

**NFRC 100 Applied Films Ballot** ([click here to access the original proposed ballot](#))



**Legend:**

AC :Approve with Comment

NEG: Negative response with Comments

**NFRC Ballot Comments through November 2, 2009  
Technical Committee – U-Factor Subcommittee**

Company Name, Rep Initials	AC/ NEG	Section and/or Page #	Comment/Alternate Language
Cardinal Glass, JL	NEG	Table 5-4	Table 5.4 includes window combinations that do not exist in the default tables from the model energy code. To eliminate confusion on how to use these tables, the cleanest remedy would be to make films a stand alone document similar to attachments or add a disclaimer to the scope in 5.10.1 and a footnote to table 5.4 stating that these ratings are not code compliant.
Andersen Corp, SJ	NEG		Interior applied films are actually an attachment product; and should be addressed in standalone attachment product documents. Also, why retain residential and non-residential classifications? Those classifications were eliminated some time ago in the existing window rating program. How will the consumer know whether the film is being applied to a residential or a commercial window, especially in retro-fit applications? There is no indicator on the window.
Alliance to Save Energy, NP	NEG	Tables 5-3 and 5-4	I recommend a different set of reference windows for two reasons: 1) ensure that U-factor results are conservative and 2) simplify the rating by reducing the number of reference windows from six to four. <a href="#">See comments attached.</a>
LBNL, SS	APC	Tables 5-3 and 5-4	Missing units in Table 5-3 and 5-4
Hunter Douglas, MC	APC		references to “ fenestration attachment products” in the NFRC 100 document should be consistent with other applied films language in order to differentiate Applied Films from other Fenestration Attachment products
WESTLab, JB	APC		I still do not like the multiple glass ratings in this procedure. It will lead to confusion on the label. A simpler rating to truly compare films would be better.
Marvin Windows and Doors, JK	APC		Please explain. 1. Why we are using aluminum fixed only? 2. Explain the correlation between the 0.55 and 0.47 COG ratings and the 0.71 and the 0.593 total unit ratings.

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### Negative by Nils Petermann, Alliance to Save Energy

The reference products proposed in the ballot are fixed windows and therefore don't represent the worst case for metal-framed window U-factor. I propose using operable windows as metal-framed reference products for the U-factor. This would ensure that results are conservative. To take into account that non-metal windows have significantly lower U-factors, though, non-metal windows should be added to the reference windows. At the same time, we can simplify by reducing the number of reference windows we eliminate the distinction between residential and non-residential windows and leave out tinted reference windows.

I propose using the tables below instead of Tables 5-3 and 5-4 in the ballot. These tables do not show definite U-factor values, as these would depend on the specific geometry of these reference windows.

**Table 5-3 Center-of-Glazing Values  $U_c$**

<u>Reference Glazing System</u>	<u>Without Film</u>	<u>With Film</u>	
	<u><math>U_c</math></u>	<u>Film Posn.</u>	<u><math>U_c^*</math></u>
<u>3 mm (1/8 in.) clear</u>	<u>1.04</u>	<u>Interior</u>	
<u>3 mm (1/8 in.) clear</u> <u>3 mm (1/8 in.) clear</u> <u>7mm (0.25 in.) gap</u>	<u>0.55</u>	<u>Interior</u>	

**\*  $U_c$  'with Film' shall be calculated using reference glazing with film to be rated.**

**Table 5-4 Values of U-factor for Reference and Applied Films**

<u>Reference Product</u>			<u>U-factor</u>	
<u>Operator Type</u>	<u>Reference Frame</u>	<u>Reference Glazing</u>	<u>no film</u>	<u>with film*</u>
<u>Operable</u>	<u>Metal</u>	<u>3mm (1/8 in.) clear</u>		
<u>Fixed</u>	<u>Non-Metal</u>	<u>3mm (1/8 in.) clear</u>		
<u>Operable</u>	<u>Metal</u>	<u>3mm (1/8 in.) clear</u> <u>3mm (1/8 in.) clear</u> <u>7mm (0.25 in.) gap</u>		
<u>Fixed</u>	<u>Non-Metal</u>	<u>3mm (1/8 in.) clear</u> <u>3mm (1/8 in.) clear</u> <u>7mm (0.25 in.) gap</u>		

**\* 'with film' shall be calculated using reference glazing with film to be rated.**

The rationale for these proposed changes is as follows:

- **Relevant but easy-to-use information**

- Differentiate between metal and non-metal, not between residential and non-residential

- The U-factor differences between metal and non-metal are more significant
- Users of ratings can easily tell if windows are metal or non-metal, but they may not always be certain whether a window is residential or non-residential

- **Keep it relatively simple.**

- I suggest four categories that are easy to distinguish: single vs. double pane, metal vs. non-metal.

- **Use reference windows based on conservative (reasonably worst case) assumptions.**

- In the case of metal windows, use operable reference windows. These yield more conservative U-factor results than fixed metal windows.

- The resulting U-factors should be close to the default values used in the IECC:

<u>Glazing</u>	<u>Frame</u>	<u>U-factor</u>
<u>Single pane</u>	<u>metal</u>	<u>1.20</u>
	<u>non-metal</u>	<u>0.95</u>
<u>Double pane</u>	<u>metal</u>	<u>0.80</u>
	<u>non-metal</u>	<u>0.55</u>

The ASHRAE Handbook of Fundamentals shows the following U-factors for the proposed reference window types (these are based on NFRC 100-91, though, and have not been updated since):

<u>Glazing</u>	<u>Frame</u>	<u>Operator Type</u>	<u>Air space</u>	<u>U-factor</u>
<u>Single pane</u>	<u>metal</u>	<u>Operable</u>	<u>---</u>	<u>1.27</u>
	<u>non-metal</u>	<u>Fixed</u>	<u>---</u>	<u>0.98</u>
<u>Double pane</u>	<u>metal</u>	<u>Operable</u>	<u>1/4"</u>	<u>0.87</u>
	<u>non-metal</u>	<u>Fixed</u>	<u>1/4"</u>	<u>0.56</u>