Fenestration
2013 Residential Alterations

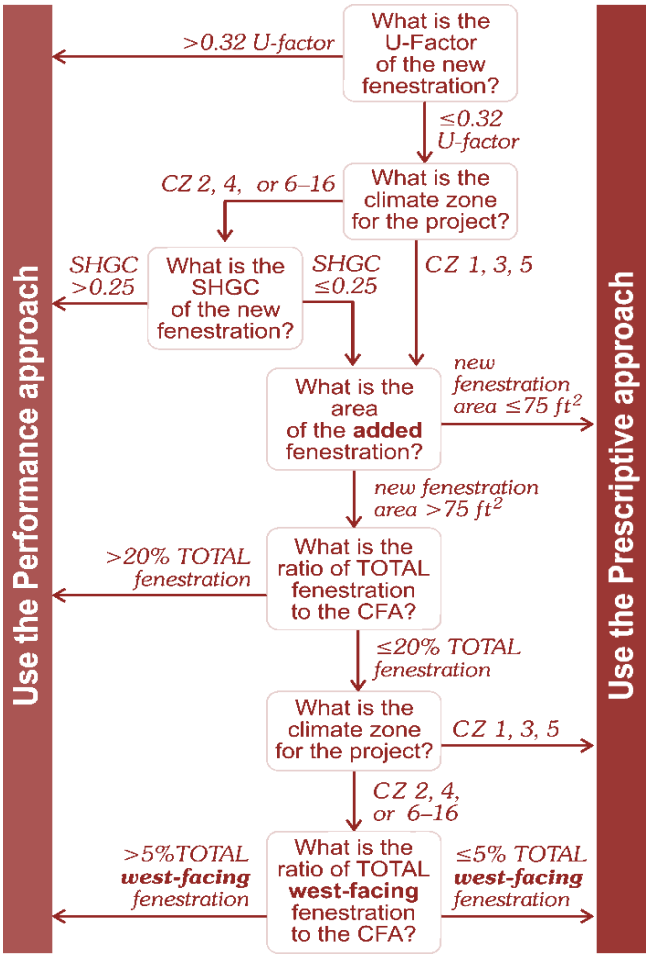
Assessing Your Project

Title 24 Prescriptive requirements for alterations affecting fenestration (windows, skylights, and doors with >3 sq. ft. of glass) vary depending upon the fenestration added or replaced in the project.

- If you add more than 75 sq. ft. to the building's fenestration area, the new fenestration must meet requirements for TOTAL fenestration area and WEST-facing fenestration area, as well as the U-factor and SHGC for the climate zone.
- If you add fenestration area up to 75 sq. ft. — or if you add up to 16 sq. ft. of new skylight area with U-factor ≤0.55 and SHGC ≤0.30 — the total/west-facing fenestration area requirements do not apply. (A skylight is fenestration installed on a roof <60° from the horizontal.)
- If you replace existing fenestration, the replaced fenestration must meet the area-weighted U-factor and SHGC requirements of Package A. (See the tables on the next page.)
- Exceptions are:
  - Replacements of vertical fenestration up to 75 sq. ft. will comply with a maximum U-factor of 0.40 in climate zones 1-16, and a maximum SHGC of 0.35 in climate zones 2, 4, and 6-16.
  - Replaced skylights are allowed a maximum U-factor of 0.55, and a maximum SHGC of 0.30.
- If the project does not meet the prescriptive requirements:
  - Adjust your project — For example, purchase more energy efficient windows or add less fenestration area.

  OR
  - Use the performance approach — This requires using approved energy modeling software.
- Check with an energy consultant before removing any existing windows or other feature.
- You may need to use the energy efficiency values from your existing features to demonstrate compliance with the Performance approach. This would require verification by a HERS Rater of the existing features before they are changed.

Prescriptive or Performance?



This flowchart depicts the most common decisions regarding fenestration alteration projects. Exceptions may apply to projects that have small glazing areas and use efficient fenestration products.

For example, if the fenestration area is ≤10 ft2 or 0.5% of the Conditioned Floor Area (CFA), whichever is larger, it is exempt from the maximum U-factor requirement.

As another example, ≤3 ft2 of new glazing area installed in doors need to meet neither the U-factor nor the SHGC maximums.

For more information on exemptions, see the Standards §150.0(q), §150.1(c)3, §150.2(b)1A and §150.2(b)1B.

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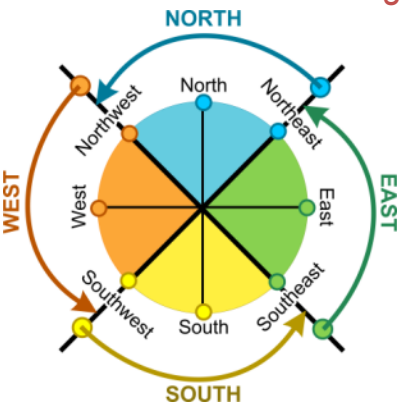
Orientation & West-facing Fenestration



"Orientation" refers to the direction that the fenestration faces.

West-facing fenestration — a consideration in climate zones 2, 4, 6–16 — includes:

- A window (or a door with glass) that faces from 45° northwest to 44° southwest
- Skylights tilted:
- To the west (45° northwest to 44° southwest)
- In any direction when the pitch is less than 1:12

Actual Orientation…	… Is Considered
45° east of north to 44° west of north	North-facing
45° north of west to 44° south of west	West-facing
45° west of south to 44° east of south	South-facing
45° south of east to 44° north of east	East-facing

Mandatory Requirements

Whether you use the Prescriptive or Performance approach to demonstrate compliance, new or replacement fenestration must meet both of the following mandatory measures:

- Manufactured fenestration's air infiltration rates must be ≤0.3 cfm/ft2 of window area at a pressure differential of 75 pascals.
- All new fenestration that separates conditioned space from unconditioned space or outdoors must have a maximum or weighted-average U-factor of 0.58.

Exception: If your project involves ≤10 ft2 of fenestration OR the fenestration area is ≤0.5% of the total CFA (whichever is greater), it does not need to meet the maximum U-factor requirement.

Prescriptive Requirements

The Prescriptive requirements for fenestration vary by climate zone and the type and area of the fenestration:

More than 75ft² additional fenestration area[A]				
Climate Zones	**U-Factor [E]**	**SHGC [B,E]**	**TOTAL Fenestration[C] Area % of CFA[D]**	**WEST-facing[C] Area % of CFA[D]**
1, 3, 5	**0.32** or lower	na	**20%** or less	na
2, 4, 6-16	**0.32** or lower	**0.25** or lower	**20%** or less	**5%** or less

75ft² or less additional fenestration area[A]		
Climate Zones	**U-Factor[E]**	**SHGC[B,E]**
1, 3, 5	**0.32** or lower	na
2, 4, 6-16	**0.32** or lower	**0.25** or lower

16ft² or less additional skylight area		
Climate Zones	**U-Factor[E]**	**SHGC[B,E]**
1, 3, 5	**0.55** or lower	na
2, 4, 6-16	**0.55** or lower	**0.30** or lower

[A] Fenestration area is the glass plus the frame. For doors with glass area less than 50% of total door area, consider the "frame" to be two inches on all sides of the glass. For doors with glass area 50% or more of the total door area, count the entire door area as glazing.

[B] If the fenestration has qualifying exterior shading (e.g., a permanent awning) the SHGC may be calculated taking that shading into consideration. If you use exterior shading to meet the SHGC requirement, you must submit a CF1R-ENV-03-E: "Solar Heat Gain Coefficient (SHGC) Worksheet."

[C] "TOTAL fenestration" is all new fenestration plus existing fenestration that remains after the alteration. See "Orientation and West-facing Fenestration" for a definition of west-facing fenestration.

[D] "CFA" is conditioned floor area; see §100.1 "Definitions and Rules of Construction" in the Standards for details.

[E] Maximum area-weighted average values.

See Exception 3 to Section 150.1(c)3A for fenestration containing chromogenic glazing. (Chromogenic glazing is high performance glazing that is able to vary its transmittance appropriately in response to automatic controls based on the solar intensity. This means it has the potential to improve building energy efficiency compared to standard low-e glazing.)

Repairs

No energy efficiency requirements apply to fenestration if you are:

- Replacing a broken pane of glass, but not the entire window

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- Uninstalling fenestration components for maintenance or repair and re-installing in the same location without increasing the pre-existing energy consumption.

Documentation

Forms

The following forms are required for residential fenestration alterations:

- **Permit**
- **CF1R-ALT-01-E** — Certificate of Compliance for Residential Alterations

  Submitted to the building department by the contractor or the home owner.
- **CF1R-ENV-02-E (if necessary)** — Area Weighted Average Calculation Worksheet

  Submitted with the CF1R-ALT-01-E when there is more than one type of window and one or more does not meet prescriptive compliance requirements.
- **CF1R-ENV-03-E (if necessary)** — Solar Heat Gain Coefficient (SHGC) Worksheet

  Submitted with the CF1R-ALT-01-E **only** if exterior shading devices are used to meet the SHGC requirement.
- **CF2R-ENV-01-E** — Certificate of Installation for Fenestration

  Completed and signed by the installing contractor and made available for final inspection by building department.

NFRC Labeling

Typically, manufactured windows come with labels indicating that the NFRC (National Fenestration Rating Council) has certified the performance ratings of the window.

Leave the labels on the windows until the field inspection is done.

Manufactured fenestration not certified by NFRC must use the CEC Default values found in Table 110.6-A and Table 110.6-B in the Standards; documented per §10-111 labeling requirements.

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