



2013 Residential Energy Standards Overview

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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)
 - ✓ Identify what to look for on the compliance forms and building plans
 - The field inspection process (Field Inspectors)
 - ✓ 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 chat box anytime
 - List of Q and A from webinar will be posted online



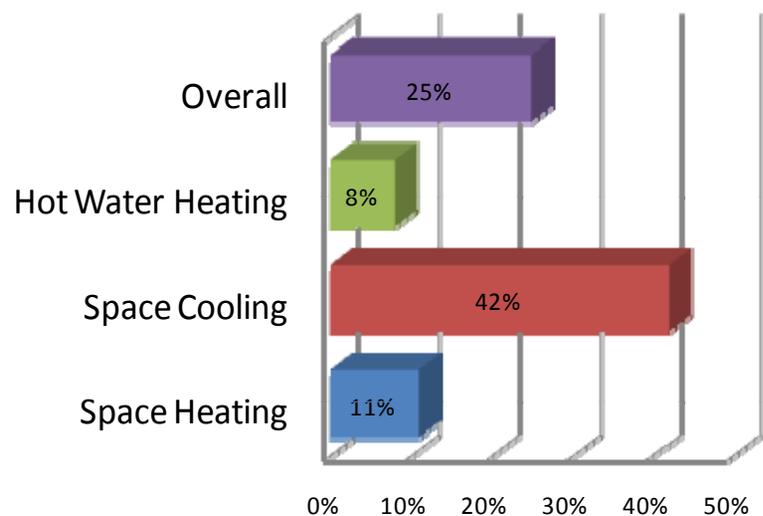


*Let's discuss the 2013
Building Energy Efficiency
Standards*

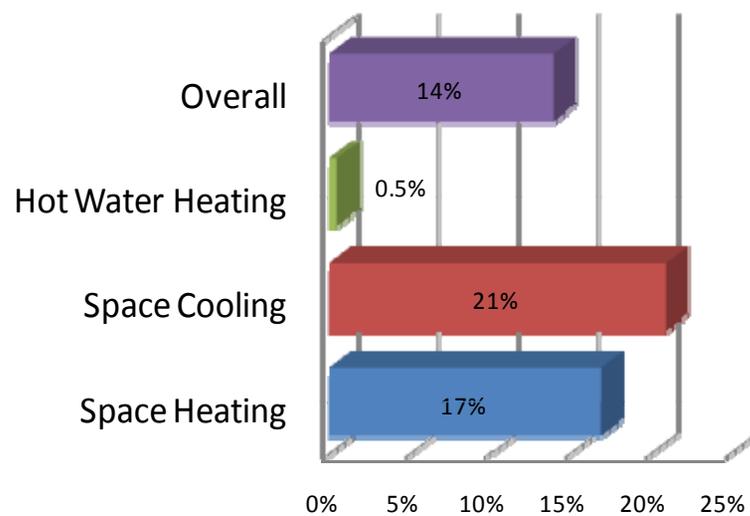


2013 Residential Energy Savings

Single Family Savings by End Use



Multi-Family Savings by End Use

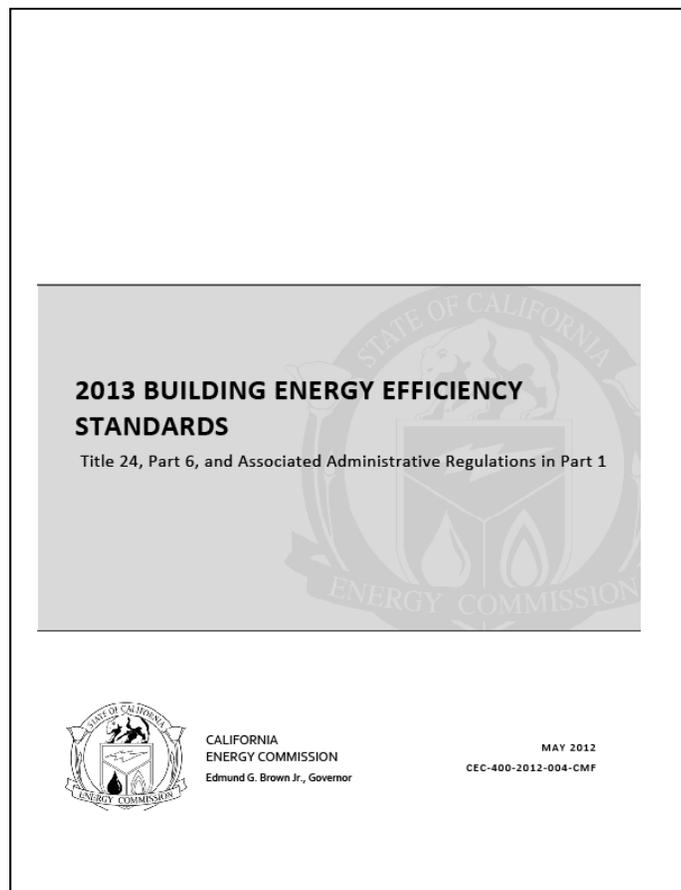


* Will save 23.6 GWH/yr; 1.1 Mtherms/yr; 35 MW (first year)



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**
 - CF-6R → CF2R
 - CF-4R → CF3R
- **Mandatory HERS testing**
- **Solar Zone ready reqs.**
- **Prescriptive reqs. more stringent**
 - Package D → Package A
 - Package C + E removed
- **HERS Testing for Additions**
 - Existing conditions – Performance Approach

* See [summary of changes handout](#)

2013 Energy Standards Section # Cheat Sheet

2008 Section #	2013 Section #
100	100.0
101	100.1
102	100.2
110	110.0
111	110.1
112	110.2
113	110.3
114	110.4
115	110.5
116	110.6
117	110.7
118	110.8
119	110.9
-	110.10
120	120.0
121	120.1
122	120.2
123	120.3
124	120.4
125	120.5
126	120.6
-	120.7
-	120.8
-	120.9
130	130.0
131	130.1
132	130.2
133	130.3
134	130.4
-	130.5
140	140.0
141	140.1
142	140.2
143	140.3
144	140.4
145	140.5
146	140.6
147	140.7
148	140.8
-	140.9
149	141.0
-	141.1
150	150.0
151	150.1
152	150.2

1.4 What's New for 2013

The most significant changes in the 2013 Building Energy Efficiency Standards affecting residential buildings include the new requirements for high performance fenestration products. Other changes for residential buildings include the following:

1.4.1 All compliance approaches:

- A. Revisions to the administrative section §10-103 sets the format and informational order for electronic compliance document registration and submittal and for electronic retention of compliance documentation for future use and clarifies the roles and responsibilities of the documentation author and the responsible person; §10-109 describes the rules for approving compliance software, alternative component packages, exceptional methods, data registries and related data input software, or electronic document repositories. §10-111 describes the rules for reporting fenestration U-factor, SHGC, and VT.
- B. §110.3(c)5 explains the requirements for the water heating recirculation loops serving multiple dwelling units, high-rise residential, hotel/motel, and nonresidential occupancies.
- C. Revisions to §110.9 now covers ballasts and luminaires and residential vacancy sensors.

1.4.2 Mandatory Measures

- A. Duct sealing in all climate zones (CZs) (defined in Section 1.7 of this chapter). (Section 150.0(m)11)
- B. Return duct design or fan power, airflow testing, and grill sizing requirements (Residential HVAC Quality Installation Improvements). (Section 150.0(m)13)
- C. Lighting – Improving and clarifying the mandatory lighting requirements for all residential buildings including kitchens, bathrooms, dining rooms, utility rooms, garages, hall ways, bedrooms, and outdoor lighting. (Section 150.0(k))
- D. New luminaire efficacy levels in Table 150.0-B
- E. Hot water pipe insulation - Requires insulation on pipes $\frac{3}{4}$ inch and larger. (Section 150.0(j)2Aii)
- F. Solar Ready Measure – 250 square feet of solar ready zone on single family roofs in subdivisions of 10 or more dwelling units. (Section 150.0(r))
- G. Walls with 2x6 framing and larger must have at least R-19 insulation (Section 150.0(c)2).

- H. New mandatory U-factor of 0.58 for vertical fenestrations products and skylights, Section 150.0(q).
- I. New third party HERS verifications requirement for Ventilation for Indoor Air Quality, ASHRAE 62.2 requirements, Section 150.0(o).

1.4.3 Prescriptive compliance:

- A. High Performance Windows – Reducing the U-Factor to 0.32 and SHGC to 0.25 in most climate zones. (Section 150.1(c)3A).
- B. Duct Insulation – Raise minimum from R-4.2 to R-6.0 in climate zones 6, 7, and 8. (Section 150.1(c)9).
- C. Night Ventilation – Whole house fan required to be installed in climate zones 8 through 14; a Smart Vents and Night Breeze allowed as performance path alternatives. (Section 150.1(c)12).
- D. Expand the Radiant Barrier requirements to climate zones 3, and 5 through 7. (Section 150.1(c)2).
- E. Refrigerant charge and verification now expanded to include ducted package units, mini-splits, and other units (Section 150.1(c)7).
- F. Increase wall insulation to R15+4 in all CZs (Section 150.1(c)1B).

1.4.4 Performance compliance:

The modeling procedures and requirements for compliance software have been significantly modified for the 2013 Standards. All compliance software vendors must use a single modeling approach and a single interpretation of the performance compliance rules. This “Compliance Manager” software will be integrated into vendor-supplied compliance software that is certified by the Energy Commission. More information is available in the 2013 Residential ACM Approval Manual and the 2013 Residential ACM Reference Manual.

1.4.5 Additions and Alterations:

- A. Simplified Compliance documentation requirements for small additions and alteration projects that do not involve a HERS measure. (Section 10-103(a)1C and Section 10-103(a)3C)
- B. Simplified rules for both the prescriptive and performance paths for additions, alterations, and existing plus additions plus alterations. (Section 150.2(a) and (b))



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



Signatures, Registration, Additions/Alterations

2008 – §10-103(a)1, 3, 5

- 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 ft² from CF1R
- Can exempt alterations and additions < 300 ft² from CF2R



§10-103 and the Plans Examiner

- Bldg. Dept. may not require CF1R for alterations ONLY if HERS Testing is not required:
 - Window/skylight replacement/installations
 - Water heating replacements/installations
 - Re-roofs
- Bldg. Dept. may not require CF1R for additions < 300 ft² ONLY if HERS Testing is not required.
- “Shorthand” versions of CF1R available for [alterations](#) and [additions](#)



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

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

B. BUILDING INSULATION DETAILS (Section 150.2(b)1)											
01	02	03	04	05	06		07	08	09	10	11
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Proposed				Required		Comments
					Cavity R-value	Continuous Insulation R-value	U-factor	Appendix JA4 Reference		U-Factor	
			Table	Cell							

C. ROOF REPLACEMENT (Prescriptive Alteration, Section 150.2(b)1H)												
01	02	03	04	05	06	07	08		09	10	11	12
Altering > 50% of roof surface	Roof Pitch	Exception	CRRC Product ID Number	Product Type	R-value Deck Insulation	Aged Solar Reflectance	Proposed		SRI	Minimum Required		
							Thermal Emittance			Aged Solar Reflectance	Thermal Emittance	SRI

NOTES

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

EXCEPTION:

RESIDENTIAL ALTERATIONS

CEC-CF1R-ALT-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF COMPLIANCE		CF1R-ALT-01-E
Residential Alterations		(Page 2 of 5)
Project Name:	Date Prepared:	

D. FENESTRATION/GLAZING AREAS ALLOWED (Section 150.2(b)1)				
01	02	03	04	05
Alteration Type	Fenestration Type	Orientation	Maximum Allowed ft2	Comments

E. FENESTRATION/GLAZING PROPOSED AREAS AND EFFICIENCIES (Section 150.2(b)1)												
01	02	03	04	05	06	07	08	09	10	11	12	13
Fenestration Type	Frame Type	Orientation	Area Removed ft2	Area Added ft2	Net Added Area ft2	Maximum Allowed U-factor	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
a	Net Added West-facing Fenestration Area											
b	Existing + Added West-facing Fenestration Area											
c	Maximum Allowed West-facing Fenestration Area											
d	Is West-facing Fenestration Area \leq Allowed											
e	Net Added Fenestration Area (all orientations)											
f	Existing + Added Fenestration Area (all orientations)											
g	Maximum Allowed Fenestration Area (all orientations)											
h	Is Existing + Added Fenestration Area \leq Allowed											
i	If exterior shading devices are used, what is the calculated value from CF1R-ENV-03											



CERTIFICATE OF COMPLIANCE							CF1R-ALT-01-E
Residential Alterations							(Page 3 of 5)
Project Name:						Date Prepared:	

F. SPACE CONDITIONING(SC) SYSTEMS – HEATING/COOLING (Prescriptive section 150.2(b))							
01	02	03	04	05	06	07	08
Alteration Type	Floor Area Served (ft2)	Heating System Type	Heating Component Altered	Cooling System Type	Cooling Component Altered	Thermostat Type	Comments
<ul style="list-style-type: none"> The Appliance Efficiency Standards regulate the minimum efficiency requirement of regulated appliances sold in California. Any new appliance legally offered for sale will meet the minimum efficiency required for prescriptive compliance. 							

G. DUCT SYSTEMS (Section 150.2(b)1D)					
01	02	03	04	05	06
Duct Alteration Type	Distribution System Type	Duct Location	Added Duct Length	Duct R-Value	Comments
New/Replacement, Extension					
<ul style="list-style-type: none"> 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. 					

H. WATER HEATING SYSTEMS (Section 150.2(b)1G)								
01	02	03	04	05	06	07	08	09
Existing Water Heater Fuel Type	Proposed DHW Water Heater Type	Proposed Water Heater Fuel Type	Proposed Water Heater Efficiency (EF, AFUE)	Water Heater Volume (gal)	Central Distribution Type	Dwelling Unit Distribution Type	Solar Water Heater Solar Fraction	Comments



CERTIFICATE OF COMPLIANCE		CF1R-ALT-01-E
Residential Alterations		(Page 4 of 5)
Project Name:	Date Prepared:	

I. HERS VERIFICATION SUMMARY The enforcement agency should pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.	
Ducts	<ul style="list-style-type: none"> Duct Leakage Testing in accordance with Section 150.2(b)1C,D, and E is required (Residential Appendix RA3.1)
Refrigerant Charge	<ul style="list-style-type: none"> Refrigerant Charge Verification in accordance with Section 150.2(b)1F is required in climate zones 2 and 8-15 (Residential Appendix RA3.2).
Central System Air Handlers	<ul style="list-style-type: none"> Airflow or Fan Efficacy Verification is required for ducted air cooled air conditioners and air source heat pumps in accordance with Section 150.2(b)1C, and F (Residential Appendix RA3.2. and RA3.3).

For information and data collection only. Not valid until registered with a HERS provider



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

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA/ HERS Certification Identification (if applicable):
City/State/Zip:	Phone:
RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California:	
<ol style="list-style-type: none"> The information provided on this Certificate of Compliance is true and correct. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer). That the energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application. I will ensure that a registered copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy. 	
Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

For assistance or questions regarding the Energy Standards, contact the Energy Hotline at: 1-800-772-3300.



CERTIFICATE OF COMPLIANCE	CF1R-ADD-01-E
Additions 1,000 ft ² or less	(Page 1 of 7)
Project Name:	Date Prepared:

A. GENERAL INFORMATION			
Project Name:		Date:	
Project Location:		Compliance Method:	
CA City:		Building Front Orientation (deg):	
Zip Code:		Number of Dwelling Units:	
Climate Zone:		Fuel Type:	
Building Type	<input type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	Total Conditioned Floor Area (Addition):	
Project Type:	Addition <input type="checkbox"/> ≤ 300 <input type="checkbox"/> > 300 to ≤ 400 <input type="checkbox"/> > 400 to ≤ 700 <input type="checkbox"/> > 700 to ≤ 1000	Slab Area:	

B. OPAQUE SURFACE DETAILS – Framed (Section 150.2(a))											
01	02	03	04	05	06		07	08	09	10	11
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Proposed			Appendix JA4 Reference		Required	Comments
					Cavity R-value	Continuous Insulation R-value	U-Factor	Table	Cell		
										U-Factor	

C. OPAQUE SURFACE DETAILS – Non-framed (Section 150.1(c)1)										
01	02	03	04	05	06	07	08	09	10	11
Tag/ID	Assembly Type	Assembly Materials	Thickness (inches)	Proposed			Appendix JA4 Reference		Required	Comments
				Core Insulation R-value	Continuous Insulation R-value	U-Factor	Table	Cell		
									U-Factor	



CERTIFICATE OF COMPLIANCE	CF1R-ADD-01-E
Additions 1,000 ft ² or less	(Page 2 of 7)
Project Name:	Date Prepared:

D. OPAQUE SURFACE DETAILS – Mass Walls (Section 150.1(c)1)														
01	02	03	04	05	06		07		08	09	10	11		
Tag/ID	Walls Above Grade	Mass Type	Mass Thickness (inches)	Furring Strip Thickness (inches)	Proposed				Required					
					Interior Insulation		Exterior Insulation		Appendix JA4 Reference		Interior Insulation		Exterior Insulation	
					R-value	U-factor	R-value	U-factor	Table	Cell	R-value	U-factor	R-value	U-factor

E. SLAB INSULATION (Table 150.1-A)					
01	02	03	04	05	06
Floor Type	Proposed		Required		Comments
	R-value	U-factor	Insulation R-value	Insulation U-factor	

- Heated slab floors require mandatory slab insulation (see Table 110.8-A).

F. RADIANT BARRIER (Section 150.1(c)2)	
01	02
Radiant Barrier installed below the roof deck and on all gable end walls	Comment

A radiant barrier is required (for Climate Zones 2-15)

- To meet the prescriptive requirement, a minimum free ventilation area of not less than one square foot of vent area for each 300 ft² of attic floor area with 30 percent upper vent.
- A minimum air space between the top surface of the radiant barrier and roof decking of not less than 1.5 inches at the center of the truss/rafter span.
- Radiant Barrier shall be installed to cover all gable end walls and other vertical surfaces in the attic.

ADDITIONS 1000 FT² OR LESS

CEC-CF1R-ADD-01-E (Revised 06/13)



CERTIFICATE OF COMPLIANCE	CF1R-ADD-01-E
Additions 1,000 ft ² or less	(Page 3 of 7)
Project Name:	Date Prepared:

G. ROOFING PRODUCTS (COOL ROOF) (Section 150.1(c)11)										
01	02	03	04	05	06	07	08	09	10	11
Mass Roof 25 lb ft ² or greater	Roof Pitch	CRRC Product ID Number	Product Type	Proposed			Minimum Required			Comments
				Aged Solar Reflectance	Thermal Emittance	SRI	Aged Solar Reflectance	Thermal Emittance	SRI	
NOTES:										
<ul style="list-style-type: none"> Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements. Liquid field applied coatings must comply with installation criteria from section 110.8(i)4. 										

H. FENESTRATION/GLAZING AREAS ALLOWED (Section 150.2(a)1)				
01	02	03	04	05
		The Greater		
Addition Type ft ²	Orientation	Maximum Allowed %	Maximum Calculated Allowed ft ²	Comments



CERTIFICATE OF COMPLIANCE	CF1R-ADD-01-E
Additions 1,000 ft ² or less	(Page 4 of 7)
Project Name:	Date Prepared:

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES (Section 150.2(a)1)											
01	02	03	04	05	06	07	08	09	10	11	12
Fenestration Type	Frame Type	Orientation	Proposed West Facing Area ft ²	Proposed Non West Facing Area ft ²	Total Proposed Area All Orientations	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
a	Added West-facing Fenestration Area										
b	Maximum Allowed West-facing Fenestration Area										
c	Is West-facing Fenestration Area ≤ Allowed										
d	Added Fenestration Area (all orientations)										
e	Maximum Allowed Fenestration Area (all orientations)										
F	Is Total Proposed Fenestration Area ≤ Allowed										
g	If exterior shading devices are used, what is the calculated value from CF1R-ENV-03										

J. HVAC SYSTEMS – NEW HEATING/COOLING (Section 150.1(c)7)							
01	02	03	04	05	06	07	08
Alteration Type	Area to be heated/cooled (ft ²)	Heating System Type	Heating Efficiency	Cooling System Type	Cooling Efficiency	Thermostat Type	Comments
<ul style="list-style-type: none"> The Appliance Efficiency Standards regulate the minimum efficiency requirement of regulated appliances sold in California. Any new appliance legally offered for sale will meet the minimum efficiency required for prescriptive compliance. Central gas furnaces have a minimum efficiency of 78% AFUE, heat pumps 7.7 HSPF. While any gas heating appliance sold in California is acceptable for prescriptive compliance, the only types of electric systems allowed are heat pumps and mini-split heat pumps. Central cooling systems and heat pumps have a minimum efficiency of 13 SEER. 							



CERTIFICATE OF COMPLIANCE	CF1R-ADD-01-E
Additions 1,000 ft ² or less	(Page 5 of 7)
Project Name:	Date Prepared:

K. DUCT SYSTEMS (Section 150.2(b)1D)					
01	02	03	04	05	06
Duct Alteration Type	Distribution System Type	Duct Location	Added Duct Length	Duct R-Value	Comments

• 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.

L. WATER HEATING SYSTEMS (Section 150.2(a)1D for Additions)									
01	02	03	04	05	06	07	08	09	10
Existing Water Heater Fuel Type	Proposed Water Heater Fuel Type	Proposed DHW Water Heater Type	Number of Added Water Heaters	Central Distribution Type	Dwelling Unit Distribution Type	Water Heater Efficiency (EF, AFUE)	Rated Input (Btuh or kWh)	Water Heater Volume (gallons)	Comments

M. WATER HEATING (Section 150.1(c)8 for New Construction)										
01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE, or Thermal Efficiency	Rated Input (Btuh or kW)	Standby Loss (percent of value (btuh))Rated	Back-Up Solar Savings Fraction



CERTIFICATE OF COMPLIANCE		CF1R-ADD-01-E
Additions 1,000 ft ² or less		(Page 6 of 7)
Project Name:	Date Prepared:	

N. HERS VERIFICATION SUMMARY The enforcement agency should pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.	
Ducts <ul style="list-style-type: none"> Duct leakage testing required (Residential Appendix RA3.1) Heating and cooling systems are ductless, no HERS verification required 	
Refrigerant Charge <ul style="list-style-type: none"> Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15 No cooling system installed 	
Central System Air Handlers <ul style="list-style-type: none"> Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design No cooling system installed Non-ducted cooling system 	

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CERTIFICATE OF COMPLIANCE		CF1R-ADD-01-E
Additions 1,000 ft ² or less		(Page 7 of 7)
Project Name:	Date Prepared:	

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Compliance documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA/ HERS Certification Identification (if applicable):
City/State/Zip:	Phone:
RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California:	
<ol style="list-style-type: none"> The information provided on this Certificate of Compliance is true and correct. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer). That the energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application. I will ensure that a registered copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy. 	
Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

For assistance or questions regarding the Energy Standards, contact the Energy Hotline at: 1-800-772-3300.



§10-103 and the Field Inspector

CERTIFICATE OF INSTALLATION - DATA FIELD DEFINITIONS AND CALCULATIONS		CF2R - ENV-02-E
Envelope Air Sealing		(Page 4 of 4)
DOCUMENTATION AUTHOR'S DECLARATION STATEMENT		
I certify that this Certificate of Installation documentation is accurate and complete.		
Documentation Author Name: Best Doc. Author	Documentation Author Signature: Best Doc. Author	
Documentation Author Company Name: Energy Savers Inc.	Date Signed: 1/1/2014	
Address: 1516 9th Street	HERS Certification Identification (if applicable): N/A	
City/State/Zip: Sacramento, CA 95814	Phone: (916) 363-4719	
RESPONSIBLE PERSON'S DECLARATION STATEMENT		
I certify the following under penalty of perjury, under the laws of the State of California:		
1. The information provided on this Certificate of Installation is true and correct.		
2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation, and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.		
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.		
4. I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.		
5. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.		
Responsible Builder/Installer Name: Mr. Insulation Contractor	Responsible Builder/Installer Signature: Mr. Insulation Contractor	
Company Name (Installing Subcontractor or General Contractor or Builder/Owner): Best Insulation Comp.	Position With Company (Title): Owner	
Address: 123 Insulation Street	City/State/Zip: Sacramento, CA 95814	Phone: (916) 461-8528
		Date Signed: 1/1/2014

- 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. may not require CF2R for alterations and additions < 300 ft² ONLY if HERS Testing is not required

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Documentation Author Name: Best Doc. Author	Documentation Author Signature: <i>Best Doc. Author</i>
Documentation Author Company Name: Energy Savers Inc.	Date Signed: 1/1/2014
Address: 1516 9th Street	CEA/HERS Certification Identification (If applicable): N/A
City/State/Zip: Sacramento, CA 95814	Phone: (916) 363-4719

RESPONSIBLE PERSON'S DECLARATION STATEMENT

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

1. The information provided on this Certificate of Installation is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation, and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.
4. I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.
5. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Builder/Installer Name: Mr. Insulation Contractor	Responsible Builder/Installer Signature: <i>Mr. Insulation Contractor</i>	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner) Best Insulation Comp.	Position With Company (Title): Owner	
Address: 123 Insulation Street	CSLB License: 010113	
City/State/Zip: Sacramento, CA 95814	Phone: (916) 461-8528	Date Signed: 1/1/2014



*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

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	N.A.	N.A.
	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.		
	Pool and Spa Systems	110.4, 150.0(p)	N.A.		
Solar Ready Buildings	110.10	N.A.	N.A.		
Covered Processes ¹	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.	N.A.	N.A.
Solar Ready Buildings	110.10	N.A.	N.A.	N.A.	
¹ 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.					



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*)

SECTION 110.10 – MANDATORY REQUIREMENTS FOR SOLAR READY BUILDINGS

(a) Covered Occupancies.

1. **Single Family Residences.** Single family residences located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete, by the enforcement agency, on or after January 1, 2014, shall comply with the requirements of Section 110.10(b) through 110.10(e).
2. **Low-rise Multi-family Buildings.** Low-rise multi-family buildings shall comply with the requirements of Section 110.10(b) through 110.10(d).
3. **Hotel/Motel Occupancies and High-rise Multi-family Buildings.** Hotel/motel occupancies and high-rise multi-family buildings with ten stories or fewer shall comply with the requirements of Section 110.10(b) through 110.10(d).
4. **All Other Nonresidential Buildings.** All other nonresidential buildings with three stories or fewer shall comply with the requirements of Section 110.10(b) through 110.10(d).

(b) Solar Zone.

1. **Minimum Area.** The solar zone shall have a minimum total area as described below. The solar zone shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area shall be comprised of areas that have no dimension less than five feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet.

- A. **Single Family Residences.** The solar zone shall be located on the roof or overhang of the building and have a total area no less than 250 square feet.

EXCEPTION 1 to Section 110.10(b)1A: Single family residences with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than 1000 watts.

EXCEPTION 2 to Section 110.10(b)1A: Single family residences with a permanently installed domestic solar water-heating system meeting the installation criteria specified in the Reference Residential Appendix RA4 and with a minimum solar savings fraction of 0.50.

EXCEPTION 3 to Section 110.10(b)1A: Single family residences with three stories or more and with a total floor area less than or equal to 2000 square feet and having a solar zone total area no less than 150 square feet.

EXCEPTION 4 to Section 110.10(b)1A: Single family residences located in Climate zones 8-14 and the Zildland-Urban Interface Fire Area as defined in Title 24, Part 2 and having a whole house fan and having a solar zone total area no less than 150 square feet.

EXCEPTION 5 to Section 110.10(b)1A: Buildings with a designated solar zone area that is no less than 50 percent of the potential solar zone area. The potential solar zone area is the total area of any low-sloped roofs where the annual solar access is 70 percent or greater and any steep-sloped roofs oriented between 110 degrees and 270 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

EXCEPTION 6 to Section 110.10(b)1A: Single family residences having a solar zone total area no less than 150 square feet and where all thermostats comply with Reference Joint Appendix JA5 and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.

EXCEPTION 7 to Section 110.10(b)1A: Single family residences meeting the following conditions:

- A. All thermostats comply with Reference Joint Appendix JA5 and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.
- B. All applicable requirements of Section 150.0(k), except as required below:
 - i. All permanently installed indoor lighting is high efficacy as defined in TABLE 150.0-A or 150.0-B and is installed in kitchens, bathrooms, utility rooms, and garages at a minimum.
 - ii. All permanently installed lighting in bathrooms is controlled by a vacancy sensor.

EXCEPTION to EXCEPTION 7Bii: One high efficacy luminaire as defined in TABLE 150.0-A or 150.0-B with total lamp wattage rated to consume no greater than 26 watts of power is not required to be controlled by a vacancy sensor.

- iii. Every room which does not have permanently installed lighting has at least one switched receptacle installed.
- iv. Permanently installed night lights complying with Section 150.0(k)1E are allowed.
- v. Lighting integral to exhaust fans complying with Section 150.0(k)1F is allowed.
- vi. All permanently installed outdoor lighting is high efficacy as defined in TABLE 150.0-A or 150.0-B and is controlled as required in Section 150.0(k)9Ai and iii.

- B. **Low-rise and High-rise Multi-family Buildings, Hotel/Motel Occupancies, and Nonresidential Buildings.** The solar zone shall be located on the roof or overhang of the building or on the roof or overhang of another structure located within 250 feet of the building or on covered parking installed with the building project and have a total area no less than 15 percent of the total roof area of the building excluding any skylight area.

EXCEPTION 1 to Section 110.10(b)1B: Buildings with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than one watt per square foot of roof area.

EXCEPTION 2 to Section 110.10(b)1B: Buildings with a permanently installed domestic solar water-heating system complying with Section 150.1(c)8Ciii.

EXCEPTION 3 to Section 110.10(b)1B: Buildings with a designated solar zone area that is no less than 50 percent of the potential solar zone area. The potential solar zone area is the total area of any low-sloped roofs where the annual solar access is 70 percent or greater and any steep-sloped roofs oriented between 110 degrees and 270 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

EXCEPTION 4 to Section 110.10(b)1B: Low-rise and high-rise multi-family buildings meeting the following conditions:

- A. All thermostats in each dwelling unit comply with Reference Joint Appendix JA5 and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.
- B. All applicable requirements of Section 150.0(k), except as required below:
 - i. All permanently installed indoor lighting in each dwelling unit is high efficacy as defined in TABLE 150.0-A or 150.0-B and is installed in kitchens, bathrooms, utility rooms, and private garages at a minimum.
 - ii. All permanently installed lighting in bathrooms is controlled by a vacancy sensor.

EXCEPTION to EXCEPTION 4Bii: One high efficacy luminaire as defined in TABLE 150.0-A or 150.0-B with total lamp wattage rated to consume no greater than 26 watts of power is not required to be controlled by a vacancy sensor.

- iii. Every room which does not have permanently installed lighting has at least one switched receptacle installed.
- iv. Permanently installed night lights complying with Section 150.0(k)1E are allowed.
- v. Lighting integral to exhaust fans complying with Section 150.0(k)1F is allowed.
- vi. All permanently installed outdoor lighting for private patios, entrances, balconies, and porches is high efficacy as defined in TABLE 150.0-A or 150.0-B and is controlled as required in Section 150.0(k)9Ai and iii.

EXCEPTION 5 to Section 110.10(b)1B: Buildings where the roof is designed and approved to be used for vehicular traffic or parking or for a heliport.

- 2. **Orientation.** All sections of the solar zone located on steep-sloped roofs shall be oriented between 110 degrees and 270 degrees of true north.
- 3. **Shading.**
 - A. No obstructions, including but not limited to, vents, chimneys, architectural features, and roof mounted equipment, shall be located in the solar zone.
 - B. Any obstruction, located on the roof or any other part of the building that projects above a solar zone shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.

EXCEPTION to Section 110.10(b)3: Any obstruction, located on the roof or any other part of the building, that is oriented north of all points on the solar zone.

- 4. **Structural Design Loads on Construction Documents.** For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

NOTE: Section 110.10(b)4 does not require the inclusion of any collateral loads for future solar energy systems.

(c) **Interconnection Pathways.**

- 1. The construction documents shall indicate a location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service. For single family residences the point of interconnection will be the main service panel.
- 2. The construction documents shall indicate a pathway for routing of plumbing from the solar zone to the water-heating system.

- (d) **Documentation.** A copy of the construction documents or a comparable document indicating the information from Sections 110.10(b) through 110.10(c) shall be provided to the occupant.

(e) **Main Electrical Service Panel.**

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



§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**

STATE OF CALIFORNIA
SOLAR READY AREA - NEW CONSTRUCTION
 CERTIFICATE OF COMPLIANCE
 Solar Ready Area - New Construction
 Form Number: SRS-CALSB-01 Training Sample
 Date Adopted: 05/07/14
 Page 1 of 3

General Information
 Building Type:
 Single Family Residence The single family residence shall comply with the requirements of Standards Section 110.10(b) through 110.10(d).
 Low-rise Multifamily The low-rise multifamily building shall comply with the requirements of Standards Section 110.10(b) through 110.10(d).
 Use form NREC-SRA-01-E to show solar ready compliance for hotel/motel occupancies and high-rise multifamily buildings with ten stories or fewer and all other nonresidential buildings with three stories or fewer.

Solar-Ready Choose one option from A, B, C, D or E or F below.
 A. Allocated Solar Zone, Interconnection, Documentation and Electrical Service
 CF1R-SRA-01-A Minimum Solar Zone Area Worksheet is required to be submitted.
 Minimum Solar Zone Area (sqft)
 This is quantity (C) from SRA-02-E for single family and quantity (J) for low-rise multifamily buildings.
 Proposed Solar Zone Area (sqft)
 This is quantity (I) from SRA-02-E for single family and low-rise multifamily buildings.
 The construction documents will include a section for interconnection and metering equipment and a path to conduit from the solar zone to the point of interconnection with the electrical service. The electrical path will indicate a pathway for routing of plumbing from the solar zone to the water heating system.
 A copy of the construction documents or a comparable document indicating information about the path of interconnection pathway will be provided to the occupant.
 For Single Family Residences only:
 • The main electric service panel shall have a minimum busbar rating of 200 amp.
 The main electric service panel shall have reserved space to allow for the installation of a double pole reserved space that be positioned at the opposite (left) end from the right-hand location or reserved reserved space shall be permanently marked as "For Future Solar Electric".
 If the installer certifies that all above requirements have been met and the Proposed Solar Zone Area Minimum Solar Zone Area, the building complies, otherwise it does not comply.

B. Residence not in an Applicable Subdivision
 Is this a single family residence located in subdivisions with ten or more single family residences subdivision map for the residences has been deemed complete by the enforcement agency, or an enforcement agency has issued a stop-work order?
 Please check box to right if answered no to the above question in this section.

CA Building Energy Efficiency Standards - 2013 Residential Compliance

STATE OF CALIFORNIA
MINIMUM SOLAR ZONE AREA WORKSHEET - NEW CONSTRUCTION
 CERTIFICATE OF COMPLIANCE
 Minimum Solar Zone Area Worksheet - New Construction
 Form Number: SRS-CALSB-01 Training Sample
 Date Adopted: 05/07/14
 Page 1 of 4

Solar Zone Area (Requirements in §110.10 (b)(4) Exemption 1, 2, 3, or 4 and §110.10 (b)(1)(B))
 This worksheet applies to single family residences located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete by the enforcement agency, on or after January 1, 2014, and which are in zone compliance with a required solar zone area per Exemption 1, 2, 3 or 4 of the requirements of Section 110.10(b)(4). Note that Exemptions 1, 2, and 3 exempt a residence from the solar ready requirements and are documented on the Certificate of Compliance Form CF1R-SRA-01-E. Check the exemption being used and fill in the relevant details.
 This worksheet applies to low-rise multifamily projects that wish to show compliance with a reduced solar zone area allowed under Exception 3 of Section 110.10(b)(4). Note that Exemptions 1, 2, 4, and 5 exempt a residence from the solar ready requirements and are documented on the Certificate of Compliance Form CF1R-SRA-01-E. Check the exemption being used and fill in the relevant details.

General Information
 Building Type:
 Single Family The residence shall comply with the requirements of Standards Section 110.10(a) through 110.10(d).
 Low-rise Multifamily The low-rise multifamily building shall comply with the requirements of Standards Section 110.10(a) through 110.10(d).

Step 1: Determine Minimum Solar Zone Area
 Single Family Residences
 Calculate the minimum solar zone area using one of the four options provided below. Use Method 3 if your roof and overhangs are shaded.
 Method 1. Reduced Solar Zone Area For Small, Tall Residences
 Does the single family residence have three stories or more? Yes No
 Does the single family residence have a total floor area less than or equal to 2000 square feet? Yes No
 Please check box to right if answered yes to all questions in this section. REDUCED SOLAR ZONE AREA OF 150 SF APPLIES
 Method 2. Reduced Solar Zone Area For Homes With a Sloped Roof
 Is the residence located in climate zones 8-14? Yes No
 Is the residence in a designated Wildfire/Urban Interface Fire Area as defined in Title 24, Part 2? Yes No
 Does the residence have a house lot? Yes No
 Please check box to right if answered yes to all questions in this section. REDUCED SOLAR ZONE AREA OF 150 SF APPLIES
 Method 3. Reduced Solar Zone Area For Homes with Limited Solar Access (Requirements in 110.10(b)(4))
 The enforcement agency may require additional documentation that specifies how the reduced solar zone area was determined.
 List the Method/Tool(s) used to quantify annual solar access. (For example, "Software X," "CAD Tool Y")
 Area of low-sloped roof (ratio of rise to run of 2:12 or less) where the annual solar access is 70 percent or greater:

A	sq'
---	-----

 Area of steep-sloped roof (ratio of rise to run is greater than 2:12) that is oriented between 135 and 270 degrees and annual solar access is 70 percent or greater:

B	sq'
---	-----

 Minimum solar zone area becomes:
 $C = 0.5 \times (A + B)$
 REDUCED SOLAR ZONE AREA (Calculated) APPLIES
 Method 4. Reduced Solar Zone Area for Homes with "Smart Thermostats"
 Are all thermostats "Smart Thermostats" complying with Reference Joint Appendix J43 and are they capable of receiving and responding to Demand Response Signals? Yes No
 Please check box to right if answered yes to all questions in this section. REDUCED SOLAR ZONE AREA OF 150 SF APPLIES

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

* Forms must be registered if HERS req.



CERTIFICATE OF COMPLIANCE		CF1R-SRA-01-E
Solar Ready Area– New Construction		(Page 1 of 3)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14	

General Information

Building Type:

Single Family Residence The single family residence shall comply with the requirements of Standards Section 110.10(b) through 110.10(e).

Low-Rise Multifamily The low-rise multifamily building shall comply with the requirements of Standards Section 110.10(b) through 110.10(d).

Use form NRCC-SRA-01-E to show solar ready compliance for hotel/motel occupancies and high-rise multifamily buildings with ten stories or fewer and all other nonresidential buildings with three stories or fewer.

Solar-Ready Choose one option from A, B, C, D or E or F below.

A. Allocated Solar Zone, Interconnection, Documentation and Electrical Service Requirements

CF1R-SRA-02-E Minimum Solar Zone Area Worksheet is required to be submitted.

Minimum Solar Zone Area (sqft)

This is quantity [C] from SRA-02-E for single family and quantity [J] for low-rise multifamily buildings

150 ft²

Proposed Solar Zone Area (sqft)

This is quantity [S] from SRA-02-E for both single family and low-rise multifamily buildings

160 ft²

The construction documents will indicate a location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service. The construction documents will indicate a pathway for routing of plumbing from the solar zone to the water heating system.

Yes

A copy of the construction documents or a comparable document indicating information about the solar zone and interconnection pathways will be provided to the occupant.

Yes

For Single Family Residences only:

- The main electric service panel shall have a minimum busbar rating of 200 amps.

The main electric service panel shall have reserved space to allow for the installation of a double pole circuit breaker. The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location. The reserved space shall be permanently marked as "For Future Solar Electric".

Yes

If the installer certifies that all above requirements have been met and the Proposed Solar Zone Area meets or exceeds the Minimum Solar Zone Area, the building complies, otherwise it does not comply.

does not comply

complies

B. Residence not in an Applicable Subdivision

Is this a single family residence located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete, by the enforcement agency, on or after January 1, 2014

Yes No

Please check box to right if answered no to the above question in this section.

EXEMPT



CERTIFICATE OF COMPLIANCE		CF1R-SRA-01-E
Solar Ready Area– New Construction		(Page 2 of 3)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14	

<input type="checkbox"/> C. Permanently Installed Solar Photovoltaic (PV) System	
Will the proposed building have a permanently installed solar electric (PV) system? If yes, a <i>CF2R-SPV-01-E Certificate of Installation: Photovoltaic System Verification</i> will be required to be submitted as a condition of final approval.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Enter the <u>Proposed Nameplate DC Power Rating</u> for the PV System (watts)	
For Single Family Dwellings: Will the <u>Proposed Nameplate DC Power Rating</u> be equal to or greater than <u>Minimum Nameplate DC Power Rating</u> of 1000 Watts?	<input type="checkbox"/> Yes <input type="checkbox"/> No
For Low Rise Multifamily: Calculate the <u>Minimum Nameplate DC Power Rating</u> (watts) = Total Roof Area (ft ²) * (1 Watt/ ft ²)	
For Low Rise Multifamily: Will the <u>Proposed Nameplate DC Power Rating</u> be equal to or greater than the <u>Minimum Nameplate DC Power Rating</u> ?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If the proposed building will have a Permanently installed PV System that meets or exceeds the applicable Minimum Nameplate DC Power Rating the building is exempt from the Solar Ready Area requirements.	<input checked="" type="checkbox"/> EXEMPT

<input type="checkbox"/> D. Permanently Installed Solar Water Heating System	
Will the proposed building have a permanently installed solar water heating system? If yes, a <i>CF2R-STH-01-E Certificate of Installation: Solar Water Heating Systems</i> will be required to be submitted as a condition of final approval.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Will the annual solar savings fraction equal to or greater than the minimum requirements for exemption? For single family: equal to or greater than 0.5 For low-rise multi-family: equal to or great than 0.2 in climate zones 1 through 9, or 0.35 in climate zones 10 through 16	<input type="checkbox"/> Yes <input type="checkbox"/> No
Please check box to right if answered yes to all questions in this section.	<input type="checkbox"/> EXEMPT

<input type="checkbox"/> E. Smart Thermostats and High Efficacy Lighting	
Will all thermostats in each dwelling unit comply with Reference Joint Appendix 5 (JA5) and are they going to be capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Will all installed luminaires be classified as high efficacy in accordance with the applicable requirements in Section 130.0(c), and in accordance with TABLE 150.0-A or TABLE 150.0-B?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Please check box to right if answered yes to all questions in this section.	<input type="checkbox"/> EXEMPT

<input type="checkbox"/> F. Roof is Designed for Vehicle Traffic or Parking or for Heliport (Applies to Low-rise Multifamily only)	
Is the roof designed and approved to be used for vehicular traffic or parking or for a heliport.	<input type="checkbox"/> Yes <input type="checkbox"/> No
Please provide building plan reference _____.	
Please check box to right if answered yes to the above question in this section.	<input checked="" type="checkbox"/> EXEMPT

Instructions to Applicant Solar-ready Compliance & Worksheets (check box if worksheet are included)	
<input checked="" type="checkbox"/> CF2R-SRA-01-E Certificate of Compliance Solar-ready. <i>Required on plans for all submittals.</i>	
<input checked="" type="checkbox"/> CF2R-SRA-02-E Minimum Solar Zone Area Worksheet. <i>Required for compliance path A.</i>	
<input type="checkbox"/> CF2R-SPV-01-E Certificate of Installation – Solar Photovoltaic Verification <i>Required for compliance path C.</i>	
<input type="checkbox"/> CF2R-STH-01-E Certificate of Installation: Solar Water Heating Systems <i>Required for compliance path D.</i>	



CERTIFICATE OF COMPLIANCE	CF1R-SRA-02-E
Minimum Solar Zone Area Worksheet – New Construction	
(Page 1 of 4)	
Project Name: 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 (b)1B)

This worksheet applies to single family residences located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete, by the enforcement agency, on or after January 1, 2014, and which wish to show compliance with a reduced solar zone area per Exceptions 3, 4, 5 or 6 to the requirements of Section 110.10(b)1A. 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-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 reduced solar zone allowed under Exception 3 of Section 110.10(b)1B. Note that Exceptions 1, 2, 4, and 5 exempt a residence from the solar ready requirements and are documented on the Certificate of Compliance Form CF-1R-SRA-01-E. Check the exception being used and fill in the relevant details.

General Information

Building Type:

- Single Family The residence shall comply with the requirements of Standards Section 110.10(b) through 110.10(e).
- Low-rise Multifamily The low-rise multifamily building shall comply with the requirements of Standards Section 110.10(b) through 110.10(d)

Step 1: Determine Minimum Solar Zone Area

Single Family Residences

Calculate the minimum solar zone area using one of the four options provided below. Use method 3 if your roofs and overhangs are shaded.

Method 1. Reduced Solar Zone Area For Small, Tall Residences

- Does the single family residence have three stories or more? Yes No
- Does the single family residences have a total floor area less than or equal to 2000 square feet Yes No

Please check box to right if answered yes to all questions in this section.

REDUCED SOLAR ZONE AREA OF 150 ft² APPLIES

Method 2. Reduced Solar Zone Area for Homes With a Whole House Fan in a Wildland-Urban Interface in Climate Zones 8-14

- 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, Part 2? Yes No
- Does the residence have a whole house fan? Yes No

Please check box to right if answered yes to all questions in this section.

REDUCED SOLAR ZONE AREA OF 150 ft² APPLIES

Method 3. Reduced Solar Zone Area for Homes with Limited Solar Access (requirements in 110.10(b)1A)

The enforcement agency may require additional documentation that describes how the reduced solar zone area was determined.

List the Method/Tool(s) used to quantify annual solar access: (for example, "Software X," "CAD Tool Y")			
Area of low-sloped roof (ratio of rise to run of 2:12 or less) where the annual solar access is 70 percent or greater.	A		ft ²
Area of steep-sloped roof (ratio of rise to run is greater than 2:12) that is oriented between 110 and 270 degrees and annual solar access is 70 percent or greater.*	B		ft ²
Minimum solar zone area becomes	$C = 0.5 \times (A + B)$		ft ²

Please check box to right if this section is completed.

REDUCED SOLAR ZONE AREA (calculated) APPLIES

Method 4. Reduced Solar Zone Area for Homes with "Smart Thermostats"

- Are all thermostats "Smart Thermostats" complying with Reference Joint Appendix JA5 and are they capable of receiving and responding to Demand Response Signals? Yes No

Please check box to right if answered yes to all questions in this section.

REDUCED SOLAR ZONE AREA OF 150 ft² APPLIES



CERTIFICATE OF COMPLIANCE		CF1R-SRA-02-E
Minimum Solar Zone Area Worksheet – New Construction		(Page 2 of 4)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14	

Low-Rise Multifamily

Calculate the minimum solar zone area using one of the two options provided below. Use option 2 if your roofs and overhangs are shaded.

Method 1: Minimum Solar Zone Area Based on Total Roof Area (requirements in 110.10(b)1B)

New Construction: Total roof area	D		ft ²
Additions: Total roof area added to building			
New Construction: Area of roof covered with skylights	E		ft ²
Additions: Area of new roof area covered with skylights			
Minimum solar zone area	F = 0.15 x (D – E)		ft ²

Note: For additions, if $A \leq 2,000 \text{ ft}^2$ then addition does not need to comply with solar zone requirements

Method 2: Minimum Solar Zone Area Based on Potential Solar Zone (requirements in Exception 3 to 110.10(b)1B)

The enforcement agency may require additional documentation that describes how the reduced solar zone area was determined.

List the Method/Tool(s) used to quantify annual solar access: (for example, "Software X," "CAD Tool Y")			
Area of low-sloped roof (ratio of rise to run of 2:12 or less) where the annual solar access is 70 percent or greater.*	G		ft ²
Area of steep-sloped roof (ratio of rise to run is greater than 2:12) that is oriented between 110 and 270 degrees and annual solar access is 70 percent or greater.*	H		ft ²
Minimum solar zone area	I = 0.5 x (G + H)		ft ²

* For new construction consider total roof area; for additions consider newly added roof area

Minimum solar zone area (either F or I)	J		ft ²
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CERTIFICATE OF COMPLIANCE	CF1R-SRA-02-E
Minimum Solar Zone Area Worksheet – New Construction (Page 3 of 4)	
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14

Step 2: Allocated Solar Zone Subareas (for both SF and low-rise MF)

Subarea ID	Building Plan Reference	Slope of Roof or Overhang	If Steep Slope, roof or overhang oriented between 110 and 270 degrees	Subarea complies with Part 9 of Title 24 ^A	Subarea is free of obstruction ^s	Subarea is located the appropriate distance from obstruction ^s	Smallest dimension is greater than 5 feet	Subarea meet minimum area requirements ^t	Subarea Qualifies ^e	Area
H	I	J	K	L	M	N	O	P	Q	R
1	S.1	<input type="checkbox"/> Low <input checked="" type="checkbox"/> Steep	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	80 ft ²			
2	S.1	<input type="checkbox"/> Low <input checked="" type="checkbox"/> Steep	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	80 ft ²			
		<input type="checkbox"/> Low <input type="checkbox"/> Steep	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	ft ²			
		<input type="checkbox"/> Low <input type="checkbox"/> Steep	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	ft ²			
		<input type="checkbox"/> Low <input type="checkbox"/> Steep	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	ft ²			
		<input type="checkbox"/> Low <input type="checkbox"/> Steep	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	ft ²			
		<input type="checkbox"/> Low <input type="checkbox"/> Steep	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	ft ²			
		<input type="checkbox"/> Low <input type="checkbox"/> Steep	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	ft ²			
Proposed Solar Zone Area (sum of all qualifying subareas) [S]										160 ft ²

- A. The solar zone shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction.
- B. No obstructions, including but not limited to, vents, chimneys, architectural features, and roof mounted equipment, shall be located in the solar zone.
- C. Solar zone must be located no closer than twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.
- D. If building roof area ≤ 10,000 ft² then minimum area is 80ft². If building roof area >10,000 ft² then minimum area is 160ft².
- E. Check “yes” if answers to questions in columns K through P are “yes”.

Building Complies with Minimum Solar Zone Area Requirement

Check box if the sum of all subareas [S] is equal to or greater than the minimum solar zone area?
 (Minimum solar zone area is [C] for single family; [J] for low-rise multifamily)



§110.10 and the Field Inspector



- **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 (H₂O heating)

* *Forms must be registered if HERS req.*



CERTIFICATE OF INSTALLATION		CF2R-SPV-01-E
Photovoltaic System Verification		(Page 1 of 2)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

The installer is required to fill out this form for all newly installed Photovoltaic Systems (PV) when the CF1R shows PV as required for compliance. Only single family residences and townhouses may install a PV system for compliance purposes. The performance compliance approach must be utilized and the project must be located in climate zones 9-15. Procedures for verifying compliance are described in Reference Residential Appendix RA4.6.

The installer is required to fill out this form for all newly installed Photovoltaic Systems (PV) when the PV system is being used to claim an exception to the Solar Ready requirements of Section 110.10, specifically Exception 1 to Section 110.10(b)1A for single family residences or Exception 1 to Section 110.10(b)1B for low-rise multifamily buildings. High-rise Multifamily buildings and Hotel/Motel Occupancies with fewer than ten stories and nonresidential buildings with three stories or fewer must use the NRCl—SPV-01-E to claim Exception 1 to Section 110.10(b)1B.

A. General Information		
01	Status for Compliance Credit for PV installation	No compliance credit claimed
02	Status for compliance with Solar Ready Area Exception	Single family building

01b Solar Exception to Solar Ready Area requirements

B. Single Family Residence		
01	Enter Module Manufacturer Name	Solar Guys Manuf.
02	Enter Module Model Number	SP-0101-2013
03	Enter Module nameplate DC Power Rating measure under Standard Test Conditions (watts)	550 W
04	Enter Number of Modules used in the PV System	2
05.	Installed PV System Nameplate DC Power Rating (watts)	1,100 W
06.	Compliance Statement: System Complies	

C. Low-rise Multifamily		
01.	Total Roof Area (ft ²)	
02.	Minimum Nameplate DC Power Rating (Watts) = Total Roof Area (ft ²) x (1 Watt/ft ²)	
03	Enter Module Manufacturer Name	
04	Enter Module Model Number	
05	Enter Module nameplate DC Power Rating measure under Standard Test Conditions (watts)	
06	Enter Number of Modules used in the PV System	
07.	Installed PV System Nameplate DC Power Rating (watts)	
08	Compliance Statement:	



CERTIFICATE OF INSTALLATION		CF2R-STH-01-E
Solar Water Heating Systems		(Page 1 of 2)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

A. SOLAR WATER HEATING SYSTEMS

01	Manufacturer Name	
02	Model Number	
03	SRCC Certification Number	
04	Certification Type (OG-300, OG-100)	
05	Solar Savings Fraction (annual average value)	
06	# of Collectors in System (N/A for OG-300 systems)	
07	Collector Size (Square Footage) (N/A for OG-300 systems)	
08	Total Storage Volume (gallons) (N/A for OG-300 systems)	
09	Solar System Collector Orientation (N/A for OG-300 systems)	
10	Solar System Collector Tilt (N/A for OG-300 systems)	

B. SRCC OG-100 CERTIFIED COLLECTORS

The installed system shall meet the following eligibility criteria:

01	System is installed at the same orientation as modeled.
02	System is installed at the same tilt as modeled.
03	The system shall have the same collectors, pumps, controls, storage tank and backup water heater fuel type as the rated condition.
04	The collectors are located in a position that is not shaded by adjacent buildings or trees.
05	Backup Storage tanks are insulated with either an internal R-12 (labeled on tank) or external R-16
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. SRCC OG-300 CERTIFIED SYSTEMS

The installed system shall meet the following eligibility criteria:

01	The collectors shall face within 35 degrees of south and be tilted at a slope of at least 3:12
02	The system shall have the same collectors, pumps, controls, storage tank and backup water heater fuel type as the rated condition.
03	The collectors shall be located in a position that is not shaded by adjacent buildings or trees.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. SIZING COMPLIANCE WITH MULTIFAMILY PRESCRIPTIVE REQUIREMENTS:

01	For climate zones 1 through 9 only - the solar system has an annual solar savings fraction of 0.2
02	For climate zones 10 through 16 only – the solar system has an annual solar savings fraction of 0.35
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

E. SIZING COMPLIANCE WITH ELECTRIC WATER HEATING REQUIREMENTS:

01	Solar System must have an annual solar fraction of at least 50 percent. (§150.1(c)8D)
02	Site must not have natural gas
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	



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

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CEC-CF1R-NCB-01-E (Replaces 08/13)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE
Newly Constructed Buildings
Project Name: 2013 CALBO Training Sample Date Prepared: 01/01/14

CF1R-NCB-01-E
(Page 1 of 6)

A. GENERAL INFORMATION

01 Project Name:	CALBO Home	02 Date:	01/01/14
03 Project Location:	2013 CALBO Drive	04 Compliance Method:	Performance
05 CA City:	Sacramento	06 Building Front Orientation (deg or cardinal):	North
07 Zip Code:	95814	08 Number of Dwelling Units:	1
09 Climate Zone:	12	10 Fuel Type:	Natural Gas
11 Building Type:	<input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	12 Total Conditioned Floor Area:	1,500 ft ²
13 Project Type:	<input checked="" type="checkbox"/> Newly Constructed Building <input type="checkbox"/> New Addition greater than 1,000 ft ²	14 Slab Area:	1,500 ft ²

B. OPAQUE SURFACE DETAILS – Framed (Section 150.1(c)1)

Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Proposed			Appendix JAA Reference		U-Factor from Package A	Comments
					Cavity R-value	Continuous Insulation R-value	U-Factor	Table	Cell		
1	Ceiling	Wood	2 X 4	24 in.	R-30	R-0	0.031	4.2.1	A20	0.025	
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	

C. OPAQUE SURFACE DETAILS – Non-framed (Section 150.1(c)1)

Tag/ID	Assembly Type	Assembly Materials	Core Thickness (inches)	Proposed			Appendix JAA Reference		U-Factor from Package A	Comments
				Core Insulation R-value	Continuous Insulation R-value	U-Factor	Table	Cell		

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



CERTIFICATE OF COMPLIANCE		CF1R-NCB-01-E
Newly Constructed Buildings		(Page 1 of 6)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14	

A. GENERAL INFORMATION					
01	Project Name:	CALBO Home	02	Date:	01/01/14
03	Project Location:	2013 CALBO Drive	04	Compliance Method:	Performance
05	CA City:	Sacramento	06	Building Front Orientation (deg or cardinal):	North
07	Zip Code:	95814	08	Number of Dwelling Units:	1
09	Climate Zone:	12	10	Fuel Type:	Natural Gas
11	Building Type:	<input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	12	Total Conditioned Floor Area:	1,500 ft²
13	Project Type:	<input checked="" type="checkbox"/> Newly Constructed Building <input type="checkbox"/> New Addition greater than 1,000 ft ²	14	Slab Area:	1,500 ft²

B. OPAQUE SURFACE DETAILS – Framed (Section 150.1(c)1)											
01	02	03	04	05	06 Proposed				09	10	11
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Cavity R-value	Continuous Insulation R-value	U-Factor	Appendix JA4 Reference		U-Factor from Package A	Comments
								Table	Cell		
1	Ceiling	Wood	2 X 4	24 in.	R-30	R-0	0.031	4.2.1	A20	0.025	
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	

C. OPAQUE SURFACE DETAILS – Non-framed (Section 150.1(c)1)										
01	02	03	04	05	06	07	08	09	10	11
Tag/ID	Assembly Type	Assembly Materials	Thickness (inches)	Core Insulation R-value	Continuous Insulation R-value	U-Factor	Appendix JA4 Reference		U-Factor from Package A	Comments
							Table	Cell		



§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.



CERTIFICATE OF INSTALLATION		CF2R-ENV-03-E
Insulation Installation		(Page 1 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. The signer agrees that all applicable Mandatory Measures were met.

Medium and light density SPF manufacturers claim various R-values per inch. In California the maximum R-value that can be claimed for ccSPF is an R-value of 5.8 per inch and for ocSPF is an R-value of 3.6 per inch unless documentation is provided showing that the product and/or manufacturer has a current ICC Evaluation Service Report (ESR) that shows compliance with Acceptance Criteria for Spray-Applied Foam Plastic Insulation--AC377.

NOTE: The Energy Efficiency Standards Section 110.7 requires that "all joints, penetrations and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weather stripped, or otherwise sealed to limit infiltration and exfiltration." In areas where spray Foam (SPF) insulation is used, the SPF can be considered the air barrier. Other than rigid board insulation, all other forms of insulation are not considered as an air barrier.

A. ROOF/CEILING INSULATION									
01	02	03	04	05	06	07	08	09	10
I.D	Manufacturer & Brand	Framing Type	Framing Size	Frame Spacing (inches)	Insulation Type	Cavity Insulation R-value	Insulation Depth (in)	Above Deck R-value	Below Deck R-value
1	Best Insulation Manuf.	Wood	2 x 4	24 in.	Batt	R-30	10 in.	R-0	R-0

B. WALL - INSULATION									
01	02	03	04	05	06	07	08	09	10
I.D	Manufacturer & Brand	Framing Material	Framing Size	Spacing (inches)	Insulation Type	Cavity Insulation R-value	Insulation Depth (in)	Exterior Wall R-value	Interior Wall R-value
2	Best Insulation Manuf.	Wood	2 X 6	16 in.	Batt	R-19	6 in.	R-0	R-0

C. MASS - INSULATION							
01	02	03	04	05	06	07	08
I.D	Manufacturer & Brand	Location	Mass Thickness (in)	Furring Strip Type/ Depth (in)	Insulation Type	Exterior Insulation R-value	Interior Insulation R-value

D. RAISED FLOOR - INSULATION									
01	02	03	04	05	06	07	08	09	10
I.D	Manufacturer & Brand	Framing Material	Framing Size	Spacing (inches)	Insulation Type	Cavity Insulation R-value	Insulation Depth (in)	Exterior Floor R-value	Interior Floor R-value
3	Best Insulation Manuf	Wood	2 X 8	16 in.	Batt	R-19	6 in.	R-0	R-0

E. SLAB FLOOR/PERIMETER INSULATION (see F. for insulation requirements for heated slabs)							
01	02	03	04	05	06	07	08
I.D	Manufacturer & Brand	Floor type	Insulation Type	Insulation Depth (inches)	Insulation R-Value	Vertical Insulation length (in)	Horizontal Insulation Length (ft)



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 $\frac{3}{4}$ 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

CERTIFICATE OF COMPLIANCE – DATA FIELD DEFINITIONS AND CALCULATIONS										CF1R-NCB-01-E
Newly Constructed Buildings and Additions										(Page 4 of 6)
J. SPACE CONDITIONING (SC) SYSTEMS – HEATING/COOLING/DUCTS										
01	02	03	04	05	06	07	08	09		
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"> • 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. • 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. • 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. 										
K. VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12										
01						02				
Required 2 CFM per ft ² of Conditioned Floor Area						Minimum Attic Vent Free Area (column 1 / 375 CFM)				
• Homeowners shall be provided a one-page fact sheet on the efficient operation of a whole house fan.										
L. WATER HEATING (Section 150.1(c)8)										
List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating.										
01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Heating Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE or Thermal Efficiency	Rated Input (Btu/h or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
Gas Storage	DHW	Gas	N/A	Parallel	1	45	0.62	60,000	N/A	N/A

J. SPACE CONDITIONING (SC) SYSTEMS – HEATING/COOLING/DUCTS

01	02	03	04	05	06	07	08	09
Heating Equipment Type	Heating Efficiency	Cooling Equipment Type	Cooling Efficiency	Distribution System Type	Duct Location	Duct R-value	Thermostat Type	Comments

- 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.
- 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.
- 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.

K. VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12

01	02
Required 2 CFM per ft ² of Conditioned Floor Area	Minimum Attic Vent Free Area (column 1 / 375 CFM)

- Homeowners shall be provided a one-page fact sheet on the efficient operation of a whole house fan.

L. WATER HEATING (Section 150.1(c)8)

List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating.

01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Heating Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE or Thermal Efficiency	Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction
Gas Storage	DHW	Gas	N/A	Parallel	1	45	0.62	60,000	N/A	N/A

M. HERS VERIFICATION SUMMARY The enforcement agency shall pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.

Ducts

- Duct leakage testing required (Residential Appendix RA3.1)
- Heating and cooling systems are ductless, no HERS verification required
- System is zonally controlled. No bypass ducts are allowed, as confirmed by HERS verification

Refrigerant Charge

- Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15
- No cooling system installed

Central System Air Handlers

- Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design
- No cooling system installed
- Non-ducted cooling system

Water Heating

- Parallel piping verification required

TABLE 120.3-A PIPE INSULATION THICKNESS

FLUID TEMPERATURE RANGE (°F)	CONDUCTIVITY RANGE (in Btu-inch per hour per square foot per °F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER (in inches)				
			1 and less	1 to <1.5	1.5 to < 4	4 to < 8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Space heating, Hot Water systems (steam, steam condensate and hot water) and Service Water Heating Systems							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.31	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1.0	1.5	1.5	1.5	1.5
Space cooling systems (chilled water, refrigerant and brine)							
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
Below 40	0.20-0.26	50	1.0	1.5	1.5	1.5	1.5



§150.0(j)2, 3 and the Field Inspector

CERTIFICATE OF INSTALLATION – DATA FIELD DEFINITIONS AND CALCULATIONS		CF2R-PLB-02-E
Single Dwelling Unit Hot Water System Distribution		(Page 1 of 4)
A. DHW DISTRIBUTION SYSTEM		
01	Water Heating System Name:	
02	Distribution type:	
B. MANDATORY MEASURES FOR ALL DOMESTIC HOT WATER DISTRIBUTION SYSTEMS		
01	Equipment shall meet the applicable requirements of the Appliance Efficiency Regulations (Section 110.3(b)1).	
02	Unfired Storage Tanks are insulated with an external R-12 or combination of R-16 internal and external insulation. (Section 110.3(c)4).	
03	All piping with a nominal diameter of 3/4 inch (19 millimeter) or larger must be insulated with R3.6 or 1" of insulation. (Section 150.0(j))	
04	All hot water piping insulated from the water heater to the kitchen fixture or appliance with R3.6 or 1" of insulation (Section 150.0(j))	
05	The first 5 feet of hot and cold water pipes shall be insulated from the storage tank with R3.6 or 1" of insulation. (Section 150.0(j))	
06	Piping from the heating source to storage tank or between tanks must be insulated (Section 150.0(j))	
07	All piping associated with a domestic hot water recirculation system regardless of the pipe diameter must be insulated (Section 150.0(j))	
08	Piping from the heating source to storage tank or between tanks must be insulated (Section 150.0(j))	
09	Piping buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation. (Section 150.0(j))	
10	All elbows and tees shall be fully insulated. (RA4.4.1)	
11	Where insulation is required, no piping shall be visible due to insulation voids. (RA4.4.1)	
12	All insulation shall fit tightly to the pipe (RA4.4.1)	
13	The maximum length per dwelling unit of 1 inch diameter (150.0(j))	
14	For Gas or Propane Water Heaters: Ensure the following 1. A 120V electrical receptacle is within 3 feet from the vent. 2. A Category III or IV vent, or a Type B vent with straight 3. A condensate drain no more than 2 inches higher than 4. A gas supply line with capacity of at least 200,000 Btu.	
The responsible person's signature on this compliance document affi		
C. (STD)-Standard Distribution System (trunk and branch syste		
01	Verification of measures B1 through B10 show complianc	
The responsible person's signature on this compliance document affi		
D. (PIC)-Pipe Insulation Credit (For trunk and branch Hot Wat		
01	All hot water piping 1" and smaller shall be insulated to R shall comply with the insulation requirements in Table 12	
The responsible person's signature on this compliance document affi		



- **Still verify installed pipe insulation at Rough Frame:**
 - 3/4 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.

A. DHW DISTRIBUTION SYSTEM	
01	Water Heating System Name:
02	Distribution type:

B. MANDATORY MEASURES FOR ALL DOMESTIC HOT WATER DISTRIBUTION SYSTEMS	
01	Equipment shall meet the applicable requirements of the Appliance Efficiency Regulations (Section 110.3(b)1).
02	Unfired Storage Tanks are insulated with an external R-12 or combination of R-16 internal and external Insulation. (Section 110.3(c)4).
03	All piping with a nominal diameter of 3/4 inch (19 millimeter) or larger must be insulated with R3.6 or 1” of insulation. (Section 150.0(j))
04	All hot water piping insulated from the water heater to the kitchen fixture or appliance with R3.6 or 1” of insulation (Section 150.0(j))
05	The first 5 feet of hot and cold water pipes shall be insulated from the storage tank with R3.6 or 1” of insulation. (Section 150.0(j))
06	Piping from the heating source to storage tank or between tanks must be insulated (Section 150.0(j))
07	All piping associated with a domestic hot water recirculation system regardless of the pipe diameter must be insulated (Section 150.0(j))
08	Piping from the heating source to storage tank or between tanks must be insulated (Section 150.0(j))
09	Piping buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation. (Section 150.0(j))
10	All elbows and tees shall be fully insulated. (RA4.4.1)
11	Where insulation is required, no piping shall be visible due to insulation voids. (RA4.4.1)
12	All insulation shall fit tightly to the pipe (RA4.4.1)
13	The maximum length per dwelling unit of 1 inch diameter piping in a non-recirculating system is less than 15 feet (Section 150.0(j))
14	<p>For Gas or Propane Water Heaters: Ensure the following are installed (Section 150.0(n))</p> <ol style="list-style-type: none"> 1. A 120V electrical receptacle is within 3 feet from the water heater and accessible with no obstructions 2. A Category III or IV vent, or a Type B vent with straight pipe between outside and water heater 3. A condensate drain no more than 2 inches higher than the base on water heater for natural draining 4. A gas supply line with capacity of at least 200,000 Btu/Hr
The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. (STD)-Standard Distribution System (trunk and branch systems only) << Table C appears only if (STD)- is selected in A2.>>	
01	Verification of measures B1 through B10 show compliance for standard distribution system
The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. (PIC)- Pipe Insulation Credit (For trunk and branch Hot Water system) << Table D appears only if (PIC)- is selected in A2.>>	
01	All hot water piping 1” and smaller shall be insulated to R-3.6 and be 1 inch thick. Piping with a diameter larger than 1 inch shall comply with the insulation requirements in Table 120.3-A.
The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.	

E. (PP)- Central Parallel Piping << Table E appears only if (PP)- is selected in A2.>>	
01	Central manifold have 15 feet or less of pipe between manifold and water heater
02	Manifolds that include valves the manifold must be readily accessible in accordance with the plumbing code.
03	Hot water distribution system piping from the manifold to the fixtures and appliances must take the most direct path. Ex Piping from a second story manifold cannot supply the first floor
04	The hot water distribution piping must be separated by at least two inches from any other hot water supply piping
05	Hot and cold water supply piping must be separated by at least six inches or the hot water supply piping must be insulated. with 1" at a minimum R3.6 based (from TABLE 120.3-A.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

F. (IPBG)- Insulated and Protected Pipe Below Grade << Table F appears only if (IPBG)- is selected in A2.>>	
01	Verification of measures B1 through B14
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

G. (R-ND)- Recirculation non demand controls << Table G appears only if (R-ND)- is selected in A2.>>	
01	If more than one loop installed each loop shall have its own pump and controls
02	Automatic Air release valve is installed on the inlet side of the recirculation pump per Section 110.3(c)5A.
03	A check valve is located between the recirculation pump and the water heater per Section 110.3(c)5B.
04	Hose bibb is installed between the pump and the water heating equipment with an isolation valve between the hose bibb and the water heating equipment per Section 110.3(c)5C.
05	Isolation valves are installed on both sides of the pump. One of the isolation valves may be the same isolation valve as in item 4 above per Section 110.3(c)5D.
06	The cold water supply piping and the recirculation loop piping is not connected to the hot water storage tank drain port per Section 110.3(c)5E.
07	A check valve is installed on the cold water supply line between the hot water system and the next closest tee on the cold water supply per Section 110.3(c)5F.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

For information only. Not valid until registered with a HERS provider

H.(RDRmc)-Demand Recirculation – Manual Control << Table H appears only if (RDRmc)- is selected in A2>>

01	Verify the controlled recirculation systems operate “on-demand”, meaning that pump operation shall be initiated shortly prior to the hot water draw. The controls shall operate on the principal of shutting off the pump with a sensed rise in pipe temperature (Delta-T)
02	If more than one loop installed each loop shall have its own pump and controls
03	Verify that the pump, demand controls and thermo-sensor are present
04	Manual switches are located in the kitchen, all bathrooms, and any hot water use location that is at least 20 feet (measured along the hot water piping) from the water heater
05	Manual controlled systems may be activated by wired or wireless button mechanisms
06	Automatic Air release valve is installed on the inlet side of the recirculation pump per Section 110.3(c)5A.
07	A check valve is located between the recirculation pump and the water heater per Section 110.3(c)5B.
08	Hose bibb is installed between the pump and the water heating equipment with an isolation valve between the hose bibb and the water heating equipment per Section 110.3(c)5C.
09	Isolation valves are installed on both sides of the pump. One of the isolation valves may be the same isolation valve as in item 8 above per Section 110.3(c)5D.
10	The cold water supply piping and the recirculation loop piping is not connected to the hot water storage tank drain port per Section 110.3(c)5E.
11	A check valve is installed on the cold water supply line between the hot water system and the next closest tee on the cold water supply per Section 110.3(c)5F.

The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.

I. (RDRsc)-Demand Recirculation – Sensor Control << Table I appears only if (RDRsc)- is selected in A2.>>

01	Verify the controlled recirculation systems operate “on-demand”, meaning that pump operation shall be initiated shortly prior to the hot water draw. The controls shall operate on the principal of shutting off the pump with a sensed rise in pipe temperature (Delta-T)
02	If more than one loop installed each loop shall have its own pump and controls
03	Verify that the pump, demand controls and thermo-sensor are present
04	Sensor controls are located in the kitchen, all bathrooms, and any hot water use location that is at least 20 feet (measured along the hot water piping) from the water heater
05	Automatic Air release valve is installed on the inlet side of the recirculation pump per Section 110.3(c)5A.
06	A check valve is located between the recirculation pump and the water heater per Section 110.3(c)5B.
07	Hose bibb is installed between the pump and the water heating equipment with an isolation valve between the hose bibb and the water heating equipment per Section 110.3(c)5C.
08	Isolation valves are installed on both sides of the pump. One of the isolation valves may be the same isolation valve as in item 7 above per Section 110.3(c)5D.
09	The cold water supply piping and the recirculation loop piping is not connected to the hot water storage tank drain port per Section 110.3(c)5E.
10	A check valve is installed on the cold water supply line between the hot water system and the next closest tee on the cold water supply per Section 110.3(c)5F.

The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Documentation Author Name:	Documentation Author Signature:
Documentation Author Company Name:	Date Signed:
Address:	CEA/HERS Certification Identification (If applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

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

- The information provided on this Certificate of Installation is true and correct.
- I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation, and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.
- The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.
- I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.
- I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

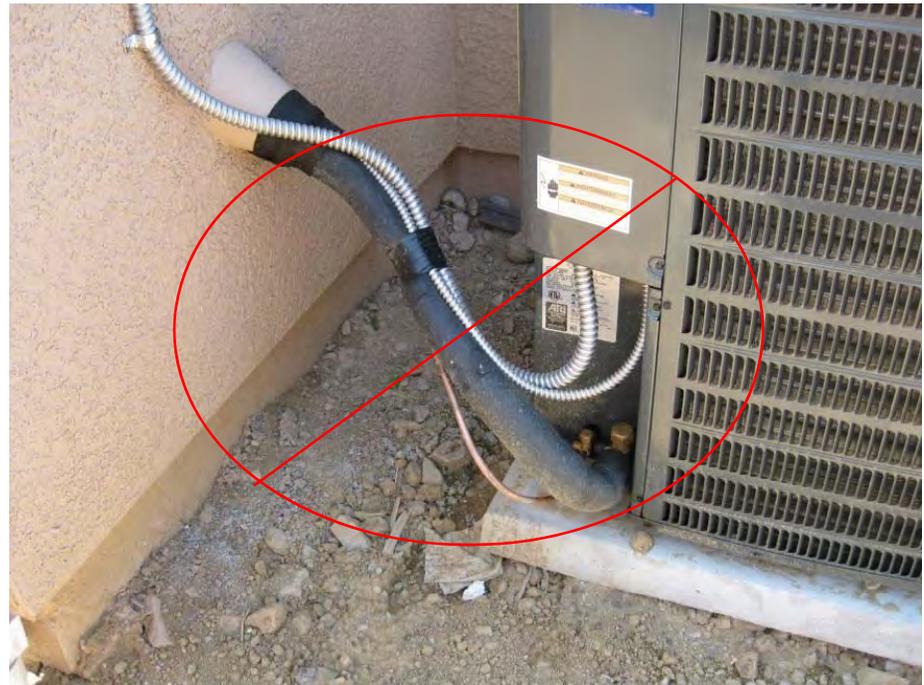
Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:

For information only. Not valid until data collection with HERS provided.



§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 $0.1 < \text{perm rating} \leq 1.0$
 - 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

TABLE 150.0-A CLASSIFICATION OF HIGH EFFICACY AND LOW EFFICACY LIGHT SOURCES

<p>High Efficacy Light Sources</p>	<p>Low Efficacy Light Sources</p>
<p>Luminaires manufactured, designed and rated for use with only lighting technologies in this column shall be classified as high efficacy:</p>	<p>Luminaires manufactured, designed or rated for use with any of the lighting technologies in this column shall be classified as low efficacy.</p>
<ol style="list-style-type: none"> 1. Pin-based linear or compact fluorescent lamps with electronic ballasts. Compact fluorescent lamps \geq 13 watts shall have 4 pins for compliance with the electronic ballast requirements in Section 150.0(k)1D. 2. Pulse-start metal halide lamps. 3. High pressure sodium lamps. 4. GU-24 sockets rated for LED lamps. 5. GU-24 sockets rated for compact fluorescent lamps. 6. Luminaires using LED light sources which have been certified to the Commission as high efficacy in accordance with Reference Joint Appendix JA8. 7. Luminaire housings rated by the manufacturer for use with only LED light engines. 8. Induction lamps. 	<ol style="list-style-type: none"> 1. Line-voltage lamp holders (sockets) capable of operating incandescent lamps of any type. 2. Low-voltage lamp holders capable of operating incandescent lamps of any type. 3. High efficacy lamps installed in low-efficacy luminaires, including screw base compact fluorescent and screw base LED lamps. 3. Mercury vapor lamps. 4. Track lighting or other flexible lighting system which allows the addition or relocation of luminaires without altering the wiring of the system. 6. Luminaires using LED light sources which have not been certified to the Commission as high efficacy. 7. Lighting systems that have modular components that allow conversion between high-efficacy and low-efficacy lighting without changing the luminaires' housing or wiring. 8. Electrical boxes finished with a blank cover or where no electrical equipment has been installed, and where the electrical box can be used for a luminaire or a surface mounted ceiling fan.
<p>Note: Adaptors which convert an incandescent lamp holder to a high-efficacy luminaire shall not be used to classify a luminaire as high efficacy.</p>	

TABLE 150.0-B MINIMUM REQUIREMENTS FOR OTHER LIGHT SOURCES TO QUALIFY AS HIGH EFFICACY

Use this table to determine luminaire efficacy only for lighting systems not listed in TABLE 150.0-A

Luminaire Power Rating	Minimum Luminaire Efficacy to Qualify as High Efficacy
5 watts or less	30 lumens per watt
over 5 watts to 15 watts	45 lumens per watt
over 15 watts to 40 watts	60 lumens per watt
over 40 watts	90 lumens per watt

Note: Determine minimum luminaire efficacy using the system initial rated lumens divided by the luminaire total rated system input power.



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

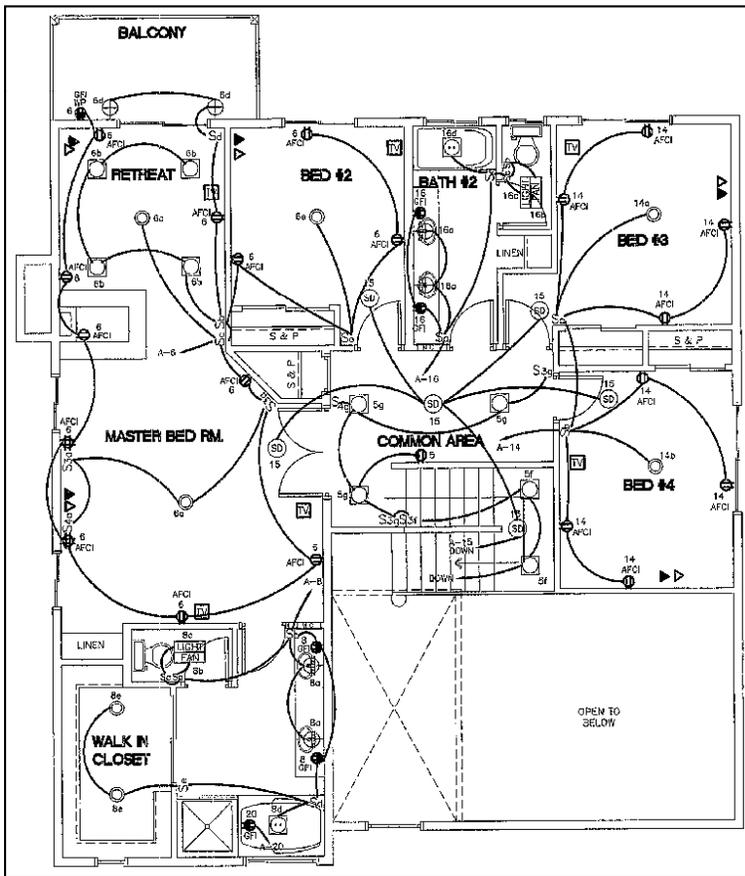
- Lighting recessed into insulated ceilings must be:
 - IC rated (zero clearance)
 - AT rated (airtight – leakage)
 - Sealed with a gasket or caulk between the housing and ceiling

2013 – §150.0(k)8

- ALL 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



§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*

Lighting – Single Family Dwellings

CEC-CF2R-LTG-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-LTG-01-E
Lighting – Single Family Dwellings		(Page 1 of 4)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

A. Does the scope of this project include (select Yes or No to the following options):		Y or N
01	Controls for any interior or outdoor lighting	
02	Luminaires in any interior room or outdoor	
03	luminaires recessed into ceilings	
04	Light Emitting Diode (LED) luminaires	
05	Kitchen lighting scope. << user pick from list: <ul style="list-style-type: none"> Only high efficacy luminaires (method (a)); or At least 50% of installed watts from permanently installed high efficacy lighting (method (b)) Installation qualifies for additional low efficacy lighting allotment (method (c)) 	
06	Lighting internal to cabinets	
07	Bathroom lighting	
08	Lighting in garages, laundry rooms, or bathrooms	
09	Lighting in rooms other than a kitchen, bathroom, garage, laundry room, or and utility room	
10	Outdoor lighting for single family residential	
11	Internally illuminated address signs	
12	Garages for 8 or more vehicles	

B. Lighting Controls	
01	150.0(k)2A: High efficacy luminaires are switched separately from low efficacy luminaires.
02	150.0(k)2B: Exhaust fans are switched separately from lighting systems, or can be switched OFF in accordance with EXCEPTION
03	150.0(k)2C: Luminaires are switched with readily accessible controls that permit luminaires to be manually switched ON and OFF
04	150.0(k)2D: Lighting controls and equipment are installed in accordance with manufacturer's instructions
05	150.0(k)2E: No controls are installed that bypass a dimmer or vacancy sensor function where that dimmer or vacancy sensor has been installed to comply with Section 150.0(k)
06	150.0(k)2F: Lighting controls comply with the applicable requirements in Section 110.9; Certified to the Energy Commission as applicable
07	150.0(k)2G: EMCS used to comply with dimmer requirements provides the functionality of a dimmer in accordance with Section 110.9, meets the installation certificate requirements in Section 130.4, the EMCS requirements in Section 130.5, and complies with all other applicable requirements in Section 150.0(k)2.
08	150.0(k)2H: EMCS used to comply with vacancy sensor requirements in Section 150.0(k) provides the functionality of a vacancy sensor in accordance with Section 110.9, meets the installation certificate requirements in Section 130.4, the EMCS requirements in Section 130.5, and complies with all other applicable requirements in Section 150.0(k)2.
09	150.0(k)2I: A multi-scene programmable controller used to comply with dimmer requirements provides the functionality of a dimmer in accordance with Section 110.9, and complies with all other applicable requirements in Section 150.0(k)2.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. Luminaires (Lighting Fixtures)	
01	150.0(k)1(A-C): For compliance with Section 150.0(k), all installed luminaires have been classified as high efficacy or low efficacy in accordance with the applicable requirements in Section 130.0(c), and in accordance with TABLE 150.0-A or TABLE 150.0-B
02	150.0(k)1D: Ballasts for fluorescent lamps rated 13 watts or greater are electronic.
03	150.0(k)1E: Night lights are rated to consume no more than five watts of power
04	150.0(k)1F: Lighting integral to exhaust fans meets all applicable requirements of Section 150.0(k)
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

This Table is applicable only if recessed lighting is selected in Table A above

D. Recessed Luminaires	
01	150.0(k)8A: Listed for zero clearance insulation contact (IC)
02	150.0(k)8B: Has label certifying air tight
03	150.0(k)8C: Sealed with a gasket or caulk between the luminaire housing and ceiling, and all air leak paths between conditioned and unconditioned spaces are sealed with a gasket or caulk; and
04	150.0(k)8D: Ballasts for compact fluorescent luminaires certified to the Commission in accordance with Section 110.9; and
05	150.0(k)8E: Allows ballast maintenance and replacement to be readily accessible to building occupants from below the ceiling without requiring the cutting of holes in the ceiling.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

June 2013

Lighting – Single Family Dwellings

CEC-CF2R-LTG-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-LTG-01-E
Lighting – Single Family Dwellings		(Page 2 of 4)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

This Table is applicable only if LED lighting is selected in Table A above

E. LED Luminaires	
01	TABLE 150.0-A: The LED luminaires are classified as low efficacy because they have NOT been Certified to the Energy Commission, or they do not comply with all of the following requirements, as applicable: Sections 110.9(e), 130.0(c)9, 150.0(k)1A, TABLE 150.0-A, and Reference Joint Appendix JA8.
02	150.0(k)1A: The LED luminaires are classified as high efficacy because they ARE Certified to the Energy Commission by the manufacturer in accordance with all of the following requirements, as applicable: Sections 110.9(e), 130.0(c)9, 150.0(k)1A, TABLE 150.0-A, and Reference Joint Appendix JA8.

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

This Table is applicable only if Kitchen lighting is selected in Table A above

F. Kitchen Lighting	
01	150.0(k)1C: The wattage of permanently installed luminaires determined as specified in Section 130.0(c).
02	150.0(k)1C: In the kitchen, wattage calculated as 180 watts of low efficacy lighting per blank electrical boxes finished with a blank cover.
03	Method <(a), (b), or (c) as selected above> from Section 150(k)3A: Compliance demonstrated using Method (a) because only high efficacy luminaires have been installed in the kitchen. Compliance demonstrated using Method (b). At least 50% of the installed watts from permanently installed high efficacy. Total A ≥ Total B in Installed Wattage Calculation Table (below) Compliance demonstrated with additional low efficacy wattage allowance of EXCEPTION to 150(k)3
04	<If method (c) is selected, this additional field will be displayed> EXCEPTION to 150.0(k)3: Additional low efficacy watts may be allowed when all luminaires in the kitchen are controlled by a vacancy sensor or dimmers, and 1. See 150.0(k)2A where high efficacy and low efficacy luminaires must be separately controlled. 2. See 150.0(k)2G where EMCS may be used as a dimmer; Section 150.0(k)2H where EMCS may be used as a vacancy sensor; or, 150.0(k)2I where multi-scene programmable controller may be used as a dimmer. NOTES: Compliance demonstrated using Method (c). Kitchen lighting qualifies for additional low efficacy lighting and as demonstrated in Installed Wattage Calculation Table in Method (b) (above) in addition to Additional Low Efficacy Wattage Calculation Table (below).

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

This Table is applicable only if Kitchen Lighting using Method (b) or (c) is selected in Table A above

Method (b) Total Wattage Calculation					
Luminaire Type	Luminaire (Fixture)		Quantity	Total Watts	
	High Efficacy Watts	Low Efficacy Watts		High Efficacy	Low Efficacy
			x	=	0
			x	=	0
			x	=	0
			x	=	0
			x	=	0
			x	=	0
Complies with method (b) if Total A ≥ Total B					0
					A ≥ B

This Table is applicable only if Kitchen Lighting using Method (c) is selected in Table A above

Method (c) Total Additional Low Efficacy Wattage Calculation			
Watts From Method (b)		(see footnote)	Total Low Efficacy Watts Allowed
High Efficacy	Low Efficacy	Additional Watts Low Efficacy	
0	0	0	0

1. Insert 50 if house is ≤ 2,500 square feet; Insert 100 if house is > 2,500 square feet.

Lighting – Single Family Dwellings

CEC-CF2R-LTG-01-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-LTG-01-E
Lighting – Single Family Dwellings		(Page 3 of 4)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

This Table is applicable only if Internal Cabinet lighting is selected in Table A above

G. Lighting Internal to Cabinets	
01	150.0(k)4: Permanently installed lighting internal to cabinets uses ≤ 20 watts of power per linear foot of illuminated cabinet.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

This Table is applicable only if bathroom lighting is selected in Table A above

H. Lighting in Bathrooms	
01	150.0(k)5A: A minimum of one high efficacy luminaire is installed in each bathroom; and
02	150.0(k)5B: All other lighting installed in each bathroom is high efficacy or controlled by vacancy sensors.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

This Table is applicable only if garage, laundry room and utility room lighting is selected in Table A above

I. Lighting in Garages, Laundry Rooms, and Utility Rooms	
01	150.0(k)6: All installed luminaires are high efficacy AND controlled by vacancy sensors
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

This Table is applicable only if lighting in rooms other than garage, laundry room and utility room lighting is selected in Table A above

J. Lighting other than in Kitchens, Bathrooms, Garages, Laundry Rooms, and Utility Rooms	
01	150.0(k)7: Installed lighting is high efficacy
02	150.0(k)7: Installed lighting is low efficacy and controlled by dimmers or vacancy sensors
03	150.0(k)7: Exempt lighting is in closets that are < 70 sq ft.
04	150.0(k)7: Exempt lighting is in detached storage buildings that are $< 1,000$ sq ft.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

This Table is applicable only if internally illuminated address signs is selected in Table A above

K. Address Signs	
01	150.0(k)10A: Internally illuminated address signs. Internally illuminated address signs shall (Select option A or B): A. Comply with Section 140.8. Applicable SLTG forms shall also be submitted
02	A. Comply with Section 140.8. Applicable SLTG forms shall also be submitted.
03	B. Address sign(s) consume no more than 5 watts of power as determined according to Section 130.0(c).
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

This Table is applicable only if outdoor lighting is selected in Table A above

L. Single Family Outdoor Lighting	
01	150.0(k)9A: High efficacy outdoor lighting is installed
02	150.0(k)9A: Low efficacy outdoor lighting is installed, and meets all of the lighting control requirements as specified in Section 150.0(k)9A, as summarized below: i. Controlled by a manual ON and OFF switch; and ii. Controlled by a motion sensor; and iii. Controlled by Photocontrol, Astronomical time clock, or EMCS.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	



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 AND packaged A/Cs and heat pumps
- Return duct and grille sizing alternative in:
 - TABLE 150.0-C; and
 - TABLE 150.0-D

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

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

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

System Nominal Cooling Capacity (Ton)*	Minimum Return Duct Diameter (inch)	Minimum Total Return Filter Grille Gross Area (inch²)
1.5	16	500
2.0	18	600
2.5	20	800

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



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

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

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

System Nominal Cooling Capacity (Ton)*	Return Duct 1 Minimum Diameter (inch)	Return Duct 2 Minimum Diameter (inch)	Minimum Total Return Filter Grille Gross Area (inch²)
1.5	12	10	500
2.0	14	12	600
2.5	14	14	800
3.0	16	14	900
3.5	16	16	1000
4.0	18	18	1200
5.0	20	20	1500

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





§150.0(m) and the Plans Examiner

- **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**

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CED-CF1R-N28-01-E (Revised 08/13) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE
Newly Constructed Buildings
Project Name: 2013 CALBO Drive, Sacramento, CA 95814 Date Prepared: 1/1/2014

J. SPACE CONDITIONING (SC) SYSTEMS – HEATING/COOLING/DUCTS

01	02	03	04	05	06	07	08	09
Heating Equipment Type	Heating Efficiency	Cooling Equipment Type	Cooling Efficiency	Distribution System Type	Duct Location	Duct R-value	Thermostat Type	Comments
Furnace	80% AFUE	Central Air Split System	13 SEER	Ducted	Attic	6.0	Setback	

• 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.
• 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.
• 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.

K. VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12

01	02
Required 2 CFM per ft ² of Conditioned Floor Area	Minimum Attic Vent Free Area (column 1 / 375 CFM)

• Homeowners shall be provided a one-page fact sheet on the efficient operation of a whole house fan.

L. WATER HEATING (Section 150.1(c)8)
List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating.

01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Heating Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE or Thermal Efficiency	Rated Input (Btu/h or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction

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



CERTIFICATE OF COMPLIANCE	CF1R-NCB-01-E
Newly Constructed Buildings	(Page 4 of 6)
Project Name: 2013 CALBO Drive, Sacramento, CA 95814	Date Prepared: 1/1/2014

J. SPACE CONDITIONING (SC) SYSTEMS – HEATING/COOLING/DUCTS								
01	02	03	04	05	06	07	08	09
Heating Equipment Type	Heating Efficiency	Cooling Equipment Type	Cooling Efficiency	Distribution System Type	Duct Location	Duct R-value	Thermostat Type	Comments
Furnace	80% AFUE	Central Air Split System	13 SEER	Ducted	Attic	6.0	Setback	
<ul style="list-style-type: none"> 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. 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. 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. 								

K. VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12	
01	02
Required 2 CFM per ft ² of Conditioned Floor Area	Minimum Attic Vent Free Area (column 1 / 375 CFM)
<ul style="list-style-type: none"> Homeowners shall be provided a one-page fact sheet on the efficient operation of a whole house fan. 	

L. WATER HEATING (Section 150.1(c)8)										
List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating.										
01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Heating Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE or Thermal Efficiency	Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction



CERTIFICATE OF COMPLIANCE		CF1R-NCB-01-E
Newly Constructed Buildings		(Page 5 of 6)
Project Name: 2013 CALBO Drive, Sacramento, CA 95814	Date Prepared: 1/1/2014	

M. HERS VERIFICATION SUMMARY The enforcement agency shall pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.

Ducts

- Duct leakage testing required (Residential Appendix RA3.1)
- Heating and cooling systems are ductless, no HERS verification required
- System is zonally controlled. No bypass ducts are allowed, as confirmed by HERS verification

Refrigerant Charge

- Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15
- No cooling system installed

Central System Air Handlers

- Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design
- No cooling system installed
- Non-ducted cooling system



§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](#))





CERTIFICATE OF INSTALLATION		CF2R-MCH-01-H
Space Conditioning Systems Ducts and Fans		(Page 2 of 4)
Project Name: CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-0101-13
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

D. Installed Cooling Equipment information: (note: this table is not applicable if cooling system type in C04 is "no cooling")							
01	02	03	04	05	06	07	08
System Identification or Name	Cooling Efficiency SEER	Cooling Efficiency EER	Condenser or Package Unit Manufacturer	Condenser or Package Unit Model Number	Condenser or Package Unit Serial Number	Condenser Rated Cooling Capacity (BTUH)	Condenser Rated Nominal Capacity (ton)
Notes:							

E. Installed Heating Equipment information						
01	02	03	04	05	06	07
System Identification or Name	Heating Efficiency AFUE	Heating Efficiency HSFP	Heating Unit Manufacturer	Heating Unit Model Number	Heating Unit serial number	Rated Heating Capacity (BTUH)
Notes:						

F. Installed Duct System information <<this table is not applicable if distribution system type in C05 is ductless>>									
01	02	03	04	05	06	07	08	09	10
SC System Identification or Name	SC System Location or Area Served	Supply Duct Location	Supply Duct R-Value	Return Duct Location	Return Duct R-Value	Method of compliance with duct and filter grille sizing Req's in 150.0(m)13	Status- R-Value less than minimum for Ducts In Cond. Space	Status - Bypass Ducts	Number of Air Filter Devices
HVAC 1	Zone 1	Attic	R-6	Attic	R-6	HERS verified Fan Efficacy and Airflow Rate	N/A	No Bypass Duct used	1
Notes:									

DUCT LEAKAGE DIAGNOSTIC TEST

CEC-CF2R-MCH-20-H (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-MCH-20-H
Duct Leakage Diagnostic Test		(Page 1 of 3)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

A. System Information

01	HVAC System Identification or Name:	HVAC 1
02	HVAC System Location or Area Served:	Zone 1
03	Building Type from CF1R	Single Family
04	Verified Low Leakage Ducts in Conditioned Space (VLLDCS) Credit from CF1R?	N/A
05	Verified Low Leakage Air-handling Unit Credit from CF1R?	N/A
06	Duct System Compliance Category:	Completely New System

B. Duct Leakage Diagnostic Test - MCH-20a - Completely New Duct System

01	Condenser Nominal Cooling Capacity (ton)	2.5 tons
02	Heating Capacity (kBtu/h)	70,000 Btu/H
03	Conditioned Floor Area Served by this HVAC System (ft ²)	1,800 ft²
04	Duct Leakage Test Conditions	Test Final
05	Duct Leakage Test Method?	Total Leakage
06	Leakage Factor ()	0.06
07	Air-Handling Unit Airflow (AHUAirflow) Determination Method	Default Airflow Method
08	Measured AHUAirflow (cfm)	N/A
09	Calculated Target Allowable Duct Leakage Rate (cfm)	60 cfm
10	Actual duct leakage rate from leakage test measurement (cfm)	50 cfm
11	Compliance statement: System passes leakage test	



CERTIFICATE OF INSTALLATION		CF2R-MCH-20-H
Duct Leakage Diagnostic Test		(Page 2 of 3)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

C. ADDITIONAL REQUIREMENTS FOR COMPLIANCE

01.	System was tested in its normal operation condition. No temporary taping allowed.
02.	Outside air (OA) ducts for Central Fan Integrated (CFI) ventilation systems shall not be sealed/taped off during duct leakage testing. CFI OA ducts that utilize controlled motorized dampers, that open only when OA ventilation is required to meet ASHRAE Standard 62.2, and close when OA ventilation is not required, may be configured to the closed position during duct leakage testing.
03.	All supply and return register boots were sealed to the drywall.
04.	Building cavities were not used as plenums or platform returns in lieu of ducts.
05.	If cloth backed tape was used it was covered with Mastic and draw bands.
06.	All connection points between the air handler and the supply and return plenums are completely sealed.
Visual Inspection at Final Construction Stage (applicable if system was tested at rough-in) After installing the interior finishing wall and verifying that the above rough-in tests was completed, the following procedure must be performed	
07.	For all supply and return registers, verify that the spaces between the register boot and the interior finishing wall are properly sealed.
08.	If the house rough-in duct leakage test was conducted without an air handler installed, inspect the connection points between the air handler and the supply and return plenums to verify that the connection points are properly sealed.
09.	Inspect all joints to ensure that no cloth backed rubber adhesive duct tape is used.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

STATE OF CALIFORNIA
DUCT LEAKAGE DIAGNOSTIC TEST

CEC-CF2R-MCH-20-H (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-MCH-20-H
Duct Leakage Diagnostic Test		(Page 3 of 3)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Installation documentation is accurate and complete.	
Documentation Author Name: HERS Rater	Documentation Author Signature: <i>HERS Rater</i>
Documentation Author Company Name: Best HERS Rating Company	Date Signed: 01/01/14
Address: 2013 HERS Street	CEA/HERS Certification Identification (if applicable): CA-2013-0101
City/State/Zip: Sacramento, CA 95814	Phone: (916) 437-7283

RESPONSIBLE PERSON'S DECLARATION STATEMENT	
I certify the following under penalty of perjury, under the laws of the State of California:	
<ol style="list-style-type: none"> The information provided on this Certificate of Installation is true and correct. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency. I understand that a HERS rater will check the installation to verify compliance, and that if such checking identifies defects; I am required to take corrective action at my expense. I understand that Energy Commission and HERS Provider representatives will also perform quality assurance checking of installations, including those approved as part of a sample group but not checked by a HERS rater, and if those installations fail to meet the requirements of such quality assurance checking, the required corrective action and additional checking/testing of other installations in that HERS sample group will be performed at my expense. I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy. 	
Responsible Builder/Installer Name: HVAC Installer	Responsible Builder/Installer Signature: <i>HVAC Installer</i>
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner) Cool Installation Guys	Position With Company (Title): Owner
Address: 2013 Installation Street	CSLB License: 010113
City/State/Zip: Sacramento, CA 95814	Phone (916) 432-2489 Date Signed: 01/01/14
Third Party Quality Control Program (TPQCP) Status:	Name of TPQCP (if applicable):



CERTIFICATE OF INSTALLATION		CF3R-MCH-22-H
Fan Efficacy (Fan Watt Draw)		(Page 1 of 2)
Project Name: CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

A. System Information

Each system requiring verification must use a separate form.

01	System Name or Identification/Tag	HVAC 1
02	System Location or Area Served	Zone 1

B. Fan Watt Draw Measurement

When the Certificate of Compliance indicates Fan Watt Draw verification is required, the procedures must be performed as specified in RA3.3. This measure requires verification by a HERS rater.

01	Fan Watt Draw Verification Method	Portable Watt Meter Measurement	
02	Actual Tested Watt	Watts	500 W
03	Actual Tested Airflow from MECH-23	CFM	1,000 cfm
04	Required Fan Efficiency	Watts/CFM	0.58 W/cfm
05	Actual Fan Efficiency	Watts/CFM	0.50 W/cfm
Compliance Statement: Pass			

C. ADDITIONAL REQUIREMENTS FOR COMPLIANCE

01	All registers were fully open.
02	System fan was set at maximum speed.
03	If fresh air duct is part of the HVAC system it was not closed.
04	Airflow and fan watt draw requires simultaneous measurements to calculate tested values.
05	Multi-speed compressor systems or variable speed compressor systems verified air flow (cfm/ton) and fan efficacy (Watt/cfm) for system operation in cooling mode at the maximum compressor speed and the maximum air handler fan speed.
06	Zoned air distribution systems met both the airflow (cfm/ton) and fan efficacy (Watt/cfm) criteria in every zonal control mode.
07	Zoned air distribution systems that have multi-speed compressor systems or variable speed compressor systems shall only be required to verify air flow (cfm/ton) and fan efficacy (Watt/cfm) for system operation in cooling mode at maximum compressor capacity and maximum system fan speed and with all zones calling for conditioning.
08	Verification Status: Pass
09	Correction Notes:
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	



CERTIFICATE OF INSTALLATION		CF3R-MCH-23-H
Space Conditioning System Airflow Rate		(Page 1 of 2)
Project Name: CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

A. Ducted Cooling System Information		
01	System Identification or Name	HVAC 1
02	System Location or Area Served	Zone 1
03	Nominal Cooling Capacity (tons) of Condenser	2.5 tons
04	System Installation Type	New
05	Cooling System Zonal Control Type	Not Zonal
06	Bypass Duct Status	System does not have bypass duct
07	Required Minimum System Airflow Rate (cfm)	875 cfm
08	Allowable Minimum Zonal Airflow Rate (cfm)	N/A
09	Date of System Airflow Rate Measurement	01/01/13
10	Type of System Airflow Rate Compliance	Airflow Rate Measurement

B. Hole for the placement of a Static Pressure Probe (HSPP), and Permanently installed Static Pressure Probe (PSPP) in the supply plenum. Procedures for installing HSPP or PSPP are specified in RA3.3.1.1.		
01	Method used to demonstrate compliance with the HSPP/PSPP requirement	HSPP Installed

C. Airflow Rate Measurement Apparatus and Procedure Information Instrument Specifications as given in RA3.3.1.1, and system airflow rate measurement apparatus information is given in RA3.3.2.		
01	Airflow Rate Measurement Type used for this airflow rate verification.	Flow Grid
03	Manufacturer of Airflow Measurement Apparatus	Flow Tester Manuf.
04	Model number of Airflow Measurement Apparatus	FG-01012013-09
05	Certification Status of the Airflow Measurement Apparatus Accuracy	CEC Certified
06	Determine compliance method for this document; display applicable tables below	Include Table

MCH-23a Forced Air System Airflow Rate Measurement - Single Zone Systems or Zonally Controlled Systems with All Zones Calling

D. Forced Air System Airflow Rate Measurement The procedures for System Airflow Rate Verification are specified in Reference Residential Appendix RA3.3.		
01	Target System Airflow Rate (cfm)	875 cfm
02	Actual System Airflow Rate Measurement (cfm)	1,000 cfm
Compliance Statement: System airflow rate complies		

E. Additional Requirements		
01	Air filters that meet the applicable requirements of Standards Section 150.0(m)12 or 150.0(m)13 were properly installed in the system during system air flow rate measurement identified on this Certificate of Installation.	
02	The airflow rate measurement apparatus used to perform the airflow rate measurement identified on this Certificate of Installation was calibrated in accordance with the apparatus manufacturer's specifications and conforms to the instrumentation specifications given in RA3.3.1.	
03	Verification Status:	
04	Correction Notes:	

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.



CERTIFICATE OF INSTALLATION		CF3R-MCH-23-H
Space Conditioning System Airflow Rate		(Page 2 of 2)
Project Name: CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Installation documentation is accurate and complete.

Documentation Author Name: HERS Rater Assistant	Documentation Author Signature: <i>HERS Rater Assistant</i>
Documentation Author Company Name: Best HERS Rating Company	Date Signed: 01/01/14
Address: 2013 HERS Street	CEA/HERS Certification Identification (If applicable): CA-2013-0101
City/State/Zip: Sacramento, CA 95814	Phone: (916) 437-7283

RESPONSIBLE PERSON'S DECLARATION STATEMENT

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

- The information provided on this Certificate of Installation is true and correct.
- I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.
- The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.
- I understand that a HERS rater will check the installation to verify compliance, and that if such checking identifies defects; I am required to take corrective action at my expense. I understand that Energy Commission and HERS Provider representatives will also perform quality assurance checking of installations, including those approved as part of a sample group but not checked by a HERS rater, and if those installations fail to meet the requirements of such quality assurance checking, the required corrective action and additional checking/testing of other installations in that HERS sample group will be performed at my expense.
- I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.
- I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Builder/Installer Name: HERS Rater	Responsible Builder/Installer Signature: <i>HERS Rater</i>	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner) Best HERS Rating Company	Position With Company (Title): Owner	
Address: 2013 HERS Street	CSLB License:	
City/State/Zip: Sacramento, CA 95814	Phone (916) 437-7283	Date Signed: 01/01/14
Third Party Quality Control Program (TPQCP) Status:	Name of TPQCP (if applicable):	



Water Heating

2008 – §150(n)

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

2013 – §150.0(n)

- 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

- **Verify mandatory measures on building plans**

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

OR

- Require mandatory measure note block

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:

1. A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions; and
2. 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
3. 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
4. A gas supply line with a capacity of at least 200,000 Btu/hr.

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:

1. A 120V electrical receptacle that is within 3 feet from the water heater and accessible to the water heater with no obstructions; and
2. 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
3. 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
4. A gas supply line with a capacity of at least 200,000 Btu/hr.



§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 = <u>100 cfm</u>	Fan Flow = <u>50 cfm</u>
Sone Rating = <u>3 sone</u>	Sone Rating = <u>3 sone</u>
Duct Size (diameter) = <u>4 inches</u>	Duct Size (diameter) = <u>4 inches</u>
Duct Length = <u>10 feet</u>	Duct Length = <u>15 feet</u>
Whole-Building Ventilation	
Location = <u>Master Bathroom</u>	Whole House Fan Calculation = $Q_{fan} = 0.01A_{floor} + 7.5(N_{br} + 1)$
Fan Flow = <u>70 cfm (continuous)</u>	Where: Q_{fan} = fan flow rate, (cfm) A_{floor} = conditioned floor area, ft ² N_{br} = number of bedrooms; not to be less than one
Sone Rating = <u>1 sone</u>	
Duct Size (diameter) = <u>4 inches</u>	
Duct Length = <u>20 feet</u>	
	$Q_{fan} = 0.01(2,500 \text{ ft}) + 7.5(5 + 1)$ $Q_{fan} = 25 + 7.5(6)$ $Q_{fan} = 25 + 45$ $Q_{fan} = 70 \text{ cfm}$

- **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**

Ventilation Schedule

Local Ventilation Rate Summary

Kitchens

Fan Flow = 100 cfm

Sone Rating = 3 sone

Duct Size (diameter) = 4 inches

Duct Length = 10 feet

Bathrooms

Fan Flow = 50 cfm

Sone Rating = 3 sone

Duct Size (diameter) = 4 inches

Duct Length = 15 feet

Whole-Building Ventilation

Location = Master Bathroom

Fan Flow = 70 cfm (continuous)

Sone Rating = 1 sone

Duct Size (diameter) = 4 inches

Duct Length = 20 feet

Whole House Fan Calculation =

$$Q_{fan} = 0.01A_{floor} + 7.5(N_{br} + 1)$$

Where:

Q_{fan} = fan flow rate, (cfm)

A_{floor} = conditioned floor area, ft²

N_{br} = number of bedrooms; not to be less than one

$$Q_{fan} = 0.01(2,500 \text{ ft}) + 7.5(5 + 1)$$

$$Q_{fan} = 25 + 7.5(6)$$

$$Q_{fan} = 25 + 45$$

$$Q_{fan} = 70 \text{ cfm}$$



§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





CERTIFICATE OF VERIFICATION		CF3R-MCH-27a-H
Indoor Air Quality and Mechanical Ventilation		(Page 1 of 2)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

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

A. Dwelling Mechanical Ventilation - General Information		
01	Building Type	Single Family
02	Conditioned floor area of dwelling unit	1,800 ft²
03	Number of bedrooms in dwelling unit	3
04	Ventilation Operation Schedule	Continuous
05	Whole-Building Ventilation Rate Calculation Method.	Fan Ventilation Rate
06	Whole Building Ventilation System Type	Exhaust

27a - Continuous Ventilation Airflow - Fan Vent Rate Method

B. Whole-Building Continuous Ventilation - Fan Ventilation Rate Method - A mechanical supply system, exhaust system, or combination thereof shall provide whole-building ventilation with outdoor air each hour at no less than the rate in equation 4.1a.		
01	Required Continuous Whole-Building Ventilation Rate (Q_{fan})	48 cfm
02	Installed Continuous Whole-Building Ventilation Rate	50 cfm

C. Compliance Statement		
Building Passes Continuous Whole-Building Ventilation Rate Test		



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 ft² 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

- 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

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE
Newly Constructed Buildings
Project Name: 2013 CALBO Training Sample
Date Prepared: 01/01/2014

CF1R-NCB-01-E
(Page 3 of 6)

G. ROOFING PRODUCTS (COOL ROOF) [Section 150.1(c)11]

01	02	03	04	05	06	07	08	09	10	11
Mass Roof 25 sq ft or greater	Roof Pitch	CMC Product ID Number	Product Type	Aged Solar Reflectance	Thermal Emittance	SBI	Aged Solar Reflectance	Thermal Emittance	SBI	Comments

NOTES:
• Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
• Liquid field applied coatings must comply with installation criteria from section 110.8(j)4.

H. FENESTRATION/GLAZING AREAS ALLOWED

01	02	03	04	05	06
Tag/ID	Orientation	Maximum Allowed	U-factor	SHGC	Comments

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES

01	02	03	04	05	06	07	08	09	10	11	12
Tag/ID	Fenestration Type	Surface Area	Orientation N, S, W, E or Roof	# of Panels	Total Proposed Area	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
1	Operable Window	40	North	2	40	0.31	NFRC	0.23	NFRC	Bug Screen	
2	Sliding Door	80	West	2	80	0.31	NFRC	0.23	NFRC	Bug Screen	
3	Operable Window	50	South	2	50	0.31	NFRC	0.23	NFRC	Bug Screen	
4	Operable Window	25	East	2	25	0.31	NFRC	0.23	NFRC	Bug Screen	
a.	Total Proposed Fenestration Area										
b.	Maximum Allowed Fenestration Area										
c.	Row a. < Row b.										
d.	If exterior shading devices are used, what is the new calculated SHGC value from CF1R-ENV-03?										

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



CERTIFICATE OF COMPLIANCE	CF1R-NCB-01-E
Newly Constructed Buildings	(Page 3 of 6)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/2014

G. ROOFING PRODUCTS (COOL ROOF) (Section 150.1(c)11)										
01	02	03	04	05	06	07	08	09	10	11
Mass Roof 25 lb ft ² or greater	Roof Pitch	CRRC Product ID Number	Product Type	Proposed			Required			Comments
				Aged Solar Reflectance	Thermal Emittance	SRI	Aged Solar Reflectance	Thermal Emittance	SRI	

NOTES:

- Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
- Liquid field applied coatings must comply with installation criteria from section 110.8(i)4.

H. FENESTRATION/GLAZING AREAS ALLOWED					
01	02	03	04	05	06
Tag/ID	Orientation	Maximum Allowed	U-factor	SHGC	Comments

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES											
01	02	03	04	05	06	07	08	09	10	11	12
Tag/ID	Fenestration Type	Surface Area	Orientation N, S, W, E or Roof	# of Panels	Total Proposed Area	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
1	Operable Window	40	North	2	40	0.31	NFRC	0.23	NFRC	Bug Screen	
2	Sliding Door	80	West	2	80	0.31	NFRC	0.23	NFRC	Bug Screen	
3	Operable Window	50	South	2	50	0.31	NFRC	0.23	NFRC	Bug Screen	
4	Operable Window	25	East	2	25	0.31	NFRC	0.23	NFRC	Bug Screen	
a.	Total Proposed Fenestration Area										
b.	Maximum Allowed Fenestration Area										
c.	Row a. ≤ Row b.)										
d.	If exterior shading devices are used, what is the new calculated SHGC value from CF1R-ENV-03?										

Window Schedule

I.D.	Orientation	Area (ft ²)	U-factor	SHGC	Ext. Shading Device	Len.	Hgt.	Lext.	Rext.
1	North	15.0	0.39	0.29					
2	North	15.0	0.39	0.29					
3	North	6.0	0.39	0.29					
4	North	6.0	0.39	0.29					
5	West	15.0	0.39	0.30					
6	West	25.0	0.45	0.38					
7	West	15.0	0.39	0.29					
8	West	25.0	0.45	0.38					
9	West	20.0	0.45	0.38					
10	South	25.0	0.45	0.38	Overhang	6.0	0.1	5.0	5.0
11	South	30.0	0.39	0.29	Overhang	6.0	0.1	5.0	5.0
12	South	20.0	0.45	0.38	Overhang	6.0	0.1	5.0	5.0
13	South	25.0	0.45	0.38					



CERTIFICATE OF INSTALLATION		CF2R-ENV-01-E
Fenestration Installation (Page 1 of 2)		
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-0101-13
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. The signer agrees that all applicable Mandatory Measures were met. Temporary labels are not to be removed before verification by the building inspector.

A. FENESTRATION/GLAZING

Includes all Windows, Skylights, Greenhouse/Bay Windows, Glazed Doors and Skylights

01	02	03	04	05	06	07	08	09
Manufacturer/Brand or Tag/ID	Installed				Source NFRC, CEC Default	Number of Like Products	Exterior Shading Devices	Comments/ Location/Special Features
	U- factor	SHGC	Area (ft ²)	Orientation				
Best Window Manuf./ Cool Windows	0.31	0.23	40	North	NFRC	1	Bug screen	
Best Window Manuf./ Cool Windows	0.31	0.23	80	West	NFRC	1	Bug screen	
Best Window Manuf./ Cool Windows	0.31	0.23	50	South	NFRC	1	Bug Screen	
Best Window Manuf./ Cool Windows	0.31	0.23	25	East	NFRC	1	Bug Screen	

B. Fenestration Installation.

01	Installed window U-factor and SHGC for new construction should be the same or better than listed on the CF1Rs.
02	For existing buildings the U-factor and SHGC values should be the same or better than the required Energy Commission prescriptive requirements.
03	Temporary labels should not be removed until verified by the building inspector.
04	The window manufacturer installation instructions should be followed when installing these windows. The space around the window and rough opening is completely filled with insulation. If bat insulation is used it is cut to size and placed into the window.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	



*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

TABLE 150.1-A COMPONENT PACKAGE-A Standard Building Design

			Climate Zone																		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
Building Envelope	Insulation ¹	Roofs /Ceilings	U 0.025 R-38	U 0.031 R-30	U 0.025 R-38																
		Walls	Above Grade	2x4 Framed ²	U 0.065 R-15+4 or R-13+5																
				Mass Wall Interior ³	U 0.070 R-13	U 0.070 R-13	U 0.059 R-17														
				Mass Wall Exterior ³	U 0.125 R-8.0	U 0.125 R-8.0	U 0.125 R-8.0														
			Below Grade	Below Grade Interior ³	U 0.070 R-13	U 0.070 R-13	U 0.066 R-15														
				Below Grade Exterior ³	U 0.200 R-5.0	U 0.100 R-10	U 0.100 R-10	U 0.053 R-19													
			Floors	Slab Perimeter	NR	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 R4.0	U 0.092 R-8.0	U 0.092 R-8.0	U 0.138 R-4.0	U 0.092 R-8.0									
		Radiant Barrier			NR	REQ	NR														
	Roofing Products	Low-sloped	Aged Solar Reflectance	NR	0.63	NR	0.63	NR													
			Thermal Emittance	NR	0.75	NR	0.75	NR													
		Steep Sloped	Aged Solar Reflectance	NR	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	NR									
	Fenestration	Maximum U-factor ⁴		0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32		
Maximum SHGC ⁵		NR	0.25	NR	0.25	NR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25				
Maximum Total Area		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%				
Maximum West Facing Area		NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%				

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

			Climate Zone																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
HVAC SYSTEM	Space Heating	Electric-Resistance Allowed	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
		If gas, AFUE	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		If Heat Pump, HSPF⁶	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	Space cooling	SEER	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		Refrigerant Charge Verification or Charge Indicator Display	NR	REQ	NR	NR	NR	NR	NR	NR	REQ	NR							
		Whole House Fan⁷	NR	NR	NR	NR	NR	NR	NR	NR	REQ	NR	NR						
	Central System Air Handlers⁸	Central Fan Integrated Ventilation System Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Ducts	Duct Insulation	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-8	R-6	R-6	R-8	R-8	R-8		
Water Heating	All Buildings	System Shall meet Section 150.1(c)8																	

Footnote requirements to TABLE 150.1-A:

1. The U-factors/R-values shown for ceiling, wall and raised floor insulation are for wood-frame construction with insulation installed between the framing members. For alternative construction assemblies, see Section 150.1(c)1A, B and C.
2. U-factors can be met by cavity insulation alone or with continuous insulation alone, or with both cavity and continuous insulation that results in a U-factor equal to or less than the U-factor shown. "R-15+4" means R-15 cavity insulation plus R-4 continuous insulation. Any combination of cavity insulation and/or continuous insulation that results in a U-factor equal to or less than 0.065 is allowed, such as R-13+5.
3. Mass wall has a thermal heat capacity greater than or equal to 7.0 Btu/h-ft². Below grade "interior" denotes insulation installed on the inside surface of the wall. Below grade "exterior" denotes insulation installed on the outside surface of the wall.
4. The installed fenestration products shall meet the requirements of Section 150.1(c)3.
5. The installed fenestration products shall meet the requirements of Section 150.1(c)4.
6. HSPF means "heating seasonal performance factor."
7. When whole house fans are required (REQ), only those whole house fans that are listed in the Appliance Efficiency Directory may be installed. Compliance requires installation of one or more WHFs whose total airflow CFM is capable of meeting or exceeding a minimum 2 cfm/square foot of conditioned floor area per Section 150.1(c)12.
8. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a time-limiting device not exceeding 30 minutes.



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

2013 – §150.1(c)1

- Package A requirements:
 - Must meet R-value or U-factor
 - 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

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CERTIFICATE OF COMPLIANCE (Section 150.1)

Project Name: 2013 CALBO Training Sample Date Prepared: 01/01/14

A. GENERAL INFORMATION

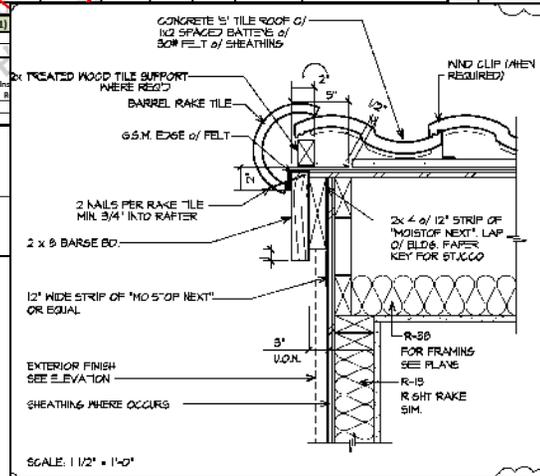
01	Project Name:	CALBO Home	02	Date:	01/01/14
03	Project Location:	2013 CALBO Drive	04	Compliance Method:	Performance
05	CA City:	Sacramento	06	Building Front Orientation (deg or cardinal):	North
07	Zip Code:	95814	08	Number of Dwelling Units:	1
09	Climate Zone:	12	10	Fuel Type:	Natural Gas
11	Building Type:	<input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	12	Total Conditioned Floor Area:	1,500 ft ²
13	Project Type:	<input checked="" type="checkbox"/> Newly Constructed Building <input type="checkbox"/> New Addition greater than 1,000 ft ²	14	Slab Area:	1,500 ft ²

B. OPAQUE SURFACE DETAILS – Framed (Section 150.1(c)1)

Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Cavity R-value	Continuous Insulation R-value	U-Factor	Appendix J4 Reference Table	Cell	U-Factor from Package A	Comments
1	Ceiling	Wood	2 X 4	16 in.	R-38	R-0	0.026	4.2.1	A9	0.025	
2	Wall – North	Wood	2 X 4	16 in.	R-15	R-4	0.065	4.3.1	C4	0.065	
3	Wall – South	Wood	2 X 4	16 in.	R-15	R-4	0.065	4.3.1	C4	0.065	
4	Wall – East	Wood	2 X 6	16 in.	R-19	R-0	0.074	4.3.1	A5	0.065	
5	Wall – West	Wood	2 X 6	16 in.	R-19	R-0	0.074	4.3.1	A5	0.065	

C. OPAQUE SURFACE DETAILS – Non-framed (Section 150.1(c)1)

Tag/ID	Assembly Type	Assembly Materials	Thickness (inches)	R-value



- 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

* Remember mand. insulation reqs.



CERTIFICATE OF COMPLIANCE		CF1R-NCB-01-E
Newly Constructed Buildings		(Page 1 of 6)
Project Name: 2013 CALBO Training Sample		Date Prepared: 01/01/14

A. GENERAL INFORMATION					
01	Project Name:	CALBO Home	02	Date:	01/01/14
03	Project Location:	2013 CALBO Drive	04	Compliance Method:	Performance
05	CA City:	Sacramento	06	Building Front Orientation (deg or cardinal):	North
07	Zip Code:	95814	08	Number of Dwelling Units:	1
09	Climate Zone:	12	10	Fuel Type:	Natural Gas
11	Building Type:	<input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	12	Total Conditioned Floor Area:	1,500 ft²
13	Project Type:	<input checked="" type="checkbox"/> Newly Constructed Building <input type="checkbox"/> New Addition greater than 1,000 ft ²	14	Slab Area:	1,500 ft²

B. OPAQUE SURFACE DETAILS – Framed (Section 150.1(c)1)											
01	02	03	04	05	06		07	08	09	10	11
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Proposed			Appendix JA4 Reference		Required U-Factor from Package A	Comments
					Cavity R-value	Continuous Insulation R-value	U-Factor	Table	Cell		
1	Ceiling	Wood	2 X 4	16 in.	R-38	R-0	0.026	4.2.1	A9	0.025	
2	Wall – North	Wood	2 X 4	16 in.	R-15	R-4	0.065	4.3.1	C4	0.065	
3	Wall – South	Wood	2 X 4	16 in.	R-15	R-4	0.065	4.3.1	C4	0.065	
4	Wall – East	Wood	2 X 6	16 in.	R-19	R-0	0.074	4.3.1	A5	0.065	
5	Wall – West	Wood	2 X 6	16 in.	R-19	R-0	0.074	4.3.1	A5	0.065	

C. OPAQUE SURFACE DETAILS – Non-framed (Section 150.1(c)1)										
01	02	03	04	05	06	07	08	09	10	11
Tag/ID	Assembly Type	Assembly Materials	Thickness (inches)	Proposed			Appendix JA4 Reference		Required U-Factor from Package A	Comments
				Core Insulation R-value	Continuous Insulation R-value	U-Factor	Table	Cell		



§150.1(c)1 and the Field Inspector



- **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.

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



CERTIFICATE OF INSTALLATION		CF2R-ENV-03-E
Insulation Installation		(Page 1 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. The signer agrees that all applicable Mandatory Measures were met.

Medium and light density SPF manufacturers claim various R-values per inch. In California the maximum R-value that can be claimed for ccSPF is an R-value of 5.8 per inch and for ocSPF is an R-value of 3.6 per inch unless documentation is provided showing that the product and/or manufacturer has a current ICC Evaluation Service Report (ESR) that shows compliance with Acceptance Criteria for Spray-Applied Foam Plastic Insulation--AC377.

NOTE: The Energy Efficiency Standards Section 110.7 requires that "all joints, penetrations and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weather stripped, or otherwise sealed to limit infiltration and exfiltration." In areas where spray Foam (SPF) insulation is used, the SPF can be considered the air barrier. Other than rigid board insulation, all other forms of insulation are not considered as an air barrier.

A. ROOF/CEILING INSULATION									
01	02	03	04	05	06	07	08	09	10
I.D	Manufacturer & Brand	Framing Type	Framing Size	Frame Spacing (inches)	Insulation Type	Cavity Insulation R-value	Insulation Depth (in)	Above Deck R-value	Below Deck R-value
1	Best Insulation Manuf.	Wood	2 X 4	16 in.	Batt	R-38	12 in.	R-0	R-0

B. WALL - INSULATION									
01	02	03	04	05	06	07	08	09	10
I.D	Manufacturer & Brand	Framing Material	Framing Size	Spacing (inches)	Insulation Type	Cavity Insulation R-value	Insulation Depth (in)	Exterior Wall R-value	Interior Wall R-value
2	Best Insulation Manuf.	Wood	2 X 6	16 in.	Batt	R-19	6 in.	R-0	R-0
3	Best Insulation Manuf.	Wood	2 X 4	16 in.	Batt	R-15	4 in.	R-4	R-0

C. MASS - INSULATION							
01	02	03	04	05	06	07	08
I.D	Manufacturer & Brand	Location	Mass Thickness (in)	Furring Strip Type/ Depth (in)	Insulation Type	Exterior Insulation R-value	Interior Insulation R-value

D. RAISED FLOOR - INSULATION									
01	02	03	04	05	06	07	08	09	10
I.D	Manufacturer & Brand	Framing Material	Framing Size	Spacing (inches)	Insulation Type	Cavity Insulation R-value	Insulation Depth (in)	Exterior Floor R-value	Interior Floor R-value
4	Best Insulation Manuf	Wood	2 X 8	16 in.	Batt	R-19	6 in.	R-0	R-0

E. SLAB FLOOR/PERIMETER INSULATION (see F. for insulation requirements for heated slabs)							
01	02	03	04	05	06	07	08
I.D	Manufacturer & Brand	Floor type	Insulation Type	Insulation Depth (inches)	Insulation R-Value	Vertical Insulation length (in)	Horizontal Insulation Length (ft)



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F. HEATED SLABS - INSULATION	
01	All heated slabs shall be insulated as required by Section 110.8(g). Footings must meet required insulation levels.
02	Insulation shall be installed from the top of the slab, down 16 inches or to the frost line, whichever is greater. Climate zones 1-5 requires R-5, climate zone 16 requires R-10.
03	Alternatively, vertical insulation from top of slab at inside edge of outside wall down to the top of the horizontal insulation. Horizontal insulation from the outside edge of the vertical insulation extending 4 feet toward the center of the slab in a direction normal to the outside of the building in plan view. Climate zones 1-5 require R-5, climate zone 16 requires R-10 vertical and R-7 horizontal.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

G. MINIMUM MANDATORY MEASURES	
01	Insulation - 110.8(a): All installed Insulation is certified and listed with Department of Consumer Affairs, Standards for Insulating Material.
02	Insulation - 110.8(b): Urea formaldehyde foam insulation is protected by 4 mil polyethylene vapor retarder.
03	Insulation - 110.8(c): Flame spread and smoke density requirements of CBC are met.
02	Raised Floor - 150.0(d): All raised wood-frame floor have a minimum R-19 insulation or equivalent U-factor
03	Slab Floor/Perimeter - 150.0(l): Water absorption rate for the insulation material alone without facings is no greater than 0.3%; water vapor permeance rate is no greater than 2.0 perm/inch and is protected from physical damage and UV light deterioration.
04	Above Grade Exterior Wall - 150.0(c)1: All 2x4 wood-frame walls have a minimum R-13 insulation or equivalent U-factor.
05	Above Grade Exterior Wall - 150.0(c)2: All 2x6 wood-frame walls have a minimum R-19 insulation or equivalent U-factor.
06	Ceiling/Rafter Roof - 150.0(a)1: All wood-frame ceiling have a minimum R-30 insulation or equivalent U-factor.
07	Vapor Retarder - 150(g)1: Class I or II vapor retarder installed on conditioned space side of insulation in exterior walls, vented attics, and unvented attics with air-impermeable insulation in Climate Zones 14 and 16.
08	Vapor Retarder - 150(g)2: Class I or II vapor retarder installed on earth floor of unvented crawlspaces in Climate Zones 1-16.
09	Vapor Retarder - 150(g)3: Class I or II vapor retarder installed on earth floor of raised floor buildings with controlled ventilation crawlspaces.
10	<p>Heated Slabs - 110.8(g): All heated slabs shall be insulated as required.</p> <ul style="list-style-type: none"> ▪ Insulation shall be installed from the top of the slab, down 16 inches or to the frost line, whichever is greater. Climate zones 1-5 require R-5, climate zone 16 requires R-10. ▪ Alternatively, vertical insulation from top of slab at inside edge of outside wall down to the top of the horizontal insulation. Horizontal insulation from the outside edge of the vertical insulation extending 4 feet toward the center of the slab in a direction normal to the outside of the building in plan view. Climate zones 1-5 require R-5, climate zone 16 requires R-10 vertical and R-7 horizontal.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

H. INSTALLED INSULATION	
01	Installed insulation R-values are the same or greater than listed on the CF1R.
02	No gaps or voids between the insulation and framing.
03	No gaps between the sides or ends of batts.
04	Loose-fill insulation must be installed to the minimum installed weight per square foot (density) of the manufacturer's cut sheet for the proposed R-value.
05	Batt insulation is not compressed (no stuffing of the insulation into the cavity) and is installed to its full thickness.
06	Insulation is cut around obstructions such as electrical boxes.
07	Batt insulation is delaminated around all plumbing and electrical lines in ceilings, walls and floors.
08	Band joists are insulated to the same R-value as the wall.
09	In all narrow cavities the insulation shall be cut to fit or filled with expanding foam.
10	Insulation was installed per manufacturer instructions.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	



CERTIFICATE OF INSTALLATION		CF2R-ENV-03-E
Insulation Installation		(Page 3 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
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I. WALL INSULATION	
01	When allowed by manufacturer, Low expanding foam shall be used to fill gaps and voids around windows and doors. If not, the cavity must be air tight and filled completely with insulation. Batts must be cut to width. No stuffing allowed.
02	Installed wall insulation before installing tubs, showers and fireplaces.
03	Electric Panel on walls separating conditioned and nonconditioned space are sealed and insulated behind the panel with rigid insulation or expanding foam.
04	All walls of interior closets vented to the outside for HVAC or water heating equipment have the same R-value and air barrier as the exterior walls and ceiling. Doors are insulated and weather stripped.
05	Ducting not allowed in exterior walls unless insulated to R6 or greater and the insulation and duct are not crushed. Ducting not allowed in 2x4 wall assemblies.
06	Corner channels, wall intersections, and double sided shear walls insulated to the required R-value before enclosing the wall.
07	Insulation that does not fill the cavity placed against exterior air barrier.
08	Band joists are insulated to the same R-value as the walls.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

J. CEILING/ROOF INSULATION	
01	Insulation extends to the outside edge of the exterior top plates and is flush against any ventilation dams/baffles.
02	Insulation is in direct contact with ceiling, so there are no gaps between the ceiling and the insulation.
03	For chimneys and flues, the insulation is in contact with the sheet metal collar.
04	Can lights are covered with insulation to the same depth as required by the CF1R for ceiling insulation. If not an area weighted calculation is required to be turned in with this form.
05	Walkways and mechanical platforms insulated to the same R-value as required for the ceiling. If not an area weighted calculation is required to be turned in with this form.
06	Insulate a soffit by adding an air barrier and cover with insulation, or insulate the entire soffit including floor and walls.
07	Knee walls and skylight shafts are insulated to the wall R-value and in full contact with the interior air barrier. If framing on these surfaces is laid flat batt insulation is cut to fit around the framing. Batt insulation is not allowed to be draped over the framing.
08	Attic access doors insulated to the same R-value as ceiling. The insulation is permanently attached using adhesive or mechanical fasteners.
09	Attic access must be surrounded with a dam at least the same depth as the insulation to prevent loss of ceiling insulation.
10	Batt insulation cut to fit around cross bracings and truss webs in attic.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

K. RAISED FLOOR INSULATION	
01	Insulation in full contact with subfloor.
02	Insulation hangers spaced at 18 inches or less, insulation hangers must not compress insulation.
03	If netting or mesh is used, the cavity under the floor is filled and in contact with the subfloor.
04	If the basement is conditioned the walls adjacent to the crawlspace must meet minimum wall R-value requirements. This includes framed stem walls, and vertical concrete retaining walls.
05	If access to the crawl space is from the conditioned area, the raised floor must have an airtight insulated access hatch.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

L. FLOOR ABOVE GARAGE INSULATION QUALITY	
01	Insulation must be in full contact with subfloor if the air barrier is at the band joist at the garage house wall.
02	Insulation hangers spaced at 18 inches or less, insulation hangers must not compress insulation.
03	If netting or mesh is used, the cavity under the floor is filled and in contact with the subfloor.
04	If air barrier is at the perimeter of the garage, below conditioned subfloor, the insulation is placed on the garage ceiling. Perimeter of subfloor is also insulated.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	



CERTIFICATE OF INSTALLATION		CF2R-ENV-03-E
Insulation Installation		(Page 4 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
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M. CANTILEVERED FLOOR INSULATION QUALITY	
01	Insulation in full contact with cantilevered subfloor. Insulation hangers spaced at 18 inches or less, insulation hangers do not compress insulation.
02	If netting or mesh is used, the cavity under the floor is filled and in contact with the subfloor.
03	Sealed Blocking is installed between joists where wall rim joist would be located in the absence of a cantilever. Insulation is placed on both sides of this block.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

N. ATTACHED PORCH ROOF INSULATION QUALITY	
01	Exterior insulated wall at the intersection of the porch roof is fully insulated above, below and behind the roof line.
02	Where truss framing is used, airtight blocking is at the top and bottom of each wall/roof section and insulated.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

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

RESPONSIBLE PERSON'S DECLARATION STATEMENT		
I certify the following under penalty of perjury, under the laws of the State of California:		
1. The information provided on this Certificate of Installation is true and correct.		
2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation, and attest to the declarations in this statement (responsible builder/installer), otherwise I am an authorized representative of the responsible builder/installer.		
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations, and the installation conforms to the requirements given on the plans and specifications approved by the enforcement agency.		
4. I reviewed a copy of the Certificate of Compliance approved by the enforcement agency that identifies the specific requirements for the scope of construction or installation identified on this Certificate of Installation, and I have ensured that the requirements that apply to the construction or installation have been met.		
5. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.		
Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:



CERTIFICATE OF INSTALLATION		CF2R-ENV-02-E
Envelope Air Sealing - ENV-02		(Page 1 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

Note: The Energy Efficiency Standards Section 110.7 requires that "all joints, penetrations and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weather stripped, or otherwise sealed to limit infiltration and exfiltration." The requirements below are for newly constructed spaces, additions and alterations to existing assemblies. In areas where Spray Foam (SPF) insulation is used, the SPF can be considered the air barrier. Rigid board insulation is also an air barrier as long as infiltration cannot bypass the product. All other forms of insulation are not considered an air barrier and cannot be used as such.

A. Does the scope of this project include (select Yes or No to the following options):		
01	Raised Floor Air Sealing	<input checked="" type="checkbox"/> Y or <input type="checkbox"/> N
02	Wall Air Sealing	<input checked="" type="checkbox"/> Y or <input type="checkbox"/> N
03	Ceiling Air Sealing	<input checked="" type="checkbox"/> Y or <input type="checkbox"/> N
04	Conditioned Space Above or Adjacent to Garage Air Sealing	<input checked="" type="checkbox"/> Y or <input type="checkbox"/> N
05	Cantilevered Floor Air Sealing	<input type="checkbox"/> Y or <input checked="" type="checkbox"/> N
06	Attached porch Roof Air Sealing	<input type="checkbox"/> Y or <input checked="" type="checkbox"/> N
07	Multifamily Air Sealing	<input type="checkbox"/> Y or <input checked="" type="checkbox"/> N

B. RAISED FLOOR AIR SEALING	
01	All gaps in the raised floor are sealed.
02	All chases sealed at floor level using a hard cover and the hard cover is sealed.
03	All Plumbing and electrical wires that penetrate the floor are sealed.
04	Subfloor sheathing is glued or sealed at all exterior panel edges, to create a continuous air tight subfloor
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. WALL AIR SEALING	
01	All penetrations through the exterior wall are sealed to provide an air-tight envelope to unconditioned spaces such as the outdoors, attic, garage and crawl space.
02	Exterior wall air barrier is sealed at the top plate and bottom plate in each stud bay.
03	All electrical boxes including knockouts that penetrate the exterior sheathing to unconditioned space are sealed.
04	All openings in the top and bottom plate, including all interior and exterior walls, to unconditioned space are sealed.
05	Exterior bottom plates (all stories) are sealed to the floor using the appropriate method under the entire exterior bottom plate of the home.
06	All gaps around windows and doors are sealed. Sealant used was specified by window manufacturer.
07	Rim Joist gaps/openings are fully sealed.
08	Fan exhaust ducts that run between conditioned floors to the exterior walls include a damper at the exterior wall.
09	Metal tie downs are insulated between exterior framing and tie down.
10	HVAC boots installed in the walls are sealed to the surrounding drywall.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. CEILING AIR SEALING	
01	There is a continuous air barrier at the ceiling level. All openings in the ceiling such as into walls, drops, chasses, double walls are sealed.
02	Chimneys and flues have sheet metal flashings. The flashings are sealed to the chimney/flue with fire rated caulk and sealed to surrounding framing.
03	All penetrations through the top plate of interior and exterior walls are sealed.
04	Electrical boxes, fire alarm boxes, fire sprinklers, cut into ceiling are sealed to the surrounding drywall and all gaps in the box are sealed. If not possible to seal fixture directly a secondary barrier was created around the fixture that creates an air tight seal between conditioned and unconditioned spaces.
05	All installed recessed light fixtures that penetrate the ceiling to unconditioned space are rated to be Insulation Contact and air tight (IC and AT) which allows direct contact with insulation. Housing is sealed to the drywall.
06	Exhaust fan housings are sealed to surrounding drywall and all holes and seams in housing sealed.
07	All chases are covered with a hard cover that is sealed to framing.



CERTIFICATE OF INSTALLATION		CF2R-ENV-02-E
Envelope Air Sealing - ENV-02		(Page 2 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

08	Double walls that open to attic are covered and cover is sealed to framing.
09	Attic access forms airtight seal from conditioned space to unconditioned space. Vertical attic access have mechanical compression using screws or latches.
10	Knee walls are air tight: (a) Knee walls have solid blocking at the ceiling level to control air leakage down the wall. Ensure blocking is sealed to framing and drywall. (b) When the knee wall is placed on top of a subfloor the open cavity below the subfloor and the ceiling below are sealed.
11	Soffits are air tight. Either: a hard cover at ceiling level that seals the top plate, or interior of the soffit is air tight. If an interior wall is part of the soffit additional blocking must be added in the wall at the bottom of the soffit.
12	HVAC ducts in a chase are sealed at the ceiling level. Insulation not considered as air barrier (batts) not allowed.
13	HVAC boots that penetrate the ceiling are sealed to the surrounding drywall.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met	

E. CONDITIONED SPACE ABOVE OR ADJACENT TO GARAGE AIR SEALING	
01	All penetration in the subfloor above the garage into conditioned space are installed to meet the raised floor air sealing requirements above.
02	Air infiltration does not enter the house between the space above the garage and subfloor. Select the option used below:
03	[Y or No] (a) Edges are sealed at the garage ceiling (typical drywall) at the perimeter of the garage to create a continuous air tight surface between the garage and adjacent conditioned envelope. Sealed all plumbing, electric and mechanical penetrations between the garage and the adjacent conditioned space. For an open-web truss, airtight blocking is added on four sides of the garage perimeter. Insulation can be placed on the garage ceiling.
04	[Y or No] (b) Sealed band joist above the wall at the garage to conditioned space transition. Sealed all subfloor seams and penetrations between the conditioned space and the garage. Insulation is placed in contact with subfloor below conditioned space.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

F. CANTILEVERED FLOOR AIR SEALING	
01	Airtight blocking is installed between joists where the wall rim joist would have been located in the absence of a cantilever.
02	Exterior sheathing is installed to the bottom of the cantilever so that there is a continuous air and weather barrier for the cantilever. The cantilevered joist must be insulated to the same R-value as would be required for the subfloor prior to closing.
03	Any gaps, cracks or penetrations in the air barrier of the cantilever are sealed. Can lights in the cantilever must be IC and AT rated and properly sealed to sheathing.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

G. ATTACHED PORCH/ATTIC AIR SEALING	
01	Exterior wall, air sealant is placed at the intersection of the porch and exterior wall.
02	Truss framing blocking is used at top and bottom of each wall/roof section.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

H. MULTIFAMILY AIR SEALING	
01	Multifamily buildings must meet all air sealing requirements listed above.
02	Each dwelling unit must be air sealed to stop air movement from one unit to another.
03	Floor AND Ceiling of each Dwelling Unit: All penetrations through the floor and ceiling of each unit are sealed including, electric and gas utilities, water pipes, drain pipes, fire protection service pipes, communication wiring.
04	Elevator penthouse, mechanical penthouse, stairwell doors, roof access hatch, plumbing stacks sealed to reduce air transfer from attached spaces.
05	Common Walls: Bottom plate between units is sealed to the subfloor. All penetrations in the common walls are sealed including electrical boxes, wiring and plumbing penetrations. Perpendicular Interior walls that open into the common walls are sealed.

ENVELOPE AIR SEALING

CEC-CF2R-ENV-02-E (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF INSTALLATION		CF2R-ENV-02-E
Envelope Air Sealing - ENV-02		(Page 3 of 4)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

06	Vertical Chases for garbage chutes, elevator shafts, and HVAC ducting plumbing must be sealed to the floor and ceiling of each unit to stop air movement up and around the chase due to stack effect.
07	Vertical Chases for garbage chutes, elevator shafts, and HVAC ducting plumbing, wiring etc. must be sealed to stop air movement through the chase to the surrounding spaces.
08	Common Hallways must be sealed to stop air movement into dwelling units.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

For information and data collection
only. Not valid until registered with a
HERS provider



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

- 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)

STATE OF CALIFORNIA NEWLY CONSTRUCTED BUILDINGS CED-CF1R-MCB-01-E (Revised 06/12)											CALIFORNIA ENERGY COMMISSION			
CERTIFICATE OF COMPLIANCE											CF1R-NCB-01-E			
Newly Constructed Buildings											(Page 2 of 6)			
Project Name: 2013 CALBO Training Sample											Date Prepared: 01/01/14			
D. OPAQUE SURFACE DETAILS – Mass Walls (Section 150.1(c)1)														
01	02	03	04	05	06		07		08	09	10	11		
Tag/ID	Walls Above Grade	Mass Type	Mass Thickness (inches)	Furring Strip Thickness (inches)	Proposed				Required					
					Interior Insulation		Exterior Insulation		Appendix J44 Reference		Interior Insulation		Exterior Insulation	
					R-value	U-Factor	R-value	U-Factor	Table	Cell	R-value	U-Factor	R-value	U-Factor
E. SLAB INSULATION (Table 150.1-A)														
01		02		03				04						
Floor Type		Proposed		Required				Comments						
		R-value	U-factor	Insulation R-value	Insulation U-factor									
• Heated slab floors require mandatory slab insulation (see Table 110.8-A).														
F. RADIANT BARRIER (Section 150.1(c)2)														
01		02												
Radiant Barrier installed below the roof deck and on all gable end walls		Comment												
Yes														
A radiant barrier is required (for climate Zones 2-3):														
• To meet the prescriptive requirements, a minimum free ventilation area of not less than one square foot of vent area for each 300 ft ² of attic floor area with 30 percent upper vent.														
• A minimum air space between the top surface of the radiant barrier and roof decking of not less than 1.5 inches at the center of the truss/rafter span.														
• Radiant Barrier shall be installed to cover all gable end walls and other vertical surfaces in the attic.														
Registration Number: CA Building Energy Efficiency Standards - 2013 Residential Compliance														
Registration Date/Time:														
HERS Provider:														
June 2013														



CERTIFICATE OF COMPLIANCE										CF1R-NCB-01-E	
Newly Constructed Buildings										(Page 2 of 6)	
Project Name: 2013 CALBO Training Sample										Date Prepared: 01/01/14	

D. OPAQUE SURFACE DETAILS – Mass Walls (Section 150.1(c)1)														
01	02	03	04	05	06		07		08	09	10		11	
Tag/ID	Walls Above Grade	Mass Type	Mass Thickness (inches)	Furring Strip Thickness (inches)	Proposed				Required					
					Interior Insulation		Exterior Insulation		Appendix JA4 Reference		Interior Insulation		Exterior Insulation	
					R-value	U-factor	R-value	U-factor	Table	Cell	R-value	U-factor	R-value	U-factor

E. SLAB INSULATION (Table 150.1-A)					
01	02		03		04
Floor Type	Proposed		Required		Comments
	R-value	U-factor	Insulation R-value	Insulation U-factor	

- Heated slab floors require mandatory slab insulation (see Table 110.8-A).

F. RADIANT BARRIER (Section 150.1(c)2)	
01	02
Radiant Barrier installed below the roof deck and on all gable end walls	Comment
Yes	

A radiant barrier is required (for Climate Zones 2-15)

- To meet the prescriptive requirement, a minimum free ventilation area of not less than one square foot of vent area for each 300 ft² of attic floor area with 30 percent upper vent.
- A minimum air space between the top surface of the radiant barrier and roof decking of not less than 1.5 inches at the center of the truss/rafter span.
- Radiant Barrier shall be installed to cover all gable end walls and other vertical surfaces in the attic.



§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.



CERTIFICATE OF INSTALLATION		CF2R-ENV-04-E
Roofing-Radiant Barrier		(Page 1 of 2)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-0101-13
Dwelling Address: 2013 CALBO Drive	City: Sacramento	Zip Code: 95814

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. The signer agrees that all applicable Mandatory Measures were met. Temporary labels are not to be removed before verification by the building inspector.

A. RADIANT BARRIER				
		Ventilation Requirements (when installing Radiant Barrier)		
1	2	3	4	5
Brand Name	Installation Type	Total Attic Area (ft ²)	Required Total Net Free Area Attic Ventilation (in ²)	Minimum Upper Vent Net Free Area (in ²)
Best Radiant Barrier	Attached to underside of roof deck	1,000 ft²	480 in²	144 in²

NOTE: Radiant barrier must be installed on gable ends and all other vertical surfaces in the attic. When determining the Total Attic Area the attic area over nonconditioned spaces (ex garage) must be included when the attic over the conditioned and nonconditioned space are connected. For example a one story house with an attached garage the garage attic area must be included. Minimum Upper Vent must not be greater than 50% of the Total Net Free Area. Upper Vents must be within one foot of the ridge. Lower vents to be within one foot of the Eave. Emittance of the radiant barrier shall be less than or equal to 0.05 as tested with ASTM C1371, or E408.

Installed Type of **Lower Vent** **Eave** Type of **Upper Vent** **Ridge Vent**

Installed Net Free Area (NFA)

Upper vents = $\frac{44}{(\text{NFA per vent})} \text{ in}^2 \times \frac{4}{(\text{quantity})} = \frac{176}{(\text{total NFA})} \text{ in}^2$ (**144**)
(Req. NFA from above)

Lower vents = $\frac{25}{(\text{NFA per vent})} \text{ in}^2 \times \frac{14}{(\text{quantity})} = \frac{350}{(\text{total NFA})} \text{ in}^2$ (**336**)
(Req. NFA from above)

NOTE: The Net Free Area of a product is usually one half to one third of the open area. For example 2" round vent the open area is 3.14 in2 and the net free area is 1.1 in2. A 22" x 3" eave vent will have an open area of 81 in2 and the net free area is 39 in2.



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

- 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

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CF1R-NCB-01-E (Revised 05/13)
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE
Newly Constructed Buildings
Project Name: 2013 CALBO Training Sample
Date Prepared: 01/01/2014

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G. ROOFING PRODUCTS (COOL ROOF) (Section 150.1(c)11)

01	02	03	04	05	06	07	08	09	10	11
Mass Roof Area greater than 25 sq ft	Roof Pitch	CRRC Product ID Number	Product Type	Proposed Aged Solar Reflectance	Proposed Thermal Emittance	Required Aged Solar Reflectance	Required Thermal Emittance	SRI	SRI	Comments

NOTES:
• Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
• Liquid field applied coatings must comply with installation criteria from section 110.8(i)(4).

H. FENESTRATION/GLAZING AREAS ALLOWED

01	02	03	04	05	06
Tag/ID	Orientation	Maximum Allowed	U-factor	SHGC	Comments

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES

01	02	03	04	05	06	07	08	09	10	11	12
Tag/ID	Fenestration Type	Surface Area	Orientation N, S, W, E or Roof	# of Panes	Total Proposed Area	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
1	Operable Window	40	North	2	40	0.31	NFRC	0.23	NFRC	Bug Screen	
2	Sliding Door	80	West	2	80	0.31	NFRC	0.23	NFRC	Bug Screen	
3	Operable Window	50	South	2	50	0.31	NFRC	0.23	NFRC	Bug Screen	
4	Operable Window	25	East	2	25	0.31	NFRC	0.23	NFRC	Bug Screen	
a.	Total Proposed Fenestration Area				195						
b.	Maximum Allowed Fenestration Area				300						
c.	Row a.5 Row b.5										
d.	If exterior shading devices are used, what is the new calculated SHGC value from CF1R-ENV-03?										

Registration Number: CA Building Energy Efficiency Standards - 2013 Residential Compliance
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* Remember mand. 0.58 U-factor



CERTIFICATE OF COMPLIANCE	CF1R-NCB-01-E
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Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/2014

G. ROOFING PRODUCTS (COOL ROOF) (Section 150.1(c)11)

01	02	03	04	05	06	07	08	09	10	11
Mass Roof 25 lb ft ² or greater	Roof Pitch	CRRC Product ID Number	Product Type	Proposed			Required			Comments
				Aged Solar Reflectance	Thermal Emittance	SRI	Aged Solar Reflectance	Thermal Emittance	SRI	

- NOTES:**
- Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
 - Liquid field applied coatings must comply with installation criteria from section 110.8(i)4.

H. FENESTRATION/GLAZING AREAS ALLOWED

01	02	03	04	05	06
Tag/ID	Orientation	Maximum Allowed	U-factor	SHGC	Comments

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES

01	02	03	04	05	06	07	08	09	10	11	12
Tag/ID	Fenestration Type	Surface Area	Orientation N, S, W, E or Roof	# of Panels	Total Proposed Area	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
1	Operable Window	40	North	2	40	0.31	NFRC	0.23	NFRC	Bug Screen	
2	Sliding Door	80	West	2	80	0.31	NFRC	0.23	NFRC	Bug Screen	
3	Operable Window	50	South	2	50	0.31	NFRC	0.23	NFRC	Bug Screen	
4	Operable Window	25	East	2	25	0.31	NFRC	0.23	NFRC	Bug Screen	
a.	Total Proposed Fenestration Area				195						
b.	Maximum Allowed Fenestration Area				300						
c.	Row a. ≤ Row b.)										
d.	If exterior shading devices are used, what is the new calculated SHGC value from CF1R-ENV-03?										



§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**

STATE OF CALIFORNIA NEWLY CONSTRUCTED BUILDINGS CEC-CF1R-NCB-01-E (Revised 06/13)		CALIFORNIA ENERGY COMMISSION	
CERTIFICATE OF COMPLIANCE		CF1R-NCB-01-E	
Newly Constructed Buildings		(Page 5 of 6)	
Project Name: 2013 CALBO Training Sample		Date Prepared: 01/01/14	
M. HERS VERIFICATION SUMMARY The enforcement agency shall pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.			
Ducts			
<ul style="list-style-type: none">• Duct leakage testing required (Residential Appendix RA3.1)• Heating and cooling systems are ductless, no HERS verification required• System is zonally controlled. No bypass ducts are allowed, as confirmed by HERS verification			
Refrigerant Charge			
<ul style="list-style-type: none">• Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15• No cooling system installed			
Central System Air Handlers			
<ul style="list-style-type: none">• Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design• No cooling system installed• Non-ducted cooling system			
Registration Number: CA Building Energy Efficiency Standards - 2013 Residential Compliance		Registration Date/Time: HERS Provider: June 2013	



CERTIFICATE OF COMPLIANCE	CF1R-NCB-01-E
Newly Constructed Buildings	(Page 5 of 6)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14

M. HERS VERIFICATION SUMMARY The enforcement agency shall pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.

Ducts

- Duct leakage testing required (Residential Appendix RA3.1)
- Heating and cooling systems are ductless, no HERS verification required
- System is zonally controlled. No bypass ducts are allowed, as confirmed by HERS verification

Refrigerant Charge

- Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15
- No cooling system installed

Central System Air Handlers

- Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design
- No cooling system installed
- Non-ducted cooling system



§150.0(c)7 and the Field Inspector

- 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

STATE OF CALIFORNIA
REFRIGERANT CHARGE VERIFICATION
REG. CODE 150.0(c)(7) (Updated 2013) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF VERIFICATION CF3R-MCH-25
 Refrigerant Charge Verification (Page 1 of 3)

Project Name: 2013 CALBO Training Sample Enforcement Agency: Local Jurisdiction Permit Number: ND-510113
 Dwelling Address: 2013 CALBO Drive City: Sacramento Zip Code: 95814

A. System Information
 HERS Rater to field-verify all system information, discrepancies 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	2.5
06	Condenser (or package unit) serial number	4568721
07	Refrigerant Type	R-22
08	Other Refrigerant Type (if applicable)	N/A
09	Project Type	Completely New
10	Charge Indicator Display (CID) Status (Note: Even systems with a CID must have refrigerant charge verified by installer)	System does not have CID installed
11	Is the system of a type that the minimum airflow can be verified using an approved measurement procedure (RA3.3 or RA3.2.2.7)?	Yes
12	Is the system of a type that approved refrigerant charge verification procedures can be used to verify compliance with the refrigerant charge verification requirements when temperatures are ≥ 50°F (RA3.2.2, or RA1)?	Yes
13	Date of HERS Rater Refrigerant Charge Verification for this system	01/01/14
14	Refrigerant charge verification method used by installer	Superheat
15	Person who performed the Refrigerant Charge Verification reported on the Certificate of Installation:	HVAC Guys
16	HERS Verification Compliance Requirement Status	System qualifies for Group Sampling
17	Refrigerant charge verification method used by HERS Rater	Superheat

Standard Charge Verification Procedure – CF3R-MCH-25a - Superheat Method

B. Metering Device Verification – HERS Rater is required to visually field verify all information from CF2R Superheat Method can only be used on systems that do not have a variable metering device.

01	Refrigerant metering device	Fixed orifice
02	Superheat Method applicability status	Superheat Method applicable to system

C. Instrument Calibration – HERS Raters are required to calibrate their diagnostic tools. Procedures 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

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

Refrigerant Charge Verification Methods

- **Superheat** (outdoor temperature must be ≥ 55 degF); This verification method can only be used when the outdoor temperature is at or above 55 degF. It is only used on systems with fixed orifice refrigerant metering devices (non-variable metering devices). This method is detailed in Reference Appendix RA3.2.2.6.1. Systems verified using this method may be eligible for HERS verification compliance using sampling. Choosing this option will generate a CF2R-MCH-25a.
- **Subcooling** (outdoor temperature must be ≥ 55 degF); This verification method can only be used when the outdoor temperature is at or above 55 degF. It is only used on systems with variable metering devices (TXV or EXV). This method is detailed in Reference Appendix RA3.2.2.6.2. Systems verified using this method may be eligible for HERS verification compliance using sampling. Choosing this option will generate a CF2R-MCH-25b.
- **Weigh-in**; This verification method can be used at any outdoor temperature allowed by the equipment manufacturer. This method is detailed in Reference Appendix RA3.2.3. Systems verified using this method are NOT eligible for HERS verification compliance using Group Sampling. Choosing this option will generate a CF2R-MCH-25c.
- **Winter Setup** (applicable when outdoor temperature is < 55 degF); The Winter Setup verification method is a special version of the Subcooling method. It can be used when the outdoor temperature is between 37 and 55 degF. It can only be used on equipment where the manufacturer has specifically approved it for the equipment being tested. The Winter Setup procedure is details in Residential Appendix RA1.2. Choosing this option will generate a CF2R-MCH-25e.
- **New Package Unit Factory Charge**; Choose this option when a new package unit is being installed that has an AHRI rating. This helps ensure that the unit was properly charged at the factory. HERS verification of refrigerant charge may not be required in this case. Choosing this option will generate a CF2R-MCH-25f.

REFRIGERANT CHARGE VERIFICATION

CEC-CF3R-MCH-25-H (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF VERIFICATION		CF3R-MCH-25
Refrigerant Charge Verification		(Page 1 of 3)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

A. System Information		
HERS Rater to field-verify all system information, discrepancies 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	2.5
06	Condenser (or package unit) serial number	4568721
07	Refrigerant Type	R-22
08	Other Refrigerant Type (if applicable)	N/A
09	Project Type	Completely New
10	Charge Indicator Display (CID) Status (Note: Even systems with a CID must have refrigerant charge verified by installer)	System does not have CID Installed
11	Is the system of a type that the minimum airflow can be verified using an approved measurement procedure (RA3.3 or RA3.2.2.7)?	Yes
12	Is the system of a type that approved refrigerant charge verification procedures can be used to verify compliance with the refrigerant charge verification requirements when temperatures are $\geq 55^{\circ}\text{F}$ (RA3.2.2, or RA1)?	Yes
13	Date of HERS Rater Refrigerant Charge Verification for this system	01/01/14
14	Refrigerant charge verification method used by installer.	Superheat
15	Person who performed the Refrigerant Charge Verification reported on the Certificate of Installation:	HVAC Guys
16	HERS Verification Compliance Requirement Status	System qualifies for Group Sampling
17	Refrigerant charge verification method used by HERS Rater.	Superheat

Standard Charge Verification Procedure – CF3R-MCH-25a - Superheat Method

B. Metering Device Verification – HERS Rater is required to visually field verify all information from CF2R Superheat Method can only be used on systems that do not have a variable metering device.		
01	Refrigerant metering device	Fixed orifice
02	Superheat Method applicability status	Superheat Method applicable to system

C. Instrument Calibration – HERS Raters are required to calibrate their diagnostic tools.		
Procedures 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

Registration Number:

Registration Date/Time:

HERS Provider:

CA Building Energy Efficiency Standards - 2013 Residential Compliance

June 2013

REFRIGERANT CHARGE VERIFICATION

CEC-CF3R-MCH-25-H (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF VERIFICATION		CF3R-MCH-25
Refrigerant Charge Verification		(Page 2 of 3)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

D. Measurement Access Hole (MAH) Verification – HERS Raters are required to visually field verify MAH

Procedures for installing MAH are specified in Reference Residential Appendix RA3.2.2.3

01	Method used to demonstrate compliance with the Measurement Access Hole (MAH) requirement	MAH installed and labeled
----	--	----------------------------------

E. Minimum System Airflow Rate Verification

Procedures for verifying minimum system airflow are specified in Reference Residential Appendix RA3.2.2.7.

01	Minimum Required System Airflow Rate (cfm)	875 cfm
02	System Airflow Rate Verification Status	1,000 cfm

F. Data Collection – HERS Rater must independently collect all data in this section.

Procedures for determining Refrigerant Charge using the Standard Charge Verification Procedure are given in Reference Residential Appendix RA3.2.2 and RA3.2.2.2

01	Lowest return air dry bulb temperature that occurred during the refrigerant charge verification procedure (degreeF)	70.0
02	Measured Condenser air entering dry-bulb temperature ($T_{\text{condenser, db}}$) (degreeF)	90.0
03	Outdoor Temperature Qualification Status	Qualifies
04	Measured Return (evaporator entering) air dry-bulb temperature ($T_{\text{return, db}}$) (degreeF)	85.0
05	Measured Return (evaporator entering) air wet-bulb temperature ($T_{\text{return, wb}}$) (degreeF)	72.0
06	Measured Suction line temperature (T_{suction}) (degreeF)	50.0
07	Measured Suction line pressure (P_{suction} - psig)	100
08	Evaporator saturation temperature ($T_{\text{evaporator, sat}}$) from digital gauge or P-T Table using Line F07 (degreeF)	26.0
09	Measured Superheat (Line F06 – Line F08) (degreeF)	24.0
10	Target Superheat (from Table RA3.2.2, using F02 and F05) (degreeF)	27.0
11	Compliance Statement: System complies with Refrigerant Charge Verification requirement by use of the Superheat Method	



Cool Roofs

2008 – §151(f)12

- Package D requirements:
 - Steep-sloped roofs < 5 lb/ft²:
 - 0.20 SR and 0.75 TE, or 16 SRI in Cl. Zns. 10 – 15
 - Steep-sloped roofs ≥ 5 lb/ft²:
 - 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)

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CERTIFICATE OF COMPLIANCE
NEWLY CONSTRUCTED BUILDINGS
Project Name: 2013 CALBO Training Sample Date Prepared: 01/01/14

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G. ROOFING PRODUCTS (COOL ROOF) (Section 150.1(c)11)

01	02	03	04	05	06	07	08	09	10	11
Mass Roof 25 to 125 or greater	Roof Pitch	CRRC Product ID Number	Product Type	Proposed			Required			
				Aged Solar Reflectance	Thermal Emittance		Aged Solar Reflectance	Thermal Emittance	SRI	Comments
	4:12	0101-2013	Tile Roof	0.30	0.85		0.20	0.75	16	

NOTES:
• Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
• Liquid field applied coatings must comply with installation criteria from section 110.8(j)(4).

H. FENESTRATION/GLAZING AREAS ALLOWED

01	02	03	04	05	06
Tag/ID	Orientation	Maximum Allowed	U-factor	SHGC	Comments

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES

01	02	03	04	05	06	07	08	09	10	11	12
Tag/ID	Fenestration Type	Surface Area	Orientation N, S, W, E or Roof	# of Panels	Total Proposed Area	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
a.	Total Proposed Fenestration Area										
b.	Maximum Allowed Fenestration Area										
c.	Row a. ≤ Row b.)										
d.	If exterior shading devices are used, what is the new calculated SHGC value from CF1R-ENV-03?										

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Newly Constructed Buildings	(Page 3 of 6)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14

G. ROOFING PRODUCTS (COOL ROOF) (Section 150.1(c)11)										
01	02	03	04	05	06	07	08	09	10	11
Mass Roof 25 lb ft ² or greater	Roof Pitch	CRRC Product ID Number	Product Type	Proposed			Required			Comments
				Aged Solar Reflectance	Thermal Emittance	SRI	Aged Solar Reflectance	Thermal Emittance	SRI	
	4:12	0101-2013	Tile Roof	0.30	0.85		0.20	0.75	16	

NOTES:

- Any roof area covered by building integrated photovoltaic panels and solar thermal panels are exempt from the above Cool Roof requirements.
- Liquid field applied coatings must comply with installation criteria from section 110.8(i)4.

H. FENESTRATION/GLAZING AREAS ALLOWED					
01	02	03	04	05	06
Tag/ID	Orientation	Maximum Allowed	U-factor	SHGC	Comments

I. FENESTRATION PROPOSED AREAS AND EFFICIENCIES												
01	02	03	04	05	06	07	08	09	10	11	12	
Tag/ID	Fenestration Type	Surface Area	Orientation N, S, W, E or Roof	# of Panes	Total Proposed Area	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments	
a.	Total Proposed Fenestration Area											
b.	Maximum Allowed Fenestration Area											
c.	Row a. ≤ Row b.)											
d.	If exterior shading devices are used, what is the new calculated SHGC value from CF1R-ENV-03?											



§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/ft² 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

- 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

STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CERTIFICATE OF COMPLIANCE
Project Name: 2013 CALBO Training Sample | Date Prepared: 01/01/14

SECTION 150.1(c)(12) HEATING/COOLING/DUCTS

01	02	03	04	05	06	07	08	09
Heating Equipment Type	Heating Efficiency	Cooling Equipment Type	Cooling Efficiency	Distribution System Type	Duct Location	Duct R-value	Thermostat Type	Comments

• 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 systems allowed.
• 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.
• 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.

SECTION 150.1(c)(12) VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12

01	02
Required 2 CFM per ft ² of Conditioned Floor Area	Minimum Attic Vent Free Area (column 1, 1.425 CFM)
1,500 CFM	4 ft ²
1,500 CFM	4 ft ²

• Homeowners shall be provided a one-page brochure on the efficient operation of a whole house fan.

SECTION 150.1(c)(8) WATER HEATING (Section 150.1(c)(8))
List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating.

01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Heating Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE or Thermal Efficiency	Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction

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



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J. SPACE CONDITIONING (SC) SYSTEMS – HEATING/COOLING/DUCTS

01	02	03	04	05	06	07	08	09
Heating Equipment Type	Heating Efficiency	Cooling Equipment Type	Cooling Efficiency	Distribution System Type	Duct Location	Duct R-value	Thermostat Type	Comments

- 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.
- 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.
- 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.

K. VENTILATION COOLING in Climate Zones 8-14 Section 150.1(c)12

01	02
Required 2 CFM per ft ² of Conditioned Floor Area	Minimum Attic Vent Free Area (column 1 / 375 CFM)
1,500 CFM	4 ft²
1,500 CFM	4 ft²

- Homeowners shall be provided a ~~one-page fact sheet~~ on the efficient operation of a whole house fan.

L. WATER HEATING (Section 150.1(c)8)

List water heaters and boilers for both domestic hot water (DHW) heaters and hydronic space heating.

01	02	03	04	05	06	07	08	09	10	11
Water Heater Type	Water Heating System Type	Fuel Type	Central Domestic Hot Water Heating Distribution System	Dwelling Unit Distribution Type	Number of Water Heaters In System	Water Heater Volume (gal)	Energy Factor, AFUE or Thermal Efficiency	Rated Input (Btuh or kW)	Standby Loss (% or Btu)	Back-Up Solar Savings Fraction



§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.





CERTIFICATE OF INSTALLATION		CF2R-MCH-02-E
Whole House Fan		(Page 1 of 2)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City: Sacramento	Zip Code: 95814

Whole House Fan requirements are given in Standards Section 150.1(c)12.

A. Whole House Fan (WHF) Equipment Information		
01	WHF Manufacturer Name	Keeping Cool Manuf.
02	WHF Manufacturer Model #	0101-2013
03	WHF Rated CFM	1,500 CFM
04	Quantity of identical WHF installed of type described in A1, A2, A3	2
05	Total Whole House Fan CFM	3,000 CFM
06	Required Attic Ventilation Area (in ²)	1,152 in²
07	Installed Attic Ventilation Area (in ²)	1,200 in²

B. Whole House Fan compliance criteria calculations		
01	Dwelling Conditioned Floor Area from CF1R	1,500 ft²
02	Minimum Required Fan (CFM)	3,000 CFM

C. Compliance Statement		
PASS		

D. Additional Requirements		
01	The installed fan shall be listed on the CEC appliance directory as an approved model.	
02	The homeowner shall be provided with user instructions documentation that describe the proper use of the whole house fan necessary to obtain the full energy savings benefit.	
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.		



*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 ft²
 - Additions < 1,000 ft²
 - 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 ≤ 400 ft²
 - Additions > 400 ft² and ≤ 700 ft²
 - Additions > 700 ft²
 - Tables 9-3A – C in [Manual](#)
- Can exempt additions < 300 ft² from CF1R and CF2R forms if HERS not req.

Table 9-3A: Envelope Roof/Ceiling Requirements for Prescriptive Additions

Component	Requirements of Additions $\leq 400 \text{ ft}^2$	Requirements of Additions $> 400 \text{ ft}^2$ and $\leq 700 \text{ ft}^2$	Requirements of Additions $> 700 \text{ ft}^2$
Roof/Ceiling Insulation:	<u>Package A:</u> CZ1, 11-16: R-38 / U=0.025; CZ2-10: R-30 / U=0.031	<u>Package A:</u> CZ1, 11-16: R-38 / U=0.025; CZ2-10: R-30 / U=0.031	<u>Package A:</u> CZ1, 11-16: R-38 / U=0.025; CZ2-10: R-30 / U=0.031
Roof Products (Cool Roof):	<u>Package A:</u> <u>Steep-Sloped (> 2:12):</u> CZ10-15: Reflect.=0.20 and Emittance=0.75; or SRI=16	<u>Package A:</u> <u>Steep-Sloped (> 2:12):</u> CZ10-15: Reflect.=0.20 and Emittance=0.75; or SRI=16	<u>Package A:</u> <u>Steep-Sloped (> 2:12):</u> CZ10-15: Reflect.=0.20 and Emittance=0.75; or SRI=16
	<u>Package A:</u> <u>Low-Sloped (< 2:12):</u> CZ13 & 15: Reflect.=0.63 and Emittance=0.75; or SRI=75	<u>Package A:</u> <u>Low-Sloped (< 2:12):</u> CZ13 & 15: Reflect.=0.63 and Emittance=0.75; or SRI=75	<u>Package A:</u> <u>Low-Sloped (< 2:12):</u> CZ13 & 15: Reflect.=0.63 and Emittance=0.75; or SRI=75
	<u>Exception:</u> Additions $< 300 \text{ ft}^2$ exempt from all cool roof requirements.		
Radiant Barrier Above Attic:	<u>Package A:</u> CZ2-15: Radiant Barrier above Attic Spaces	<u>Package A:</u> CZ2-15: Radiant Barrier above Attic Spaces	<u>Package A:</u> CZ2-15: Radiant Barrier above Attic Spaces

Table 9-3B: Envelope Glazing Requirements for Prescriptive Additions

Component	Requirements of Additions $\leq 400 \text{ ft}^2$	Requirements of Additions $> 400 \text{ ft}^2$ and $\leq 700 \text{ ft}^2$	Requirements of Additions $> 700 \text{ ft}^2$
Total Glazing Area:	Up to 75 ft^2 or 30% of Conditioned Floor Area, whichever is greater	Up to 120 ft^2 or 25% of Conditioned Floor Area, whichever is greater	Up to 175 ft^2 or 20% of Conditioned Floor Area, whichever is greater
West-Facing Glazing Area: In Climate Zone 2, 4, 6-16	Up to 60 ft^2	Up to 60 ft^2	Up to 70 ft^2 or 5% of Conditioned Floor Area, whichever is greater
Glazing U-Factor & SHGC ¹ :	<u>Package A:</u> All CZs: U = 0.32 CZ 2, 4 & 6-16: SHGC = 0.25	<u>Package A:</u> All CZs: U = 0.32 CZ 2, 4 & 6-16: SHGC = 0.25	<u>Package A:</u> All CZs: U = 0.32 CZ 2, 4 & 6-16: SHGC = 0.25

1. See §150.0(q) and §150.1(c)3 for new and replaced window and skylight exceptions .

Table 9-3C: Envelope Insulation Requirements for Prescriptive Additions

Component	Requirements of Additions ≤ 400 ft ²	Requirements of Additions > 400 ft ² and ≤ 700 ft ²	Requirements of Additions > 700 ft ²
Exterior Wall ¹ Insulation:	In 2x4 Framing: R-13, U=0.102 In 2x6 Framing: R-19, U=0.074	In 2x4 Framing: R-13, U=0.102 In 2x6 Framing: R-19, U=0.074	<u>Package A:</u> All CZs: U=0.065
Raised Floor ¹ Insulation:	<u>Package A:</u> All CZs: R-19 or equivalent U-factor	<u>Package A:</u> All CZs: R-19 or equivalent U-factor	<u>Package A:</u> All CZs: R-19 or equivalent U-factor
Slab Floor ¹ Insulation:	<u>Package A:</u> CZ1-15: No Requirement; CZ 16: R-7.0 or U=0.58	<u>Package A:</u> CZ1-15: No Requirement; CZ 16: R-7.0 or U=0.58	<u>Package A:</u> CZ1-15: No Requirement; CZ 16: R-7.0 or U=0.58

1. R-values refer to wood framing and U-factors refer to metal framing.



§150.2(a) and the Plans Examiner

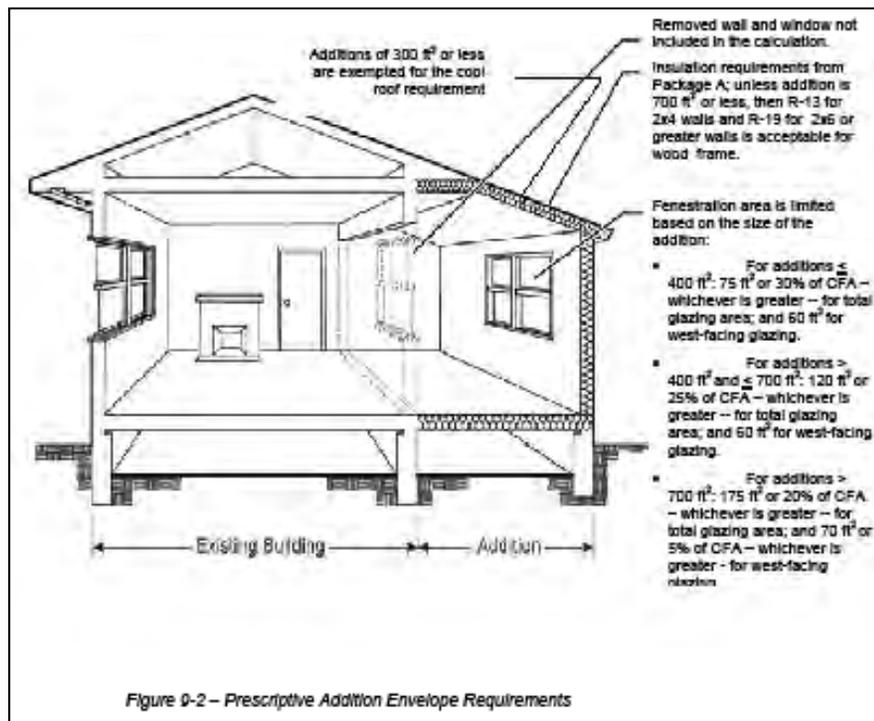
- **Plan review like new construction:**
 - Verify values on CF1R or CF1R-ADD meet prescriptive reqs.
 - Use Tables 9-3A - C as reference
 - Must be registered if HERS testing req.
 - Verify values specified on respective section of building plans

STATE OF CALIFORNIA ADDITIONS 1000 FT ² OR LESS CEC-CF1R-ADD-01-E (Revises 05/13)											CALIFORNIA ENERGY COMMISSION
CERTIFICATE OF COMPLIANCE											CF1R-ADD-01-E
Additions 1,000 ft ² or less											(Page 1 of 7)
Project Name:						Date Proposed:					
A. GENERAL INFORMATION											
Project Name:						Date:					
Project Location:						Compliance Method:					
CA City:						Building Front Orientation (deg):					
Zip Code:						Number of Dwelling Units:					
Climate Zone:						Fuel Type:					
Building Type: <input type="checkbox"/> Single Family <input type="checkbox"/> Multi Family						Total Conditioned Floor Area (Addition):					
Project Type: Addition <input type="checkbox"/> ≤ 300 <input type="checkbox"/> > 300 to ≤ 400 <input type="checkbox"/> > 400 to ≤ 700 <input type="checkbox"/> > 700 to ≤ 1000						Slab Area:					
B. OPAQUE SURFACE DETAILS – Framed (Section 150.2(a))											
01	02	03	04	05	06	07	08	09	10	11	
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Cavity R-value	Continuous Insulation R-value	Proposed		Required		Comments
							U-Factor	Appendix JA4 Reference Table	Cell	U-Factor	
C. OPAQUE SURFACE DETAILS – Non-framed (Section 150.1(c)1)											
01	02	03	04	05	06	07	08	09	10	11	
Tag/ID	Assembly Type	Assembly Materials	Thickness (inches)	Core Insulation R-value	Continuous Insulation R-value	U-Factor	Proposed		Required		Comments
							Table	Cell	U-Factor from Package A		
Registration Number: 2008 Residential Compliance Forms						Registration Date/Time:			HERS Provider:		January 2013

** Additions < 300 ft² exempt if no HERS req.*



§150.2(a) and the Field Inspector



- **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 < 300 ft² exempt if no HERS req.*

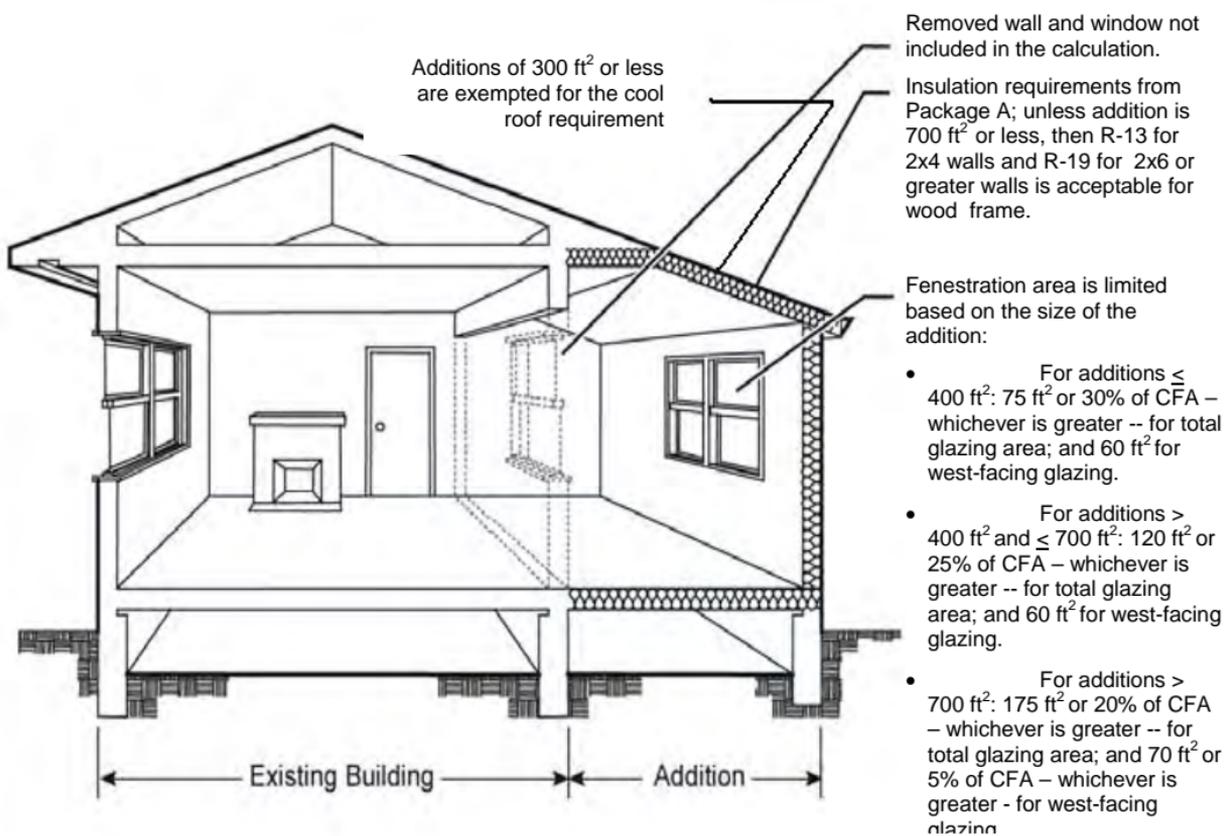


Figure 9-2 – Prescriptive Addition Envelope Requirements



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](#)

TABLE 150.2-B STANDARD DESIGN FOR AN ALTERED COMPONENT

Altered Component	Standard Design Without Third Party Verification of Existing Conditions Shall be Based On	Standard Design With Third Party Verification of Existing Conditions Shall be Based On
Ceiling Insulation, Wall Insulation, and Raised-floor Insulation	The requirements of Sections 150.0(a), (c), and (d)	The existing insulation R-value
Fenestration	The U-factor of 0.40 and SHGC value of 0.35. The glass area shall be the glass area of the existing building.	If the proposed U-factor is ≤ 0.40 and SHGC value is ≤ 0.35 , the standard design shall be based on the existing U-factor and SHGC values as verified. Otherwise, the standard design shall be based on the U-factor of 0.40 and SHGC value of 0.35. The glass area shall be the glass area of the existing building.
Window Film	The U-factor of 0.40 and SHGC value of 0.35.	The existing fenestration in the alteration shall be based on Table 110.6-A and Table 110.6-B.
Space-Heating and Space-Cooling Equipment	The requirements of TABLE 150.1-A.	The existing efficiency levels.
Air Distribution System – Duct Sealing	The requirements of Section 150.2(b)1D.	
Air Distribution System – Duct Insulation	The proposed efficiency levels.	The existing efficiency levels.
Water Heating Systems	The requirements of Section 150.1(b)1 without the solar water heating requirements.	The existing efficiency energy factor.
Roofing Products	The requirements of Section 150.2(b)1H.	
All Other Measures	The proposed efficiency levels.	The existing efficiency levels.



§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

STATE OF CALIFORNIA NEWLY CONSTRUCTED BUILDINGS CER-CP1R-NCB-01-E (Revised 08/13)		CALIFORNIA ENERGY COMMISSION
CERTIFICATE OF COMPLIANCE		CF1R-NCB-01-E
Newly Constructed Buildings		(Page 5 of 6)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14	
M, HERS VERIFICATION SUMMARY The enforcement agency shall pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.		
Ducts <ul style="list-style-type: none">• Duct leakage testing required (Residential Appendix RA3.1)• Heating and cooling systems are ductless, no HERS verification required• System is zonally controlled. No bypass ducts are allowed, as confirmed by HERS verification		
Refrigerant Charge <ul style="list-style-type: none">• Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15• No cooling system installed		
Central System Air Handlers <ul style="list-style-type: none">• Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design• No cooling system installed• Non-ducted cooling system		
Existing Conditions <ul style="list-style-type: none">• Existing R-13 wall must be verified• Existing 0.75 U-Factor and 0.80 SHGC windows must be verified• Existing 10 SEER A/C must be verified		
Registration Number: CA Building Energy Efficiency Standards - 2013 Residential Compliance	Registration Date/Time:	HERS Provider: June 2013

* *HERS testing req. before permit issued*



CERTIFICATE OF COMPLIANCE		CF1R-NCB-01-E
Newly Constructed Buildings		(Page 5 of 6)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14	

M. HERS VERIFICATION SUMMARY The enforcement agency shall pay special attention to the HERS Measures specified in this checklist below. A registered Certificate of Verification for all the measures specified shall be submitted to the building inspector before final inspection.

Ducts

- Duct leakage testing required (Residential Appendix RA3.1)
- Heating and cooling systems are ductless, no HERS verification required
- System is zonally controlled. No bypass ducts are allowed, as confirmed by HERS verification

Refrigerant Charge

- Refrigerant Charge Testing is required (Residential Appendix RA3.2) in climate zones 2 and 8-15
- No cooling system installed

Central System Air Handlers

- Airflow and Fan Efficacy (Residential Appendix RA3.3) or System Design
- No cooling system installed
- Non-ducted cooling system

Existing Conditions

- Existing R-13 wall must be verified
- Existing 0.75 U-Factor and 0.80 SHGC windows must be verified
- Existing 10 SEER A/C must be verified

CERTIFICATE OF VERIFICATION - EXISTING CONDITIONS FOR RESIDENTIAL ALTERATIONS		CF3R-EXC-20-H
Project Name:	CF1R-PRF Calculation Date/Time:	(Page 1 of 5)
CF1R-PRF Calculation description:	CF1R-PRF Input File Name:	

A. GENERAL INFORMATION

01	Project Name:				
02	Calculation Description				
03	Input File Name				
04	Multifamily/Subdivision Name				
05	Project Location:		06	Rule Set Filename:	
07	CA City :		08	Compliance Method:	
09	Zip code		10	Compliance Software:	
11	Climate Zone:		12	Bldg Front Orientation (deg or cardinal):	
13	Building Type:		14	Number of Dwelling Units:	
15	Construction Type:		16	Number of Zones:	
17	Total Cond. Floor Area (FT2):		18	Number of Stories:	
19	Slab Area (FT2):		20	Average Ceiling Height (FT):	
21	Addition Cond Floor Area (FT2):		22	Natural Gas on site?:	
23	Addition Slab Area (FT2):		24	Glazing Percentage (%):	

Verification Status:

B. OPAQUE SURFACES - Roof Details (Gray columns are informational and need not be verified by Rater)*

Roof Type	Roof Pitch	Aged (or Initial?) Solar Reflectance	Thermal Emittance	Frame Type	Frame Depth (in)	Frame Spacing (in)	R-Value Above Deck	R-Value Below Deck	Status

Verification Status:

CERTIFICATE OF VERIFICATION - EXISTING CONDITIONS FOR RESIDENTIAL ALTERATIONS		CF3R-EXC-20-H
Project Name:	CF1R-PRF Calculation Date/Time:	(Page 2 of 5)
CF1R-PRF Calculation description:	CF1R-PRF Input File Name:	

C. OPAQUE SURFACES - Attic Details (Gray columns are informational and need not be verified by Rater)*

Dwelling Unit	Frame Type	Area (ft ²)	U-factor	Cavity R-value	Continuous Insulation R-value	Actual Azimuth (deg)	Tilt	Solar Gains	Appendix JA4 Reference	Attic Ventilation	Status

Verification Status:

D. OPAQUE SURFACES - Floor Details (Gray columns are informational and need not be verified by Rater)*

Dwelling Unit	Surface Type	Frame Type	Area (ft ²)	U-factor	Cavity R-value	Continuous Insulation R-value	Tilt	Solar Gains	Appendix JA4 Reference	Status

Verification Status:

E. OPAQUE SURFACES - Wall Details (Gray columns are informational and need not be verified by Rater)*

Surface Type	Frame Type	Area (ft ²)	U-factor	Cavity R-value	Continuous Insulation R-value	Actual Azimuth	Tilt	Solar Gains	Appendix JA4 Reference	Location/Comments	Status

Verification Status:

CERTIFICATE OF VERIFICATION - EXISTING CONDITIONS FOR RESIDENTIAL ALTERATIONS		CF3R-EXC-20-H
Project Name:	CF1R-PRF Calculation Date/Time:	(Page 3 of 5)
CF1R-PRF Calculation description:	CF1R-PRF Input File Name:	

F. FENESTRATION SURFACES*										
Orientation	Surface	Area (ft ²)	U-factor	SHGC	Source	Actual Azimuth	Tilt	Film SHGC	Location/Glazing Type	Status
Verification Status:										

G. EXTERIOR SHADING*													
Window					Overhang				Side Fin				Status
Surface	Exterior Shade Type	Area (ft ²)	Width	Height	Depth	Height	Left Extension	Right Extension	Left Dist	Left Len	Right Dist	Right Len	
Verification Status:													

H. HVAC SYSTEMS*								
HVAC System Name	Heating System Type	Heating Efficiency	Cooling System Type	Cooling Efficiency SEER	Cooling Efficiency EER	duct system Name	Fan Type	Status
Verification Status:								

CERTIFICATE OF VERIFICATION - EXISTING CONDITIONS FOR RESIDENTIAL ALTERATIONS

CF3R-EXC-20-H

Project Name:	CF1R-PRF Calculation Date/Time:	(Page 4 of 5)
CF1R-PRF Calculation description:	CF1R-PRF Input File Name:	

I. HVAC DUCT SYSTEMS*

Duct System Name	Return Duct System Type	Return Duct R-Value	Return Duct Location	Supply Duct System Name	Supply Duct R-Value	Supply Duct Location	Status

Verification Status:

J. WATER HEATING SYSTEMS*

Water Heating System Name	Water Heating System Type	Central Distribution Type	Dwelling Unit Distribution Type	DHW Water Heater Type	Energy Factor or Recovery Efficiency or Thermal Efficiency	Rated Output (Btuh)	Standby Loss Total (Btuh)	Pilot Energy (Btuh)	Standby Loss (%)	Water Heater Volume (gal)	Number of water heaters in System	Water Heater Tank Exterior Insulation	Supplemental Tank Volume (gal)	Supplemental Tank External Insulation R-value	Supplemental Tank Interior Insulation R-Value	Status

Verification Status:

K. HYDRONIC HEATING SYSTEM PIPING*

System Name	Pipe Length (FT)	Nominal Pipe Diameter (inch)	Insulation R-Value	Status

Verification Status:

Registration Number:

Registration Date/Time:

HERS Provider:



*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 $\leq 50 \text{ ft}^2$
- 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

B. Replacement Fenestration. Replacement of fenestration, where existing fenestration area in an existing wall or roof is replaced with a new manufactured fenestration product and up to the total fenestration area removed in the existing wall or roof, the replaced fenestration shall meet the U-factor and Solar Heat Gain Coefficient requirements of Sections 150.1(c)3A, and 150.1(c)4.

EXCEPTION 1 to Section 150.2(b)1B: Replacement of vertical fenestration no greater than 75 square feet with a U-factor no greater than 0.40 in Climate Zones 1-16, and a SHGC value no greater than 0.35 in Climate Zones 2, 4, and 6-16.

EXCEPTION 2 to Section 150.2(b)1B: Replaced skylights must meet a U-factor no greater than 0.55, and a SHGC value no greater than 0.30.

A. Fenestration. Alterations that add vertical fenestration and skylight area shall meet the total fenestration area and west facing fenestration area, U-factor, and Solar Heat Gain Coefficient requirements of Section 150.1(c) and TABLE 150.1-A .

EXCEPTION 1 to Section 150.2(b)1A: Alterations that add fenestration area of up to 75 square feet shall not be required to meet the total fenestration area and west-facing fenestration area requirements of Sections 150.1(c)3B and C.

EXCEPTION 2 to Section 150.2(b)1A: Alterations that add up to 16 square feet of new skylight area with a maximum U-factor of 0.55 and a maximum SHGC of 0.30 area shall not be required to meet the total fenestration area and west-facing fenestration area requirements of Sections 150.1(c)3B and C.



§150.2(b)1A, B and the Permit Process



- **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

* *Can exempt from CF1R and CF2R*



CERTIFICATE OF COMPLIANCE	CF1R-ALT-01-E
Residential Alterations	(Page 2 of 5)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14

D. FENESTRATION/GLAZING AREAS ALLOWED (Section 150.2(b)1)				
01	02	03	04	05
Alteration Type	Fenestration Type	Orientation	Maximum Allowed ft2	Comments
Add 75	Window	North	300 ft²	

E. FENESTRATION/GLAZING PROPOSED AREAS AND EFFICIENCIES (Section 150.2(b)1)												
01	02	03	04	05	06	07	08	09	10	11	12	13
Fenestration Type	Frame Type	Orientation	Area Removed ft2	Area Added ft2	Net Added Area ft2	Maximum Allowed U-factor	U-factor	Source	SHGC	Source	Exterior Shading Device	Comments
Window	Wood	North	0 ft²	75 ft²	75 ft²	0.40	0.40	NFRC	0.35	NFRC		
a	Net Added West-facing Fenestration Area				0 ft²							
b	Existing + Added West-facing Fenestration Area				50 ft²							
c	Maximum Allowed West-facing Fenestration Area				75 ft²							
d	Is West-facing Fenestration Area \leq Allowed				Yes							
e	Net Added Fenestration Area (all orientations)				75 ft²							
f	Existing + Added Fenestration Area (all orientations)				300 ft²							
g	Maximum Allowed Fenestration Area (all orientations)				300 ft²							
h	Is Existing + Added Fenestration Area \leq Allowed				Yes							
i	If exterior shading devices are used, what is the calculated value from CF1R-ENV-03											



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

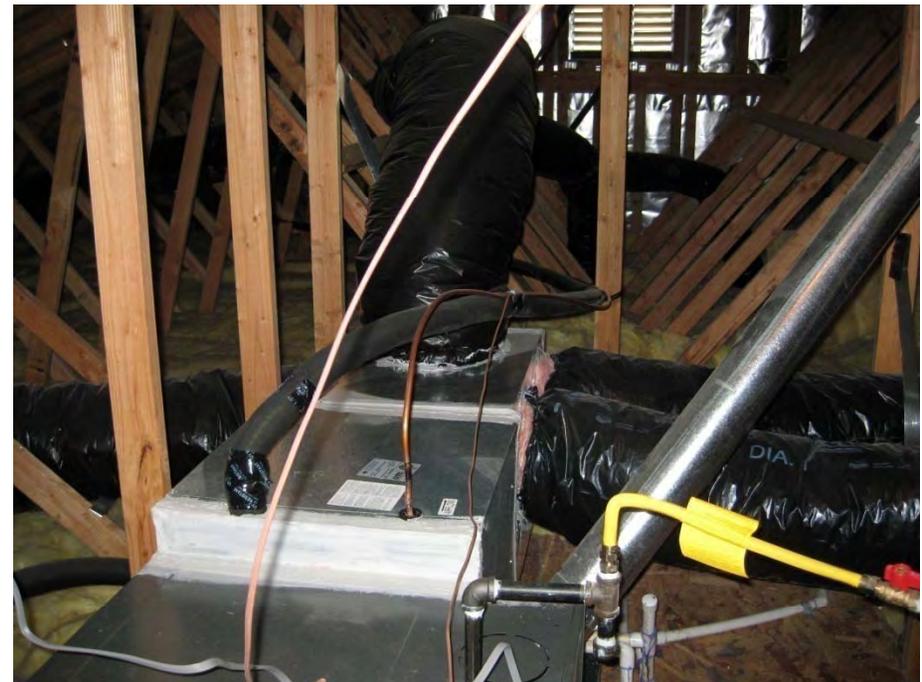
2013 – §150.2(b)1C

- 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:**
 - Duct insulation \geq R-6.0 ([MCH-1](#))
 - Duct leakage ([MCH-20](#))
 - AF/FWD ([MCH 22](#) and [23](#))
 - RC ([MCH-25](#))



ALTERATION TO HVAC SYSTEM

CEC-CF1R-ALT-02-E (Revised 06/13)

**CERTIFICATE OF COMPLIANCE**

CF1R-ALT-02-E

Alteration to an HVAC System

(Page 1 of 2)

Project Name: **2013 CALBO Training Sample**Date Prepared: **01/01/14**

A. GENERAL INFORMATION											
1	Project Name:	CALBO Changeout			2	Date Prepared:	01/01/14				
3	Project Location:	Black Oak Hills			4	Building Type:	Single Family				
5	CA City:	Sacramento			6	Dwelling Unit Name:					
7	Zip Code:	95814			8	HVAC System Identification or Name:	HVAC 1				
9	Climate Zone:	12			10	CFA served by HVAC System (ft ²):	1,500 ft²				
11	Alteration Type:	Entirely New or Complete Replacement Space Conditioning System			12	HVAC System Location or Area Served	Whole House				

B. - ALT-02d - Entirely New or Complete Replacement Space Conditioning System (Section 150.2(b)1C)										
1	2	3		4	5	6		7	8	9
Heating System Type	Altered Heating Component	Required Min Heating Efficiency AFUE or HSPF		Cooling System Type	Altered Cooling Components	Required Min Condenser Efficiency SEER or EER		Required Thermostat Type	New or Replaced Duct Length (ft)	Req'd Min New Duct R-Value
Furnace	Furnace	78	7.7	Split Sys AC	Condenser, coil, compressor, refrigerant line set	13	N/A	Setback	20 ft	R-6

C. Certificate of Installation Documents Required										
CF2R-MECH-01-E										
CF2R MECH-20-H – Duct Leakage										
CF2R MECH-22-H – Fan Efficacy										
CF2R MECH-23-H - Airflow										
CF2R MECH-25-H – Refrigerant Charge										

D. Certificate of Verification Documents Required										
CF3R MECH-20-H – Duct Leakage										
CF3R MECH-22-H – Fan Efficacy										
CF3R MECH-23-H - Airflow										
CF3R MECH-25-H – Refrigerant Charge										

STATE OF CALIFORNIA
DUCT LEAKAGE DIAGNOSTIC TEST

CEC-CF3R-MCH-20-H (Revised 06/13)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF VERIFICATION		CF3R-MCH-20-H
Duct Leakage Diagnostic Test		(Page 1 of 2)
Project Name: 2013 CALBO Training Sample	Enforcement Agency: Local Jurisdiction	Permit Number: NC-010113
Dwelling Address: 2013 CALBO Drive	City Sacramento	Zip Code 95814

A. System Information		
01	HVAC System Identification or Name:	HVAC 1
02	HVAC System Location or Area Served:	Zone 1
03	Building Type from CF1R	Single Family
04	Verified Low Leakage Ducts in Conditioned Space (VLLDCS)	N/A
05	Verified Low Leakage Air-handling Unit	N/A
06	Duct System Compliance Category:	Complete Replacement System

B. Duct Leakage Diagnostic Test - MCH-20d - Complete Replacement or Altered Duct System		
01	Condenser Nominal Cooling Capacity (ton)	2.5 tons
02	Heating Capacity (kBtu/h)	70,000 Btu/H
03	Conditioned Floor Area Served by this HVAC System (ft2)	1,800 ft²
04	Duct Leakage Test Conditions	Test Final
05	Duct Leakage Test Method?	Total Leakage
06	LeakageFactor ()	0.06
07	Air-Handler Unit Airflow (AHUAirflow) Determination Method	Default Airflow Method
08	Measured AHUAirflow (cfm)	N/A
09	Calculated Target Allowable Duct Leakage Rate (cfm)	60 cfm
10	Actual duct leakage rate from leakage test measurement (cfm)	45 cfm
Compliance statement: System passes leakage test		

C. ADDITIONAL REQUIREMENTS FOR COMPLIANCE		
The responsible persons signature on this document indicates the installation complies with the following requirements:		
01	System was tested in its normal operation condition. No temporary taping allowed.	
02	Outside air (OA) ducts for Central Fan Integrated (CFI) ventilation systems, shall not be sealed/taped off during duct leakage testing. CFI OA ducts that utilize controlled motorized dampers, that open only when OA ventilation is required to meet ASHRAE Standard 62.2, and close when OA ventilation is not required, may be configured to the closed position during duct leakage testing.	
03	All supply and return register boots were sealed to the drywall.	
04	Building cavities were not used as plenums or platform returns in lieu of ducts.	
05	If cloth backed tape was used it was covered with Mastic and draw bands.	
06	All connection points between the air handler and the supply and return plenums are completely sealed.	
07	If the system complies using the Smoke Test method, the smoke test was conducted in accordance with the requirements of Reference Residential Appendix RA3.1.4.3.6. Systems that comply using smoke test shall not be included in sample groups for HERS verification.	
08	Verification Status	Pass
If Verification Status for this table indicates "Fail", the reason shall be described in the correction notes for this table.		
Correction Notes for this table:		
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.		



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

ALTERATION TO AN HVAC SYSTEM

CEC-CF1R-ALT-02-E (Revised 06/13)



CERTIFICATE OF COMPLIANCE	CF1R-ALT-02-E
Alteration to an HVAC System	(Page 1 of 2)
Project Name:	Date Prepared:

A. GENERAL INFORMATION					
01	Project Name:		02	Date Prepared:	
03	Project Location:		04	Building Type:	
05	CA City:		06	Dwelling Unit Name:	
07	Zip Code:		08	HVAC System Identification or Name:	
09	Climate Zone:		10	CFA served by HVAC System (ft ²):	
11	Alteration Type:		12	HVAC System Location or Area Served	

B. ALT-02a – Extension of Existing Duct System, Greater Than 40 Feet (Section 150.2(b)1Diib)										
01	02	03		04	05	06		07	08	09
Heating System Type	Altered Heating Component	Required Min Heating Efficiency AFUE or HSPF		Cooling System Type	Altered Cooling Components	Required Min Condenser Efficiency SEER or EER		Required Thermostat Type	New or Replaced Duct Length (ft)	Req'd Min New Duct R-Value

C. Certificate of Installation Documents Required	
CF2R-MECH-01-E	
CF2R MECH-20-H – Duct Leakage	

D. Certificate of Verification Documents Required	
CF3R MECH-20-H – Duct Leakage	



HVAC Changeouts

2008 – §152(b)1E, F

- Duct leakage req. in Cl. Zns. 2 and 9 – 16
 - Less than 15%
 - Less than 10% to outside
 - Reduce leakage by 60%
 - 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)



ALTERATION TO AN HVAC SYSTEM

CEC-CF1R-ALT-02-E (Revised 06/13)



CERTIFICATE OF COMPLIANCE	CF1R-ALT-02-E
Alteration to an HVAC System	(Page 1 of 2)
Project Name:	Date Prepared:

A. GENERAL INFORMATION					
01	Project Name:		02	Date Prepared:	
03	Project Location:		04	Building Type:	
05	CA City:		06	Dwelling Unit Name:	
07	Zip Code:		08	HVAC System Identification or Name:	
09	Climate Zone:		10	CFA served by HVAC System (ft ²):	
11	Alteration Type:		12	HVAC System Location or Area Served	

B. ALT-02b – Altered Space Conditioning System (Sections 150.2(b)1E and F)										
01	02	03		04	05	06		07	08	09
Heating System Type	Altered Heating Component	Required Min Heating Efficiency AFUE or HSPF		Cooling System Type	Altered Cooling Components	Required Min Condenser Efficiency SEER or EER		Required Thermostat Type	New or Replaced Duct Length (ft)	Req'd Min New Duct R-Value

C. Certificate of Installation Documents Required
CF2R-MECH-01-E
CF2R MECH-20-H – Duct Leakage
CF2R MECH-25-H – Refrigerant Charge
CF2R MECH-23-H - Airflow

D. Certificate of Verification Documents Required
CF3R MECH-20-H – Duct Leakage
CF3R MECH-25-H – Refrigerant Charge
CF3R MECH-23-H - Airflow



Re-roofs

2008 – §152(b)1H

- When more than 50% or 1,000 ft² 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](#)

- a. Air-space of **1.0 inch (25 mm)** is provided between the top of the roof deck to the bottom of the roofing product; or
- b. **The installed roofing product has a profile ratio of rise to width of 1 to 5 for 50 percent or greater of the width of the roofing product;** or
- c. Existing ducts in the attic are insulated and sealed according to Section 150.1(c)9; or
- d. Buildings with at least **R-38** ceiling insulation; or
- e. Buildings with a radiant barrier in the attic meeting the requirements of Section 150.1(c)2; or
- f. Buildings that have no ducts in the attic; or
- g. In Climate Zones 10-15, **R-4** or greater insulation above the roof deck.

TABLE 150.2-A AGED SOLAR REFLECTANCE INSULATION TRADE OFF TABLE

Aged Solar Reflectance	Roof Deck Insulation R-value	Aged Solar Reflectance	Roof Deck Insulation R-value
0.62-0.60	2	0.44-0.40	12
0.59-0.55	4	0.39-0.35	16
0.54-0.50	6	0.34-0.30	20
0.49-0.45	8	0.29-0.25	24



§150.2(b)1H and the Permit Process



- **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)

** Can exempt from CF1R and CF2R*



CERTIFICATE OF COMPLIANCE	CF1R-ALT-01-E
Residential Alterations	(Page 1 of 5)
Project Name: 2013 CALBO Training Sample	Date Prepared: 01/01/14

A. GENERAL INFORMATION							
01	Project Name:	CALBO Re-roof			02	Date:	01/01/14
03	Project Location:	2013 CALBO Drive			04	Compliance Method:	Prescriptive
05	CA City:	Sacramento			06	Building Front Orientation (deg or cardinal):	North
07	Zip Code:	95814			08	Number of Dwelling Units:	1
09	Climate Zone:	12			10	Fuel Type:	Natural Gas
11	Building Type	<input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Multi Family			12	Total Conditioned Floor Area:	1,500 ft ²
13	Project Type:	<input type="checkbox"/> Insulation <input checked="" type="checkbox"/> Roof Replacement <input type="checkbox"/> Fenestration/Glazing <input type="checkbox"/> Heating System <input type="checkbox"/> Cooling System <input type="checkbox"/> Duct System <input type="checkbox"/> Water Heating			14	Slab Area:	1,500 ft ²

B. BUILDING INSULATION DETAILS (Section 150.2(b)1)												
01	02	03	04	05	06			07	08	09	10	11
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Proposed				Required		Comments	
					Cavity R-value	Continuous Insulation R-value	U-factor	Appendix JA4 Reference		U-Factor		
			Table	Cell								

C. ROOF REPLACEMENT (Prescriptive Alteration, Section 150.2(b)1H)													
01	02	03	04	05	06	07			08	09	10	11	12
Altering > 50% of roof surface	Roof Pitch	Exception	CRRC Product ID Number	Product Type	R-value Deck Insulation	Proposed			SRI	Minimum Required			
						Aged Solar Reflectance	Thermal Emittance			Aged Solar Reflectance	Thermal Emittance	SRI	
Yes	4:12	N/A	0101-2013	Tile Roof	N/A	0.30	0.85				0.20	0.75	16

NOTES

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

EXCEPTION:

Alternative

Roof Deck Alt.



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>