



Windows, Doors and Skylights

This pamphlet is one in a series that describes residential energy conservation requirements of the Oregon Residential Specialty Code and Structural Specialty Code. Other pamphlets in this series may be downloaded from Oregon Department of Energy web site at <http://egov.oregon.gov/ENERGY/CONS/Codes/cdpub.shtm> 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 code sets U-factor standards and establishes minor limitations on window and skylight area.

Table N1101.1(1) lists the Standard Base Case and a Log Home case. The window U-factor requirement for Standard Base Case is 0.35.

When skylight area is 2 percent or less of heated space floor area, is deemed-to-satisfy when constructed as follows: Vinyl, or wood, or thermally broken aluminum frames and double-pane glazing with low-emissivity coatings. Skylights in excess of 2 percent of the heated floor area must have a U-factor no less than U-0.60. Skylights shall be tested in the 20 degree overhead plane per NFRC standards.

Window and skylight area limits

The code does not limit window area.

Skylight area is unlimited for skylights with tested U-factors of 0.60 or less. Otherwise, skylight area is limited to 2 percent or less of heated space floor area when constructed of material as described above. If a higher U-

factor skylight is used, performance calculations using Table N1104.1(1) must be submitted to show code compliance. The pamphlet *How to Do Residential Thermal Performance Calculations Using Table N1104.1(1)* explains the performance calculation procedure.

Calculating skylight area limits

To calculate the 2 percent deemed-to-satisfy skylight area *a*, multiply the heated space floor area by 0.02. For example, what is the 2 percent deemed-to-satisfy 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 skylight area of this home exceeds 46 square feet, skylight U-factor in excess of 46 square feet shall be 0.60. Alternately, a thermal performance calculation (Table N1104.1(1)) could be used to demonstrate compliance.

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: R-value 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.

Disregard 1 percent decorative or unique architectural feature, exempted glazing 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 insulated 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. The log home case allows less efficient doors (all at U-0.54) to maintain the design character of a log home.

Sliding glass doors are classified as windows and must have the same U-factor that is required for windows.

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

Hinged doors with >2.5 ft² glazing

Doors that contain more than 2.5 square feet of glazing must comply with an overall U-factor of 0.40. Glazing in these doors will be deemed-to-satisfy code that is either:
1) double pane with low-e coating on one pane; or

2) triple pane glazing

Hinged doors with ≤2.5 ft² glazing

Glazed areas that are 2.5 square feet in area in a door may be exempted as decorative or unique architectural features. The remaining area of the wood door is assigned either: 1) U-0.54 for untested, solid wood doors; or 2) U-0.20 for foam core, insulated doors with a thermal break.

How to find window and skylight U-factor information

Product literature

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

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>		

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 (as defined in NF1110) can comply with prescriptive values specified in Tables N1112.4(1) and N1112.4(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 insulated 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.

Information presented in this publication supports the Oregon Residential 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.

This publication was prepared by Alan Seymour, Energy Code Analyst, Oregon Department of Energy for the Oregon Building Codes Division. Funding was provided by Northwest Energy Efficiency Alliance.

Building Codes Division



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