



Windows, Doors and Skylights

This pamphlet is one in a series that describes residential energy conservation requirements of the Oregon Residential Specialty Code and the Structural Specialty Code for Group R buildings three stories and less in height. Other pamphlets in this series may be obtained from Oregon Dept of Energy at www.oregon.gov/energy/ or local building departments or from Oregon Building Codes Division.

Prescriptive window and skylight requirements

Since windows and skylights can be the biggest heat losers in the building shell, the energy *code* sets U-factor standards and establishes minor limitations on window and skylight area.

Table N1104.1(1) lists prescriptive window standards. Prescriptive Path 1 is the "Base Path." The window U-factor requirement for the Base Path is 0.40. The skylight U-factor requirement for the Base Path is 0.50 (the same as for all paths). Other paths trade less efficient windows for insulation upgrades in other parts of the building shell.

If a prescriptive path is used for code compliance, R- and U-factors listed for that prescriptive path must be used. R- and U-factors in one path may not be mixed with R- and U- factors in other paths. R- and U-factor standards may be better than code specifications.

Window and skylight area limits

Most prescriptive paths do not limit window area. Path 8, however, restricts window area to 12 percent of the heated space floor area.

Window area is calculated using the area of the rough opening.

Skylight area is unlimited for skylights with tested U-factors of 0.40 or less. Otherwise, skylight area is limited to 2 percent or less of the heated floor area. If skylight area exceeds the 2 percent limit, performance calculations using Table N1104.1(2) must be submitted to show *code* compliance. The pamphlet *How to Do Residential Thermal Performance Calculations Using Table N1104.1(2)* explains the performance calculation procedure.

Skylight area is calculated using the area of the rough opening.

Calculating window and skylight area limits

To calculate the window limit for Path 8, multiply the heated space floor area by 0.12. (Path 8 heated space floor area must be less than 1,500 square feet.) For example, a 1,500 square foot house could have up to 180 square feet of glazing and still be within Path 8 window area limits ($1,500 \times 0.12 = 180$). If window area for the home exceeds 180 square feet, some other prescriptive path or Table N1104.1(2) must be used to meet code standards. Windows in areas that are not part of the heated floor space (garage windows, for example) do not count in the window area total.

To calculate the 2 percent skylight area, multiply the heated space floor area by 0.02. For example, what is the allowable skylight area of a home with 2,300 square feet of heated space floor area?

$$2,300 \times 0.02 = 46 \text{ square feet}$$

If the skylight area of this home exceeds 46 square feet and the skylight U-factor is greater than 0.40, a performance calculation would be required.

Window and skylight U-factor

“U-factor” is established in tests that measure rate of heat transfer through an entire window or skylight assembly, including the glass, the edge spacer and frame material.

U-factors are the inverse of R-values: Rvalue equals $1/U$ -factor. Thus, lower the U-factor, higher the R-value. Low U-factors mean slower rates of heat transfer and better resistance to heat loss.

Window and skylight U-factors should be indicated on the plan section drawing, in the window schedule or in written specifications accompanying the plan.

Window exceptions

Single pane glazing for decorative or unique architectural features may not exceed 1 percent of floor area. Multi-glazed decorative or unique glazing may qualify as a decorative or unique architectural feature. Examples include door sidelights and transoms, glazing within a door and any unique glazing such as stained glass.

Garden windows also are included in this category. Use their rough opening area to determine allowable exempted area.

Skylights and conventional windows, including but not limited to horizontal sliders, double-hung and picture windows, are not considered decorative or unique architectural features.

The 1 percent limitation on single pane glazing for decorative or unique architectural features is in addition to any other glazing area limitations. Disregard exempted glazing for Path 8 window area limitation and when using thermal performance calculations. A note on the blueprints and calculations should indicate which windows are being exempted and their area.

Prescriptive door requirements

In the energy code, exterior doors are divided into two categories: an exempt door and all other exterior doors.

The default U-factor for an untested, unglazed door is 0.54. An untested, unglazed 1-3/4 inch foam core door with a thermal break is assigned a default U-factor of 0.20.

Exterior doors

A maximum of 28 square feet of exterior door area per dwelling unit can have a U-factor of 0.54 or less. Almost all prescriptive paths require doors that have a U-factor of 0.20 (an Rvalue of 5). Foam core, insulated doors with a thermal break meet these prescriptive standards. Prescriptive Path 9, for log homes, allows less efficient doors (all at U-0.54) to maintain the design character of a log home.

Door U-factors should be shown on plan section drawings, in the door schedule or in written specifications accompanying the drawings.

When is a door, a window?

Glazed areas in an untested wood door may be exempted as decorative or unique architectural features. The remaining area of the wood door is assigned a U-factor of 0.54. If it is a foam core, insulated door with a thermal break, it can be assigned a value of 0.20. A door with any amount of glazing that has a tested value of U-0.54 or less may be used as the exempt door for Paths 1,2,7 and 9. Doors with glazing that is not exempted must have tested U-factors and meet window U-factor requirements.

How to find window and skylight U-factor information

Product literature

The energy code requires tested, rather than calculated U-factors. Product literature available from window suppliers and distributors may contain suitable energy

Figure 1

SAMPLE NFRC WINDOW LABEL

		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	
0.34		0.25	
ADDITIONAL PERFORMANCE RATINGS			
Visible Transmittance		Air Leakage (U.S./I-P)	
0.41		0.2	
<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. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>			

performance information. Make sure cited U-factors were established using the following standard testing procedures:

- NFRC (National Fenestration Rating Council) Procedure for Determining Fenestration Product Thermal Performance.

Product literature listing U-factors determined by this testing procedure may be used to verify window or skylight values.

Labels

All windows must have labels affixed to the glass so they can be read from the interior of the building. Labels will state the U-factor as shown in Figure 1 or similar.

Window U-Factors

U-factors for almost all manufactured windows, skylights and glazed doors are available through the NFRC web site at <http://www.nfrc.org/>.

Site built windows

Windows that are manufactured in limited quantities and site built windows can comply with prescriptive values specified in Tables N1111.4(1) and N111.4(2) of the *Oregon Residential Specialty Code*.

Using product literature to determine door U-factors

Product literature is a source for door U-factor information. Look for tested values using NFRC Thermal Performance Test procedures. An unglazed, untested door is assigned a U-factor of 0.54. An untested, unglazed 1-3/4 inch foam core door with a thermal break is assigned a default U-factor of 0.20.

Air leakage standards for windows, skylights, and doors

Air leakage through a door or window is measured in cubic feet per minute (dm) per linear foot of sash crack, or dm per square foot of door area. Air leakage rates must be tested using ASTM E-283, "Standard Test Methods for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors." The air leakage test must be conducted under a 25 mph wind condition.

The energy code specifies the following air leakage standards:

- Windows: 0.37 dm per foot of sash crack
- Swinging doors: 0.37 dm per square foot of door area
- Sliding doors: 0.37 dm per square foot of door area

Many doors, windows and skylights on the market are tighter than code requires.

On-site air leakage control

The energy code specifies caulking and sealing between the window, door or skylight unit and the rough opening to limit air leakage between the manufactured unit and the building frame.

Sun-tempered paths

If a home fronts a street running within 30 degrees of true east/west, and if 50 percent of the home's windows are on the south side, a sun tempered prescriptive path (Paths 2, 4, 6 and 7) may be used to meet energy code. See the pamphlet *Using Sun-Tempered Prescriptive Options* for details on sun-tempered qualification paths.

Information presented in this publication supports the Oregon Residential Specialty Code, or Chapter 13 of the Oregon Structural Specialty Code. This publication does not include all code requirements. Refer to the code and check with your code official for additional requirements. If information in this publication conflicts with code or your local officials, follow requirements of code and your local officials.

For more information about the residential energy code, call the Building Codes Division at (503)378-4133 or the Oregon Dept of Energy (503)378-4040 in Salem or toll-free, 1-800-221-8035.

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