



Window Replacement Requirements Effective January 1, 2010

Forms:

- A **CF-1R-ALT** Form must be submitted with all applications to demonstrate compliance with the 2008 California Energy Standards.
- A **CR-6R-ENV-01** Form must be posted, or made available with the building permit(s) at all inspections, and a signed copy is required to be included with the documentation the installer provides to the building owner.
- A **WS-3R** Form is required only if credit for exterior shading is being used.

Minimum Requirements:

1. A Building Permit is required for all window replacements. Replacing the glass in an existing sash and frame or replacing a single sash in a multi-sash window are considered to be repairs and are exempt from all requirements.
2. Replacement windows shall not reduce the light, ventilation and egress requirements to less than the minimum required by the Building Code.
3. An existing, non-conforming sill height may remain as long as the framed opening remains unchanged.
4. Any window and/or door addition or alteration that could reduce the structural capacity for gravity or lateral loads may require an engineered analysis if conventional construction methods can not be used.
5. Replacement of existing windows in a home, and/or the addition of up to 50 square feet of new windows to a home, must meet only the U-Factor and SHGC requirements.
6. Alterations that add more than 50 square feet of window and/or skylight must meet all the requirements of Package D.

Table 151-C of the 2008 California Energy Standards Component Package D requirements:

- Maximum allowable U-Factor of 0.40.
- Maximum allowable Solar Heat Gain Coefficient (SHGC) of 0.40.
- The total allowable area of glazing in the exterior walls of homes is 20% of the Conditioned Floor Area (CFA), with a maximum of 5% in the West Facing wall.
- Glazing in doors with less than 50% glass area shall be calculated as the sum of all glass surfaces plus 2 inches on all sides of the glass (to account for the frame).

Front Orientation and Conditioned Floor Area (CFA)

When more than 50 square feet of windows and/or skylights will be added, the orientation of the front of the home and the conditioned floor area of the existing home must be noted for verification of compliance with the Prescriptive Approach fenestration area requirements.

Exterior Shading

To obtain credit for exterior shading and reduce the SHGC of a window, the WS-3R Form shall be completed and submitted in addition to the CF-1R-ALT Form. Manufactured fenestration not certified by NFRC must use the CEC Default values found in Table 116-A and Table-116-B on the next page. The only exterior shading devices to be considered are listed on the WS-3R form. When a reduced SHGC value is identified on the CF-1R-ALT Form, the reduced SHGC value must match the SHGC value calculated on the WS-3R Form.

 National Fenestration Rating Council® CERTIFIED	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider	
	ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.35	0.32	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S./I-P)	
0.51	0.2	
<small>Manufacturer stipulates that these ratings conform to applicable NFRCC procedures for determining whole product performance. NFRCC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRCC 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. www.nfrcc.org</small>		

TABLE 116-A DEFAULT FENESTRATION PRODUCT U-FACTORS

FRAME	PRODUCT TYPE	SINGLE PANE U-FACTOR	DOUBLE PANE ¹ U-FACTOR	GLASS BLOCK ² U-FACTOR
Metal	Operable	1.28	0.79	0.87
	Fixed	1.19	0.71	0.72
	Greenhouse/garden window	2.26	1.40	N.A.
	Doors	1.25	0.77	N.A.
	Skylight	1.98	1.30	N.A.
Metal, Thermal Break	Operable	N.A.	0.66	N.A.
	Fixed	N.A.	0.55	N.A.
	Greenhouse/garden window	N.A.	1.12	N.A.
	Doors	N.A.	0.59	N.A.
	Skylight	N.A.	1.11	N.A.
Nonmetal	Operable	0.99	0.58	0.60
	Fixed	1.04	0.55	0.57
	Doors	0.99	0.53	N.A.
	Greenhouse/garden windows	1.94	1.06	N.A.
	Skylight	1.47	0.84	N.A.

1. For all dual-glazed fenestration products, adjust the listed U-factors as follows:
 a. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide.
 b. Add 0.05 to any product with true divided lite (dividers through the panes).
 2. Translucent or transparent panels shall use glass block values.

TABLE 116-B DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)

FRAME TYPE	PRODUCT	GLAZING	TOTAL WINDOW SHGC		
			Single Pane	Double Pane	Glass Block ¹
Metal	Operable	Clear	0.80	0.70	0.70
	Fixed	Clear	0.83	0.73	0.73
	Operable	Tinted	0.67	0.59	N.A.
	Fixed	Tinted	0.68	0.60	N.A.
Metal, Thermal Break	Operable	Clear	N.A.	0.63	N.A.
	Fixed	Clear	N.A.	0.69	N.A.
	Operable	Tinted	N.A.	0.53	N.A.
	Fixed	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
	Fixed	Clear	0.76	0.67	0.67
	Operable	Tinted	0.60	0.53	N.A.
	Fixed	Tinted	0.63	0.55	N.A.

1. Translucent or transparent panels shall use glass block values.

Prescriptive Certificate of Compliance: Residential		CF-1R-ALT
<i>Residential Alterations</i>		(Page 1 of 5)
Project Name:	Climate Zone #	# of Stories

General Information		
Site Address:	Enforcement Agency:	Date:
Building Type <input type="checkbox"/> Single Family <input type="checkbox"/> Multi Family	Circle the Front Orientation: N, E, S, W, or degrees _____	
Conditioned Floor Area (CFA): _____	Project Type: <input type="checkbox"/> Alterations <input type="checkbox"/> Envelope <input type="checkbox"/> Fenestration <input type="checkbox"/> Roof <input type="checkbox"/> HVAC Replacement or Change Out <input type="checkbox"/> Duct Replacement <input type="checkbox"/> Water Heater	
NOTE: This form is not to be used for Newly Constructed Buildings or Additions		

FENESTRATION PROPOSED AREAS

- Replacing window alone** – Replacement windows shall meet the U-Factor and SHGC Value requirements of Component Package D in Table 151-C. The Total Fenestration and West-facing Area requirements are not applicable.
- Adding 50ft² or less of window area** – Newly installed windows shall meet the U-Factor and SHGC Value requirements of Component Package D in Table 151-C.
- Adding more than 50ft² of window area** – Newly installed windows shall meet the U-Factor and SHGC Value and the Fenestration Area requirements of Component Package D in Table 151-C. Complete the Altered Fenestration Allowed Area Table on Page 2 of the CF-1R-ALT

Fenestration Type and Frame (Window, Glass Door or Skylight)	Orientation (North, East, South, West)	Proposed Area ¹ (ft ²)	Maximum U-factor ^{2,3}	Maximum SHGC ^{2,3,4}	NFRC or Default Value ⁵

1. Fenestration area is the area of total glazed product (i.e. glass plus frame). Exception: When a door is less than 50% glass, the fenestration area may be the glass area plus a "2 inch frame" around the glass.
2. Enter value from Component Package D Requirements in Table 151-C.
3. Actual fenestration products installed and as indicated in CF-6R-ENV Form shall be equivalent to or have a lower U-factor and/or a lower SHGC value than that specified on the CF-1R-ALT Form.
4. Submit a completed WS-3R Form if a reduced SHGC is calculated with exterior shading.
5. If applicable at this stage enter "NFRC" for NFRC Certified windows or are CEC "Default" values found in Table 116-A or B.

ALTERED FENESTRATION ALLOWED AREAS (Complete if more than 50ft² of fenestration is added)

	A	B	C	D	E	F	G
	CFA of Entire Dwelling	Allowed % of CFA	Existing Fenestration Area	Fenestration Area Removed	Fenestration Area Added	Total Area Allowed (A x B)	Proposed Area ² (E-D) + C
Total Fenestration Area (ft ²)		.20					≥
West Fenestration Area ¹ (Required In CZ's 2, 4 & 7 -15)		.05					≥

1. West Fenestration Area includes west-sloping skylights and any skylights with a pitch less than 1:12.
2. West facing glazing area removed cannot be "counted" twice." In order to distribute the west glazing area removed to the other orientations, input the west glazing area removed in the Total Fenestration Area row, column D.
3. Include the Proposed Area of the West facing fenestration in both Area columns below.
4. To meet compliance, the Proposed Area must be less than or equal to the Total Allowed Area for BOTH the Total and West Fenestration Areas.

Documentation Author's Declaration Statement

• I certify that this Certificate of Compliance documentation is accurate and complete.	
Name:	Signature:
Company:	Date:
Address:	If Applicable <input type="checkbox"/> CEA or <input type="checkbox"/> CEPE (Certification #):
City/State/Zip:	Phone:

Site Address:	Enforcement Agency:	Permit Number:
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FENESTRATION/GLAZING									
Item	Manufacturer/Brand Name (GROUP LIKE RODUCTS)	Product U-factor ¹	Product SHGC ¹	# of Panes	NFRC Certified ^{1,2}	Total Quantity of Like Product (Optional)	Area ft ²	Add. Exterior Shading Dev. or Overhang	Comments/ Location/ Special Features
1									
2									
3									
4									
5									
6									
7									
8									

1. Use values from a fenestration product's NFRC Certified Label. For fenestration products without an NFRC label, use the default values from Section 116, Table 116-A and 116-B of the 2008 Energy Efficiency Standards.
2. NFRC Label Certificates shall not be removed until the building inspector has verified the efficiency. Enter Yes or No.

- §116(a)1: Doors and windows between conditioned and unconditioned spaces designed to limit air leakage.
- §116(a)2 and 3: Actual fenestration products installed are equivalent to or have a lower U-factor and/or a lower SHGC than that specified on the Certificate of Compliance (Form CF-1R).
- §116(a)4: Fenestration products (except field-fabricated windows) have a label listing the certified U-Factor, certified Solar Heat Gain Coefficient (SHGC), and infiltration that meets the requirements of §10-111(a)
- §117: Exterior doors and windows weather-stripped; all joints and penetrations caulked and sealed.

DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, the information provided on this form is true and correct.
- I am eligible under Division 3 of the Business and Professions Code to accept responsibility for construction, or an authorized representative of the person responsible for construction (responsible person).
- I certify that the installed features, materials, components, or manufactured devices identified on this certificate (the installation) conforms to all applicable codes and regulations, and the installation is consistent with the plans and specifications approved by the enforcement agency.
- I reviewed a copy of the Certificate of Compliance (CF-1R) form approved by the enforcement agency that identifies the specific requirements for the installation. I certify that the requirements detailed on the CF-1R that apply to the installation have been met.
- **I will ensure that a completed, signed copy of this Installation Certificate 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 signed copy of this Installation Certificate is required to be included with the documentation the builder provides to the building owner at occupancy.**

Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)		
Responsible Person's Name:	Responsible Person's Signature:	
CSLB License:	Date Signed:	Position With Company (Title):

Solar Heat Gain Coefficient Worksheet

WS-3R

Residential

(Page 1 of 2)

Site Address:

Enforcement Agency:

Date:

Items 1 through 4 must be completed for glazing/shading combinations by using the Default Table for Fenestration Products (Table 116-B of the Standards), NFRC certified data, or Solar Heat Gain Coefficients Used for Exterior Shading Attachments (Table S-1 below) for the specific conditions indicated (#1a or #1b or #3).

General Information

1a. For Fenestration Products w/NFRC testing and labels:

SHGC_{fen} = _____

OR

1b. For Fenestration Products without NFRC testing and labels (Table 116-B of the Standards):

SHGC_{fen} = _____

1c. Frame Type

1d. Product Type

1e. Glazing Type

1f. Single/Double Pane

metal, non-metal,
metal w/thermal break

operable/fixed

(visibly) tinted
clear (not visibly tinted)

single pane/double pane

2. Skylight (Y/N) _____

(A skylight is fenestration mounted on a roof surface at a slope less than 60° from the horizon.)

Combined Exterior Shade with Fenestration

3. SHGC_{Exterior Shade}: _____

Exterior Shade Type: _____

(If no exterior shade, assume standard bug screens, SHGC_{Exterior Shade} = 0.76 for ordinary windows. This requirement does not apply to skylights where SHGC_{Exterior Shade} is assumed to be 1.00. If another exterior shade is substituted for bug screens, use one of the values from Table S-1.

4.
$$\left[\left(\frac{\text{SHGC}_{\text{max}}}{\text{SHGC}_{\text{min}}} \times 0.2875 \right) + 0.75 \right] \times \text{SHGC}_{\text{min}} = \text{Total SHGC}$$

Where:

SHGC_{max} = Larger of (#1a or #1b) or #3

SHGC_{min} = Smaller of (#1a or #1b) or #3

Note: Calculated Solar Heat Gain Coefficient values for Total SHGC may be used directly for prescriptive packages.

- Package C Target Value for Total SHGC is 0.40 for Climate Zones 2 through 15
- Package D Target Value for Total SHGC is 0.40 for Climate Zones 2, 4 through 14 and 0.35 in Climate Zone 15
- Package E Target Value for Total SHGC is 0.40 for Climate Zones 2, 3, 5, 6, 8 through 10, and 0.25 in Climate Zones 4, 7, 11, 12, 14, and 15, and 0.30 in Climate Zone 13.

Table S-1: Solar Heat Gain Coefficients Used for Permanently Installed Exterior Shading Attachments for WS-3R^{1,2}

Exterior Shading Device ³	With Single Pane Clear Glass & Metal Framing ⁴
1) Standard Bug Screens	0.76
2) Exterior Sunscreens with Weave 53 x 16/inch	0.30
3) Louvered Sunscreens w/Louvers as Wide as Openings	0.27
4) Low Sun Angle (LSA) Louvered Sunscreens	0.13
5) Vertical Roller or Shades or Retractable/Drop Arm/Marquisolette and Operable Awnings ²	0.13
6) Roll Down Blinds or Slats	0.13
7) None (for skylights only)	1.00

Notes:

1. These values may be used on line 3 of the Solar Heat Gain Coefficient (SHGC) Worksheet (WS-3R) to calculate exterior shading with other glazing types and combined interior and exterior shading with glazing.
2. Exterior operable awnings (canvas, plastic or metal), except those that roll vertically down and cover the entire window, should be treated as overhangs (use the SHGC equation) for the purposes of compliance with the Standards. See Fixed Shading Devices and Exterior Shading Devices in the Residential Compliance Manual, Chapter 3.
3. Standard bug screens must be assumed for all fenestration unless replaced by other exterior shading attachments. The solar heat gain coefficient listed for bug screens is an area-weighted value that assumes that the screens are only on operable windows. The solar heat gain coefficient of any other exterior shade screens applied only to some window areas must be area-weighted with the solar heat gain coefficient of standard bug screens for all other glazing (see Form WS-2R). Different shading conditions may also be modeled explicitly in the computer performance method.
4. Reference glass for determining solar heat gain coefficients is 1/8 inch double strength (DSS) glass.

Solar Heat Gain Coefficient Worksheet		WS-3R
Residential		(Page 2 of 2)
Site Address:	Enforcement Agency:	Date:

Instructions for WS-3R

The following explains how to calculate solar heat gain coefficients on WS-3R. The number of each item below corresponds to the appropriate item on WS-3R.

Enter either:

1a. For products with NFRC testing and labels, enter the product's labeled SHGC as #1a. $SHGC_{fen}$

OR

1b.	Enter the default $SHGC_{fen}$ from Table 116-B of the Standards corresponding to the fenestration characteristics described in entries 1c, 1d, 1e, and 1f. Entries for 1c, 1d, 1e, and 1f are only needed if 1b is entered for $SHGC_{fen}$.
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If 1b is entered, then:

1c	Describe the Frame Type [metal, metal w/thermal break, or non-metal (non-metal includes both vinyl and wood)].
1d	The Product Type (operable or fixed).
1e	The glazing type (tinted or uncoated). Note that tints or coatings that cannot be easily observed by the building official must be classified as "uncoated." Tints must be easily visible to the naked eye.
1f	Single or double pane glazing.

2. For skylights mounted on a roof surface, enter "Y," otherwise enter "N." A skylight is fenestration mounted at a slope less than 60° from the horizon.

3. Describe the exterior shading device in the space provided (e.g., roll down awning). List $SHGC_{Exterior\ Shade}$, the SHGC of the exterior shade with 1/8" clear single pane glass and metal framing, from Table S-1. If a single window or skylight has multiple exterior shades (i.e., shade screens and awnings) use the one shading device with the lower SHGC.

If no exterior shade is proposed, assume standard bug screens with a SHGC of 0.76 (or a SHGC of 1.00 for horizontal glazing). This applies to the full area of fixed fenestration products as well as operable.

4. Calculate $SHGC_{Shade\ Open}$ using values from Items 3 and either 1a or 1b. The result is the combined SHGC of the fenestration product and exterior device with the interior *shade open*.