



**Home Upgrade**  
Energy Upgrade California®

# Bay Area Regional Energy Network

## How to Become a Participating Contractor

January 28, 2015

**BAY** Regional  
**AREA** Energy  
Network



# BayREN Single Family Program

## The San Francisco Bay Area Regional Energy Network!

- Funding new energy efficiency incentives
- Composed of public agencies representing all 9 counties within the Bay Area Region:

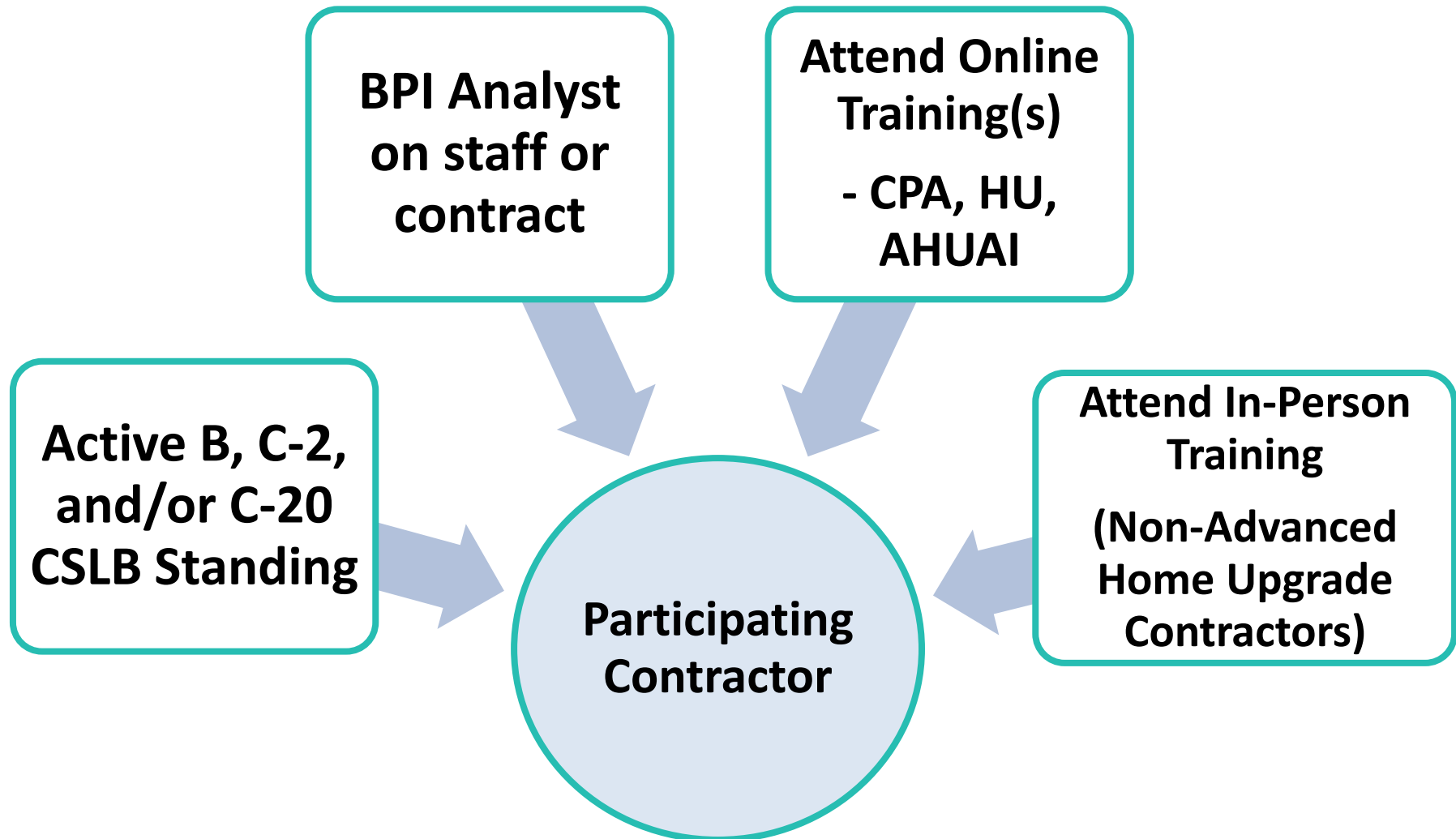
### Single Family

- **Home Upgrade (project incentive)**  
\$1,000–\$3,150 incentives
- **Home Upgrade Advisor**
- **Advanced Home Upgrade Assessment Incentive**  
\$300 incentive





# Contractor Eligibility





# Participating Contractor Documents

## ***Participating Contractors must:***

- **Complete and sign the BayREN Contractor Participation Agreement**
- **Hold and maintain the following insurance:**
  - Commercial General Liability (CGL): \$1,000,000.
  - Business Automobile Liability (BAL): \$1,000,000.
  - California Statutory Workers' Compensation: \$1,000,000.
  - Professional Liability/Errors and Omissions: Strongly recommended.
- **Provide IRS W-9 form**



# Find out more Information Online

[www.bayareaenergyupgrade.org/join-home-upgrade-team-contractors](http://www.bayareaenergyupgrade.org/join-home-upgrade-team-contractors)

## Interest Form

I'm interested in becoming a BayREN participating contractor. Please contact me. *\*Required*

Name \*

Email \*

Phone \*

I'm interested in participating in

Home Upgrade ▼

Preferred Contact Method

Email ▼

Questions / Comments

Get Started!

## Join the Team of Contractors

Home Upgrade can be easily incorporated into the way you do business; for example, combined into HVAC, insulation, or hot water heater upgrade projects. And as a Bay Area Regional Energy Network (BayREN) participating contractor, you'll receive training and mentoring opportunities to increase your marketability and competitive edge in the whole-house upgrade market. You'll stretch both technical and non-technical skills in energy efficiency, quality installations, sales and marketing, customer relations, business practices, and more.

Take the first step to learn more about the eligibility requirements for becoming a BayREN participating contractor by filling out the "Interest Form" to the left.

**Ready to take the next step by becoming a BayREN contractor?** Start by following the links below. First complete the required onboarding training(s), then submit your contractor participation documents, and once approved, download project documents to start applying for incentives!



Onboard Trainings



Contractor Participation Documents



Project Documents



# BayREN Contact Information

Visit [www.bayareaenergyupgrade.org](http://www.bayareaenergyupgrade.org)

Email [BayREN@icfi.com](mailto:BayREN@icfi.com) for questions

Home Upgrade Advisor: **1-866-878-6008**

Andrea Chow, Sustainability Coordinator

County of San Mateo

650-363-4125

[achow@smcgov.org](mailto:achow@smcgov.org)

# BayREN Codes & Standards Training

Improving Energy Code Compliance for  
Residential Envelopes

Envelope Compliance Forms and Processes



**BAY** Regional  
**AREA** Energy  
Network



# INTRODUCTION





## BayREN Codes & Standards Trainings

- BayREN Codes & Standards is a joint effort of Bay Area cities and counties to achieve full compliance with provisions of the California Energy Code.
- BayREN trainings seek to provide building department staff and private sector building professionals with tools and strategies for improving energy code compliance.
- Today's Brown Bag is part of the BayREN Compliance Enhancement for Residential Buildings Training Series.



## Today's Learning Objectives

- Prioritize your time when plan checking and field inspecting residential envelope components.
- Share best practices and strategies for improving compliance with residential envelopes and fenestration.
- Understand the purpose and application of envelope assemblies.
- Understand the purpose and application of envelope and fenestration performance values.
- Integrate 2013 energy code changes related to residential envelopes and fenestration.



## Today's Learning Objectives

- What aspects of the energy code do you think most affect building performance?
  - Envelope
  - HVAC
  - Plumbing/water heating
  - Lighting
- Where and how do you prioritize?



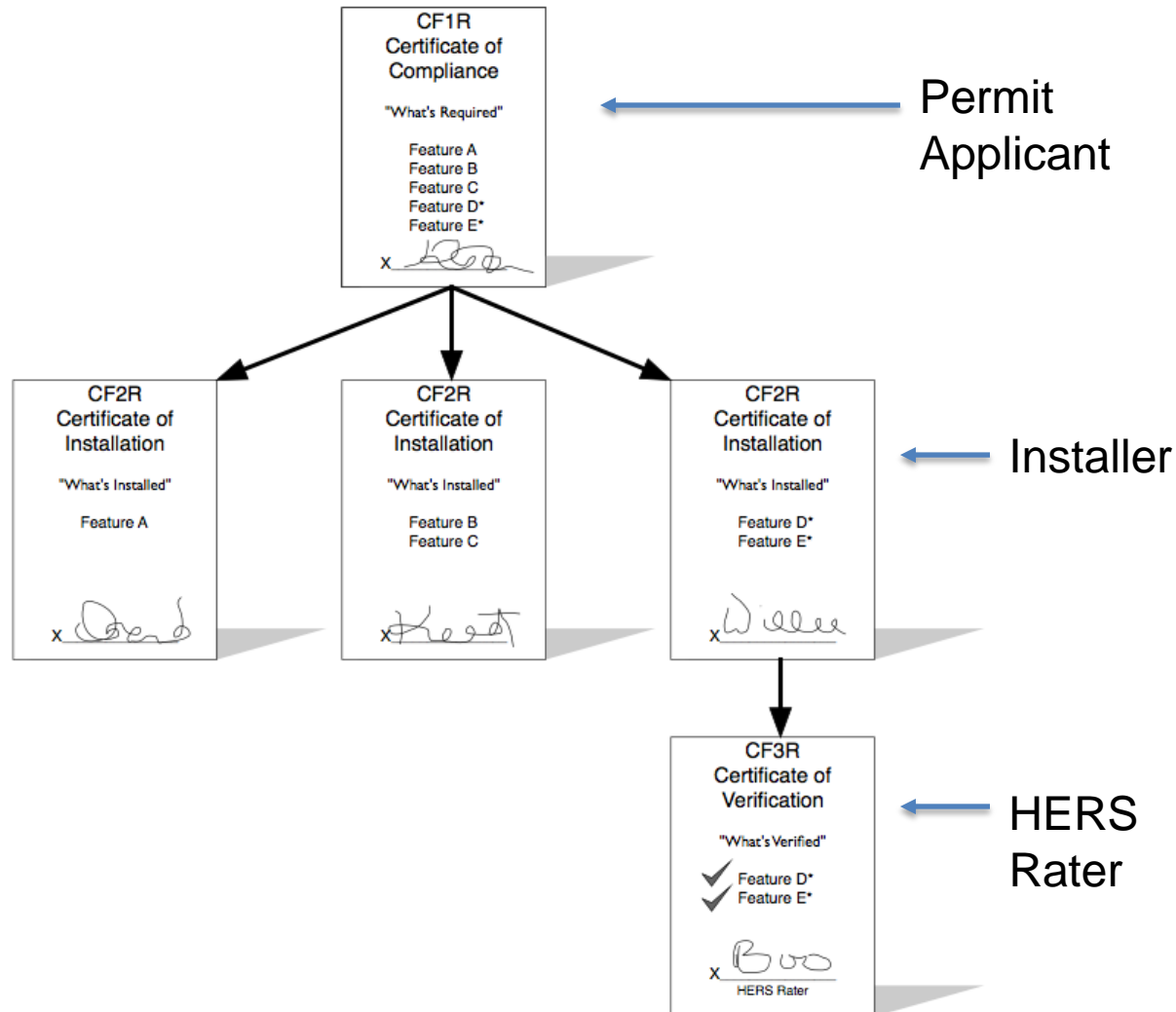
# THE COMPLIANCE PROCESS



## Understanding the forms 1-2-3

- There is a clear, intentional sequence to the documents:
  1. Document what is ***required***
  2. Document what was ***installed***
  3. Document what was ***verified***
- When these three *kinds* of documentation match, the process was successful.
- Note: Not all installed features need to be third party verified.

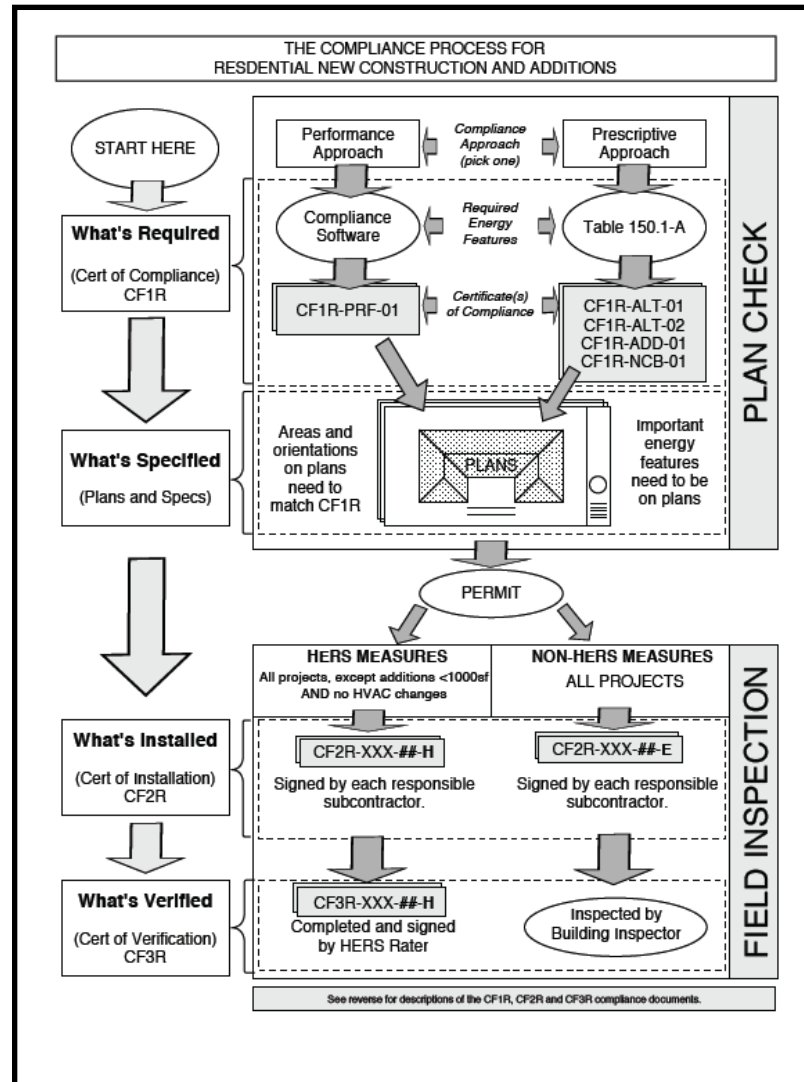
# Step 3 – Document What is Verified





# Compliance Process Flow Diagram

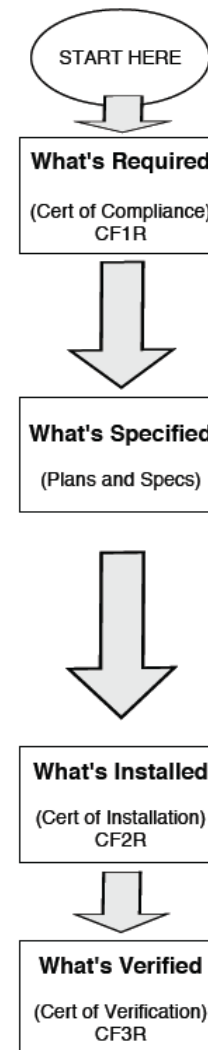
Refer to full-size copy provided with your handouts.





# Compliance Process Flow Diagram

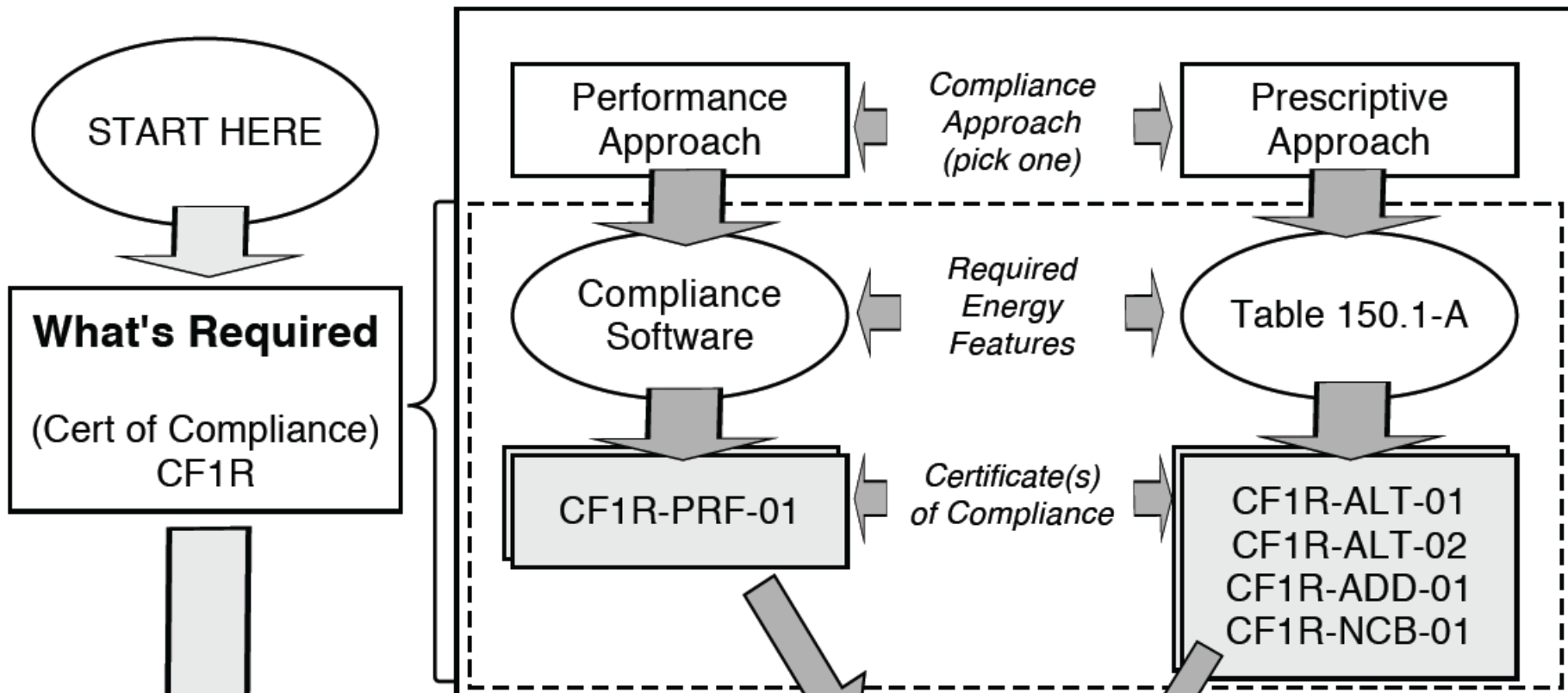
- Notice that the forms (CF1R, CF2R, and CF3R) are there, with an intermediate step of ensuring specifications on the plans.
- Notice that they are divided into Plan Check and Field Inspection steps.





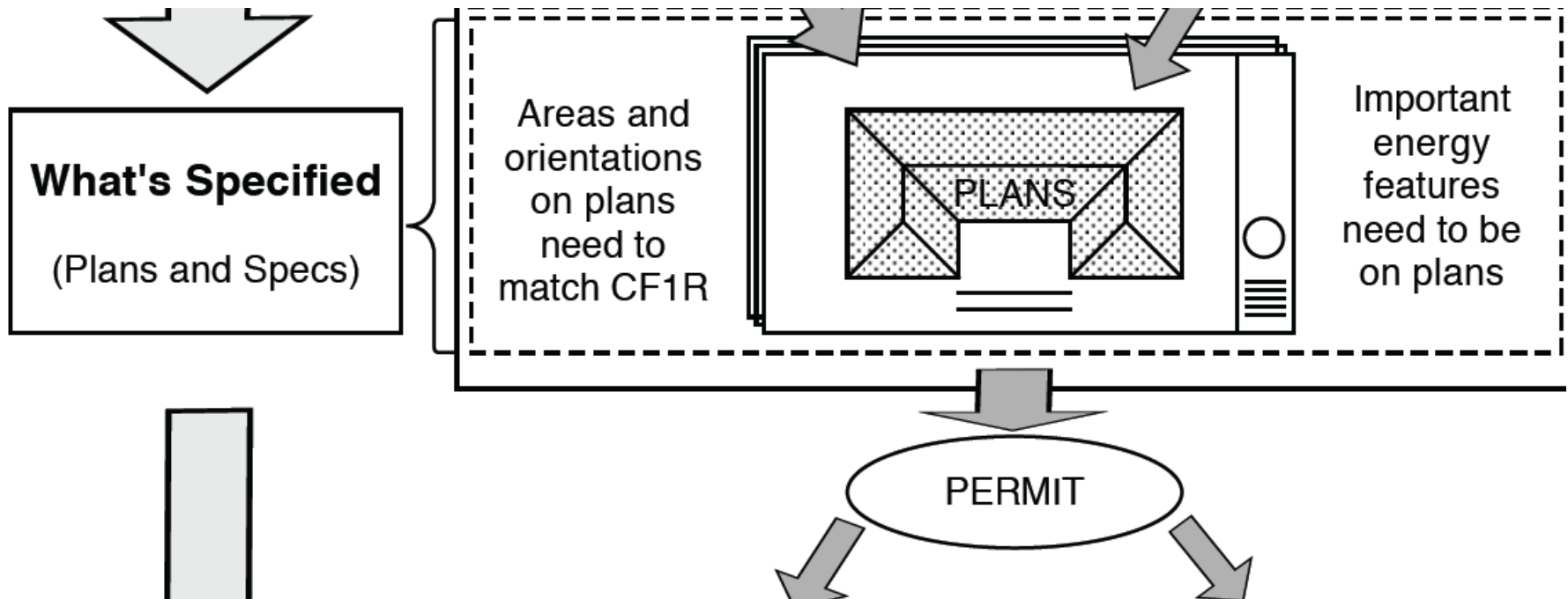


# Compliance Process Flow Diagram



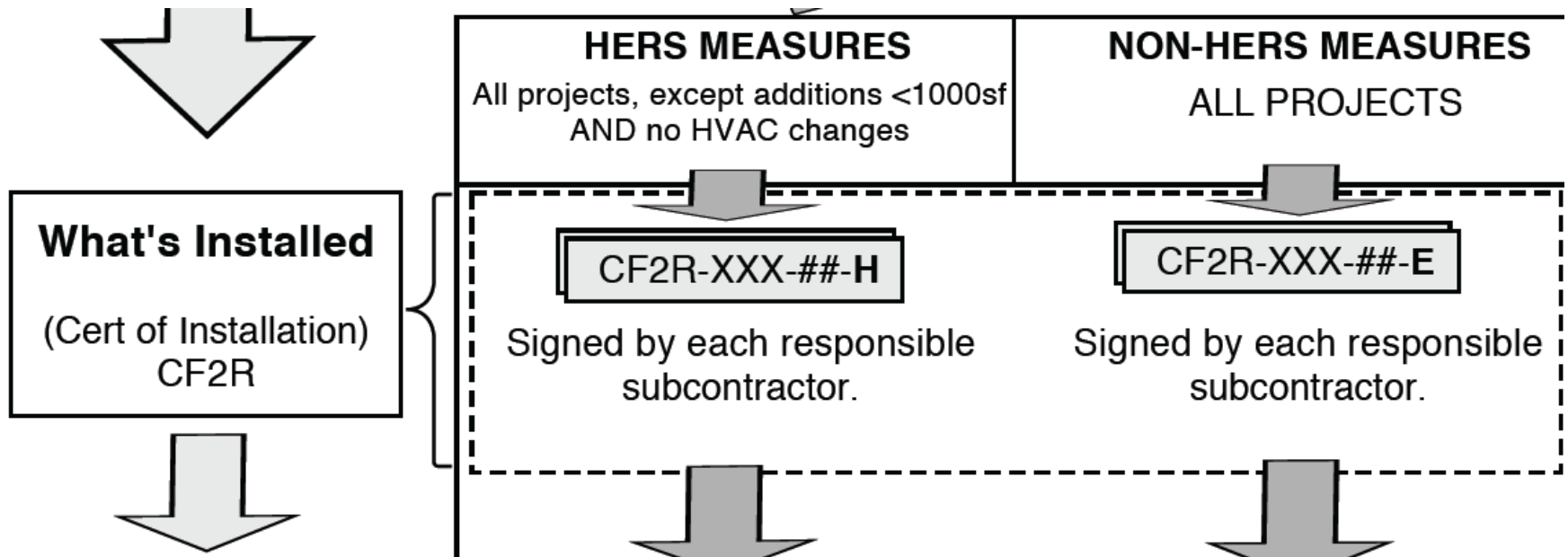


# Compliance Process Flow Diagram



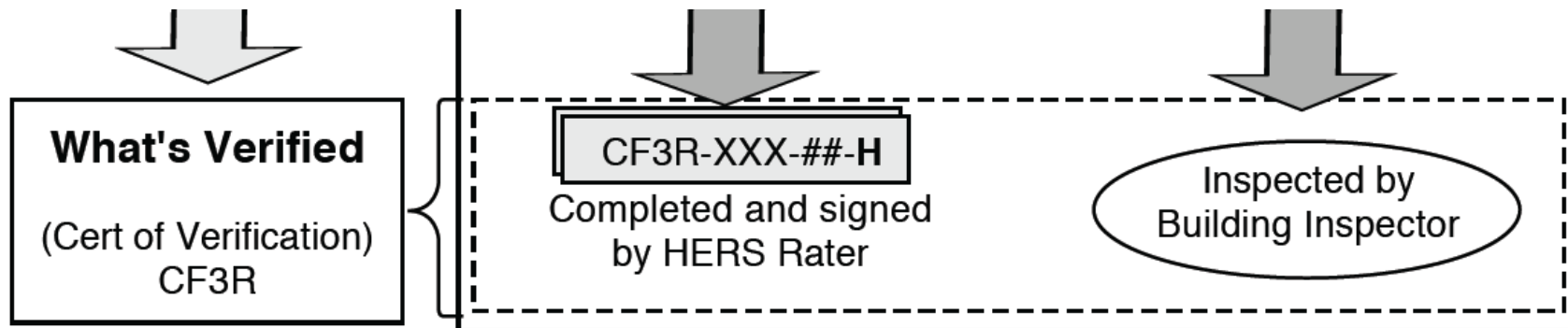


# Compliance Process Flow Diagram



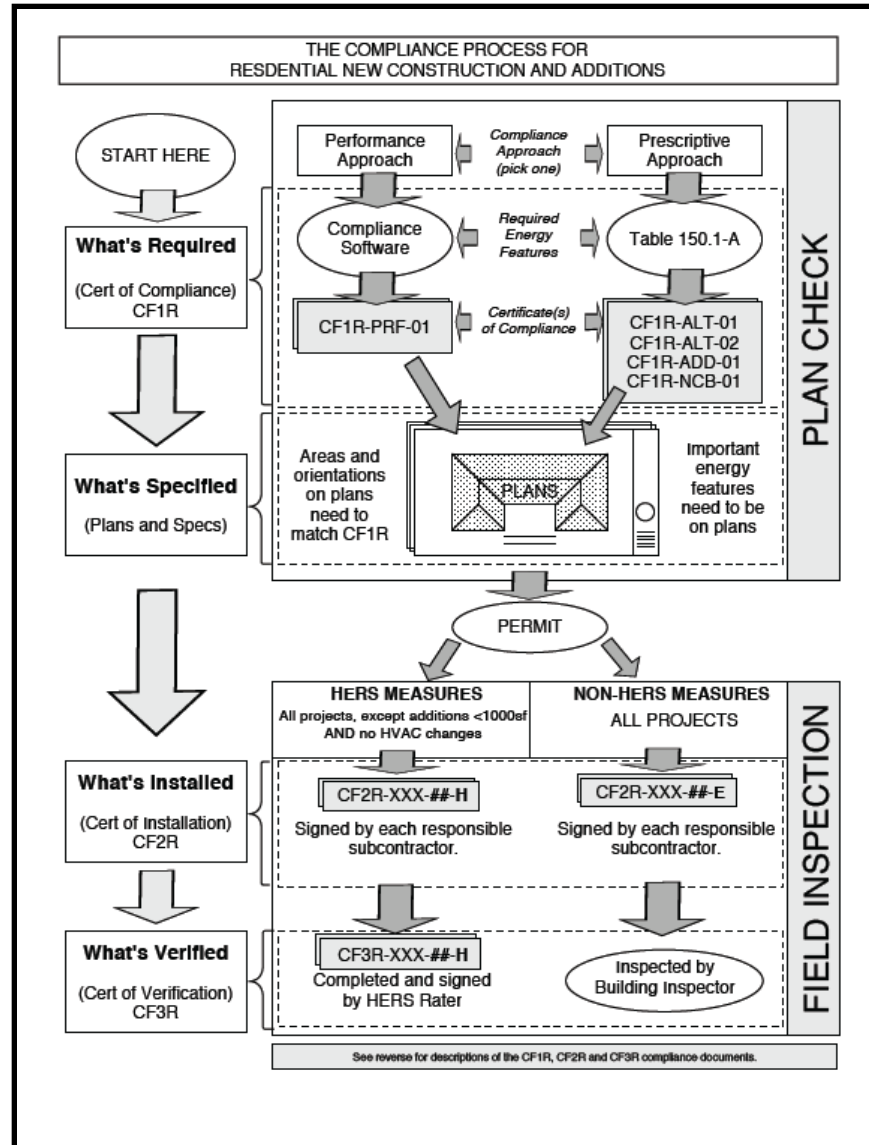


# Compliance Process Flow Diagram





# Compliance Process Flow Diagram





# WHAT TO VERIFY ON A CF1R-PRF-01 (ENVELOPE FEATURES)



# What to Verify on a CF1R

- Refer also to the “What to Verify on a CF1R” checklist tool provided in your handouts.

**What to Verify on a CF1R**

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_

- HIGH Priority
  - General Information Section**
    - Climate Zone
    - Project Scope (new, addition, etc.)
    - Total Conditioned Floor area
    - Front Orientation (degrees or “Cardinal” if master plan)
    - Number of Dwelling Units
    - Number of Stories
    - Glazing percentage (Anything over 20% is more than standard and penalized)
- HIGH Priority
  - Compliance Results Section**
    - “Building Complies” Statement
    - “Building Incorporates HERS Features” Statement
    - “Building Incorporates Special Features” Statement
    - TIP: Compliance Margin and Percent**
      - <1% = no margin for error
      - >15% = possible Energy Star or reach code
- MED Priority
  - Required Special Features Section**
    - Worth tracking, if listed
  - Project HERS Features**
    - Quick Check (HERS features listed in various sections)
  - Building Features Information Section**
    - Quick Check (No need to spend much time.)
  - Zone Information Section**
    - Quick Check (note: dwelling units are not required to be divided into zones unless served by equipment of different types or efficiencies)
- MED Priority
  - Opaque Surfaces Section**
    - Lists all unique walls, floors, ceiling, etc.
    - Cathedral ceilings, windows, doors and slab floors are detailed in later sections.
    - Column 03 “Construction” references a later section that details each surface type.
      - Quick Check azimuth/orientations, areas and tilts.
      - All sides of house should be listed (unless attached to conditioned space).
      - Roof area should make sense relative to floor area.
      - Wall areas should be reasonable (perimeter of house x average ceiling height).

[bayren.org/codes](http://bayren.org/codes) January 15, 2015  
[codes@bayren.org](mailto:codes@bayren.org)



# WHAT TO INSPECT ON A CF2R-ENV-01, 02, 03



# What to Inspect on a CF2R-ENV-01, 02, 03



- Refer also to the “What to Inspect on a CF2R-01, 02, 03” checklist tool provided in your handouts.

**BAY AREA** Regional Energy Network

### What to Inspect on a CF2R-ENV-01, 02, 03

These are currently hand-filled forms. They are to be completed and signed by the installer for all new construction projects and most additions. Collecting completed/signed copies of these compliance documents helps ensure that the installer is being accountable for the energy features that they installed, however, it does not ensure that the correct features actually got installed.

The following items highlight the more important features spelled out on the CF2R-ENV forms. There are many more items on the forms besides those highlighted below.

**CF2R-ENV-01 Fenestration Certificate of Installation**

Section B. Fenestration Installation.

- Item 01 - For new construction, installed window U-factor and SHGC values should be equal to or less than listed on the CF1R.
- Item 02 - For existing buildings the U-factor and SHGC values should be the same or better than the required Energy Commission prescriptive requirements.
- Item 03 - Temporary labels should not be removed until verified by the building inspector.
- Item 04 - The fenestration product manufacturer's installation specifications shall be followed when installing these products. The space between the fenestration product and rough opening shall be completely filled with insulation. If batt insulation is used, it is cut to size and placed properly around the fenestration product.

**CF2R-ENV-02 Envelope Air Sealing Certificate of Installation**

Section B. RAISED FLOOR AIR BARRIER

- Item 01 - All gaps in the raised floor are sealed.
- Item 02 - All chases sealed at floor level using a hard cover and the hard cover is sealed.
- Item 03 - All plumbing and electrical wires that penetrate the floor are sealed.
- Item 04 - Subfloor sheathing is glued or sealed at all exterior panel edges to create a continuous airtight subfloor.

Section C. WALL/KNEE WALL AIR BARRIER

- Item 02 - Exterior wall air barrier is sealed at the top plate and bottom plate in each stud bay.
- Item 04 - All openings in the top and bottom plate, including all interior and exterior walls, to unconditioned space are sealed.
- Item 05 - Exterior bottom plates (all stories) are sealed to the floor, using the appropriate method under the entire exterior bottom plate of the home.
- Item 06 - All gaps around windows and doors are sealed. The sealant used follows window manufacturer specifications.
- Item 07 - Rim joist gaps/openings are fully sealed.
- Item 08 - Fan exhaust ducts that run between conditioned floors to exterior walls include a damper at the exterior wall.

Section D. CEILING/ATTIC AIR BARRIER

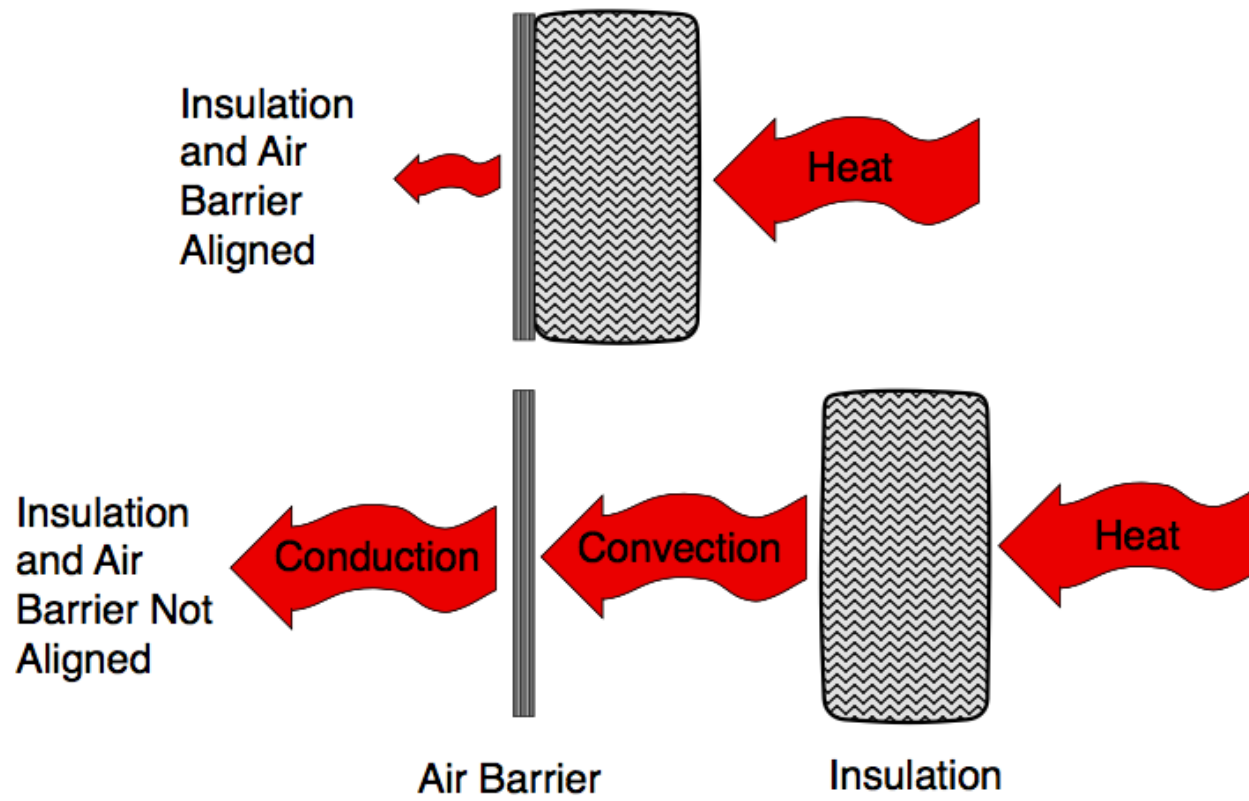
- Item 03 - All eave vents are covered with a rigid ventilation baffle that maintains the net free ventilation area.
- Item 04 - All dropped ceilings/soffits are covered with hard covers and sealed to framing.



# BUILDING ASSEMBLY PERFORMANCE VALUES



# Basic Concept: Aligning Insulation with Air Barrier





## Types of Air Barriers

The following materials meet the CEC's criteria to qualify as an Air Barrier (*only the most common are shown here*):

- Plywood or oriented strand board (OSB) – minimum. 3/8 inches
- Various kinds of rigid insulation board – minimum. 1/2 inch
- Closed cell spray polyurethane foam with a minimum density of 2.0 pcf and a minimum thickness of 2.0 inches
- Open cell spray polyurethane foam with a minimum density of 0.4 to 1.5 pcf and a minimum thickness of 5.0 inches
- Exterior or interior gypsum board - minimum 1/2 inch

**Compliance Issue:**

If air barrier is part of a rated fire separation, it should comply with both requirements.



# Building Assembly Performance Values

- Important performance values for building assemblies are:
  - R-value
  - U-factor
  - Solar Reflectance
  - Thermal Emittance

**Tip:**

Use the CF1R to identify the **required** performance values for building assemblies during plan review and field inspection.



## R-value and U-factor

- **R-value** is usually used to describe an *insulating material*.
  - A **higher** number means **less** heat transfer.
  - When verifying R-value against compliance documentation, the listed value is a **minimum**. “Higher is Better”.
- **U-factor** is usually used to describe an *assembly of materials*.
  - A **higher** number means **more** heat transfer.
  - When verifying U-factor against compliance documentation, the listed value is a **Maximum**. “Lower is Better”.



## Factors Impacting Performance Values in Building Assemblies

- The following factors can impact the performance values (U-factor) in building assemblies:
  - Framing type, size and spacing
  - R-value of cavity insulation
  - R-value of exterior insulation

### Tip:

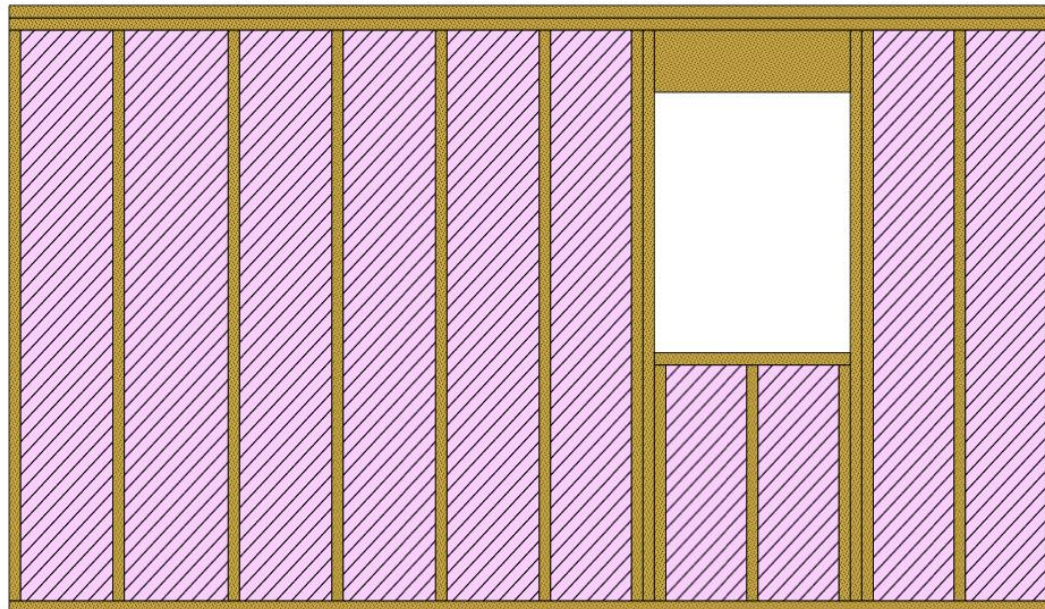
It is not adequate to just check R-value. Framing size, framing spacing and framing material all affect U-value. When called out on the plans and compliance documentation, those criteria should be met in the field.





## The Impact of Framing on Assembly U-value

On average, 15% of a framed wall's net area (not counting doors and windows) is made up of wood framing.



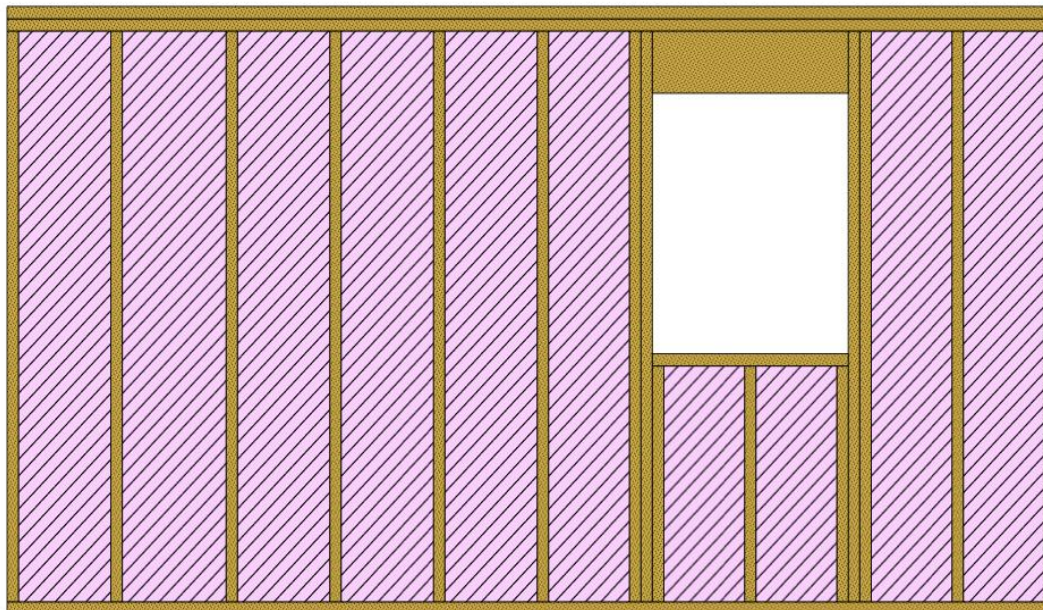




## The Impact of Framing on Assembly U-value

If the R-value of wood is R-4.4 and the R-value of the insulation is R-13, the overall R-value of the wall is:

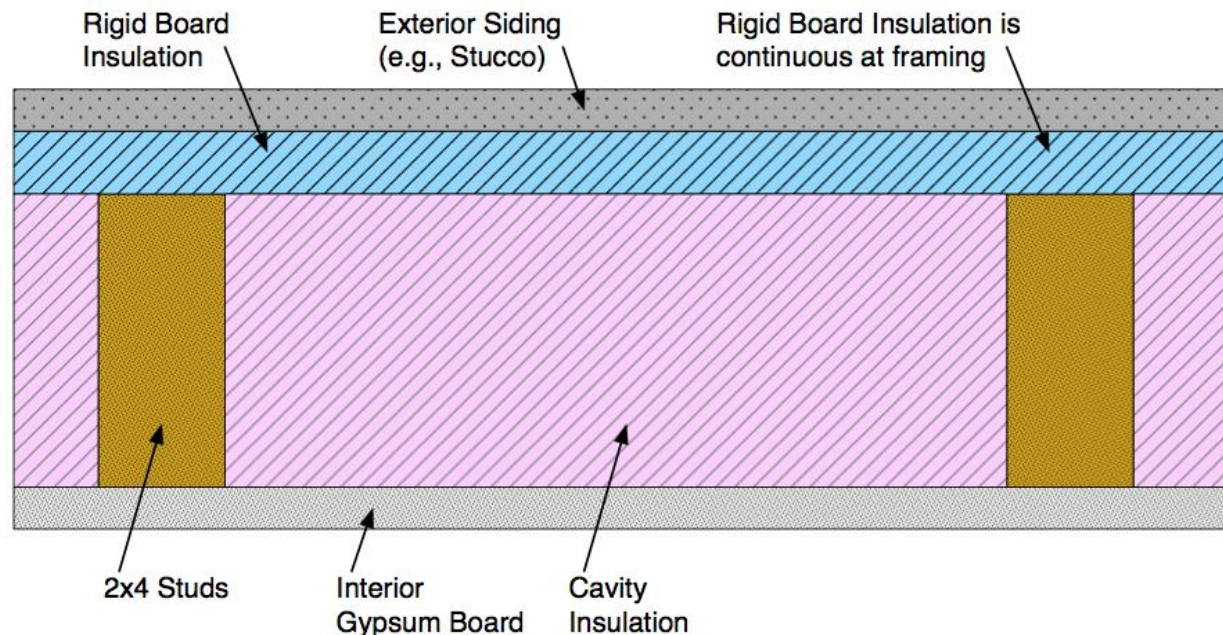
$$(0.15 \times 4.4) + (0.85 \times 13) = R-11.71$$





## The Impact of Framing on Assembly U-value

One of the big benefits of rigid board insulation installed on the exterior surface of the wall is that it is not penetrated by the wood framing and maintains its full R-value.





# Solar Reflectance and Thermal Emittance for Cool Roofs

- New Cool Roof technology has improved the roofing materials ability to reflect and emit heat energy without affecting the color of the roof.
- This is especially important in cooling dominated climates.

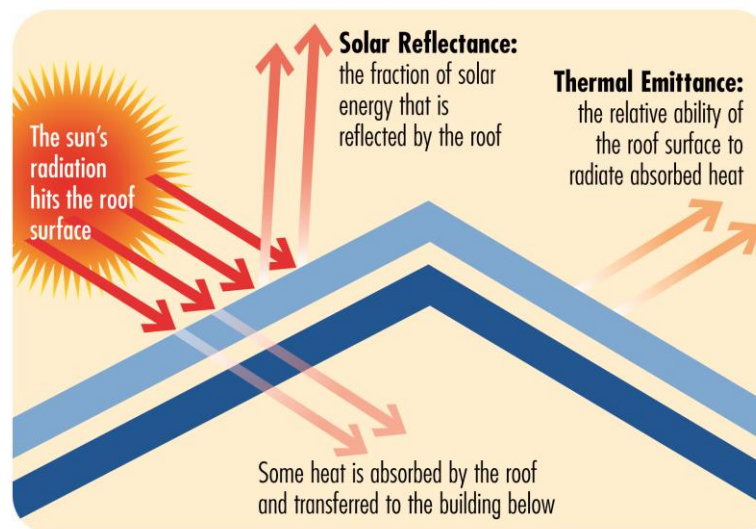


Diagram from coolroofs.org:





# Solar Reflectance and Thermal Emittance for Cool Roofs

This is the CRRC label that indicates a roofing product's Solar Reflectance and Thermal Emittance.

		<u>Initial</u>	<u>Weathered</u>
	Solar Reflectance	0.27	0.26
	Thermal Emittance	0.92	0.81
	Rated Product ID Number	0676-0043	
	Licensed Seller ID Number	- - - -	
	Classification	Production Line	
<p>Cool Roof Rating Council ratings are determined for a fixed set of conditions, and may not be appropriate for determining seasonal energy performance. The actual effect of solar reflectance and thermal emittance on building performance may vary.</p> <p>Manufacturer of product stipulates that these ratings were determined in accordance with the applicable Cool Roof Rating Council procedures.</p>			

**Compliance Issue:**  
 When verifying these values against compliance documentation, the listed value is a **minimum**.  
 "Higher is Better".



# OVERVIEW OF MANDATORY AND PRESCRIPTIVE ENVELOPE REQUIREMENTS



# Overview of Mandatory and Prescriptive Envelope Requirements

- There are two basic types of requirements that apply to all building components:
  - Mandatory requirements are always required, when applicable.
  - Prescriptive requirements are required, unless they are exceeded or traded off in the performance compliance software (most common).
- The next sections cover those requirements that apply to the building envelope.
- All envelope mandatory measures are listed on the CF2R-ENV forms.



## Joists and Other Openings – Mandatory Measures

- Air leakage through joints, penetrations, cracks, holes and openings around windows, doors, walls, roofs and floors can result in higher energy use for home heating and cooling than necessary.
- It is a simple and extremely cost effective energy measure and is therefore mandatory in all cases.
- See note on CF2R-ENV-03-E, just before Section A.



## Joists and Other Openings – Mandatory Measures

- The following openings in the building envelope shall be caulked, gasketed, weather-stripped or otherwise sealed:
  - Exterior joints around window and door frames, including doors between the house and garage, between interior HVAC closets and conditioned space, between attic access and conditioned space, between wall sole plates and the floor, exterior panels and all siding materials.

More  
detail in  
2013





## Joints and Other Openings – Mandatory Measures





## Joints and Other Openings – Mandatory Measures

Openings in exterior walls, ceilings and floors for plumbing, electricity, and gas lines.





## Joists and Other Openings – Mandatory Measures

Openings in the attic floor (such as where ceiling panels meet interior and exterior walls and masonry fireplaces).





## Joists and Other Openings – Mandatory Measures

- All field-fabricated operable windows and doors (other windows and doors must meet infiltration requirements and be laboratory tested).
- This includes doors between garage and house, between interior HVAC closets and conditioned space, and between attic access and conditioned space ( § 110.6(b)) and all other such opening in the building envelope.



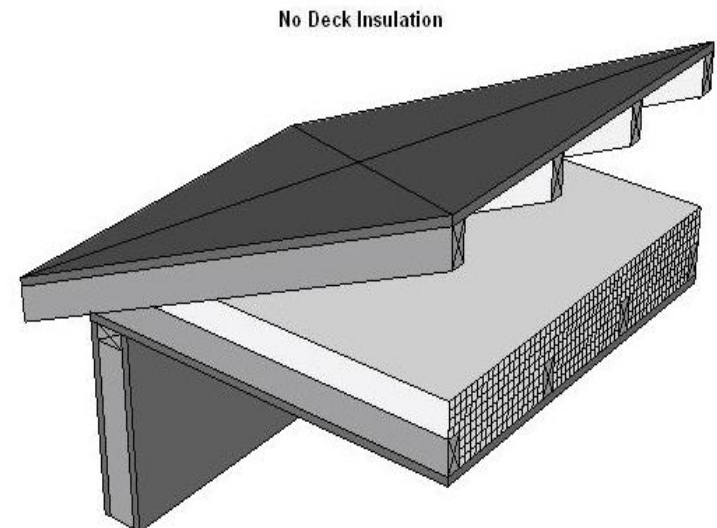




## Roof/Ceiling – Mandatory Measures

- Wood framed roof/ceiling construction assemblies must have at least **R-30** insulation or a maximum U-factor of 0.031 based on 24 inch on center wood framed rafter roofs, as determined from the Reference Joint Appendix JA4.
- See Section G of CF2R-ENV-03-E

New in 2013

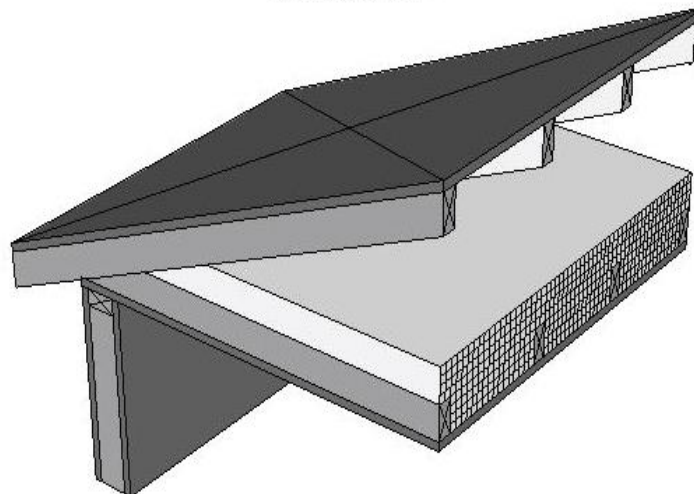




## Roof/Ceiling – Mandatory Measures

- Some areas of the roof/ceiling can be less than the mandatory minimum U-factor as long as other areas exceed the requirement and the weighted average U-factor for the overall ceiling/roof is 0.031 or less.

No Deck Insulation

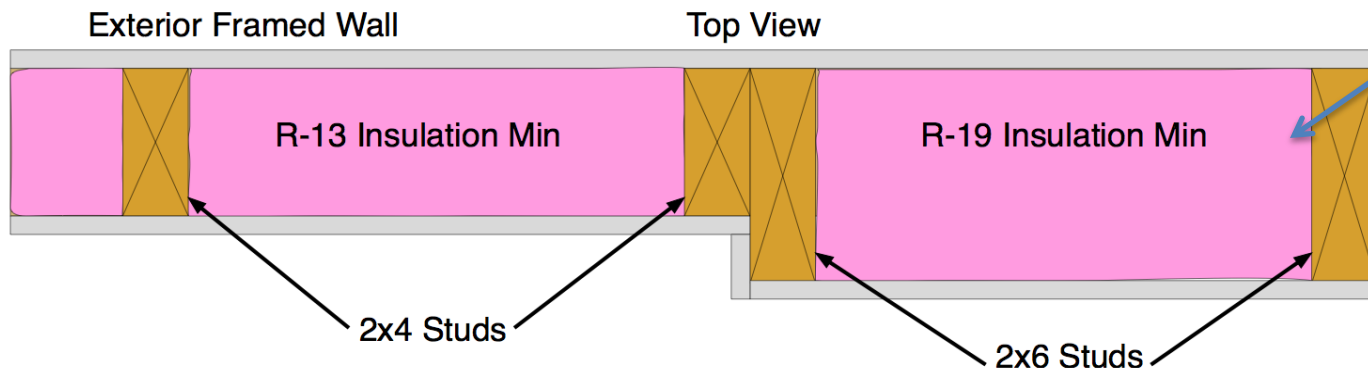




# Walls - Mandatory Measures

See Section G of CF2R-ENV-03-E

- The mandatory measures have two requirements depending on frame size:
  - 2x4 inch wood-framed walls above grade shall have at least R-13 insulation installed in the cavities between framing members, or a U-factor that cannot exceed U-0.102.
  - 2x6 inch or greater wood-framed walls above grade shall have at least R-19 insulation installed in the cavities between framing members or a U-factor not exceeding 0.074.



# Prescriptive Measures

Larger copy of this table can be found in the appendix.



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 <sup>1</sup>	Roofs /Ceilings	U 0.025 R 38	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.031 R 30	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	U 0.025 R 38	
		Walls	Above Grade	2x4 Framed <sup>2</sup>	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	U 0.065 R 15+4 or R 13+5	
				Mass Wall Interior <sup>3</sup>	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.059 R 17
			Mass Wall Exterior <sup>3</sup>	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.1025 R 8.0	U 0.125 R 8.0	U 0.070 R 13
			Below Grade	Below Grade Interior <sup>3</sup>	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.066 R 15
		Below Grade Exterior <sup>3</sup>		U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19
		Floors	Slab Perimeter	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
			Raised	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
			Concrete Raised	U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
		Radiant Barrier		NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
Roofing Products	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR		
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR		
	Steep Sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR	
		Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR	
Fenestration	Maximum U-factor <sup>4</sup>		0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32		
	Maximum SHGC <sup>5</sup>		NR	0.25	NR	0.25	NR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
	Maximum Total Area		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%		
	Maximum West Facing Area		NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%		





# HERS VERIFICATION OF RESIDENTIAL ENVELOPE MEASURES



# HERS Verification of Residential Envelope Measures

- There are two envelope special performance credits that, when taken, require field verification by a HERS Rater:
  - Quality Insulation Installation (QII)
  - Reduced Infiltration
- All other envelope measures are verified by building department personnel.

**Tip:**

Rely on HERS Verifications of QII and Reduced Infiltration to save time.



## Quality Insulation Installation (QII)

- The CEC has taken a “guilty until proven innocent” approach and automatically de-rates insulation in the compliance software by a significant percentage.
- If the builder does not want this penalty, they can choose the Quality Insulation Installation (QII) credit, which requires that the insulation be HERS verified at various stages both pre and post insulation.
- **TIP: If the QII credit is taken, the HERS rater will perform a very thorough inspection on the insulation so the building inspector does not have to.**



## Reduced Infiltration (Blower Door Test)



- A builder can take credit for building an *extra* tight house, if they want to.
- This triggers HERS verification, which is accomplished by measuring how tight a house is by performing a blower door test.
- **TIP: If this verification is done, it is much less important for building inspectors to verify caulking and sealing.**



# FENESTRATION PERFORMANCE VALUES AND IMPACTS



# NFRC Labels

	<p><b>World's Best Window Co.</b></p> <p>Millennium 2000<sup>+</sup>                  Vinyl-Clad Wood Frame                  Double Glazing • Argon Fill • Low E                  Product Type: <b>Vertical Slider</b></p>	
	<p><b>ENERGY PERFORMANCE RATINGS</b></p>	
U-Factor (U.S./I-P) <b>0.30</b>	Solar Heat Gain Coefficient <b>0.30</b>	
<p><b>ADDITIONAL PERFORMANCE RATINGS</b></p>		
Visible Transmittance <b>0.51</b>	Air Leakage (U.S./I-P) <b>0.2</b>	
<p><small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. <a href="http://www.nfrc.org">www.nfrc.org</a></small></p>		

- To be installed in a home in CA, manufactured windows must be tested and rated by the National Fenestration Rating Council (NFRC).

**Tip:**

U-factor and Solar Heat Gain Coefficient (SHGC) are identified on the NFRC label and are the most important window performance values for compliance.

Image from Residential Compliance Manual.



# NFRC Labels

 National Fenestration Rating Council® <b>CERTIFIED</b>	<b>World's Best Window Co.</b> Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: <b>Vertical Slider</b>	
	<b>ENERGY PERFORMANCE RATINGS</b>	
U-Factor (U.S./I-P) <b>0.30</b>	Solar Heat Gain Coefficient <b>0.30</b>	
<b>ADDITIONAL PERFORMANCE RATINGS</b>		
Visible Transmittance <b>0.51</b>	Air Leakage (U.S./I-P) <b>0.2</b>	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.  <a href="http://www.nfrc.org">www.nfrc.org</a> </small>		

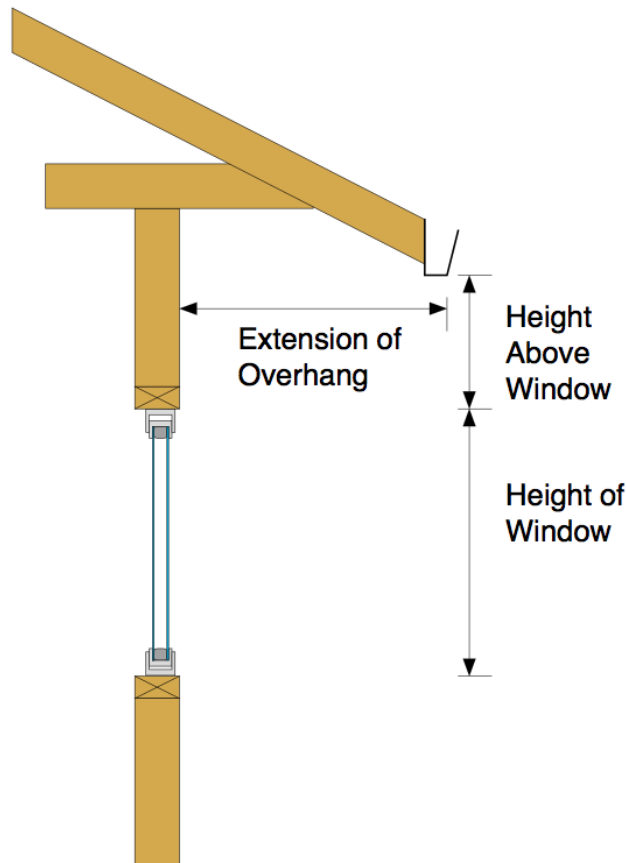
- They also provide both temporary and permanent labels that can be affixed to each window.
- Only representative sizes of each type of window are tested.
- Testing every size of every model would be too burdensome and the variations between sizes would be relatively minor.

Image from Residential Compliance Manual.





# Overhangs, Sidefins and Other Shading Devices



Overhangs are described by some simple dimensions:

- Height of window
- Height above window
- Horizontal extension from face of window

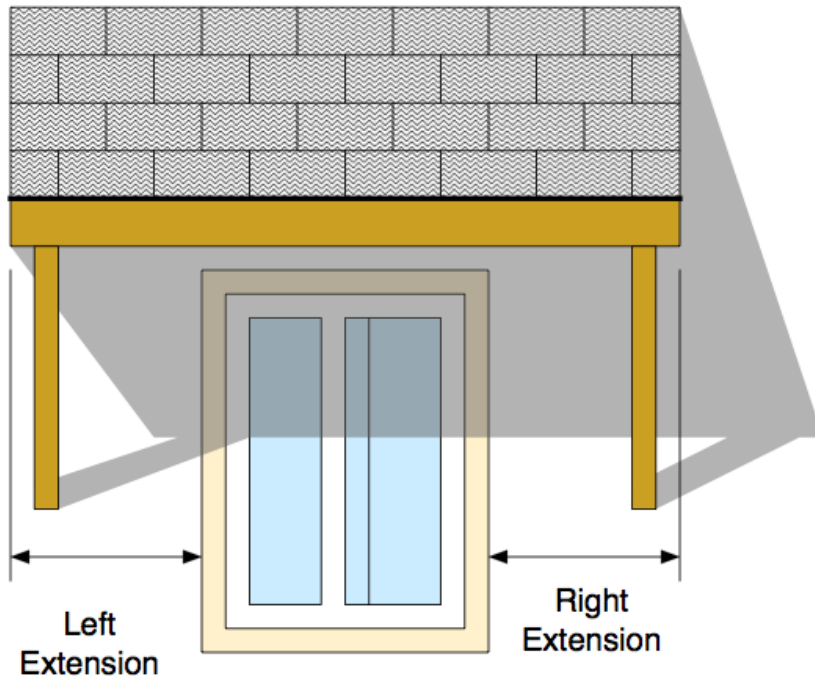
## Tip:

Overhangs and side fins can have a big impact on cooling energy compliance. When modeled, it is worth doing a quick verification.





## Overhangs, Sidefins and Other Shading Devices



- Also, the distance that the overhang extends past the left and right edge of the window should be considered.



# REVIEW AND DISCUSSION



## Reviewing Best Practices and Tips

Use CF1R to identify required energy features and confirm that the plans list those features.

For Envelopes:

- It is not adequate to just check R-value. Framing size, framing spacing and framing material all affect U-value.
- Mandatory measures deliver the most cost effective energy savings - they should always be verified.
- Poor air sealing is the #1 envelope problem in buildings.
- QII and reduced infiltration credits are third party verified by a HERS rater; relying on these verifications can save time.



## Reviewing Best Practices and Tips

### For Fenestration:

- NFRC labels help field verify the most important fenestration performance values specified by the compliance documentation.
- Overhangs and side fins can have a big impact on cooling energy compliance. When modeled, it is worth doing a quick verification.



## Class Wrap-up

- Final Questions and Class Evaluation
  
- Contact information:
  - BayREN Codes & Standards Program
    - [www.bayren.org/codes](http://www.bayren.org/codes)
    - [codes@bayren.org](mailto:codes@bayren.org)
  
- Training Materials available online:
  - [www.bayren.org/codes/training-materials](http://www.bayren.org/codes/training-materials)

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