Nonresidential Fenestration Ratings and Certifications Under the 2013 Standards

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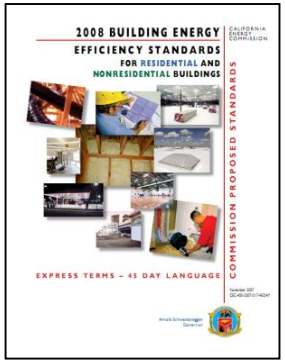
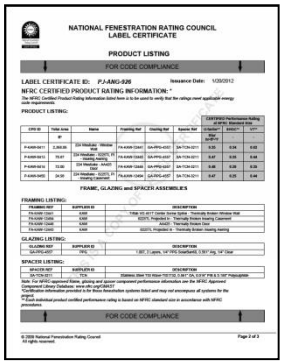
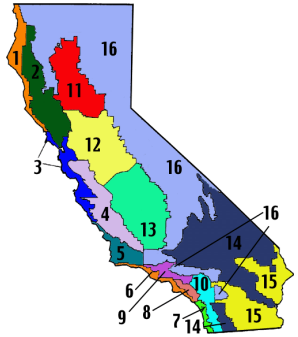
CABEC
San Diego
October 2014







About Ken Nittler, P.E.

- Licensed mechanical engineer
- Owner of Enercomp, Inc. and WESTLab
- Involved with standards since 1978
- Author of MICROPAS Residential Software
- Subcontractor to CEC on Standards Development
- Multiple term CABEC and NFRC Board Member

About WESTLab

- NFRC Accredited Simulation Laboratory
- Established in 1991
- Offices in California, Wisconsin and Canada
- First independent NFRC Accredited Calculation Entity (ACE) approved to do CMA/CMAST ratings in 2011

2013 Highlights

2013 Non-Residential Fenestration Highlights

- Prescriptive values target thermally improved metal frames with extra low solar gain low emissivity glass
- Prescriptive values are now the same in all climate zones
- The limit on using equation defaults dropped to 1,000 ft2
- *NFRC ratings are necessary to meet new prescriptive values and to get credit for product performance*

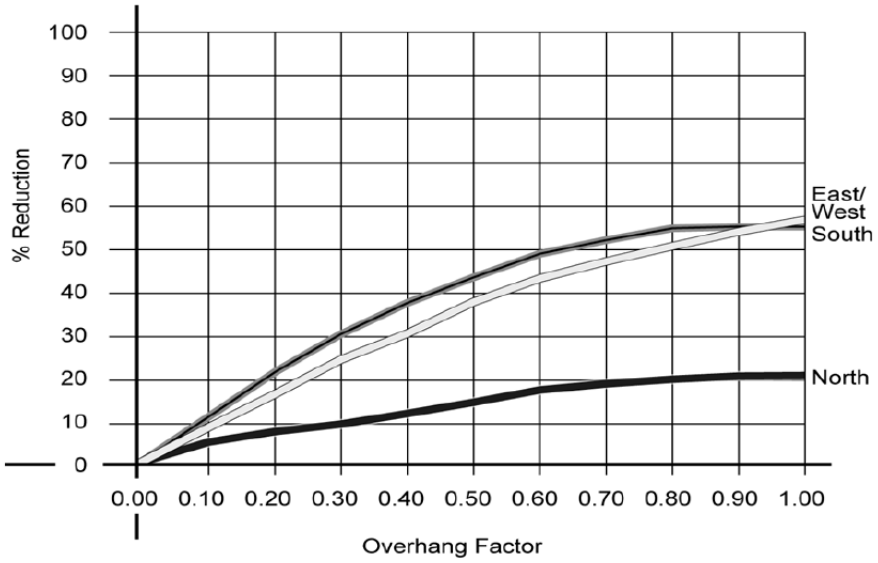
2013 Non-Residential Prescriptive

- Vertical Fenestration
  - Lower U-factors
  - Lower SHGC
  - New Visible Transmittance (VT) requirement

	All Climate Zones				
		Fixed Window	Operable Window	Curtainwall or Storefront	Glazed Doors
Area-Weighted Performance Rating	Max U-factor	0.36	0.46	0.41	0.45
	Max RSHGC	0.25	0.22	0.26	0.23
Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17
Maximum WWR%	40%				

Relative Solar Heat Gain (RSHG)

- RSHG = SHGC * Overhang Factor



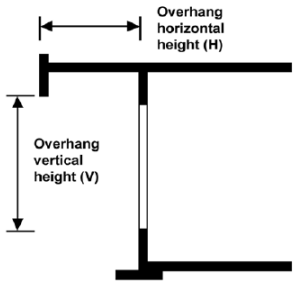


Figure 3-16 – Overhang Dimensions

Equation 3-1 – Relative Solar Heat Gain

RSHG = $SHGC_{win}$ x OHF

Where

RSHG = Relative solar heat gain.

$SHGC_{win}$ = Solar heat gain coefficient of the window.

$$OHF = OverhangFactor = 1 + \frac{aH}{V} + b\left(\frac{H}{V}\right)^2$$

Where:

H = Horizontal projection of the overhang from the surface of the window in ft, but no greater than V.

V = Vertical distance from the windowsill to the bottom of the overhang, in ft.

a = -0.41 for north-facing windows, -1.22 for south-facing windows, and -0.92 for east- and west-facing windows.

b =0.20 for north-facing windows, 0.66 for south-facing windows, and 0.35 for east- and west-facing windows.

2013 Non-Residential Prescriptive

- Skylights

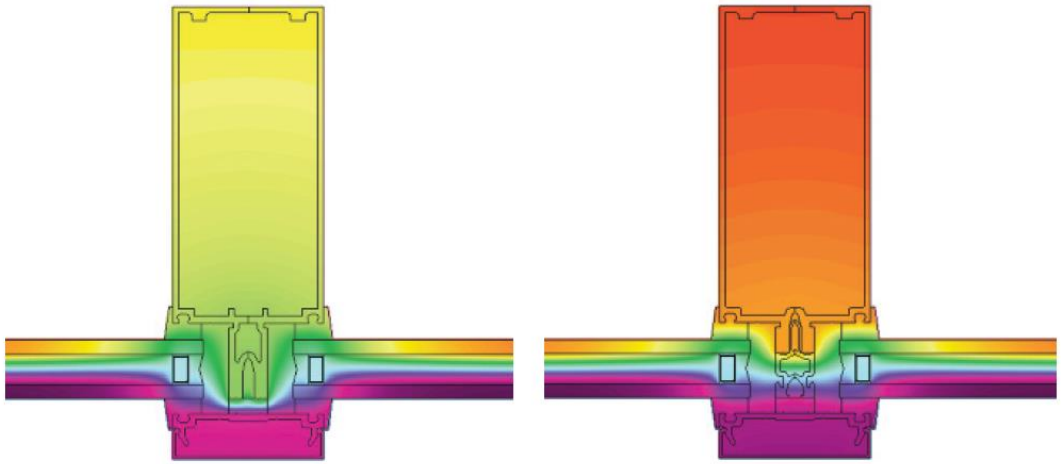
		Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted
Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88
	Max SHGC	0.25	0.25	NR
Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64
Maximum SRR%	5%			

Some Issues

- How you specify fenestration performance on your calculations is critical to compliance, and fenestration performance has a significant impact on energy use
- Make sure you understand the difference between center-of-glass and whole product ratings when reading product literature and using software
- If ratings are incorrectly used, there can be problems for all parties later in the process that can be costly

Similar Frames, Different Values

- Kawneer 1600 Products
  - Left has U-factor high 0.40's
  - Right has U-factor mid 0.30's



1600 Wall System®1
1" Insulating Glass

1600UT System™1
1" Insulating Glass

Labeling Requirement

- Every manufactured fenestration product shall have attached to it, a clearly visible temporary label that lists the U-factor, the solar heat gain coefficient (SHGC) and Visual Transmittance (VT) and that certifies compliance with the air leakage requirements of Section 110.6(a)1. For the Component Modeling Approach (CMA) and site-built fenestration products shall have an associated label certificate that lists the U-factor, the Solar Heat Gain Coefficient (SHGC), and the Visible Transmittance (VT).

NFRC Label Examples

National Fenestration Rating Council®
CERTIFIED

JELD-WEN
WINDOWS & DOORS
Builders Vinyl Side Load
Single Hung
Double-glazing with LowE
JEL-A-177-02496-00001

13240558

ENERGY PERFORMANCE RATINGS
EVALUACION DE RENDIMIENTO ENERGETICO

U-FACTOR (FACTOR-U)	SOLAR HEAT GAIN COEFFICIENT (COEFICIANTE GANANCIA DE ENERGIA SOLAR)
0.33 (U.S./I-P) | 1.87 (Metric/SI)	0.35

ADDITIONAL PERFORMANCE RATINGS
EVALUACION SUPLEMENTARIA DE RENDIMIENTO

VISIBLE TRANSMITTANCE (TRANSMISION DE LUZ VISIBLE)	AIR LEAKAGE (INFILTRATION D'AIR)
0.61	0.1 (U.S./I-P) | 0.5 (Metric/SI)

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. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.
Este fabricante estipula que estos valores cumplen con los procedimientos aplicables de NFRC para determinar el rendimiento total del producto. Los valores usados por NFRC son determinados por un conjunto fijo de condiciones ambientales y un tamano de producto especifico. NFRC no recomienda ningun producto y no garantiza que el producto sea adecuado para un uso especifico. Consulte con el folleto del fabricante para el uso apropiado de este producto.
www.nfrc.org

This fenestration product has been certified by the manufacturer to meet the air infiltration requirements of Section 116(a) 1, 2008 California Building Energy Standards.

NATIONAL FENESTRATION RATING COUNCIL
LABEL CERTIFICATE

PRODUCT LISTING

FOR CODE COMPLIANCE

LABEL CERTIFICATE ID: PJ-ARA-3410 **Issuance Date:** 9/22/2014

NFRC CERTIFIED PRODUCT RATING INFORMATION: *

This is to be completed by an NFRC Approved Calculation Entity (ACE), based on information provided by the Specifying Authority and calculated in accordance with NFRC procedures.

PRODUCT LISTING:

						CERTIFIED Performance Rating at NFRC Standard Size		
CPD ID	Product Name	Framing Ref	Glazing Ref	Spacer Ref	Total Area	U-factor**	SHGC**	VT**
					ft²	Btu/hr·ft²·°F	-	-
Metal - Curtain wall/Storefront/Window Wall					387.50			
P-ARA-31987	AG-451T TB Window Wall, 6mm Solarbronze, 0.50" Air, 6mm Clear, 0.946" OA	FA-ARA-23674	GA-PPG-9784	SA-NFC-2791	387.50	0.54	0.46	0.42

FRAME, GLAZING and SPACER ASSEMBLIES

FRAMING LISTING:

Framing Ref	Supplier ID	Product Type	Frame Material	Description
FA-ARA-23674	ARA	Glazed Wall System	AT	AG-451T Thermally Broken - Window Wall

GLAZING LISTING:

Glazing Ref	Supplier ID	# Layers	Low-e	Gap Fill	Description
GA-PPG-9784	PPG	2	N	Air	6mm Solarbronze, 0.50" Air, 6mm Clear, 0.946" OA

SPACER LISTING:

Spacer Ref	Supplier ID	Sealant Config.	Spacer Material	Description
SA-NFC-2791	NFC	N/A	Not Applicable	Generic Aluminum, Group 1, Path I

Note: For NFRC-approved frame, glazing and spacer component performance information see the NFRC Approved Component Library Database:http://cmast.nfrc.org/Project/CertificateFind.aspx
*Certification information provided is for those fenestration systems listed and may not encompass all systems for the project.
** Each individual product certified performance rating is based on NFRC standard size in accordance with NFRC procedures.

FOR CODE COMPLIANCE

Default Certificate NRCC-ENV-05-E

STATE OF CALIFORNIA
FENESTRATION CERTIFICATE LABEL
CEC-NRCC-ENV-05-E (Revised 06/14) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-ENV-05-E
Fenestration Certificate Label	(Page 1 of 2)
Project Name:	Date Prepared:

This form is only used when an NFRC Label Certificates is not available. A separate (NCRR-ENV-05-E formally FC-1) Label Certificate Form is required for each different fenestration product or different types of Fenestration.

Method 1: For buildings with less than 1,000 ft² of site-built fenestration may optionally use either CEC Default Tables 110.6-A and 110.6-B, Method 1, or the Alternative Calculation Nonresidential Reference Appendix NA6, Method 2. Enter the total U-factor$_t$, SHGC$_t$ and VT$_t$ (Optional) in the following boxes below.

Method 2: For buildings with greater 1,000 ft² of site-built fenestration without NFRC Label Certificate, only one option is available; use CEC Default Tables 110.6-A and 110.6-B. Use Method 1 only below and enter the total U-factor$_t$, SHGC$_t$ and VT$_t$ in the following boxes below.

A. GENERAL INFORMATION

1	Climate Zone:		
2	Total Number of like Fenestration products:		
3	Total square footage of like Fenestration:		

B. METHOD 1

U-FACTOR INFORMATION from default, *See TABLE 110.6-A*

1	Frame Type:	☐ Metal	☐ Metal With Thermal Break		☐ Nonmetal	
2	Product Type:	☐ Operable	☐ Fixed	☐ Greenhouse/Garden Window	☐ Doors	☐ Skylights
3	Glazing Type:	☐ Single Pane	☐ Double Pane	☐ Glass Block		
4	Enter the appropriate value from Table 110.6-A					U-factor$_t$ =

SOLAR HEAT GAIN COEFFICIENT INFORMATION from default, *See TABLE 110.6-B*

5	Product Type:	☐ Operable	☐ Fixed
6	Glazing:	☐ Clear	☐ Tinted
7	Enter the appropriate value from Table 110.6-B		SHGC$_t$ =

VISIBLE TRANSMITTANCE from *Reference Nonresidential Appendix NA6*

8	Product Type:	☐ Casement/Awning ☐ Sliding ☐ Fixed	☐ Curtainwall/Storefront)/Site-built Manufactured Skylights (Non-curb mounted)	☐ Skylights Manufactured (Curb Mounted)
9	Enter Center-of-Glass for VT$_c$ value:			VTc =
10	Calculate VT$_t$ = VT$_t$ x VT$_c$ (See Equation NA6-3)			VT$_t$ =

C. METHOD 2

Alternative Calculation Nonresidential Reference Appendix NA6

NA6 Default Calculation - Enter Center of Glass (COG) value from Manufacturer's Documentation below:					Calculated Values
1	STEP 1: Enter *Center-of-Glass* for U-factor$_c$ or the Uc value:		4	STEP 4: U-factor$_t$ = C1 + (C$_2$ X Uc)	U-factor$_t$ =
2	STEP 2: Enter *Center-of-Glass* for SHGC$_c$ value:		5	STEP 5: SHGC$_t$ = 0.08 + (0.86 x SHGC$_c$) *(See Equation NA6-2)*	SHGC$_t$ =
3	STEP 3: Enter *Center-of-Glass for* VT$_c$ value:		6	STEP 6: VT$_t$ = VT$_t$ x VT$_c$ *(See Equation NA6-3)*	VT$_t$ =

D. ATTACHED MANUFACTURER'S LITERATURE

1	*Manufacturer's literature must match the Product Type, Frame Type, Glazing, Center-of- Glass (COG) U-factor$_c$, SHGC$_c$ and VT$_c$ information needed to calculate the Default U-factor$_t$, SHGC$_t$ and VT$_t$.*

STATE OF CALIFORNIA
FENESTRATION CERTIFICATE LABEL
CEC-NRCC-ENV-05-E (Revised 06/14) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-ENV-05-E
Fenestration Certificate Label	(Page 2 of 2)
Project Name:	Date Prepared:

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA/ HERS Certification Identification (if applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name:	Responsible Designer Signature:
Company:	Date Signed:
Address:	License:
City/State/Zip:	Phone:

Default Values and Certified NFRC Ratings

Allowed Sources for Ratings

Default Values

- May not provide full credit for product performance
- Two default methods that yield different results
  - Default Tables
  - Default Equations

Certified NFRC Ratings

- Provide full credit for product performance
- Two NFRC Rating methods that yield similar results
  - Traditional NFRC Ratings
  - NFRC CMA Ratings

Default Tables

- Can always be used
- Limited choices that are often unfavorable
- Tables 110.6-A and 110.6-B
- Equation NA6 for VT

Default Tables

TABLE 110.6-B DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)

FRAME TYPE	PRODUCT	GLAZING	FENESTRATION PRODUCT SHGC		
			Single Pane[2,3] SHGC	Double Pane[2,3] SHGC	Glass Block[1,2] SHGC
Metal	Operable	Clear	0.80	0.70	0.70
	Fixed	Clear	0.83	0.73	0.73
	Operable	Tinted	0.67	0.59	N.A.
	Fixed	Tinted	0.68	0.60	N.A.
Metal, Thermal Break	Operable	Clear	N.A.	0.63	N.A.
	Fixed	Clear	N.A.	0.69	N.A.
	Operable	Tinted	N.A.	0.53	N.A.
	Fixed	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
	Fixed	Clear	0.76	0.67	0.67
	Operable	Tinted	0.60	0.53	N.A.
	Fixed	Tinted	0.63	0.55	N.A.

1 Translucent or transparent panels shall use glass block values when not rated by NFRC 200.

2. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.

3. Windows with window film applied that is not rated by NFRC 200 shall use the default values from this table

Default Equations

- Also called Alternate Defaults
- Can be used in cases with less than 1,000 ft2 of site-built fenestration
- Better credit for performance when allowed

NA6.3 Default Solar Heat Gain Coefficient, SHGC

The SHGC of the fenestration product shall be calculated using the following equation:

Equation NA6-2

$$SHGC_T = 0.08 + (0.86 \times SHGC_c)$$

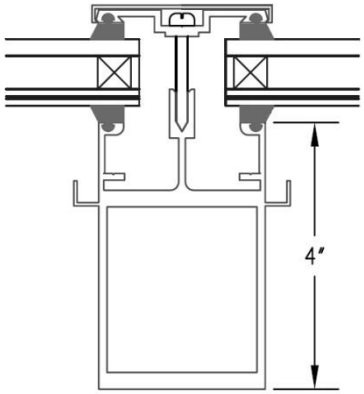
Where:

$SHGC_T$ = SHGC Is the Total Performance of the fenestration including glass and frame

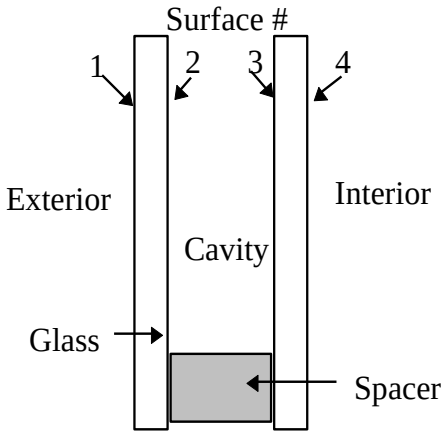
$SHGC_C$ = Center of glass SHGC calculated in accordance with NFRC 200 Section 4.5.1.1 http://www.nfrc.org/software.aspx

Traditional NFRC Ratings

- Get full credit for product performance
- Most frequently used on residential. Also used on manufactured products in many non-residential buildings
- Useful and available in many cases
- *Can have either a temporary label or a label certificate usually issued by window manufacturer*



Anatomy of an IG Unit



NFRC CMA Ratings

- Component Modeling Approach
- Get full credit for product performance
- Done using CMAST Software from NFRC
- Frames must be already simulated, tested and in the NFRC database to use CMA
- Allows flexibility to change glass options
- *Results in a label certificate for a specific building at a specific address done by a specific glazing contractor*

What's the difference?

- Product ratings under either traditional or CMA are about the same
- Both require initial simulation and testing by independent labs and must be submitted to certification agencies for approval
- The big difference is when the glazing products are integrated with the frame into a whole product rating
- Traditional usually results in a label on the window. CMA results in a label certificate for the project

Sample Defaults vs. NFRC

- Thermal Break Curtainwall with PPG Solarban 70 XL low emissivity glass on surface #2

Rating Source	U-factor	SHGC	VT	Complies
Prescriptive	0.41	0.26	0.46	n/a
Default Table	0.55	0.69	0.64	☒
Default Equation	0.44	0.31	0.64	☒
NFRC Rating	0.41	0.24	0.54	☑

Comparison of Performance Values

Frame	Product Type	Default Tables 110.6A & 110.6-B U-Factor / SHGC / VT	Alternate Default NA6 Form FC-1 U-Factor / SHGC / VT	NFRC CMA Rating U-Factor / SHGC / VT
Metal	Operable	0.79 / 0.70 / 0.42	0.72 / 0.68 / 0.42	0.78 / 0.59 / 0.64
	Operable - Tint	0.79 / 0.59 / 0.16	0.72 / 0.42 / 0.16	0.78 / 0.35 / 0.49
	Operable - SB70XL	§	0.56 / 0.31 / 0.34	0.65 / 0.24 / 0.52
	Fixed	0.71 / 0.73 / 0.61	0.72 / 0.68 / 0.61	0.65 / 0.60 / 0.66
	Fixed - Tint	0.71 / 0.60 / 0.23	0.72 / 0.42 / 0.23	0.65 / 0.35 / 0.50
	Fixed - SB70XL	§	0.56 / 0.31 / 0.49	0.51 / 0.24 / 0.53
	Door	0.77 / 0.70 / ‡	0.72 / 0.68 / ‡	0.83 / 0.40 / 0.41
	Door - Tint	0.77 / 0.59 / ‡	0.72 / 0.42 / ‡	0.83 / 0.24 / 0.31
	Door - SB70XL	§	0.56 / 0.31 / ‡	0.74 / 0.17 / 0.34
	Skylight	1.30 / 0.73 / 0.79	0.61 / 0.68 / 0.70	0.57 / 0.64 / 0.69
	Skylight - Tint	1.30 / 0.60 / 0.30	0.61 / 0.42 / 0.26	0.57 / 0.38 / 0.52
	Skylight - SB70LX	§	0.44 / 0.31 / 0.56	0.42 / 0.27 / 0.56
Metal Thermal Break	Operable	0.66 / 0.63 / 0.32	0.61 / 0.68 / 0.79	0.62 / 0.45 / 0.49
	Operable - Tint	0.66 / 0.53 / 0.32	0.61 / 0.42 / 0.30	0.62 / 0.27 / 0.37
	Operable - SB70XL	§	0.44 / 0.31 / 0.64	0.52 / 0.19 / 0.40
	Fixed	0.55 / 0.69 / 0.42	0.61 / 0.68 / 0.79	0.56 / 0.60 / 0.67
	Fixed - Tint	0.55 / 0.57 / 0.42	0.61 / 0.42 / 0.30	0.56 / 0.35 / 0.51
	Fixed - SB70XL	§	0.44 / 0.31 / 0.64	0.41 / 0.24 / 0.54
	Door	0.59 / 0.63 / ‡	0.61 / 0.68 / ‡	0.58 / 0.46 / 0.51
	Door - Tint	0.59 / 0.53 / ‡	0.61 / 0.42 / ‡	0.58 / 0.27 / 0.39
	Door - SB70XL	§	0.44 / 0.31 / ‡	0.48 / 0.19 / 0.41
	Skylight	1.11 / 0.69 / 0.79	0.72 / 0.68 / 0.70	Limited Skylight
	Skylight - Tint	1.11 / 0.57 / 0.30	0.72 / 0.42 / 0.26	Frame Availability
	Skylight - SB70LX	§	0.56 / 0.31 / 0.56	In CMAST

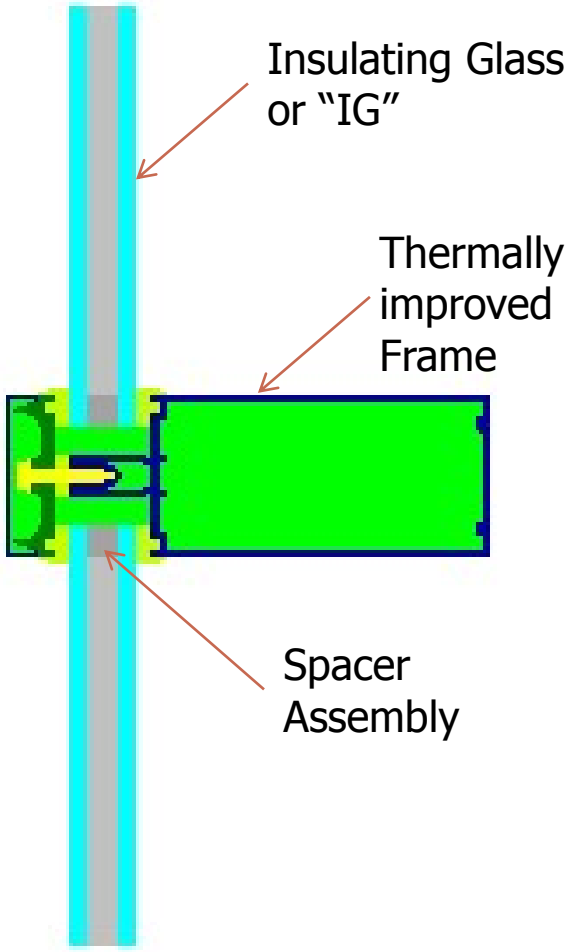
§ Default tables do not recognize Low-E. Standard values can be used

‡ There are no VTF values given in NA6 for doors

NFRC Component Modeling Approach

NFRC Component Modeling Approach (CMA)

- Non-residential Only
- Results in U-factor, SHGC and VT values similar to traditional NFRC ratings
- Separates the combining of the *glass* choices from the *frame* and *spacer* calculations
- Results in a label certificate for specific products at a specific address



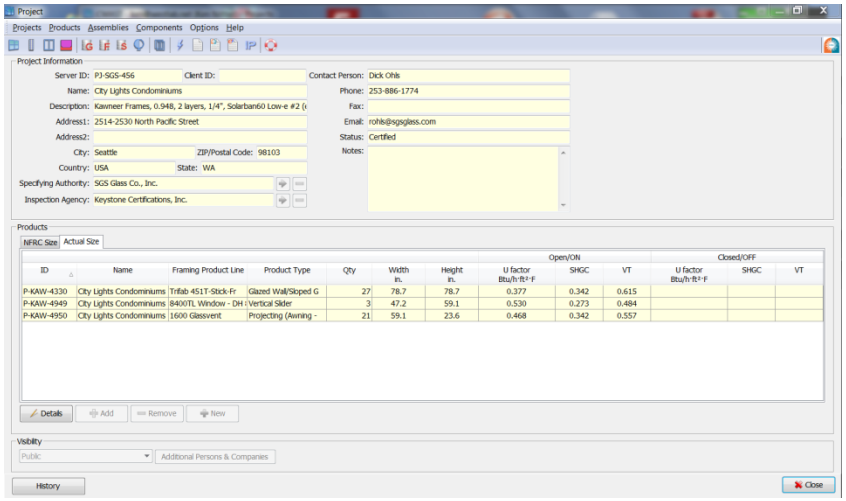
Different Approach

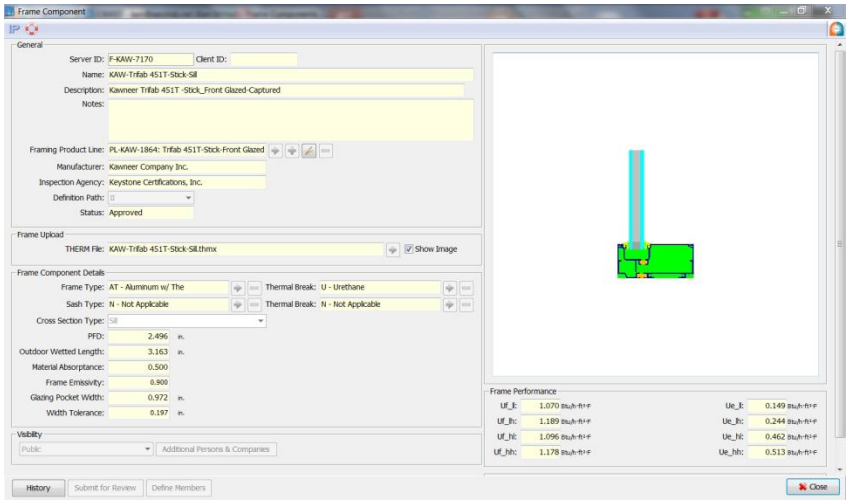
- Frame and spacer manufacturers get simulations and testing and place results in CMAST software database
- Specifying Authority, often the glazing contractor, specifies products used on a project
- Accredited Calculation Entity (ACE) organization does certified label certificates for the project

- *When the desired frame is already in the CMAST database, it is possible to get a label certificate in a single day*

CMAST Software

- Client/Server software created by NFRC. Part database, part calculations. Can see software and certificates at nfrc.org





- Project Info Page

NATIONAL FENESTRATION RATING COUNCIL
LABEL CERTIFICATE

PROJECT INFORMATION

LABEL CERTIFICATE ID: *PJ-ANG-926* **Issuance Date:** 1/20/2012

This is to be completed by an NFRC Approved Calculation Entity (ACE), based on information provided by the Specifying Authority and calculated in accordance with NFRC procedures.

PROJECT LOCATION:

Address: 224 Westlake Ave., North
City: Seattle **State:** WA **Zip code:** 98109
Contact person: Brian Horne **Title:**
Phone: 253-735-1308 **Facsimile:** 253-735-3294 **Email:** brianh@allnewglass.com
Project name (optional): 224 Westlake Building Renovation

IDENTIFICATION OF SPECIFYING AUTHORITY:

Company name: All New Glass **ID:** ANG
Address: 319 D Street NW
City: Aubrn **State:** WA **Zip code:** 98001
Contact person: Brian Horne **Title:**
Phone: 253-735-1308 **Facsimile:** **Email:** brianh@allnewglass.com

FRAMING SUPPLIER:

Company name: Kawneer Company Inc. **ID:** KAW
Address: 555 Guthridge Court
City: Norcross **State:** Ga **Zip code:** 30092
Contact person: Greg McKenna **Title:**
Phone: 770-840-6433 **Facsimile:** **Email:** greg.mckenna@alcoa.com

GLAZING SUPPLIER:

Company name: PPG Industries **ID:** PPG
Address: 400 Guys Run Road
City: Cheswick **State:** PA **Zip code:** 15024
Contact person: Paul Bush **Title:** Manager, Technical Services
Phone: 412-820-4926 **Facsimile:** 412-826-2299 **Email:** pwbush@ppg.com

IDENTIFICATION NAME OF APPROVED CALCULATION ENTITY (ACE):

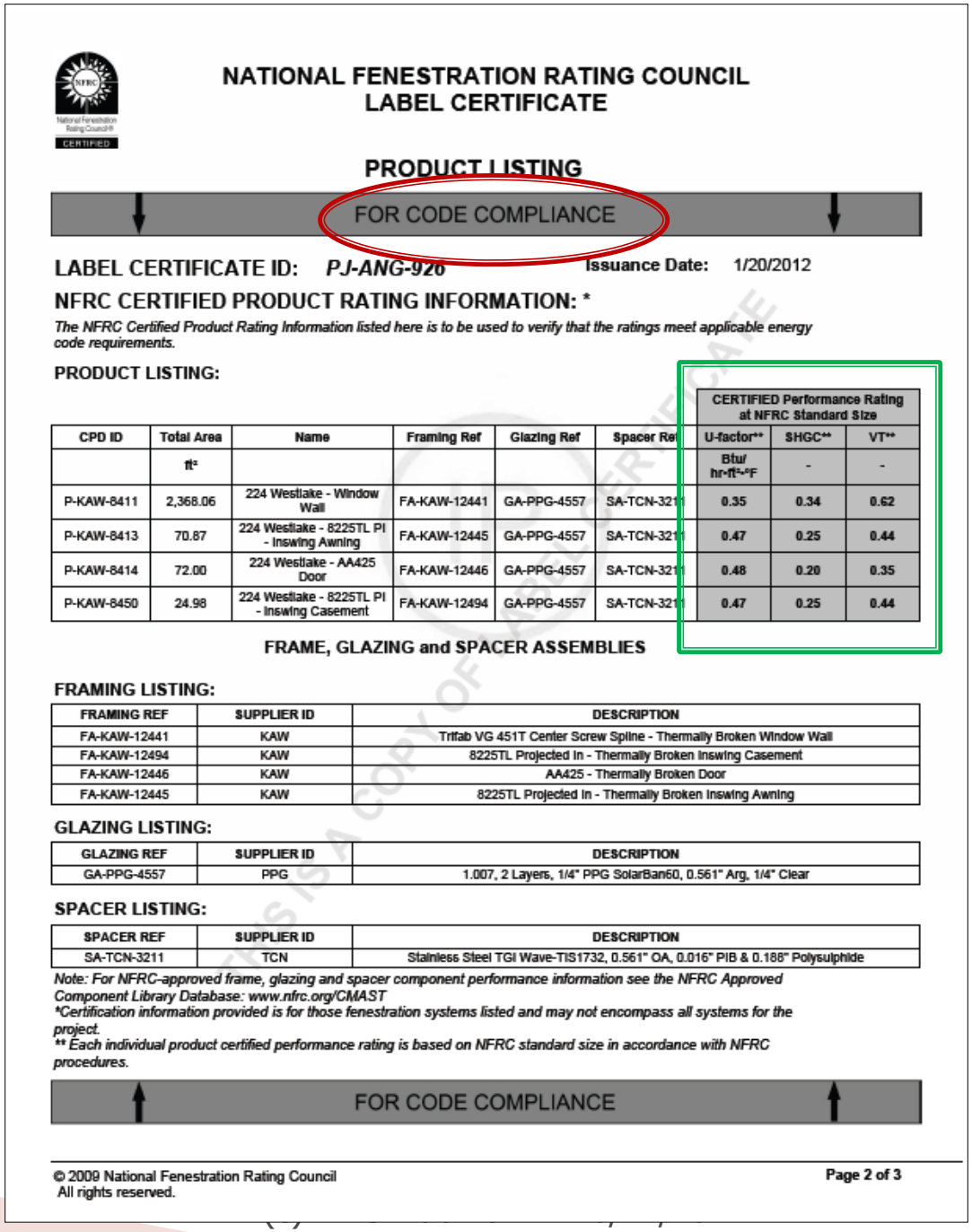
WESTLab - California **ID:** WES

IDENTIFICATION NAME OF INSPECTION AGENCY (IA):

Keystone Certifications, Inc. **ID:** KCI

Number of individual products listed on this label certificate: **4**

- Compliance info page with NFRC ratings at standard sizes for compliance use



NATIONAL FENESTRATION RATING COUNCIL
LABEL CERTIFICATE

PRODUCT LISTING

FOR CODE COMPLIANCE

LABEL CERTIFICATE ID: *PJ-ANG-926* **Issuance Date:** 1/20/2012

NFRC CERTIFIED PRODUCT RATING INFORMATION: *

The NFRC Certified Product Rating Information listed here is to be used to verify that the ratings meet applicable energy code requirements.

PRODUCT LISTING:

CPD ID	Total Area	Name	Framing Ref	Glazing Ref	Spacer Ref	CERTIFIED Performance Rating at NFRC Standard Size		
						U-factor**	SHGC**	VT**
	ft²					Btu/ hr-ft²-°F	-	-
P-KAW-8411	2,368.06	224 Westlake - Window Wall	FA-KAW-12441	GA-PPG-4557	SA-TCN-3211	0.35	0.34	0.62
P-KAW-8413	70.87	224 Westlake - 8225TL PI - Inswing Awning	FA-KAW-12445	GA-PPG-4557	SA-TCN-3211	0.47	0.25	0.44
P-KAW-8414	72.00	224 Westlake - AA425 Door	FA-KAW-12446	GA-PPG-4557	SA-TCN-3211	0.48	0.20	0.35
P-KAW-8450	24.98	224 Westlake - 8225TL PI - Inswing Casement	FA-KAW-12494	GA-PPG-4557	SA-TCN-3211	0.47	0.25	0.44

FRAME, GLAZING and SPACER ASSEMBLIES

FRAMING LISTING:

FRAMING REF	SUPPLIER ID	DESCRIPTION
FA-KAW-12441	KAW	Trifab VG 451T Center Screw Spline - Thermally Broken Window Wall
FA-KAW-12494	KAW	8225TL Projected In - Thermally Broken Inswing Casement
FA-KAW-12446	KAW	AA425 - Thermally Broken Door
FA-KAW-12445	KAW	8225TL Projected In - Thermally Broken Inswing Awning

GLAZING LISTING:

GLAZING REF	SUPPLIER ID	DESCRIPTION
GA-PPG-4557	PPG	1.007, 2 Layers, 1/4" PPG SolarBan60, 0.561" Arg, 1/4" Clear

SPACER LISTING:

SPACER REF	SUPPLIER ID	DESCRIPTION
SA-TCN-3211	TCN	Stainless Steel TGI Wave-TIS1732, 0.561" OA, 0.016" PIB & 0.188" Polysulphide

Note: For NFRC-approved frame, glazing and spacer component performance information see the NFRC Approved Component Library Database: www.nfrc.org/CMAST

**Certification information provided is for those fenestration systems listed and may not encompass all systems for the project.*

*** Each individual product certified performance rating is based on NFRC standard size in accordance with NFRC procedures.*

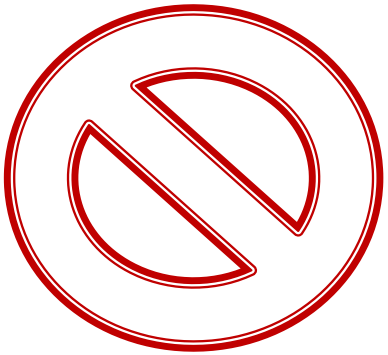
FOR CODE COMPLIANCE

Certified Ratings

- At NFRC standard sizes
- Combines specific frame, glass, spacer for a specific address

						CERTIFIED Performance Rating at NFRC Standard Size		
CPD ID	Total Area	Name	Framing Ref	Glazing Ref	Spacer Ref	U-factor**	SHGC**	VT**
	ft²					Btu/ hr·ft²·°F	-	-
P-KAW-8411	2,368.06	224 Westlake - Window Wall	FA-KAW-12441	GA-PPG-4557	SA-TCN-3211	0.35	0.34	0.62
P-KAW-8413	70.87	224 Westlake - 8225TL PI - Inswing Awning	FA-KAW-12445	GA-PPG-4557	SA-TCN-3211	0.47	0.25	0.44
P-KAW-8414	72.00	224 Westlake - AA425 Door	FA-KAW-12446	GA-PPG-4557	SA-TCN-3211	0.48	0.20	0.35
P-KAW-8450	24.98	224 Westlake - 8225TL PI - Inswing Casement	FA-KAW-12494	GA-PPG-4557	SA-TCN-3211	0.47	0.25	0.44

- "Actual" size listing that is NOT for compliance and is not necessarily the actual configuration



NATIONAL FENESTRATION RATING COUNCIL LABEL CERTIFICATE

SUPPLEMENTAL PRODUCT INFORMATION

For Informational Purposes Only

Non-Certified Product Information at Actual Product Size

Reference NFRC Labeled Certificate ID: ***PJ-ANG-926*** **for Certified Ratings for Code Compliance:**

Individual product performance at actual size is listed in the table below and has been determined in accordance with NFRC technical procedures; however, these are not certified ratings. Certified ratings are determined at NFRC model sizes for comparative purposes and are listed on the actual Label Certificate referenced above. The actual size performance calculations below are for information purposes and use in calculations and energy simulation programs to estimate energy use, and are not intended for use in code compliance.

PRODUCT LISTING:

CPD ID	Qty	Total Area	Name	Energy Plus Report File*	NON-CERTIFIED Performance at Actual Size				
					Width	Height	U-factor	SHGC	VT
		ft²			in.	in.	Btu/ hr-ft²-°F	-	-
P-KAW-8411	55	2,368.06	224 Westlake - Window Wall	P-KAW-8411.txt	78.74	78.74	0.35	0.34	0.62
P-KAW-8413	8	70.87	224 Westlake - 8225TL PI - Inswing Awning	P-KAW-8413.txt	32.50	39.25	0.46	0.26	0.45
P-KAW-8414	3	72.00	224 Westlake - AA425 Door	P-KAW-8414.txt	36.00	96.00	0.48	0.20	0.35
P-KAW-8450	3	24.98	224 Westlake - 8225TL PI - Inswing Casement	P-KAW-8450.txt	22.00	54.50	0.49	0.24	0.42

** In order to download EnergyPlus report file for a product, you need to open your web browser, go to the address bar and type "http://cmast.nfrc.org/product/EPlusReport.aspx?id=" followed by the certified product CPD ID*

Conclusion

Why Are There So Few Ratings?

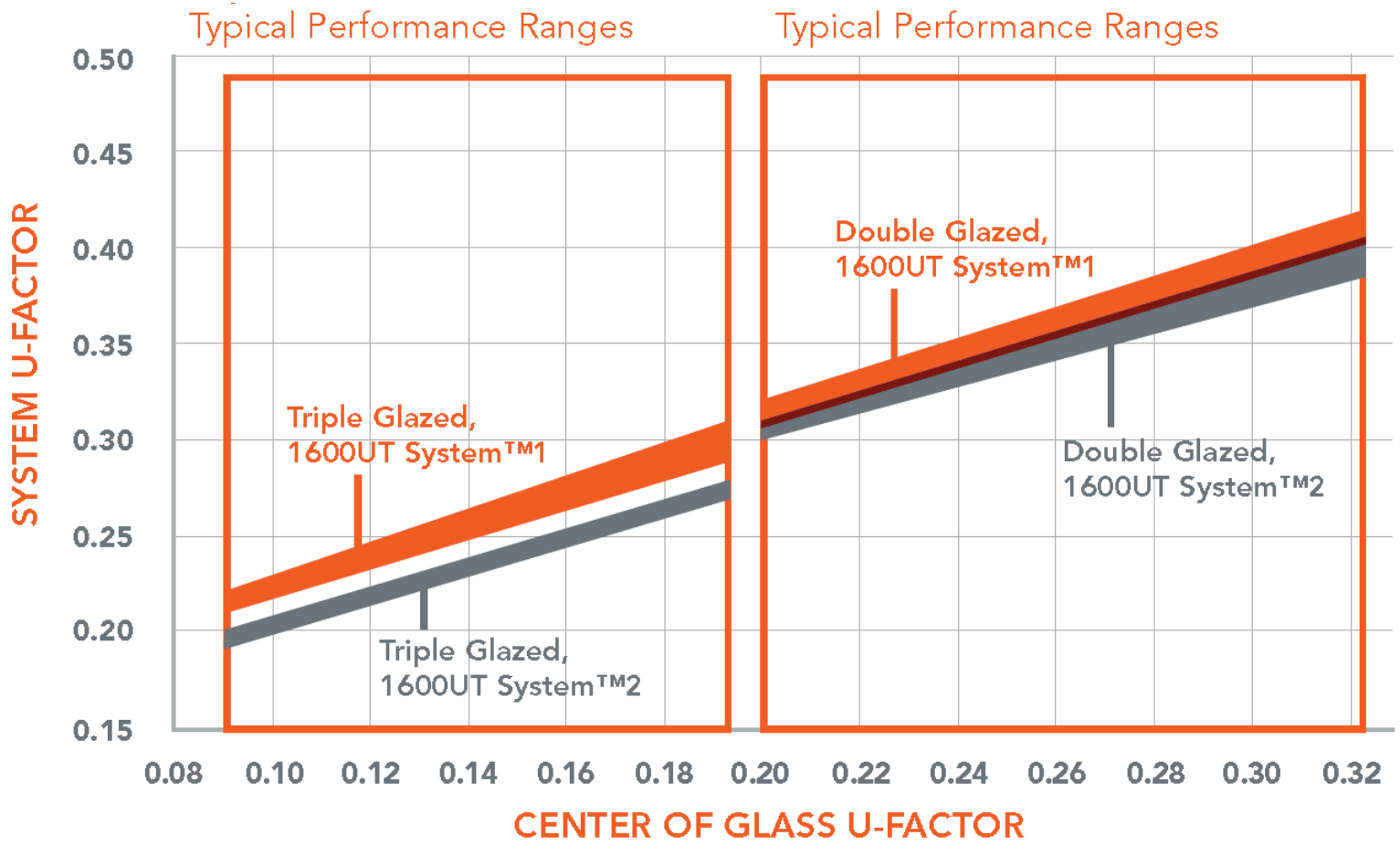
- About 389 CMA certificates issued so far, only 34 are in California. WESTLab has issued 75 certificates
- Getting ratings takes time and costs money no matter what method is used
- Confusion over use of NA6 defaults
- Lack of enforcement due to reliance on design professionals in larger Non-residential projects

- *With the reduction to 1,000 ft2 limit on default equations, and ever tighter prescriptive values, use of NFRC ratings will increase*

Recommendations

- *Learn about "safe" values to use for calculations that can be met with a variety of products.*
  - *Manufacturer product web sites*
  - *Nfrc.org for products with traditional NFRC ratings*
  - *Cmast.nfrc.org for products with NFRC CMA ratings*
- *When NFRC ratings are required, make sure that everyone in the process understands this.*
  - *Many contractors are unprepared*
  - *Many bid specifications are incomplete*
- *WESTLab is available to help you get NFRC CMA ratings quickly and efficiently. Call us.*

Kawneer 1600UT Product Literature



Center of Glass Values

- For equation defaults
- CEC says use NFRC, but NFRC doesn't provide center of glass data
- Recommend using glass manufacture web sites
- Need to know details of insulating glass unit – dimensions, products, tints, low e surfaces, etc.

Sample PPG Data Sheet

***Solarban*® 70XL Glass Performance — Commercial Insulating Glass Unit**

Insulating Vision Unit Performance Comparisons 1-inch (25mm) units with 1/2-inch (13mm) airspace and two 1/4-inch (6mm) lites; interior lite clear unless otherwise noted

Glass Type	Transmittance			Exterior Reflectance		U-Value (Imperial)		European U-Value	Shading Coefficient	Solar Heat Gain Coefficient	Light to Solar Gain (LSG)
	Ultra-violet %	Visible %	Total Solar Energy %	Visible Light %	Total Solar Energy %	Winter Night-time	Summer Day-time				
Coated											
SOLARBAN*® 70XL Solar Control Low-E Glass											
SOLARBAN 70XL (2)* + Clear	6	64	25	12	52	0.28	0.26	1.5	0.32	0.27	2.37
SOLARBAN 70XL (2) *ATLANTICA* + Clear	2	51	17	9	8	0.28	0.26	1.5	0.28	0.24	2.13
SOLARBAN 70XL (2) *AZURIA* + Clear	5	52	18	9	7	0.28	0.26	1.5	0.29	0.25	2.08
SOLARBAN 70XL (2) *OPTIGRAY* + Clear	4	47	18	8	18	0.28	0.26	1.5	0.28	0.24	1.96
SOLARBAN 70XL (2) *PACIFICA* + Clear	2	32	12	6	7	0.28	0.26	1.5	0.22	0.19	1.68
SOLARBAN 70XL (2) *SOLARBLUE* + Clear	4	42	17	8	15	0.28	0.26	1.5	0.26	0.23	1.83
SOLARBAN 70XL (2) *SOLARBRONZE* + Clear	3	40	15	7	19	0.28	0.26	1.5	0.25	0.21	1.90
SOLARBAN 70XL (2) *SOLARGRAY* + Clear	3	34	13	6	15	0.28	0.26	1.5	0.23	0.20	1.70
SOLARBAN 70XL (2) *SOLEXIA* + Clear	4	58	21	10	13	0.28	0.26	1.5	0.31	0.27	2.15
ATLANTICA + *SOLARBAN* 70XL (3)	2	49	17	10	8	0.28	0.26	1.5	0.32	0.28	1.75
AZURIA + *SOLARBAN* 70XL (3)	4	49	17	9	8	0.28	0.26	1.5	0.33	0.29	1.69
GRAYLITE II + *SOLARBAN* 70XL (3)	0	6	3	4	5	0.28	0.26	1.5	0.13	0.11	0.55
OPTIGRAY + *SOLARBAN* 70XL (3) *STARPHIRE*	3	45	17	9	18	0.28	0.26	1.5	0.33	0.29	1.55
PACIFICA + *SOLARBAN* 70XL (3)	2	31	12	6	7	0.28	0.26	1.5	0.26	0.22	1.41
SOLARBLUE + *SOLARBAN* 70XL (3)	3	40	16	8	16	0.28	0.26	1.5	0.32	0.27	1.48

Standards Details

Manufactured

- MANUFACTURED FENESTRATION is a fenestration product constructed of materials which are factory cut or otherwise factory formed with the specific intention of being used to fabricate a fenestration product. However a knocked-down or partially assembled product, sold as a fenestration product is also a manufactured fenestration product when provided with temporary and permanent labels as described in Section 10-111; otherwise it is a site-built fenestration product when provided with temporary and permanent labels as described in Section 10-111.

Site-Built

- SITE-BUILT is fenestration designed to be field-glazed or field assembled units using specific factory cut or otherwise factory formed framing and glazing units, that are manufactured with the intention of being assembled at the construction site. These include storefront systems, curtain walls, and atrium roof systems.

Field-Fabricated

- **FIELD-FABRICATED** is a fenestration product whose frame is made at the construction site of standard dimensional lumber or other materials that were not previously cut, or otherwise formed with the specific intention of being used to fabricate a fenestration product. Field fabricated does not include site-built fenestration.

Default Table for U-factor

TABLE 110.6-A DEFAULT FENESTRATION PRODUCT U-FACTORS

FRAME	PRODUCT TYPE	SINGLE PANE [3,4] U-FACTOR	DOUBLE PANE [1,3,4] U-FACTOR	GLASS BLOCK [2,3] U-FACTOR
Metal	Operable	1.28	0.79	0.87
	Fixed	1.19	0.71	0.72
	Greenhouse/garden window	2.26	1.40	N.A.
	Doors	1.25	0.77	N.A.
	Skylight	1.98	1.30	N.A.
Metal, Thermal Break	Operable	N.A.	0.66	N.A.
	Fixed	N.A.	0.55	N.A.
	Greenhouse/garden window	N.A.	1.12	N.A.
	Doors	N.A.	0.59	N.A.
	Skylight	N.A.	1.11	N.A.
Nonmetal	Operable	0.99	0.58	0.60
	Fixed	1.04	0.55	0.57
	Doors	0.99	0.53	N.A.
	Greenhouse/garden windows	1.94	1.06	N.A.
	Skylight	1.47	0.84	N.A.

1. For all dual-glazed fenestration products, adjust the listed U-factors as follows:
    a. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide.
    b. Add 0.05 to any product with true divided lite (dividers through the panes).
2. Translucent or transparent panels shall use glass block values when not rated by NFRC 100.
3. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.
4. Windows with window film applied that is not rated by NFRC 100 shall use the default values from this table.

Default Table for SHGC

TABLE 110.6-B DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)

FRAME TYPE	PRODUCT	GLAZING	FENESTRATION PRODUCT SHGC		
			Single Pane[2,3] SHGC	Double Pane[2,3] SHGC	Glass Block[1,2] SHGC
Metal	Operable	Clear	0.80	0.70	0.70
	Fixed	Clear	0.83	0.73	0.73
	Operable	Tinted	0.67	0.59	N.A.
	Fixed	Tinted	0.68	0.60	N.A.
Metal, Thermal Break	Operable	Clear	N.A.	0.63	N.A.
	Fixed	Clear	N.A.	0.69	N.A.
	Operable	Tinted	N.A.	0.53	N.A.
	Fixed	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
	Fixed	Clear	0.76	0.67	0.67
	Operable	Tinted	0.60	0.53	N.A.
	Fixed	Tinted	0.63	0.55	N.A.

1 Translucent or transparent panels shall use glass block values when not rated by NFRC 200.

2. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.

3. Windows with window film applied that is not rated by NFRC 200 shall use the default values from this table

Default Equation for U-factor

NA6.2 Default U-factor

Equation NA6-1

$$U_T = C_1 + (C_2 \times U_c)$$

Where:

U_T = U-factor Is the Total Performance of the fenestration including glass and frame

C_1 = Coefficient selected from Table NA6-5

C_2 = Coefficient selected from Table NA6-5

U_C = Center of glass U-factor calculated in accordance with NFRC 100 Section 4.5.3.1 http://www.nfrc.org/software.aspx

Table NA6-5 – U-factor Coefficients

Product Type	Frame Type	C_1	C_2
Site-Built Vertical Fenestration	Metal	0.311	0.872
	Metal Thermal Break	0.202	0.867
	Non-Metal	0.202	0.867
Skylights with a Curb	Metal	0.711	1.065
	Metal Thermal Break	0.437	1.229
	Non-Metal	0.437	1.229
Skylights with no Curb	Metal	0.195	0.882
	Metal Thermal Break	0.310	0.878
	Non-Metal	0.310	0.878

Default Equation for SHGC

NA6.3 Default Solar Heat Gain Coefficient, SHGC

The SHGC of the fenestration product shall be calculated using the following equation:

Equation NA6-2

$$SHGC_T = 0.08 + (0.86 \times SHGC_c)$$

Where:

$SHGC_T$ = SHGC Is the Total Performance of the fenestration including glass and frame

$SHGC_C$ = Center of glass SHGC calculated in accordance with NFRC 200 Section 4.5.1.1 http://www.nfrc.org/software.aspx

Default Equation for VT

NA6.4 Default Visible Transmittance, VT

(a) Equation NA6-3 - VT of Center of Glass (COG) calculation

$$VT_T = VT_F \times VT_C$$

Where:

VT_T = Is the Total Performance of the fenestration including glass and frame

VT_F = 0.53 for projecting windows, such as casement and awning windows

VT_F = 0.67 for operable or sliding windows

VT_F = 0.77 for fixed or non operable windows

VT_F= 0.88 for curtain wall/storefront, Site-built and manufactured non-curb mounted skylights

VT_F = 1.0 for Curb Mounted manufactured Skylights

VT_C = Center of glass VT is calculated in accordance with NFRC 200 Section 4.5.1.1 or NFRC 202 for Translucent Products or NFRC 203 for Tubular Daylighting Devices and Hybrid Tubular Daylighting Devices or ASTM E972 http://www.nfrc.org/software.aspx