



# Fenestration in Residential Alterations

sponsored by the  
Statewide Codes and Standards Program  
under the auspices of the CPUC



## 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 ft<sup>2</sup> 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 ft<sup>2</sup>** 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.

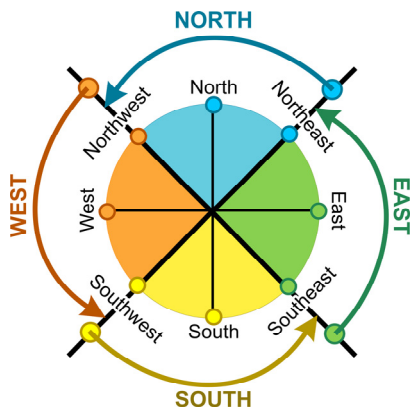
Consider working with an energy consultant to determine if the Performance approach is feasible for your project.

## 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<sup>2</sup> or less additional fenestration area<sup>A</sup>

| Climate Zones | U-Factor             | SHGC <sup>B</sup>    |
|---------------|----------------------|----------------------|
| 1, 3, 16      | <b>0.40</b> or lower | na                   |
| 2, 4-14       | <b>0.40</b> or lower | <b>0.40</b> or lower |
| 15            | <b>0.40</b> or lower | <b>0.35</b> or lower |

## More than 50 ft<sup>2</sup> additional fenestration area<sup>A</sup>

| Climate Zones | U-Factor             | SHGC <sup>B</sup>    | TOTAL <sup>C</sup> Fenestration % of CFA <sup>D</sup> | TOTAL <sup>C</sup> WEST-facing % of CFA <sup>C</sup> |
|---------------|----------------------|----------------------|-------------------------------------------------------|------------------------------------------------------|
| 1, 3, 16      | <b>0.40</b> or lower | na                   | <b>20%</b> or less                                    | na                                                   |
| 2, 4, 7-14    | <b>0.40</b> or lower | <b>0.40</b> or lower | <b>20%</b> or less                                    | <b>5%</b> or less                                    |
| 5, 6          | <b>0.40</b> or lower | <b>0.40</b> or lower | <b>20%</b> or less                                    | na                                                   |
| 15            | <b>0.40</b> or lower | <b>0.35</b> or lower | <b>20%</b> or less                                    | <b>5%</b> 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 ft<sup>2</sup> or less additional fenestration area**.

- <sup>A</sup> 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.
- <sup>B</sup> 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.
- <sup>C</sup> "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.
- <sup>D</sup> "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.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |
| <b>World's Best Window Co.</b><br>Millennium 2000+<br>Vinyl-Clad Wood Frame<br>Double Glazing • Argon Fill • Low E<br>Product Type: Vertical Slider                                                                                                                                                                                                                                                                                                     |                             |
| <b>ENERGY PERFORMANCE RATINGS</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |
| U-Factor (U.S./I-P)                                                                                                                                                                                                                                                                                                                                                                                                                                     | Solar Heat Gain Coefficient |
| <b>0.35</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>0.32</b>                 |
| <b>ADDITIONAL PERFORMANCE RATINGS</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |
| Visible Transmittance                                                                                                                                                                                                                                                                                                                                                                                                                                   | Air Leakage (U.S./I-P)      |
| <b>0.51</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <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. www.nfrc.org</small> |                             |

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.

