

Quick Reference Guide for



(QRG-Residential)

2013 Title 24, Part 6 Standards / Efficiency Standards, California Code of Regulations, Title 24, Part 6 / Subchapter 2 All Occupancies—Mandatory Requirements for the Manufacturer, Construction and Installation of Systems, Equipment and Building Components

SECTION 110.6 – MANDATORY REQUIREMENTS FOR FENESTRATION PRODUCTS AND EXTERIOR DOORS

(a) Certification of Fenestration Products and Exterior Doors other than Field-fabricated.

Any fenestration product and exterior door, other than field-fabricated fenestration products and field-fabricated exterior doors, may be installed only if the manufacturer has certified to the Commission, or if an independent certifying organization approved by the Commission has certified that the product complies with all of the applicable requirements of this subsection.

1. **Air leakage.** Manufactured fenestration products and exterior doors shall have air infiltration rates not exceeding 0.3 cfm/ft² of window area, 0.3 cfm/ft² of door area for residential doors, 0.3 cfm/ft² of door area for nonresidential single doors (swinging and sliding), and 1.0 cfm/ft² for nonresidential double doors (swinging), when tested according to NFRC-400 or ASTM E283 at a pressure differential of 75 pascals (or 1.57 pounds/ft²), incorporated herein by reference.

EXCEPTION to Section 110.6(a)1: Field-fabricated fenestration and field-fabricated exterior doors.

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2. **U-factor.** The fenestration product's U-factor shall be rated in accordance with NFRC 100, or use the applicable default U-factor set forth in TABLE 110.6-A.

Prescriptive Approach:

Table 3-3 – Maximum U-factors, SHGC and Fenestration Area by Climate Zone in Packages A

Climate Zone	1, 3, 5	2,4,6-16
Maximum U-factor	0.32	0.32
Maximum SHGC	NR	0.25
Maximum Fenestration Area	20%	20%
Maximum West-Facing Fenestration	NR	5%



Performance Approach:

U-factors all fenestration products within a single project must meet a .58 or better (Lower Number)– This is weighed averaged of JUST THE fenestration products on the project (Size doesn't matter).

Reference (Residential Compliance Manual 2013)

Applicable Section: §150.0(q)

With the 2013 update, the mandatory maximum U-factor is set by §150.0(q) for fenestration including skylights to be at maximum U-factor of 0.58. While there is an allowance for area weighted averaging, this will limit the use of single pane products. Up to 10 ft² **or** 0.5% of conditioned floor area (whichever is greater) is exempt from the maximum U-factor requirement.

Example: In a 2000 square foot (CFA) home, (2000x.05=100 sq feet) you could replace one 12-0 x 8-0 Slider (96 square feet of vertical fenestration) without having to comply with Title 24

EXCEPTION 1 to Section 110.6(a)2: If the fenestration product is a vertical skylight or is a site-built fenestration product in a building covered by the nonresidential standards with less than 1,000 square feet of site-built fenestration, the default U-factor may be calculated as set forth in Reference Nonresidential Appendix NA6.

EXCEPTION 2 to Section 110.6(a)2: If the fenestration product is an alteration consisting of any area replacement of glass in a skylight product or in a vertical site-built fenestration product, in a building covered by the nonresidential standards, the default U-factor may be calculated as set forth in Reference Nonresidential Appendix NA6.

- 3. **Solar Heat Gain Coefficient (SHGC).** The fenestration product's SHGC shall be rated in accordance with NFRC 200, or use the applicable default SHGC set forth in TABLE 110.6-B.

Prescriptive Approach:

Table 3-3 – Maximum U-factors, SHGC and Fenestration Area by Climate Zone in Packages A

Climate Zone	1, 3, 5	2,4,6-16
Maximum U-factor	0.32	0.32
Maximum SHGC	NR	0.25
Maximum Fenestration Area	20%	20%
Maximum West-Facing Fenestration	NR	5%



Performance Approach:

Solar Heat Gain Coefficient (RSHGC) -On all fenestration products, Even though there is a Prescriptive target number to meet in most zones, there is NO Min requirement target number. However, this number does weigh in towards the total performance of the building and the total buildings performance must meet requirements.

EXCEPTION 1 to Section 110.6(a)3: If the fenestration product is a skylight or is a vertical site-built fenestration product in a building covered by the nonresidential standards with less than 1,000 square feet of site-built fenestration, the default SHGC may be calculated as set forth in Reference Nonresidential Appendix NA6.

EXCEPTION 2 to Section 110.6(a)3: If the fenestration product is an alteration consisting of any area replacement of glass in a skylight product or in a vertical site-built fenestration product, in a building covered by the nonresidential standards, the default SHGC may be calculated as set forth in Reference Nonresidential Appendix NA6.



- 4. **Visible Transmittance (VT).** The fenestration product's VT shall be rated in accordance with NFRC 200 or ASTM E972, for tubular skylights VT shall be rated using NFRC 203.

Visible Transmission (VT) – The Visible Transmission value is required on the label, however, there are no residential requirements at this time.

NA6.4 Default Visible Transmittance, VT

(a) Equation NA6-3 - VT of Center of Glass (COG) calculation

$$VTT = VTF \times VTC$$

Where:

VTT = Is the Total Performance of the fenestration including glass and frame

VTF = 0.53 for projecting windows, such as casement and awning windows

VTF = 0.67 for operable or sliding windows

VTF = 0.77 for fixed or non-operable windows

VTC = Center of glass VT is calculated in accordance with NFRC 200 Section 4.5.1.1 or NFRC 202 (provided by glass manufacturer).

EXCEPTION 1 to Section 110.6(a)4: If the fenestration product is a skylight or is a vertical site-built fenestration product in a building covered by the nonresidential standards with less than 1,000 square feet of site-built fenestration, the default VT may be calculated as set forth in Reference Nonresidential Appendix NA6.



EXCEPTION 2 to Section 110.6(a)4: If the fenestration product is an alteration consisting of any area; replacement of glass in a skylight product or in a vertical site-built fenestration product in a building covered by the nonresidential standards, the default VT may be calculated as set forth in Reference Nonresidential Appendix NA6.

5. **Labeling.** Fenestration products shall:

- A. Have a temporary label for manufactured fenestration products or a label certificate when the Component Modeling Approach (CMA) is used and for site-built fenestration meeting the requirements of Section 10-111(a)1. The label listing the certified U-factor, SHGC and VT, shall not be removed before inspection by the enforcement agency. The temporary label shall certify that the air leakage requirements of Section 110.6(a)1 are met for each product line; and
- B. Have a permanent label or a label certificate when the Component Modeling Approach (CMA) is used and for site-built fenestration meeting the requirements of Section 10-111(a)2 if the product is rated using NFRC procedures.
- C. In lieu of the NFRC label a "Default Label" along with a "Compliance Certificate" can be used and must remain attached until the building inspector has verified its efficiencies. As long as the Air Leakage and U-Factor minimums have been met and the Solar Heat Gain Coefficient has been identified, a Default Label based on the Default Table, may be used in lieu of an NFRC Label.

6. **Fenestration Acceptance Requirements.** Before an occupancy permit is granted, site-built fenestration products in other than low-rise residential buildings shall be certified as meeting the Acceptance Requirements for Code Compliance, as specified in the Reference Nonresidential Appendix NA7 to ensure that site-built fenestration meet Standards requirements, including a matching label certificate for product(s) installed and be readily accessible at the project location. A Certificate of Acceptance certifying that the fenestration product meets the acceptance requirements shall be completed, signed and submitted to the enforcement agency.

EXCEPTION to Section 110.6(a): Fenestration products removed and reinstalled as part of a building alteration or addition.

Greenhouse Windows -Residential Compliance Manual 2013 (9.4.5)

Greenhouse or garden windows are special windows that project from the façade of the building and are typically five sided structure. An NFRC-rated U-factor for greenhouse windows is typically quite high and may not meet the mandatory requirements for the fenestration U-factor of 0.58. The three ways to meet this mandatory measure for greenhouse windows are:

- Must have a maximum U-factor of 0.58 or better; or
- Use the area-weighted average for all new and replacement fenestration with a combined mandatory maximum of 0.58 U-factor as per §150.0(q)2; or

The Exception to §150.0(q)1 for up to 10 ft² or 0.5% of CFA, whichever is greater; or When using the performance approach, Exception 1 to s. 150.2(b) states that any dual glazed greenhouse or



garden window installed as part of an alteration complies automatically with the U-factor requirements of s. 150.1(c)3. However, these windows are not exempt from the SHGC requirements of s. 150.1(c)3.

Example: In a 2000 square foot (CFA) home, you could replace one 12-0 x 8-0 Greenhouse window (96 square feet of vertical fenestration) without having to comply with Title 24

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Reference-Residential Compliance Manual 2013 (3.5.10)

Glazed Doors §110.6-Residential Compliance Manual 2013 (E)

The following rules apply to doors with glass:

Any door that is more than one-half glass is considered a glazed door and must comply with the mandatory other requirements applicable to a fenestration product. Up to 3 ft² of glass in a door is exempt from the U-factor and SHGC requirements (or can be considered equivalent to the Package A values). The U-factor and SHGC shall be based on either the NFRC values for the entire door including glass area, or use default values in Table 110.6- A for the U-factor and Table 110.6-B for the SGHC. If the door is made up of less than 50 percent, the opaque part of the door is ignored in the prescriptive approach, but in the performance method it is assumed a default U-factor of 0.50. The glass area of the door is calculated as the sum of all glass surfaces plus 2 inches on all sides of the glass to account for a frame.

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Bay Windows -Residential Compliance Manual 2013 (H)

For bay windows that come with an NFRC rating for the entire unit, compliance is determined based on the rough opening area of the entire unit, applying the NFRC U-factor and SHGC. If the unit U-factor and SHGC do not meet the package requirements or area-weighted average, the project must show compliance using the performance approach.

(b) Installation of Field-fabricated Fenestration and Exterior Doors.

Field-fabricated fenestration and field-fabricated exterior doors may be installed only if the compliance documentation has demonstrated compliance for the installation using U-factors from TABLE 110.6-A and SHGC values from TABLE 110.6-B Field-fabricated fenestration and field-fabricated exterior doors shall be caulked between the fenestration products or exterior door and the building, and shall be weather-stripped.

EXCEPTION to Section 110.6(b): Unframed glass doors and fire doors need not be weather stripped or caulked.



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CEC Reference links:

A) CEC Reference links:

1. [2013 Building Energy Efficiency Standards](#)
2. [2013 Residential Compliance Manual](#)
3. [2013 Nonresidential Appendices](#)

B) CF2R - 2013 Residential Compliance Forms

http://www.energy.ca.gov/title24/2013standards/res_compliance_forms/CF2R/

C) Summary of Major Changes from Title 24 2008

http://www.energy.ca.gov/title24/2013standards/2013-03-12_Changes_for_the_2013_Update_to_Building_Energy_Efficiency_Standards.pdf

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Disclaimer: Regulations and tables are subject to updates and revisions by the CEC. Any discrepancies in the information provided must default to the CEC regulations and updates.



TABLE 110.6-A DEFAULT FENESTRATION PRODUCT U-FACTORS

FRAME	PRODUCT TYPE	SINGLE PANE ^{3,4} U-FACTOR	DOUBLE PANE ^{1,3,4} U-FACTOR	GLASS BLOCK ^{2,3} 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.
<p>1. For all dual-glazed fenestration products, adjust the listed U-factors as follows:</p> <p>a. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide.</p> <p>b. Add 0.05 to any product with true divided lite (dividers through the panes).</p> <p>2. Translucent or transparent panels shall use glass block values when not rated by NFRC 100.</p> <p>3. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.</p> <p>4. Windows with window film applied that is not rated by NFRC 100 shall use the default values from this table.</p>				

Performance Approach:

U-factors all fenestration products within a single project must meet a .58 or better (Lower Number)– This is weighed averaged of JUST THE fenestration products on the project (Size doesn’t matter).

TABLE 110.6-B DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)

FRAME TYPE	PRODUCT	GLAZING	FENESTRATION PRODUCT SHGC		
			Single Pane ^{2,3} SHGC	Double Pane ^{2,3} SHGC	Glass Block ^{1,2} SHGC
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 when not rated by NFRC 200.
2. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.
3. Windows with window film applied that is not rated by NFRC 200 shall use the default values from this table

Performance Approach:

Solar Heat Gain Coefficient (RSHGC) -On all fenestration products, Even though there is a Prescriptive target number to meet in most zones, there is NO Min requirement target number. However, this number does weigh in towards the total performance of the building and the total buildings performance must meet requirements.