HGC 0.23 0.23 0.23	10 Source NFRC NFRC NFRC	11 Exterior Shading Device Bug Screen Bug Screen Bug Screen	12 Comments
. FENESTR 01 Tag/ID 1 2 3 4	Orientation Orientation Contraction Contraction Coperable Operable Operable	03 Maximum / DSED AREAS AN 12 tion Type tion Type Window Window	Allowed DEFFICIENCIE 05 Surface N.S. Area or 40 NC 80 W 80 S0 S0 S0 S0	04 U-factor S Od 05 Itation # of Reof Panes Forth 2 iest 2 ast 2	05 SHGC 06 Total Proposed Area 40 80 50 25	07 U-factor 0.31 0.31 0.31 0.31	Source NFRC NFRC NFRC NFRC	09 SHGC 0.23 0.23 0.23 0.23	10 Source NFRC NFRC NFRC NFRC	11 Exterior Shading Device Bug Screen Bug Screen Bug Screen	12 Comments
Tag/ID . FENESTR 01 Tag/ID 1 2 3 4 2.	Orientation Orientation RATION PROPO C Fenestra Operable Operable Operable	03 Maximum / DSED AREAS AN 2 tion Type Window Window Window	Allowed DEFFICIENCIE 03 0 Orier 0 Orier 0 Area 0 No 80 No 50 Sc 25 E Total Proposed F	04 U-factor S S OD OS Tataion Reof Panes Of Panes Of Panes Of Panes Panes Of Panes Of Panes Of Panes Of Panes OS OS OS OS OS OS OS OS OS OS OS OS OS	05 SHGC 06 Total Proposed Area 40 80 50 25 195	07 U-factor 0.31 0.31 0.31 0.31	Source NFRC NFRC NFRC NFRC	09 SHGC 0.23 0.23 0.23 0.23	10 Source NFRC NFRC NFRC	11 Exterior Shading Device Bug Screen Bug Screen Bug Screen Bug Screen	12 Comments
Tag/ID . FENESTR 01 Tag/ID 1 2 3 4 a. b.	Orientation Orientation RATION PROP( C Fenestra Operable Slidin Operable Operable	03 Maximum / DSED AREAS AN 12 tion Type 2 Window 2 Window 2 Window 2 Window	Allowed DEFFICIENCIE B Surface N. 5 Area Orier Surface N. 5 Area	04 U-factor S 04 05 mation WE # of Read Panes Torth 2 vest 2 vuth 2 ast 2 ast 2 ast 2 energation Area	05 SHGC 06 Total Proposed Area 40 80 50 25 195 300	07 U-factor 0.31 0.31 0.31	Source NFRC NFRC NFRC NFRC NFRC	09 SHGC 0.23 0.23 0.23 0.23	10 Source NFRC NFRC NFRC	11 Exterior Shading Device Bug Screen Bug Screen Bug Screen Bug Screen	12 Comments
Tag/ID . FENESTF 01 Tag/ID 1 2 3 4 a. b. c.	Orientation CATION PROPO CATION PROPO CO Fenestra Operable Operable	03 Maximum / DSED AREAS AN 22 tion Type Window Window Window Ma	DEFFICIENCIE Surface N 5 Area or 40 Nc 80 W 50 Sc 25 E Tony Proposed F Tony Proposed F	04 U-factor 5 05 05 05 05 05 05 05 05 05 05 05 05 0	05 SHGC 06 Total Proposed Area 40 80 50 25 195 195 300	07 0.31 0.31 0.31 0.31	Source NFRC NFRC NFRC NFRC NFRC	09 SHGC 0.23 0.23 0.23 0.23	10 Source NFRC NFRC NFRC	11 Exterior Shading Device Bug Screen Bug Screen Bug Screen	12 Comments

\* Remember mand. 0.58 U-factor

- Most applicants use Performance Approach
  - Penalized if window efficiencies or areas are higher
- Still verify efficiencies and areas on CF1R (Section I)
- Still verify values match
   Structure/Architecture plans
  - Can require window schedule on plans



## §150.1(c)3, 4 and the Field Inspector

- Still verify efficiencies and areas at Rough Frame
  - ➢ NFRC label for efficiency
  - Both eff. and area must match the CF1R
- May verify eff. and area on CF2R-ENV-01-E form
  - Must be registered if HERS testing req.





### HVAC – Refrigerant Charge

#### **2008** – §151(f)7

- Prescriptive requirement
- Req. for only for ducted split central A/C and heat pump systems
  - ➢ Min. airflow of 300 cfm/ton
  - CID alternative
- Req. in Cl. Zns. 2, and 8 through 15

#### **2013** – §150.1(c)7

- Req. for air cooled A/Cs and air source heat pumps:
  - Ducted split systems
  - Ducted packaged systems
  - Mini splits systems
- Exception for packaged systems if manuf. verified charge (CF2R req.)
- Winter Setup test method



### §150.0(c)7 and the Plans Examiner

- Most applicants use Performance Approach
  - Prescriptive; not Mandatory
  - Penalized if not modeled when req.
- Still verify if modeled on CF1R (Section M)
- Can require a mechanical schedule on the building plans





### §150.0(c)7 and the Field Inspector

CERT	TIFICATE OF VERIFICATION			CF3R-MCH-			
Refri	igerant Charge Verification			(Page 1 of			
Project	Neme: 2013 CALBO Training Sample	Enforcement Agency: Looal Jurisdiction	Permit Numbe	imber: NC-010113			
Dwellin	ag Address: 2013 CALBO Drive	City Sacramento	21p Code 968	14			
A. Sy HERS	ystem Information Rater to field-verify all system information, discrepanci	ies to be noted by overwriting entry.					
01	System Identification or Name			HVAC 1			
02	System Location or Area Served			Zone 1			
03	Condenser (or package unit) make or brand			Cool Manuf			
04	Condenser (or package unit) model number			CU-2013421			
05	Nominal Cooling Capacity (tons) of Condenser		0.	2.5			
06	Condenser (or package unit) serial number			4568721			
07	Refrigerant Type		A.Y	R-22			
08	Other Refrigerant Type (if applicable)	. 0		N/A			
09	Project Type	die	16.	Completely New			
Charge Indicator Display (CID) Status (Note: Even systems with a CID must have refrigerant charge weified by installer)							
11	Is the system of a type that the minimum airflow can or RA3.2.2.7)?	be verified using an approved measurement pr	ocedure (RA3.3	Yes			
12	Is the system of a type that approved refrigerant char the refrigerant charge verification requirements whe	rge verification procedures can be used to verif n temperatures are ≥ 55°F (RA3.2.2, or RA1)?	y compliance with	Yes			
13	Date of HERS Rater Refrigerant Charge Verification for	er this system		01/01/14			
14	Refrigerant charge verification method used by instal			Superheat			
15	Person who performed the Refrigerant Charge Verific	cation reported on the Certificate of Installation	e	HVAC Guys			
16	HERS Verification Compliance Requirement Status	Incl. ONIC		System qualifies for Group Sampling			
17	Refrigerant charge verification method used by HERS	Rater.		Superheat			
Stan	dard Charge Varification Procedure - (530-MCH-25a - 5	unatheat Mathod					
B. M Supe	Antering Device Verification – HERS Rater is required to rheat Method can only be used on systems that do not h	visually field verify all information from CF2R					
01	Refrigerant metering device			Fixed orifice			
02	Superheat Method applicability status			Superheat Method applicable to system			
C. In	strument Calibration - HERS Raters are required to cali	brate their diagnostic tools.					
Proce	edures for instrument calibration are given in Reference	Residential Appendix RA3.2.2 and RA3.2.2.2					
01	Date of Digital Refrigerant Gauge Calibration			01/01/14			
02	Date of Digital Thermocouple Calibration			01/01/14			
03	Digital Refrigerant Gauge Calibration Status			Current			
04	Digital Thermocouple Calibration Status			Current			

- Verify CF2R and CF3R forms when modeled on CF1R
  - Standard measurement (MCH-25a/b)
  - ➢ Weigh-in (MCH-25c)
  - ➢ Winter set up (MCH-25e)
  - Packaged units (MCH-25f)
    - CF2R required only



### **Cool Roofs**

### 2008 – §151(f)12

- Package D requirements:
  - ➤ Steep-sloped roofs < 5 lb/ft<sup>2</sup>:
    - 0.20 SR and 0.75 TE, or 16 SRI in Cl. Zns. 10 – 15
  - ➤ Steep-sloped roofs  $\geq$  5 lb/ft<sup>2</sup>:
    - 0.15 SR and 0.75 TE, or 10 SRI in ALL Cl. Zns.
  - ➤ Low-sloped roofs:
    - 0.55 SR and 0.75 TE, or 64
       SRI in Cl. Zns. 13 and 15

**2013** – §150.1(c)11

- Package A requirements:
  - Density criteria removed
  - Steep-sloped roofs:
    - 0.20 SR and 0.75 TE, or 16 SRI in Cl. Zns. 10 - 15
  - Low-sloped roofs:
    - 0.63 SR and 0.75 TE, or 75 SRI in Cl. Zns. 13 and 15



### §150.1(c)11 and the Plans Examiner

- Most applicant use Performance Approach
  - Penalized if cool roof not modeled, or if values are lower, when req.
- Still verify efficiencies if modeled on CF1R (Section G)
- Verify specifications on Structural/Architectural plans (footnote for roof)



### §150.1(c)11 and the Field Inspector



- Still verify values when modeled at Rough Frame
  - CRRC product label
  - Must meet or exceed values on CF1R
- Verify specifications on CF2R
  - Form under development
  - Must be registered if HERS testing req.



### **Ventilation Cooling**

- New Prescriptive requirements in §150.1(c)12
- Requires one or more whole house fan (WHF)
  - Minimum 2 CFM/ft<sup>2</sup> of cond. floor area required for total WHF airflow
  - At least 1 sq. foot of attic vent free area for each 375 CFM of WHF airflow
- Required in Climate Zones 8 through 14
- WHF must be certified to the CEC



### §150.1(c)12 and the Plans Examiner

Newly Constructed Project Name: 20	Desildines								CF	1R-NCB-01-E
roject Name: 20	apolicings									(Page 4 of 6)
	13 CALBO Tr	aining Sample					Date	Prepared: 01/01	/14	
	,									
SPACE CONDIT	IONING (SC) S	SYSTEMS – HEATI	ING/COOLING	G/DUCTS						
01	02	03	04	05	06	07	08	60	09	
				<b>B</b> ( ) ( ) ( )				~		
Type	Efficiency	Cooling Equipment	: Cooling	Distribution	Duct	Buct	Type		mmentr	
1995	Entercity	- The	childreney	System type	cocation	it value		100	animenes	
			+					(V)		
Central gas furn	aces have a mini	mum efficiency of 78	% AFUE, heat pu	mps 7.7 HSPF. Any a	as heating ap	oliance sold i	n California will meet the	minimum applianc	e efficiency sta	ndard and is
Homeowners shal	1, 1, I be provided a o	500 CFM 500 CFM	n the efficient op	peration of a whole h	ouse fan.		4 ft <sup>2</sup> 4 ft <sup>2</sup>	$\geq$		
. WATER HEATI	NG (Section 1 s and boilers f	50.1(c)8) for both domestic	c hot water (C	)HW) heaters and	hydronic :	space heati	ng.			
ist water heater				No. of the second se	6	07	06	09	10	11
ist water heater 01	02	.03	0	05	00					
01	02 Water Heatin	03 Ceni Hot V	0 tral Domestic Water Heating listribution	05 Dwelling Unit	Number of Water Heaters In	Water Heater Volume	Energy Factor, AFUE	or Rated Input	Standby Loss (% or	Back-Up Solar Savings
01 Vater Heater Type	02 Water Heatin System Type	03 Ceni Hot I Type	0 tral Domestic Water Heating listribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
01 Nater Heater Type	02 Water Heatin System Type	03 Cent Hot I Type	0 tral Domestic Water Heating listribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
ot water heater 01 Vater Heater Type	02 Water Heatin System Type	03 Cen Hiot J Type	0 tral Domestic Water Heating listribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
01 01 Water Heater Type	02 Water Heatin System Type	03 Cent Hot Type	0 tral Domestic Water Heating Vistribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
01 01 Water Heater Type	02 Water Heatin System Type	03 Ceni Hot Type	0 tral Domestic Water Heating Nistribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
01 01 Water Heater Type	02 Water Heatin System Type	03 Ceni Kiti Type	0 tral Domestic Water Heating Nistribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Sola Savings Fraction
st water heater 01 Vater Heater Type	02 Water Heatin System Type	03 Cent Hot Type	0 tral Domestic Water Heating Netribution System	05 Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE Thermal Efficiency	or Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Sola Savings Fraction

- Most applicants use Performance Approach
  - Penalized if WHF not modeled when req.
- If modeled, verify airflow + vent area on CF1R (Section K)
  - Values must meet or exceed min. requirements
- Can require ventilation cooling schedule on plans



### §150.1(c)12 and the Field Inspector

- If modeled on CF1R, verify at Rough Frame
  - WHF installation and airflow
  - ≻ Attic vent area
- Verify specifications on CF2R-MCH-02
  - Must be registered if HERS testing req.





# Let's talk about the changes to the Energy Standards – Additions



### **Additions – Prescriptive**

#### 2008 - \$152(a)

- Meet Package D reqs.
  - Some envelope alternatives and exceptions for:
    - Additions < 100 ft<sup>2</sup>
    - Additions < 1,000 ft<sup>2</sup>
  - ➤ Table 8-2 in Manual
- CF-1R or CF-1R-ADD form req. at Plan Review
- CF-6Rs req. at Final

2013 - \$150.2(a)

- Meet Package A reqs.
  - > Env. alternatives/exception for:
    - Additions  $\leq 400 \text{ ft}^2$
    - Additions > 400 ft<sup>2</sup> and  $\leq$  700 ft<sup>2</sup>
    - Additions > 700 ft<sup>2</sup>
  - $\succ$  Tables 9-3A C in Manual
- Can exempt additions < 300 ft<sup>2</sup> from CF1R and CF2R forms if HERS not req.



### §150.2(a) and the Plans Examiner

# • Plan review like new construction:

- Verify values on CF1R or CF1R-ADD meet prescriptive reqs.
  - Use Tables 9-3A C as reference
  - Must be registered if HERS testing req.
- Verify values specified on respective section of building plans

Aditions 1,000 ft <sup>2</sup> or less dditions 1,000 ft <sup>2</sup> or less set home roject Name: roject Name: project Location: 1 Güry: p Code: imste Zone:						Date:	Prepared:		CF1R-ADD-01-E (Page 1 of 7)
ditions 1,000 ft <sup>2</sup> or less entime GENERAL INFORMATION siject Name: ject Loation: Criy: Code: mate Zone:						Date:	Prepared:		(Page 1 of 7)
GENERAL INFORMATION Gent Name: get Name: get Name: Get Content City: Code: mate Zone:						Date:	Prepared:		
GENERAL INFORMATION ject Name: ject Location: Gry: Code: mate Zone:						Date:	~	1	
oject Name: oject Location: City: Code: mate Zone:						Date:	<u> </u>		
oject Location: City: Code: mate Zone:									
City: Code: mate Zone:						Complian	ce Method:		
Code: mate Zone:						<b>Building</b>	ront Orientation (d	eg):	
mate Zone:						Number	of Dwelling Units:	<u>.</u>	
					~ ~	Fuel Type			
ilding Type Single Family Multi Family						Total Con	ditioned Floor Area	(Addition):	
nject Type: Addition □ ≤ 300 □ > 300 to	< 400 □ > 400	to <u> &lt;</u> 700 □	> 700 to < 1000	0	201	Slab Area	· · · · ·		
						$\overline{\lambda}$	÷		
OPAQUE SURFACE DETAILS – Framed (Sec	tion 150.2(a))								
01 02 03 04	05		06 🐁	07	08		9 10		11
				Proposed	xC	P	Require	d	
Frame	Frame		Continuou	s	Appendia	JA4 Refer	ence		
Depth	Spacing	Cavity	Insulation	1.8					<b>.</b> .
g/ID Assembly Type Frame Type (inches	(inches)	K-Value	R-value	ractor	Table		u-racto	r	Comments
		- C		100	10	-			
		12	1800	÷.,	0			•	
OPAQUE SURFACE DETAILS - Non-framed	(Section 150.	1(c)1)							
01 02 03	04	05	06	07	08	09	10		11
	A.0.	7 1	Pr	oposed			Required		
	N	20		)	Append	ix JA4			
	Transfer	Core	Continuous		Refer	ence	II Frates from		
e/ID Assembly Type Assembly Materials	Assembly Materials (inches) R-value R-		R-value	U-Factor Table		Cell	Package A	6	Comments
	20		4						
	10	N.							

\* Additions  $< 300 \, ft^2$  exempt if no HERS req.



### §150.2(a) and the Field Inspector



\* Additions  $< 300 \, ft^2$  exempt if no HERS req.

Inspect like new construction:

- Verify installed efficiencies match CF1R or CF1R-ADD during respective stage of construction
- Verify req. CF2R and CF3R forms (HERS)
  - All must be registered if HERS testing req.



### **Additions – Performance**

#### **2008** – §152(b)2

- Standard Budget based on Prescriptive requirements
- For E + A + A projects, Standard Budget may be based on existing conditions
  - Compliance credit for upgrading existing components
  - Credit for alteration upgrades may be traded off between addition

2013 - \$150.2(b)2

- For E + A + A projects, Standard Budget may be based on existing conditions ONLY when verified by a HERS Rater
  - Compliance credit for upgrading existing components that are HERS verified
- Standard Budget for altered components outlined in TABLE 150.2-B



### §150.2(b)2 and the Plans Examiner

- Most applicants will use Performance approach
  - Still verify if building "Complies" on CF1R
- For E + A + A projects:
  - Verify if HERS testing is modeled for existing conditions on CF1R (Section M)
  - If modeled, CF3R-EXC-20 required at plan review



\* HERS testing req. before permit issued

# Let's talk about the changes to the Energy Standards – Alterations (Prescriptive Approach)



### Fenestration

#### **2008** – §152(b)1A, B

- Package D requirements:
  - Replacement fen. must meet U-Factor and SHGC reqs.
  - Added fen. must meet efficiency and area reqs.
    - Exception: when fen. added ≤ 50 ft<sup>2</sup>
- CF-1R-ALT required
- CF-6R-ENV-01 required

### 2013 - \$150.2(b)1A, B

- Package A requirements:
  - Replacement fen. must meet efficiency reqs.
    - Exceptions for vertical glazing and skylights
  - Added fen. must meet efficiency and area reqs.
    - Exceptions for vertical glazing and skylights
- Can exempt from CF1R and CF2R forms


## §150.2(b)1A, B and the Permit Process



\* Can exempt from CF1R and CF2R

- Should req. CF1R-ALT-01 at permit (Sections D, E)
  - Verify efficiency values and glazing area meet reqs.
  - ➢ May req. at Final
- Verify at Final
  - Replaced/added fen. meets values/areas on CF1R-ALT
  - ≻ CF2R-ENV-01 form



## New space cond. system

**2008** – §152(b)1C

- Min. R-4.2 duct insulation
- Duct leakage req. in Cl. Zns.
  2 and 9 16
- Airflow/FWD req. in Cl.
   Zns. 10 15
- RC req. in Cl. Zns. 2 and 8 –
   15 for split systems
- Forms must be registered

**2013** – §150.2(b)1C

- Min. R-6.0 duct insulation
- Duct leakage req. in ALL Cl. Zns.
- Airflow/FWD req. in ALL Cl. Zns.
- RC req. in same Cl. Zns for split and packaged A/Cs and heat pumps, and mini-split systems



# §150.2(b)1C and the Permit Process

CF1R-ALT-02 form

≻ Can req. at Final

HERS tests/forms specified

• Verify at Final:

≻ RC (MCH-25)

- ➢ Duct insulation ≥ R-6.0 (MCH-1)
- ➢ Duct leakage (MCH-20)
- ≻ AF/FWD (MCH 22 and 23)





## **Duct alterations**

**2008** – §152(b)1D

- When more than 40 linear feet added/replaced in uncond. space:
  - ➢ Min. R-4.2 duct insulation
  - Duct leakage req. in Cl. Zns. 2 and 9 – 16
    - 6% for new duct systems
    - Less than 15%
    - Less than 10% to outside
    - Reduce leakage by 60%
    - Smoke test

## **2013** – §150.2(b)1D

- When more than 40 linear feet added/replaced in uncond. or indirectly conditioned space:
  - ➢ Min. R-6.0 duct insulation
  - Duct leakage req. in ALL Cl. Zns.
    - 6% leakage req. when more than 75% of ducting replaced
    - Reduce leakage by 60% option removed



# §150.2(b)1D and the Permit Process



- CF1R-ALT-02 form
  - ≻ Can req. at Final
  - Duct leakage specified
- Verify at Final
  - → Duct insulation  $\ge$  R-6.0
    - Uncond. and indirectly cond. space
  - ➢ Duct Leakage (MCH-20)
    - ALL Climate Zones



## **HVAC Changeouts**

**2008** – §152(b)1E, F

- Duct leakage req. in Cl. Zns.
  2 and 9 16
  - $\succ$  Less than 15%
  - ➤ Less than 10% to outside
  - ➤ Reduce leakage by 60%
  - $\succ$  Smoke test
- RC req. in Cl. Zns. 2 and 8 –
   15 for split systems

2013 - §150.2(b)1E, F

- Duct leakage req. in ALL Cl. Zns.
  - Reduce leakage by 60% option removed
- RC req. in same Cl. Zns. for:
  - Split A/Cs and heat pumps
  - Packaged A/C and heat pumps
  - Mini-split systems



# §150.2(b)1E, F and the Permit Process

### • CF1R-ALT-02 form

≻ Can req. at Final

- HERS tests/forms specified
- Verify at Final:

➢ Duct leakage (MCH-20)
➢ RC (MCH-25)
➢ AF (MCH-23)





## **Re-roofs**

### **2008** – §152(b)1H

- When more than 50% or 1,000 ft<sup>2</sup> replaced (whichever is less), must be cool roof
  - Steep-sloped roofs: same reqs. as prescriptive (new const.)
    - Numerous alternatives
  - Low-sloped roofs: same reqs. as prescriptive (new const.)
    - Exempt if no ducts in attic

### 2013 - \$150.2(b)1H

- When more than 50% replaced, must be cool roof
  - Steep-sloped roofs: same reqs. as prescriptive (new const.)
    - Alternatives revised/added
  - Low-sloped roofs: same reqs. as prescriptive (new const.)
    - New roof deck alternative in TABLE 150.2-A



## §150.2(b)1H and the Permit Process



\* Can exempt from CF1R and CF2R

- Should req. CF1R-ALT-01 at permit (Section C)
  - Verify SR and TE values meet reqs.
  - ➢ May req. at Final

#### • Verify at Final

- Installed cool roof values meet or exceed CF1R-ALT
- Verify CF2R (currently under development)



## For more information

• 2013 Standards Website at:

http://www.energy.ca.gov/title24/2013standards/index.html

• CEC training (ICC Chapters)

Contact Energy Standards Hotline at: Title24@energy.ca.gov

### • Utility training

http://www.energy.ca.gov/title24/training/

• HERS training (Building Departments)

http://www.energy.ca.gov/HERS/providers.html

#### • Ace Web Toolkit

http://energydesignresources.com/resources/software-tools/ace-tools.aspx