



Fenestration in Residential Alterations

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Assessing Your Project

The Title 24 Prescriptive requirements for fenestration (windows, skylights, and doors with glass area greater than 50% of the total door area) vary depending upon fenestration area added as a result of the project.

- If you **replace existing fenestration**, without changing the size of the opening — or if you **add 50 ft² or less** to the building's fenestration area — the new fenestration must meet the U-factor and SHGC for the climate zone to comply prescriptively.
- If you add **more than 50 ft²** to the building's fenestration area, the new fenestration must meet any climate-zone specific requirements for TOTAL fenestration area and TOTAL WEST-facing fenestration as well as the U-factor and SHGC for the climate zone.
- 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.

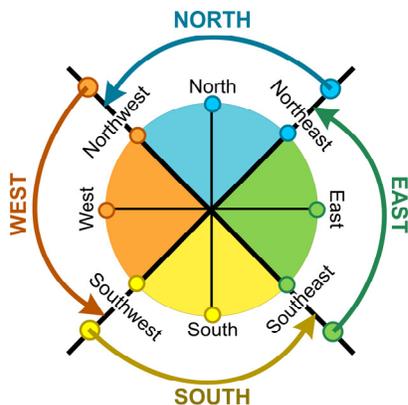
Consider working with an energy consultant to determine if the Performance approach is feasible for your project.

Orientation and West-facing Fenestration

“Orientation” refers to the direction that the fenestration faces. West-facing fenestration, which is a consideration in climate zones 2, 4, 7-15, includes:

- A window (or door that is 50% or more 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

The figure and table below show how orientation is assigned.



Actual Orientation...	... Is Considered
45° northeast to 44° northwest	North-facing
45° northwest to 44° southwest	West-facing
45° southwest to 44° southeast	South-facing
45° southeast to 44° northwest	East-facing

50 ft ² or less additional fenestration area ^A		
Climate Zones	U-Factor	SHGC ^B
1, 3, 16	0.40 or lower	na
2, 4-14	0.40 or lower	0.40 or lower
15	0.40 or lower	0.35 or lower

More than 50 ft ² additional fenestration area ^A				
Climate Zones	U-Factor	SHGC ^B	TOTAL ^C Fenestration % of CFA ^D	TOTAL ^C WEST-facing % of CFA ^C
1, 3, 16	0.40 or lower	na	20% or less	na
2, 4, 7-14	0.40 or lower	0.40 or lower	20% or less	5% or less
5, 6	0.40 or lower	0.40 or lower	20% or less	na
15	0.40 or lower	0.35 or lower	20% or less	5% or less

Repairing fenestration

- Replace some, but not all, the glass — no energy efficiency requirements apply.
- Replace all the glass — meet the U-Factor and SHGC values for **50 ft² or less additional fenestration area**.

- ^A Fenestration area is the glass plus the frame. For doors with glass area greater than 50% of total door area, consider the “frame” to be two inches on all sides of the glass.
- ^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 WS-3R: 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 §101 in the Standards for details.

NFRC Labeling

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



Manufactured fenestration not certified by NFRC must use the CEC Default values found in Table 116-A and Table-116-B in the Standards and documented per §10-111 labeling requirements.

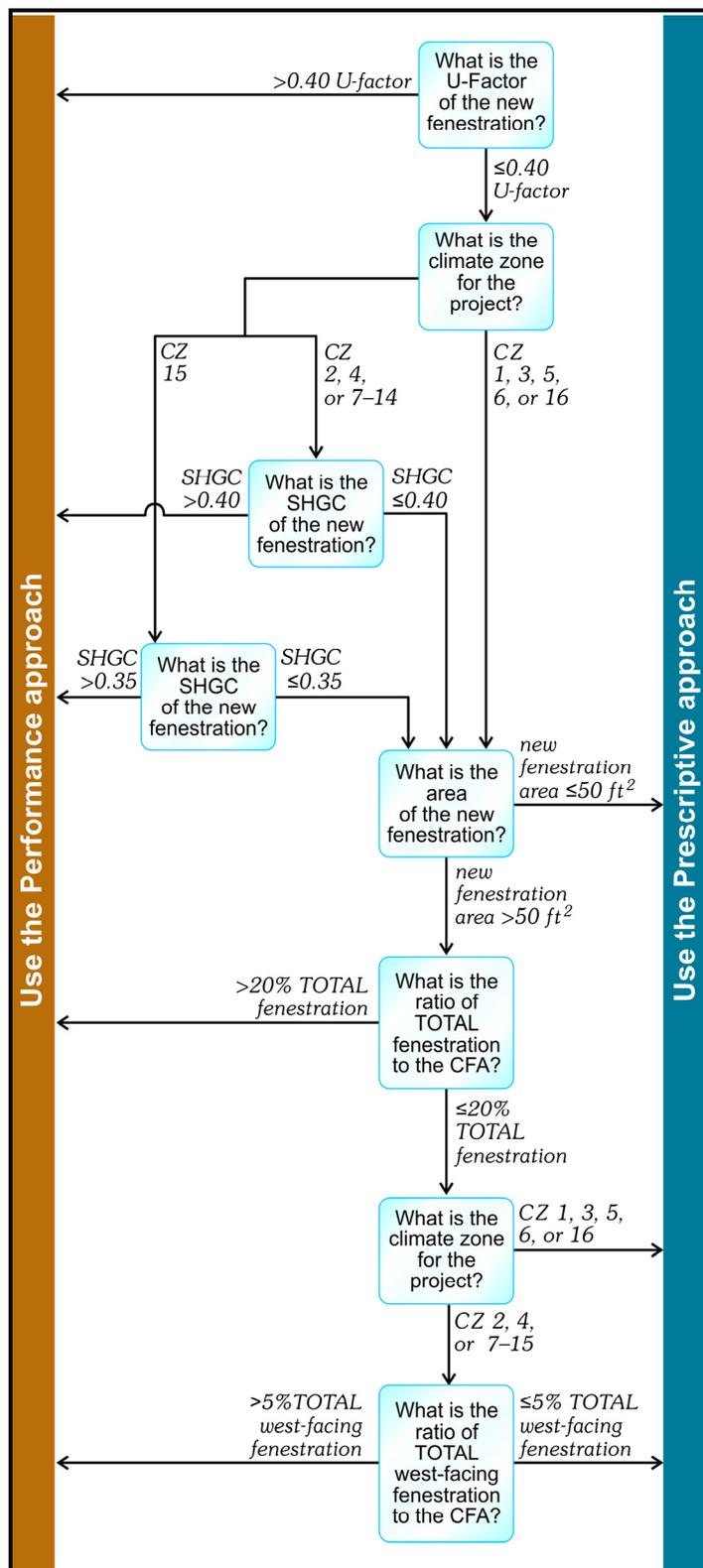
Leave the labels on the windows until the field inspection is done.

Prescriptive or Performance?

The flow chart below can help you determine whether your fenestration project complies prescriptively, or whether you need to use the performance approach (or revise the project.)

The performance approach allows “trade offs” between various aspects of a project, so it unlikely that is an appropriate alternative for a project that focuses only on altering the fenestration.

If your project does not comply prescriptively, consider working with an energy consultant to determine if the Performance approach is feasible for your project.



Forms

The following forms are required for a fenestration alteration:

- **Permit**
- **CF-1R-ALT** — Certificate of Compliance for Alterations
Submitted to the building department by the contractor or the home owner.
- **WS-3R (if necessary)** — Solar Heat Gain Coefficient (SHGC) Worksheet
Submitted with the CF-1R-ALT **only** if exterior shading is used to calculate the SHGC.
- **CF-6R-ENV-01** — Installation Certificate for Envelope
Completed and signed by the installing contractor and made available for final inspection by building department.

Tips for the Fenestration Sections of CF-1R-ALT

Fenestration Proposed Areas

- **Fenestration Type and Frame** — Enter each kind (window, glass door, or skylight) of newly installed fenestration on a separate line. Specify whether the frame is metal, wood, or vinyl.
Doors with glass in them are included **ONLY** if the glass in the door is more than 50% of the door's total area.
- **Orientation** — See “What’s West-Facing” on the preceding page for information on how to determine orientation.
- **Proposed Area** — Fenestration area is the glass plus the frame. For doors with glass area greater than 50% of total door area, consider the “frame” to be two inches on all sides of the glass.
- **Maximum U-factor and SHGC** — See the tables on the previous page for the maximum U-factor and SHGC for the climate zone your project is in.
If you are installing qualifying exterior shading (e.g., a permanent awning) your SHGC may be calculated taking the shading into consideration. If you choose to do this, you must submit a completed WS-3R form. See Section 3.2.4 of the Residential Compliance Manual for details.
- **NFRC or Default Value** — Enter either “NFRC” or “Default.” See “NFRC Labeling on the preceding page for more information.

Altered Fenestration Allowed Areas

Only for projects with more than 50 ft² additional fenestration area.

- **Total Fenestration Area and West Fenestration Area** — “Total fenestration” is all the fenestration in the residence (New Fenestration + Existing Fenestration). See “What’s West-facing” on the preceding page for details on what is west-facing fenestration.
- **CFA of Entire Dwelling** — Conditioned floor area is the floor area (in square feet) of enclosed conditioned space (heated and cooled areas) on all floors, as measured at the floor level of the exterior surfaces of exterior walls.
- **Existing, Removed and Added Fenestration Areas** — *Existing* refers to any previously installed fenestration area that remains after the alteration. *Removed* includes fenestration area that will no longer be in the residence once the alteration is complete (e.g., a window that will be walled up or the amount an existing window is made smaller). *Added* includes fenestration area that is not in the original building (e.g., a new window or the amount an existing window has been made larger).
- **Total Area Allowed** — 20% of the CFA is the maximum total fenestration area for the residence. In climate zones 2, 4 and 7-15, the maximum total west-facing fenestration is 5% of the CFA. (There is no west-facing maximum for other climate zones.)
- **Proposed Area** — The proposed area is the total fenestration area after the alteration. That is, Existing + Added – Removed.