



3.2.6 Determining Fenestration U-factors

§116 and §141(c)4D

The U-factor for a fenestration product describes the rate of heat flow through the entire unit, not just the glass or plastic glazing material. The U-factor includes the heat flow effects of the glass, the frame, and the edge-of-glass conditions (there also may be spacers, sealants and other elements that affect heat conduction). For skylights mounted on a curb that is part of the roof construction, the total heat flow considered in determining the U-factor includes losses through the frame, glazing and other components, but not through the curb that is part of the roof construction.

Standards Tables 143-A, 143-B, and 143-C, lists skylight product that includes a curb, and the effects of this curb are included in the product U-factor rating. This curb included in the product rating is separate from the curb that is a part of the roof construction. For projecting windows (greenhouse windows), the total heat flow includes the side panels, base and roof of the projecting window assembly. However, the area used to determine the U-factor for skylights and projecting windows is the rough-framed opening. Using the rough-framed opening eases the process of making load calculations and verifying compliance, since the rough-framed opening is easier to calculate than the actual surface area of the projecting window or skylight.

Reference Joint Appendix JA1 lists many of the terms and product characteristics that relate to fenestration U-factors. In particular, see the definitions for window, skylight, window area, skylight area, site-built fenestration, manufactured fenestration and field-fabricated fenestration.

Table 3-4 Shows acceptable procedures for determining fenestration U-factors for four classes of fenestration; manufactured windows, manufactured skylights, site-built fenestration, and field-fabricated fenestration.

Table 3-4 – Acceptable Methods for Determining U-factors

U-factor Determination Method	Fenestration Class			
	Manufactured Windows	Manufactured Skylights	Site-Built Fenestration	Field-Fabricated Fenestration
NFRC 100	✓	✓	✓	----
Default U-factors from Standards Table 116-A	✓	✓	✓	✓
Alternate Default U-factor equation from Reference Nonresidential Appendix NA6 ^{1,2}	----	✓	✓	----
Component Modeling Approach (CMA) ³	✓	✓	✓	----
<p>1. The default U-factors from Nonresidential Reference Nonresidential Appendix NA6 may also be used for site-built skylights. Non rated manufactured skylights must use default values.</p> <p>2. The default U-factors from Reference Joint Appendix NA6 may be used <i>only</i> for site-built fenestration in buildings having less than 10,000 ft² of site-built fenestration area. Non rated manufactured fenestration must use default values.</p> <p>3. CMA can be used for site-built and manufactured fenestration regardless of building square footage.</p>				

For manufactured windows, the default U-factors in Standards Table 116-A (reproduced in Table 3-5 below) must be used if NFRC-determined U-factors are not available. These U-factors represent the high side of the range of possible values, thereby encouraging designers to obtain ratings through NFRC.

NFRC U-factors are becoming more common for skylights; increasingly, more manufacturers are getting NFRC labels for their skylights, including tubular skylights (which includes U-factor), and SHGC. If NFRC data is not available, the Alternative Default U-factor equation from Reference Nonresidential Appendix NA6, Equation NA6-1 may be used for skylights. This equation is derived from NFRC-100 and represent average typical values, as opposed to the values published in Table 116-A in the Standards that are on the high side of the range of typical values.

The recommended method for determining the U-factor of site-built fenestration systems (curtain walls and storefront systems) is the NFRC 100 procedure. This requires that site-built fenestration, including curtain walls, go through the NFRC process for obtaining label certificates for site-built products. If the building has less than 10,000 ft² of site-built fenestration area, which includes windows, non-opaque doors, and skylights, then U-factors used for compliance for site-built products may instead be calculated from Equation NA6-1 from the Reference Nonresidential Appendix NA6, or Standards default values from Table 116-A.

For buildings with more than 10,000 ft² of site-built fenestration area, there are two compliance choices with regard to U-factor and labeling of site-built fenestration:

1. Go through the NFRC process and obtain a label certificate. This is the option described in §10-111(a)1A.
2. Provide a default label certificate using the default U-factors from Standards Table 116-A. This option results in very conservative U-factors.