

**Instructions for Electronic Forms**

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential

Revised February 2011

<b>Intro</b>	<p>Chapters 11-15 of the 2009 Washington State Energy Code apply to all nonresidential occupancies and to all multifamily residential occupancies except those within the scope of the IRC (single family residential, duplexes, attached townhouses).</p> <p>This file, ENV09.XLS, has electronic compliance forms for Chapter 13 envelope provisions for Climate Zones 1 and 2. There are three companion files: MTR09.XLS (Chapter 12 metering requirements); MECH09.XLS (Chapter 14 mechanical systems requirements); and LTG09.XLS (Chapter 15 lighting, motor, and transformer requirements).</p> <p>This form is a compliance aid and is not a substitute for the full energy code text or specific jurisdiction compliance requirements. In particular, this form is not to be used for cold storage areas. Users should refer to the code text and contact the local jurisdiction for complete information. The full 2009 WSEC code text is available for download from: <a href="http://www.ga.wa.gov/sbcc">Download 2009 WSEC from http://www.ga.wa.gov/sbcc</a></p>
<b>Start-up</b>	<p>Open a working copy of this file and be sure to use Save As to save it to a new file name. Alternatively, you can save the file as a template in the XLSTART subdirectory in the EXCEL directory, and open new copies with the "File New" menu command. Look for "ENV09".</p>
<b>Overview</b>	<p>This workbook file contains multiple worksheets. Each worksheet is indicated by a tab at the bottom of the screen. (If you don't see the tabs, visit menu option "Tools-Options-View-Sheet Tabs".) You may visit each form by clicking on its tab.</p> <p>Most calculations are automated. The spaces which display the results of calculations are not editable. Some adjustments to formatting have been made to facilitate electronic filling and calculation of the forms.</p>
<b>Save Files</b>	<p>Each time you open this file and start filling forms, you must save it under a new filename of your choosing using File Save As. The original template file cannot be altered. You may also save your own versions of the forms this way.</p>
<b>Getting Around</b>	<p>Each form has two pages (front and back). Both pages are available on screen when you click the tab for a form. Use the scroll bars to find the second page. It is either to the right, below, or sometimes to the right and below the first page.</p>
<b>Filling Fields</b>	<p>All project info and the date for all forms is entered once on "ENV-SUM" and automatically reproduced on the other forms. Always fill in the heading of ENV-SUM, even if you will not be using that form. The other forms have a reminder to do this.</p> <p>Only fillable fields are accessible. If you try to edit any other field, you'll get an error message. You may use the TAB key to move to the next fillable field. If the TAB doesn't take you where you want to go, use the mouse.</p> <p>Avoid excessively long text strings when entering information. In some cases, text that extends beyond the available space will simply not be seen. In most cases, the text will wrap within the cell. This may force part of the form onto a new page</p> <p>To enter the date, use this format: mm/dd/yyyy. For example, you would enter 6/8/2006 or 12/21/2012.</p> <p>Check boxes can be either blank, or checked-off with an "x" shown in the box. To toggle between cases, click the box with your mouse. Radio buttons (circles) are either filled or unfilled. Only one in a set may be filled.</p> <p>Drop-down lists have an arrow at the right side of the space. Click the arrow with your mouse and select the appropriate option. One of the options is a blank.</p> <p>When a form has a space for notes or explanation, click anywhere in the space to edit. Your cursor will become a text editing insertion bar and you can edit as with a word processor.</p>
<b>Personalizing</b>	<p>You can personalize the forms with your company name, address, phone, or any other information. This is done by editing the footer using File Page Setup Header/Footer. You can then save the file under a new template name and re-use it again.</p>
<b>Adding Lines and Removing</b>	<p>Many tables, such as for listing equipment types, have a certain number of lines for entering data. There may not always be enough lines for all the entries you need to make. With this electronic version, you can add additional lines to the table.</p> <p>To add additional lines where this feature is available, click on the "+" button with your mouse. This button is located to the right of the sheet. If you can't see it, scroll right (or change the View Zoom setting to 83%).</p> <p>To remove lines that you have added, click on the "-" button with your mouse. You cannot remove lines that were not added; an error appears if you try.</p> <p>If you add additional lines with this method, the pagination will usually be affected. The forms will be forced to carry additional lines over to other pages. Be sure to submit all pages to the plans examiner.</p>
<b>Occupancy Group</b>	<p>You must select a value for <b>Occupancy Group</b> on ENV-SUM (line 14) for this workbook to display the correct code requirements and automatically calculate component performance target UA.</p>
<b>Climate Zone</b>	<p>You must select a value for <b>Climate Zone</b> on ENV-SUM (line 15) for this workbook to display the correct code requirements and automatically calculate component performance target UA.</p>
<b>Fenestration vs Glazing</b>	<p>The 2009 WSEC uses the terms "fenestration" and "glazing" and the terms "overhead glazing" and "skylight" somewhat interchangeably. These forms use fenestration and skylight exclusively. In general, "vertical fenestration" is equivalent to "vertical glazing" and "skylight" is equivalent to "overhead glazing".</p>
<b>Fenestration Area</b>	<p>The Fenestration % shown on the ENV-SUM form is automatically calculated in the electronic version from the Proposed areas on the corresponding ENV-UA form. These calculations follow those in equations 13-1 and 13-2.</p> <p>If you use the Envelope Prescriptive Option, you still must enter the actual areas. As a shortcut in this case, you can enter the vertical fenestration, the skylight and the opaque wall areas (including doors) as single numbers and leave the rest of the ENV-UA form blank.</p>
<b>Fenestration Adjustments</b>	<p>Under the Envelope Component Performance option, the Target Area Adjustment Calculations are fully automatic, using information you enter for on your project type and your Proposed Areas on the ENV-UA form. Target areas are calculated automatically.</p>
<b>Printing</b>	<p>The forms should print on any printer supported by Windows. You will need to have the following TrueType fonts installed under Windows: Arial, Times New Roman, Courier New and Wingdings. These are all standard Windows fonts.</p> <p>If you are losing form or flowchart details when printing, you may have a shortage of printer memory. Try printing problem pages individually.</p> <p>By default, only selected forms are printed. To select one or more forms, hold down the Ctrl key and click the tabs of the worksheets you need. Issue the File Print Selected Sheets command. To print the entire set, use File Print Entire Workbook.</p>
<b>Clean Forms</b>	<p>It is possible to print clean, blank versions of these forms for hand filling. To do so, delete all of the heading information at the beginning of ENV-SUM, select the desired Climate Zone and Occupancy Group, and make sure that all fillable cells in the forms are empty. Then print the clean forms.</p> <p>For each radio button group, there is a button labeled "Clear". Clicking this button will clear the other buttons so that they will print as empty circles. The "Clear" button will not print.</p>
<b>Partial Form Sets</b>	<p>Forms in a set may not be deleted, because the file is locked, but you need not print all the forms, as explained in "Printing" above.</p>
<b>Re-Calculation</b>	<p>As this is a large file, it may respond slowly to changes if it is set to automatically re-calculate after every action. To set calculation to manual, visit the "Tools-Options-Calculation" menu item. Then manually recalculate using the F9 key.</p>



# Envelope Summary (back)

# ENV-SUM

## Minimum Requirements for Prescriptive Option

Use table to determine if project qualifies for the optional Prescriptive Option. All components must meet the stated

Climate Zone	Climate Zone 1		Climate Zone 2	
	Nonresidential	Residential, Other than Single-Family	Nonresidential	Residential, Other than Single-Family
<b>Occupancy Group</b>				
<b>Opaque Elements</b>	<b>Insulation Min. R-Value</b>			
<b>Roofs</b>				
Insulation Entirely above Deck	R-30 c.i.	R-38 c.i.	R-30 c.i.	R-38 c.i.
Metal Building	R-25 + R-11 Ls	R-25 + R-11 Ls	R-25 + R-11 Ls	R-25 + R-11 Ls
Single-Rafter	R-38	R-	R-38	R-38
Attic and Other	R-38 adv or R-49	R-38 adv or R-49	R-38 adv or R-49	R-38 adv or R-49
<b>Walls, Above-grade</b>				
Mass	R-5.7 c.i. <sup>1</sup>	R-11.4 c.i. <sup>1</sup>	R-7.6 c.i.	R-13.3 c.i.
Metal Building	R-13 + R-7.5 c.i.	R-19 + R-8.5 c.i.	R-13 + R-7.5 c.i.	R-19 + R-16 c.i.
Steel Framed	R-13 + R-7.5 c.i.	R-19 + R-8.5 c.i.	R-13 + R-7.5 c.i.	R-19 + R-14 c.i.
Wood Framed and Other	R-21	R-13 + R-6 c.i.	R-13 + R-7.5 c.i., or R-21 + R-2.5 c.i.	R-21 + R-5 c.i.
<b>Below Grade Wall</b>	Same as above grade		Same as above grade	
<b>Floors</b>				
Mass	R-30 c.i.	R-30 c.i.	R-30 c.i.	R-30 c.i.
Steel Joist	R-38 + R-4 c.i.	R-38 + R-4 c.i.	R-38 + R-4 c.i.	R-38.0 + R-4 c.i.
Wood Framed and Other	R-30	R-	R-30	R-30
<b>Slab-On-Grade Floors</b>		30		
Unheated	R-10 for 24 in. (with thermal break)	R-10 for 24 in. (with thermal break).	R-10 for 24 in. (with thermal break)	R-10 for 24 in. (with thermal break)
Heated	R-10 c.i.(with thermal break)	R-10 c.i. (with thermal break)	R-10 c.i. (with thermal break)	R-10 c.i. (with thermal break)
<b>Opaque Doors</b>	<b>Maximum U-Factor</b>			
Swinging	U-0.600	U-0.400	U-0.600	U-0.400
Non-Swinging	U-0.600	U-0.400	U-0.600	U-0.400
<b>Fenestration 0-40% of Wall</b>	<b>Assembly Maximum U-factor (NFRC Rated)</b>			
<b>Vertical Fenestration</b>				
Nonmetal framing	U-	U-0.32	U-0.32	U-0.32
Metal framing	U-0.32	U-0.40	U-0.40	U-0.40
Entrance doors	U-0.40	U-0.60	U-0.60	U-0.60
<b>Skylights</b>	0.60			
Without curb (i.e. sloped)	U-	U-0.50	U-0.50	U-0.50
With curb (i.e. individual unit)	U-0.50	U-0.60	U-0.60	U-0.60
<b>Fenestration 0-40% of Wall</b>	0.60	<b>Assembly Maximum SHGC Factor</b>		
Vertical Fenestration	SHGC-0.40 all, OR SHGC-0.45 all PLUS permanent PF > 0.50 on west, south, east	No Requirement	SHGC-0.40 all, OR SHGC-0.45 all PLUS permanent PF > 0.50 on west, south, east	No Requirement
Skylights	SHGC-0.35	SHGC-0.35	SHGC-0.35	SHGC-0.35

The following definitions apply: c.i. = continuous insulation, Ls = liner system (see

definition). Zone 1, nonresidential walls may be ASTM C90 concrete block walls, ungrouted or partially grouted at 32 inches vertically and 48 inches or less on center horizontally, with ungrouted cores filled with material having a maximum conductivity of 0.12 ft<sup>2</sup> ft/F in. u.

**Envelope UA Calculations Zone 1 Non-Residential ENV-UA**

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential

Revised February 2011

Project Address	Date
Occupancy Group <input checked="" type="radio"/> Nonresidential <input type="radio"/> Multifamily residential <input type="button" value="Clear"/>	For Building Department Use
Climate Zone <input checked="" type="radio"/> Zone 1 <input type="radio"/> Zone 2	
Fenestration Area as % gross exterior wall area _____ Max. Target: _____	
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: U-factors shall come from chapter 10 or calculated per 1332. See the ENV-CHK worksheet for example of how to complete the rows on this form.	

Building Component		Proposed UA			Target UA			
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A)	= UA (U x A)	
Roofs	Deck	R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
	Above Deck Insulation						U-0.034	
	Mtl Bld	R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
	Metal Building						U-0.031	
	Other	R= _____ ID: _____						
R= _____ ID: _____								
R= _____ ID: _____								
Single raft, attic, other						U-0.027		
Opaque Walls - Above	Metal Frm	R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
	Wood/Oth	R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
	Mass*	R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
Proposed assembly U-factor from Tables 10-5 thru 10-5B								
Below Grade Walls	R= _____ ID: _____							
	R= _____ ID: _____							
	R= _____ ID: _____							
Proposed assembly U-factor from Tables 10-5 thru 10-5B. Do NOT use Table 10-1.								
Opaque Doors	U= _____ ID: _____							
	U= _____ ID: _____							
	U= _____ ID: _____							
All Doors						U-0.60		
Floors	R= _____ ID: _____							
	R= _____ ID: _____							
	R= _____ ID: _____							
Floors						U-0.029		
		F-factor	x Perimeter	= UA(U x A)	F-factor	x Perimeter	= UA (U x A)	
Slab-on-grade	Unheated	R= _____ ID: _____						
		R= _____ ID: _____						
		R= _____ ID: _____						
	Slab-On-Grade						U-0.540	
	Heated	R= _____ ID: _____						
R= _____ ID: _____								
Heated Slab-On-Grade						U-0.360		
Proposed assembly F-factors can use the unheated values in Table 10-2								

\*Zone 1 CMU walls meeting Table 13-1 Footnote 1 can be entered with U-value of 0.15 rather than Table 10-5b values. Plans must clearly state footnote requirements.

	<b>Area</b>	<b>UA</b>		<b>Area</b>	<b>UA</b>
<b>Page 1 Subtotal</b>					

**Envelope UA, continued. Zone 1 Non-Residential ENV-UA**

Project Address				Date				
<b>Fenestration Area</b> as % gross exterior wall area				Max. Target:				
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: Provide NFRC or Table 10-6 U-factor (See Section 1312.1) for fenestration assembly (combined)				For Building Department Use				
See the ENV-CHK worksheet for example of how to complete the rows on this form.								
Building Component		Proposed UA			Target UA			
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A) =	UA (U x A)	
Vertical Fenestration	Metal Frame	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
	Non-Metal	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
	Mtl entrance	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
Skylights	No Curb	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
	With Curb	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						

	<b>Area</b>	<b>UA</b>	<b>Area</b>	<b>UA</b>
<b>Page 2 Subtotal</b>				
<b>Page 1 Subtotal</b>				
<b>Total</b>				

To comply:

- 1) Proposed Total UA shall not exceed Target Total UA.
- 2) Proposed Total Area shall equal Target Total Area.

# SHGC Calculation Zone 1 Non-Residential ENV-SHGC

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential Revised February 2011

Project Address		Date	
<b>Fenestration Area</b> as % gross exterior wall area	Prop	Max.Target	For Building Department Use
<b>Prescriptive PF Credit</b>	<input type="radio"/> Yes	<input type="radio"/> No	
<b>Vertical North Facing Credit (1323.3 Exp. 2)</b>	<input type="radio"/> Yes	<input type="radio"/> No	
Notes: To comply the Proposed total SHGC x A for all fenestration (vertical & skylights) shall not exceed Target total SHGC x A. If the north facing credit is used then the north and non-north must comply separately with skylights being included with the non-north vertical fenestration.			

Skylights	Proposed SHGC		Target SHGC	
List ID & page #, NFRC or glass only	SHGC*	x Area (A) = SHGC x A	SHGC	x Area (A) = SHGC x A
ID:				
ID:				
ID:				
ID:				
ID:				
<b>Totals</b>			<b>Totals</b>	

\* Note: Manufacturer's SC may be used in lieu of SHGC.  
 Nonresidential compliance is based upon combined skylight and vertical fenestration performance. Residential compliance is based upon skylight only.

All Non-North Vertical Fenestration++	Proposed SHGC				Target SHGC	
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A) = SHGC x A	SHGC x Area (A) = SHGC x A
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
<b>Totals</b>						
<b>Non-North Total</b>						

++Note: If projection factors or north vertical glazing credit are used then vertical fenestration must be entered according to orientation. If neither are used then vertical fenestration can be entered in either section.  
 + Note: Manufacturer's SC may be used in lieu of SHGC. Fenestration that separates conditioned space from a non-conditioned or semi-conditioned space shall be listed here with a proposed SHGC equal to the target value.  
 \* Note: Multipliers only apply if prescriptive PF credit not used.

North Vertical Fenestration++	Proposed SHGC				Target SHGC		
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A) = SHGC x A	SHGC	x Area (A) = SHGC x A
ID:							
ID:							
ID:							
ID:							
ID:							
<b>North Total</b>							

For compliance: Proposed total SHGC x A shall not exceed Target total SHGC x A. If north glazing credit is used then north facing vertical fenestration must comply separately from non-north vertical fenestration and skylights.

	Area	SHGC x A		Area	SHGC x A
<b>Grand Total</b>			<b>Grand Total</b>		

# Envelope UA Calculations

# Zone 1 Residential

# ENV-UA

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential

Revised February 2011

Project Address	Date
Occupancy Group <input type="radio"/> Nonresidential <input checked="" type="radio"/> Multifamily residential <input type="radio"/> Clear	For Building Department Use
Climate Zone <input checked="" type="radio"/> Zone 1 <input type="radio"/> Zone 2	
Fenestration Area as % gross exterior wall area <span style="float:right">Max. Target:</span>	
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: U-factors shall come from chapter 10 or calculated per 1332. See the ENV-CHK worksheet for example of how to complete the rows on this form.	

Building Component		Proposed UA			Target UA		
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A)	= UA (U x A)
Roofs	Deck	R= ID:					
		R= ID:					
		R= ID:					
	Mtl Bld	R= ID:					
		R= ID:					
		R= ID:					
	Other	R= ID:					
		R= ID:					
		R= ID:					
Opaque Walls - Above	Metal Frm	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Wood/Oth	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Mass*	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Proposed assembly U-factor from Tables 10-5 thru 10-5B						
Below Grade Walls	R= ID:						
	R= ID:						
	R= ID:						
	Proposed assembly U-factor from Tables 10-5 thru 10-5B. Do NOT use Table 10-1.						
Opaque Doors	U= ID:						
	U= ID:						
	U= ID:						
Floors	R= ID:						
	R= ID:						
	R= ID:						
		F-factor	x Perimeter	= UA(U x A)	F-factor	x Perimeter	= UA (U x A)
Slab-on-grade	Unheated	R= ID:					
		R= ID:					
		R= ID:					
	Heated	R= ID:					
	R= ID:						
	Proposed assembly F-factors can use the unheated values in Table 10-2						

\*Zone 1 CMU walls meeting Table 13-1 Footnote 1 can be entered with U-value of 0.15 rather than Table 10-5b values. Plans must clearly state footnote requirements.

	<b>Area</b>	<b>UA</b>		<b>Area</b>	<b>UA</b>
<b>Page 1 Subtotal</b>					

**Envelope UA, continued. Zone 1 Residential ENV-UA**

Project Address		Date				
<b>Fenestration Area</b> as % gross exterior wall area		Max. Target:				
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: Provide NFRC or Table 10-6 U-factor (See Section 1312.1) for fenestration assembly (combined)		For Building Department Use				
See the ENV-CHK worksheet for example of how to complete the rows on this form.						
Building Component		Proposed UA		Target UA		
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A) = UA (U x A)
Vertical Fenestration	Metal Frame	U= ID:			Metal Frame U-0.40	
		U= ID:				
		U= ID:				
		U= ID:				
	Non-Metal	U= ID:			Non-Metal Frame U-0.32	
		U= ID:				
		U= ID:				
		U= ID:				
	Mtl entrance	U= ID:			Metal Entrance Door U-0.60	
		U= ID:				
		U= ID:				
		U= ID:				
Skylights	No Curb	U= ID:			Without Curb U-0.50	
		U= ID:				
		U= ID:				
		U= ID:				
	With Curb	U= ID:			Including Curb U-0.60	
		U= ID:				
		U= ID:				
		U= ID:				

	<b>Area</b>	<b>UA</b>	<b>Area</b>	<b>UA</b>
<b>Page 2 Subtotal</b>				
<b>Page 1 Subtotal</b>				
<b>Total</b>				

To comply:

- 1) Proposed Total UA shall not exceed Target Total UA.
- 2) Proposed Total Area shall equal Target Total Area.

# SHGC Calculation Zone 1 Residential ENV-SHGC

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential Revised February 2011

Project Address		Date	
<b>Fenestration Area</b> as % gross exterior wall area		Prop	Max.Target
<b>Prescriptive PF Credit</b>		<input type="radio"/> Yes <input type="radio"/> No	
<b>Vertical North Facing Credit (1323.3 Exp. 2)</b>		<input type="radio"/> Yes <input type="radio"/> No	
Notes: To comply the Proposed total SHGC x A for all fenestration (vertical & skylights) shall not exceed Target total SHGC x A. If the north facing credit is used then the north and non-north must comply separately with skylights being included with the non-north vertical fenestration.			

Skylights	Proposed SHGC		Target SHGC	
List ID & page #, NFRC or glass only	SHGC*	x Area (A)	SHGC	x Area (A)
ID:				
ID:				
ID:				
ID:				
ID:				
<b>Totals</b>				
<b>Totals</b>				

\* Note: Manufacturer's SC may be used in lieu of SHGC.  
 Nonresidential compliance is based upon combined skylight and vertical fenestration performance. Residential compliance is based upon skylight only.

No Residential Vertical Fenestration SHGC Requirement	Proposed SHGC				Target SHGC	
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A)	SHGC x A
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
ID:						
<b>Totals</b>						
<b>Non-North Total</b>						

++Note: If projection factors or north vertical glazing credit are used then vertical fenestration must be entered according to orientation. If neither are used then vertical fenestration can be entered in either section.  
 + Note: Manufacturer's SC may be used in lieu of SHGC. Fenestration that separates conditioned space from a non-conditioned or semi-conditioned space shall be listed here with a proposed SHGC equal to the target value.  
 \* Note: Multipliers only apply if prescriptive PF credit not used.

No Residential Vertical Fenestration SHGC Requirement	Proposed SHGC				Target SHGC		
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A)	SHGC	x Area (A)
ID:							
ID:							
ID:							
ID:							
ID:							
<b>North Total</b>							

For compliance: Proposed total SHGC x A shall not exceed Target total SHGC x A. If north glazing credit is used then north facing vertical fenestration must comply separately from non-north vertical fenestration and skylights.

	<b>Area</b>	<b>SHGC x A</b>		<b>Area</b>	<b>SHGC x A</b>
<b>Grand Total</b>			<b>Grand Total</b>		

# Envelope UA Calculations

# Zone 2 Non-Residential

# ENV-UA

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential

Revised February 2011

Project Address	Date
Occupancy Group <input checked="" type="radio"/> Nonresidential <input type="radio"/> Multifamily residential <input type="radio"/> Clear	For Building Department Use
Climate Zone <input type="radio"/> Zone 1 <input checked="" type="radio"/> Zone 2	
Fenestration Area as % gross exterior wall area <span style="float:right">Max. Target:</span>	
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: U-factors shall come from chapter 10 or calculated per 1332. See the ENV-CHK worksheet for example of how to complete the rows on this form.	

Building Component		Proposed UA			Target UA		
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A)	= UA (U x A)
Roofs	Deck	R= ID:					
		R= ID:					
		R= ID:					
	Mtl Bld	R= ID:					
		R= ID:					
		R= ID:					
	Other	R= ID:					
		R= ID:					
		R= ID:					
Opaque Walls - Above	Metal Frm	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Wood/Oth	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Mass*	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Proposed assembly U-factor from Tables 10-5 thru 10-5B						
Below Grade Walls	R= ID:						
	R= ID:						
	R= ID:						
	Proposed assembly U-factor from Tables 10-5 thru 10-5B. Do NOT use Table 10-1.						
Opaque Doors	U= ID:						
	U= ID:						
	U= ID:						
Floors	R= ID:						
	R= ID:						
	R= ID:						
		F-factor	x Perimeter	= UA(U x A)	F-factor	x Perimeter	= UA (U x A)
Slab-on-grade	Unheated	R= ID:					
		R= ID:					
		R= ID:					
	Heated	R= ID:					
	R= ID:						
	Proposed assembly F-factors can use the unheated values in Table 10-2						

\*Zone 1 CMU walls meeting Table 13-1 Footnote 1 can be entered with U-value of 0.15 rather than Table 10-5b values. Plans must clearly state footnote requirements.

	<b>Area</b>	<b>UA</b>		<b>Area</b>	<b>UA</b>
<b>Page 1 Subtotal</b>					

**Envelope UA, continued. Zone 2 Non-Residential ENV-UA**

Project Address				Date				
<b>Fenestration Area</b> as % gross exterior wall area				Max. Target:				
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: Provide NFRC or Table 10-6 U-factor (See Section 1312.1) for fenestration assembly (combined)				For Building Department Use				
See the ENV-CHK worksheet for example of how to complete the rows on this form.								
Building Component		Proposed UA			Target UA			
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A) =	UA (U x A)	
Vertical Fenestration	Metal Frame	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
	Non-Metal	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
	Mtl entrance	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
Skylights	No Curb	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						
	With Curb	U= ID:						
		U= ID:						
		U= ID:						
		U= ID:						

	Area	UA	Area	UA
<b>Page 2 Subtotal</b>				
<b>Page 1 Subtotal</b>				
<b>Total</b>				

- To comply:
- 1) Proposed Total UA shall not exceed Target Total UA.
  - 2) Proposed Total Area shall equal Target Total Area.

# SHGC Calculation Zone 2 Non-Residential ENV-SHGC

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential Revised February 2011

Project Address		Date	
<b>Fenestration Area</b> as % gross exterior wall area		Prop	Max.Target
<b>Prescriptive PF Credit</b>		<input type="radio"/> Yes <input type="radio"/> No	
<b>Vertical North Facing Credit (1323.3 Exp. 2)</b>		<input type="radio"/> Yes <input type="radio"/> No	
Notes: To comply the Proposed total SHGC x A for all fenestration (vertical & skylights) shall not exceed Target total SHGC x A. If the north facing credit is used then the north and non-north must comply separately with skylights being included with the non-north vertical fenestration.			

Skylights	Proposed SHGC		Target SHGC	
List ID & page #, NFRC or glass only	SHGC*	x Area (A)	SHGC	x Area (A)
ID:				
ID:				
ID:				
ID:				
ID:				
<b>Totals</b>				
<b>Totals</b>				

\* Note: Manufacturer's SC may be used in lieu of SHGC.  
 Nonresidential compliance is based upon combined skylight and vertical fenestration performance. Residential compliance is based upon skylight only.

All Non-North Vertical Fenestration++	Proposed SHGC					Target SHGC	
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A)	SHGC	x Area (A)
ID:							
ID:							
ID:							
ID:							
ID:							
ID:							
ID:							
ID:							
ID:							
<b>Totals</b>							
<b>Non-North Total</b>							

++Note: If projection factors or north vertical glazing credit are used then vertical fenestration must be entered according to orientation. If neither are used then vertical fenestration can be entered in either section.  
 + Note: Manufacturer's SC may be used in lieu of SHGC. Fenestration that separates conditioned space from a non-conditioned or semi-conditioned space shall be listed here with a proposed SHGC equal to the target value.  
 \* Note: Multipliers only apply if prescriptive PF credit not used.

North Vertical Fenestration++	Proposed SHGC					Target SHGC		
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A)	SHGC	x Area (A)	SHGC x A
ID:								
ID:								
ID:								
ID:								
ID:								
<b>North Total</b>								

For compliance: Proposed total SHGC x A shall not exceed Target total SHGC x A. If north glazing credit is used then north facing vertical fenestration must comply separately from non-north vertical fenestration and skylights.

	Area	SHGC x A		Area	SHGC x A
<b>Grand Total</b>			<b>Grand Total</b>		

# Envelope UA Calculations

# Zone 2 Residential

# ENV-UA

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential

Revised February 2011

Project Address	Date
Occupancy Group <input type="radio"/> Nonresidential <input checked="" type="radio"/> Multifamily residential <input type="radio"/> Clear	For Building Department Use
Climate Zone <input type="radio"/> Zone 1 <input checked="" type="radio"/> Zone 2	
Fenestration Area as % gross exterior wall area <span style="float:right">Max. Target:</span>	
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: U-factors shall come from chapter 10 or calculated per 1332. See the ENV-CHK worksheet for example of how to complete the rows on this form.	

Building Component		Proposed UA			Target UA		
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A)	= UA (U x A)
Roofs	Deck	R= ID:					
		R= ID:					
		R= ID:					
	Mtl Bld	R= ID:					
		R= ID:					
		R= ID:					
	Other	R= ID:					
		R= ID:					
		R= ID:					
Opaque Walls - Above	Metal Frm	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Wood/Oth	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Mass*	R= ID:					
		R= ID:					
		R= ID:					
		R= ID:					
	Proposed assembly U-factor from Tables 10-5 thru 10-5B						
Below Grade Walls	R= ID:						
	R= ID:						
	R= ID:						
	Proposed assembly U-factor from Tables 10-5 thru 10-5B. Do NOT use Table 10-1.						
Opaque Doors	U= ID:						
	U= ID:						
	U= ID:						
Floors	R= ID:						
	R= ID:						
	R= ID:						
		F-factor	x Perimeter	= UA(U x A)	F-factor	x Perimeter	= UA (U x A)
Slab-on-grade	Unheated	R= ID:					
		R= ID:					
		R= ID:					
	Heated	R= ID:					
	R= ID:						
	Proposed assembly F-factors can use the unheated values in Table 10-2						

\*Zone 1 CMU walls meeting Table 13-1 Footnote 1 can be entered with U-value of 0.15 rather than Table 10-5b values. Plans must clearly state footnote requirements.

	<b>Area</b>	<b>UA</b>		<b>Area</b>	<b>UA</b>
<b>Page 1 Subtotal</b>					

**Envelope UA, continued. Zone 2 Residential ENV-UA**

Project Address		Date				
<b>Fenestration Area</b> as % gross exterior wall area		Max. Target:				
Notes: 1: If fenestration area exceeds maximum allowed, then calculate adjusted areas on Target Area Adjustment sheet on the backside of the ENV-SHGC form. 2: Provide NFRC or Table 10-6 U-factor (See Section 1312.1) for fenestration assembly (combined)		For Building Department Use				
See the ENV-CHK worksheet for example of how to complete the rows on this form.						
Building Component		Proposed UA		Target UA		
Provide assembly ID & page/plan # for each bldg. element		U-factor	x Area (A)	= UA (U x A)	U-factor	x Area (A) = UA (U x A)
Vertical Fenestration	Metal Frame	U= ID:			Metal Frame U-0.40	
		U= ID:				
		U= ID:				
		U= ID:				
	Non-Metal	U= ID:			Non-Metal Frame U-0.32	
		U= ID:				
		U= ID:				
		U= ID:				
	Mtl entrance	U= ID:			Metal Entrance Door U-0.60	
		U= ID:				
		U= ID:				
		U= ID:				
Skylights	No Curb	U= ID:			Without Curb U-0.50	
		U= ID:				
		U= ID:				
		U= ID:				
	With Curb	U= ID:			Including Curb U-0.60	
		U= ID:				
		U= ID:				
		U= ID:				

	Area	UA	Area	UA
<b>Page 2 Subtotal</b>				
<b>Page 1 Subtotal</b>				
<b>Total</b>				

To comply:

- 1) Proposed Total UA shall not exceed Target Total UA.
- 2) Proposed Total Area shall equal Target Total Area.

# SHGC Calculation Zone 2 Residential ENV-SHGC

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential Revised February 2011

Project Address		Date	
<b>Fenestration Area</b> as % gross exterior wall area		Prop	Max.Target
<b>Prescriptive PF Credit</b>		<input type="radio"/> Yes <input type="radio"/> No	
<b>Vertical North Facing Credit (1323.3 Exp. 2)</b>		<input type="radio"/> Yes <input type="radio"/> No	
Notes: To comply the Proposed total SHGC x A for all fenestration (vertical & skylights) shall not exceed Target total SHGC x A. If the north facing credit is used then the north and non-north must comply separately with skylights being included with the non-north vertical fenestration.			

Skylights	Proposed SHGC		Target SHGC	
List ID & page #, NFRC or glass only	SHGC*	x Area (A) =	SHGC	x Area (A) =
ID:				
ID:				
ID:				
ID:				
ID:				
<b>Totals</b>				
<b>Totals</b>				

\* Note: Manufacturer's SC may be used in lieu of SHGC.  
 Nonresidential compliance is based upon combined skylight and vertical fenestration performance. Residential compliance is based upon skylight only.

No Residential Vertical Fenestration SHGC Requirement					Proposed SHGC		Target SHGC	
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A) =	SHGC x A	SHGC	x Area (A) =
ID:								
ID:								
ID:								
ID:								
ID:								
ID:								
ID:								
ID:								
<b>Totals</b>								
<b>Non-North Total</b>								

++Note: If projection factors or north vertical glazing credit are used then vertical fenestration must be entered according to orientation. If neither are used then vertical fenestration can be entered in either section.  
 + Note: Manufacturer's SC may be used in lieu of SHGC. Fenestration that separates conditioned space from a non-conditioned or semi-conditioned space shall be listed here with a proposed SHGC equal to the target value.  
 \* Note: Multipliers only apply if prescriptive PF credit not used.

No Residential Vertical Fenestration SHGC Requirement					Proposed SHGC		Target SHGC		
List ID & page #, NFRC or glass only	SHGC+	PF	PF Mult*	Adjusted SHGC	x Area (A) =	SHGC x A	SHGC	x Area (A) =	SHGC x A
ID:									
ID:									
ID:									
ID:									
ID:									
<b>North Total</b>									

For compliance: Proposed total SHGC x A shall not exceed Target total SHGC x A. If north glazing credit is used then north facing vertical fenestration must comply separately from non-north vertical fenestration and skylights.

	<b>Area</b>	<b>SHGC x A</b>		<b>Area</b>	<b>SHGC x A</b>
<b>Grand Total</b>			<b>Grand Total</b>		

# Target Area Adjustment Calculations

Project Address	Date
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If the total fenestration area as a % of gross exterior wall area (calculated on ENV-SUM) exceeds the maximum allowed in Table 13-1, then this calculation must be submitted. Use the resulting areas in the Target UA and SHGC calculations above.

**SKY**= Skylight. Referred to as overhead glazing in WSEC 1333 & 1334 and equations 13-1 & 13-2.  
**VF** = vertical fenestration. Referred to as vertical glazing in WSEC 1333 & 1334 and equations 13-1 & 13-2.  
**NW** = net wall (excludes fenestration, BG, and doors.) **DBG** = Doors and below grade wall.  
**Total Fenestration** = SKY + VF. **Gross Exterior Wall Area**= VF + NW + DBG

Proposed Areas

	Above Grade Walls	Doors & BG Walls
Fenestration ->	SKY=	VF=
Opaque ->	NW=	DBG=

Gross Exterior Wall Area	X	Max Fenestration % (Table 13-1)	÷	100	=	Maximum Target Fenestration Area
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Total Fenestration	-	Maximum Target	=	Excess Fenestration	-	0 ⇕ lesser	=	Excess Fenestration
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Total Fenestration	-	Excess Fenestration	=	Target Fenestration	÷	Total Fenestration	=	Target VF Multiplier
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Net AG Wall Area	+	Excess Fenestration	=	Target Net Wall Area	÷	Net Wall	=	Target Net Wall Mult.
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Apply to all Proposed Fenestration Areas to get Target Fenestration Area

Apply to all Proposed Opaque AG Wall Areas to get Target Area

	Proposed Area	X	Target VF Mult.	=	Target Area
<b>Vertical Fenestration</b>					
metal frame		X		=	
non-metal frame		X		=	
metal entrance		X		=	
<b>Skylight</b>					
without curb		X		=	
with curb		X		=	
<b>AG Wall</b>					
Steel Frame/metal		X		=	
Wood/Other frame		X		=	
Mass		X		=	
<b>Sum of Proposed</b>			<b>Sum of Target</b>		

Target areas in shaded boxes shall be used as target areas on ENV-UA.

Sum of Proposed must equal Sum of Target.

	Proposed Area	X	Target VF Mult.	=	Target Area
<b>SHGC Calculation</b>					
Skylights (all)		X		=	
Non-North Vertical Fenestration		X		=	
North Vertical Fenestration		X		=	

SHGC target areas in shaded boxes shall be entered as target areas on ENV-SHGC

**Building Permit Plans Checklist****ENV-CHK**

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamily Residential

Revised February 2011

Project Address	Date
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The following information is necessary to check a building permit application for compliance with the building envelope requirements in the Washington State Nonresidential Energy Code.

Applicability (yes,no,na)	Code Section	Component	Information Required	Location on Plans	Building Department Notes
<b>GENERAL REQUIREMENTS (Sections 1301-1314)</b>					
	1301	Scope	Unconditioned spaces identified on plans if allowed		
	1310.2	Semi-heated spaces	Semi-heated spaces identified on plans if allowed		
	1310.3	Cold Storage / refrigerator	All refrigerated spaces identified on plans. ENV-RFG completed.		
	<b>1311</b>	<b>Insulation</b>			
	1311.1	General installation	Indicate installation method, densities and clearances to achieve intended R-value of all insulation materials		
	1311.2	Roof /ceiling insul.	Indicate R-value on roof sections for attics and other roofs; Indicate clearances for attic insulation; Indicate baffles if eave vents installed; Indicate face stapling of faced batts		
	1311.3	Wall insulation	Indicate R-value and framing material on wall sections; Indicate face stapling of faced batts; Indicate above grade exterior insulation is protected; Indicate mass of masonry walls if mass wall claimed Indicate loose-fill core insulation for masonry walls as necessary Indicate frequency of grouted cores and bond beams as necessary		
	1311.4	Floor insulation	Indicate R-value on floor sections; Indicate substantial contact with surface; Indicate supports not more than 24" o.c.; Indicate that insulation does not block airflow through foundation vents.		
	1311.5	Slab-on-grade floor	Indicate R-value on wall section or foundation detail; Indicate slab insulation extends down vertically 24" from top; Indicate above grade exterior insulation is protected		
	1311.6	Radiant floor	Indicate R-value on wall section or foundation detail; Indicate slab insulation extends down vertically 36" from the top; Indicate above grade exterior insulation is protected; Indicate insulation also under entire slab where req'd. by Official		
	1312	Glazing and doors	Provide calculation of vertical and overhead glazing area as percent of gross wall area		
	1312.1	U-factors	Indicate glazing and door U-factors on glazing and door schedule (provide area-weighted calculations as necessary); Indicate if values are NFRC or default, if default then specify frame type, glazing layers, gapwidth, low-e coatings, gas filling		
	1312.2	SHGC & SC	Indicate glazing solar heat gain coefficient or shading coefficient on glazing schedule (provide area-weighted calculations by orientation as necessary)		
	<b>1313</b>	<b>Moisture control</b>			
	1313.1	Vapor retarders	Indicate vapor retarders applied to warm side of insulation		
	1313.2	Roof/ceiling vap.ret.	Indicate vapor retarder on roof section; or list exception Indicate vap. retard. with sealed seams for non-wood structure		
	1313.3	Wall vapor retarder	Indicate vapor retarder on wall section		
	1313.4	Floor vapor retarder	Indicate vapor retarder on floor section		
	1313.5	Crawl space vap. ret.	Indicate required grade ground cover with required overlapping.		
	<b>1314</b>	<b>Air leakage</b>			
	1314.1	Bldg. envel. sealing	Indicate sealing, caulking, gasketing, and weatherstripping		
	1314.2	Glazing/door sealing	Specify maximum air leakage rates for fenestration and door products		
	1314.3	Assemb. as ducts	Indicate sealing, caulking and gasketing		
	1314.4	Recessed Lighting Fixture	Indicate IC rating, ASTM E283 cert., and gasketing or caulking to ceiling		
	1314.5	Loading Dock Seal	Indicate weatherseal at cargo and loading dock doors		
	1314.6	Continuous Air Barrier	Indicate air barrier sealing on all roof, wall & floor details Indicate leakage testing method. Provide testing results to building official. Max. leakage of 0.40 cfm/ft2 at 0.3 inch w.g.		
<b>PRESCRIPTIVE PERFORMANCE (Sections 1320-1323)</b>					
		ENV-SUM Form	Completed and attached.		
	1323	Glazing	Indicate number of glazing panes and location of emissivity coating or exception taken		
<b>COMPONENT PERFORMANCE (Sections 1330-1338)</b>					
		ENV-SUM, ENV-UA, & ENV-SHGC Forms	Completed and attached.		

If "no" is shown for any question, provide explanation:

**ENV-UA INSTRUCTIONS & EXAMPLES****ENV-CHK**

2009 Washington State Energy Code Compliance Forms for Nonresidential and Multifamil

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**FENESTRATION, SKYLIGHTS, & DOORS: Per Energy Code Section 1312.1,**

- *U-factors shall be “determined, certified, and labeled in accordance with RS-31 by a certified independent agency licensed by the National Fenestration Rating Council (NFRC).” If using this approach, provide manufacturer, model number and NFRC rating on the drawings.*
- *“Unlabeled glazing and doors shall be assigned the default U-factor in Table 10-6.”. If using this approach, provide all glazing characteristics on the drawings: list number of glazing layers, gap width, low-e coating, gas fill, frame material, thermal break details per footnote 2 to Table 10-6B.*

**OPAQUE ASSEMBLIES: Per Energy Code Section 1332,**

- *“The U-factors for typical construction assemblies are included in Chapter 10. These values shall be used for all calculations.” For example: see Table 10-5A for metal stud walls and metal building walls/roofs, see Table 10-7A to E for steel truss ceilings, etc.*

**FURTHER INFORMATION:** Refer to the Northwest Energy Efficiency Council website at: [www.neec.net](http://www.neec.net)

**Below are examples of how the Component Information on ENV-UA-1 are to be completed**

Building Component List ID & page #, code table # or calculation page #		Proposed UA U-factor x Area (A)		Typical Example
<b>Roofs</b>				
Other	R=38 ID: R1/A1.5, T.10-7 default	0.031	532	R-38 blown-in attic insulation per default
Deck	R=40 ID: R2/A1.5, T.10-7G default	0.025	9885	R-40 uniform thickness rigid insulation per default
<b>Walls</b>				
Opaque	R=13+7.5 ID: W1/A1.6, T.10-5A(1) default	0.064	7587	R-13 cavity + R-7.5 rigid ins. over metal studs per default
	R=5 ID: W2/A1.6, T.10-5B(2) default	0.157	923	R-5 rigid ins. at edge of intermediate concrete floors per def
	R= ID: R= ID:			
BG	R=11 ID: W4/A1.6, T.10-5(1) default	0.094	512	R-11 cavity ins. between wood studs on conc. wall per def.
R= ID:				
<b>Doors</b>				
	U= 0.6 ID: D1/A1.3, T.10-6 default	0.60	120	Non-NFRC fire-rated exit door per default
	U= 1.2 ID: D2/A1.3, T.10-6 default	1.20	40	Non-NFRC warehouse door per default
<b>Floors and Slabs</b>				
Floor	R=30 ID: F1/A1.7, T.10-4A default	0.031	10417	R-30 continuous ins. under concrete floor slab per default
R= ID:				
Slab	R=10 ID: F2/A1.7, T.10-2 default	0.700	612	R-10 slab edge ins. for 2 feet without thermal break per def.
<b>Fenestration and Skylights</b>				
Vertical	ID: W1/A1.3, NFRC certified	0.36	12307	Curtainwall rated, certified, and labeled per NFRC
	ID: W2/A1.3, T.10-6 default	0.50	5240	Non-NFRC curtainwall, 2 layer, 0.05emis, argon, TB, fixed
	ID: W3/A1.3, T.10-6 default	0.65	282	Non-NFRC curtainwall, 2 layer, 0.05emis fixed
	ID: W3/A1.3, T.10-6 default	0.78	282	Non-NFRC curtainwall, 2 layer, 0.05emis operable
Sky Light	ID: S1/A1.3, NFRC certified	0.50	453	Sloped glazing rated, certified, and labeled per NFRC
	ID: S2/A1.3, T.10-6 default	0.78	118	Non-NFRC atrium sloped glazing, 2 layer, 0.05 emis., fixed