SOLAR HEAT GAIN COEFFICIENT (SHGC) WORKSHEET

CALIFORNIA ENERGY COMMISSION

CEC- CF1R-ENV-03-E

CERTIFICATE OF COMPLIANCE

Field Name	Data Entry	Field Name	Data Entry
Project Name		Enforcement Agency	
Dwelling Address		Permit Number	
City and Zip Code		Permit Application Date	

A. Product Information

01	02	03	04	05	06	07
Tag/ Identification	Orientation	Fenestration has a Temporary or Site-Built NFRC Label Certificate	SHGC Value from NFRC Label	Non-NFRC Labeled SHGC Information	Exterior Shading Device Type	Exterior Shading SHGC

B. Default Solar Heat Gain Coefficient Using Table 110.6-B

NOTE: If Column A05 entry = Table 110.6-B, then fill this section. Otherwise, this section does not apply.

01	02	03	04	05	06	07
Tag/ Identification	Orientation	Frame Type	Product	Glazing	Number of Panes	Default Fenestration SHGC

C. Non-Rated Site-built Solar Heat Gain Coefficient Calculation Using Equation NA6-2 from Reference Appendices, Nonresidential Appendix NA6.3

NOTE: If Column A05 entry = Equation NA6-2, then fill this section. Otherwise, this section does not apply.

Field	**Field Name**	**Data Entry**
01	Conditioned Floor Area	
02	5% of the Condition Floor Area	
03	Total Allowed Non-Rated Site-Built Fenestration Area	
04	Proposed Area of Site-Built Fenestration	

05	06	07	08
Tag/ Identification	Glass Area	Center of Glass (COG) Solar Heat Gain Coefficient	Total Allowed SHGC of the Non-Rated Site-Built Fenestration

D. Combined Solar Heat Gain Coefficient Calculation and Shading Device Calculation

01	02	03	04
Tag/ Identification	$SHGC_{max}$ =	$SHGC_{min}$ =	Total Combined Adjusted SHGC with Exterior Shading Device ($SHGC_{total}$)

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Documentation Author's Declaration Statement 1. I certify that this Certificate of Compliance documentation is accurate and complete.	Author Name Author Signature Date Signed Company Name CEA/AEA/ECC Certification ID Address 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 understand that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building and shall be made available to the enforcement agency for all applicable inspections. I will take the necessary steps to fulfill this requirement. 6. 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. I will take the necessary steps to fulfill this requirement.	Responsible Name Responsible Signature Date Signed Company Name License No. Address City/State/Zip Phone

For assistance or questions regarding the Energy Standards, contact the Energy Hotline at: 1-800-772-3300.

CF1R-ENV-03-E Instructions

This worksheet is to be used to determine the total Solar Heat Gain Coefficient (SHGC) value of fenestration in combination with an exterior shading device. This worksheet is to be completed for each different fenestration and exterior shading combination. Total $SHGC_{total}$ value in subsection D4 is calculated by choosing the larger of A4, A7, B7 or C7 for $SHGC_{max}$ and the smaller of A4, A7, B7 or C7 for $SHGC_{min}$.

The following rules apply when selecting exterior shading devices:

1. If using this worksheet, a standard bug screen must be assumed for all vertical fenestration unless replaced by another exterior shading device as listed in A6 (and Table S-1 below); only one exterior shading device may be applied to a vertical window.
2. The listed SHGC for bug screens is an area-weighted value that assumes that the screens are only on operable windows. If no exterior shade is selected, then assume a SHGC of 0.76 for standard bug screens for all windows.
3. This requirement does not apply to skylights. For skylights the exterior shading SHGC is assumed to be 1.00.
4. When exterior shading devices are applied and the combined total SHGC values do not meet the prescriptive efficiencies for windows or skylights then these windows and skylight must be area-weighted using the CF1R-ENV-02-E. Different shading conditions may also be modeled explicitly using the computer performance method.

The target value for Total $SHGC_{total}$ is 0.23 for Climate Zones 2, 4 and 6-14 and 0.20 for Climate Zones 15. However, not being able to meet the target value will require calculating the area weighted average (CF1R-ENV-02-E compliance document) with other more efficient windows and skylights.
The resultant Total $SHGC_{total}$ value shall be documented prescriptively on the CF1R-NCB-01-E, CF1R-ADD-01-E or CF1R-ALT-01-E in the Fenestration section—attach a completed CF1R-ENV-03-E with submittal. When using the Performance Approach, the program will generate its own CF1R and will include the Total $SHGC_{total}$ values.

A. Product Information

1. Tag/Identification: User entered value which should equal data given on the other CF1Rs for the same fenestration; provides an identification name or tag name that uniquely identifies the window system. If there is a window schedule the tag name may be given on the plans.
2. Orientation: The direction the fenestration faces. User selects orientation from list: North, East, South or West.
3. Fenestration has a Temporary or Site-Built NFRC Label Certificate: Indicate Yes or No.
4. If A03 = Yes, enter SHGC value from NFRC label: Provide the SHGC from the NFRC Label. If A03 = No, then select N/A.
5. If A03 = Yes, then select N/A. If A03 = No, then User selects from list: Table 110.6-B of the Energy Standards if default SHGC are specified; Reference Appendices, Nonresidential Appendix NA6, Equation NA6-2 if site-built center of glass SHGC are specified.

6. User selects from list: Standard Bug Screens, Exterior Sunscreens with Weave 53 x 16/inch, Sunscreens w/Louvers as Wide as Window Openings, Low Sun Angle Louvered Sunscreens, Vertical Roller Shades or Retractable Drop Arm/Combination/Marquisolette and Operable Awnings, Roll Down Blinds or Slats or None (for skylights only).

   Note: Default is Standard Bug Screens.

7. Exterior Shade SHGC: This value is based on the selection in A06 and the referenced value found in Table S-1.

B. Default Solar Heat Gain Coefficient Using Table 110.6-B

NOTE: If Column A05 entry = Table 110.6-B, then fill this section. Otherwise, this section does not apply.

1. Tag/Identification: Fill from Section A.
2. Orientation: User selects orientation from list: North, East, South or West.
3. Frame Type: User selects fenestration frame type from list: Metal, Non-metal (such as wood or vinyl), or Metal w/Thermal Break.
4. Product: User selects from list: Fixed or Operable.
5. Glazing: User selects from list: Clear (not visibly tinted) or Tinted (visibly tinted).
6. Number of Panes: User selects from list: Single, Double or Glass Block.
7. Default Fenestration SHGC: This value is selected based on the selections in B03, B04, B05 and B06 and the referenced values found in Table 110.6-B. of the Energy Standards

C. Non-Rated Site-Built Solar Heat Gain Coefficient Calculation Using Equation NA6-2 from Reference Appendices, Nonresidential Appendix NA6.3

NOTE: If Column A05 entry = Equation NA6-2, then fill this section. Otherwise, this section does not apply.

1. Conditioned Floor Area: User entered Conditioned Floor Area: Indicate the Conditioned Floor Area of the building. This should be the same value found on the CF1R-NCB-01-E, CF1R-ADD-01-E orCF1R-ALT-01-E.
2. 5% of the Condition Floor Area: This value is a calculated value (field C01 x 0.05).
3. Total Allowed Non-Rated Site-Built Fenestration Area: This value is a calculated value. Enter the minimum of field C02 or 250.
4. Proposed Area of Site-Built Fenestration: User entered value equal to the total area of the site-built fenestration; Note: must be 250 square feet (ft^2) or less.
5. Tag/Identification: Filled from Section A.
6. Glass Area: User entered Fenestration Area.
7. Center of Glass Solar Heat Gain Coefficient: User entered Center of Glass (COG) Solar Heat Gain Coefficient: Indicate the $SHGC_c$ value calculated in accordance with NFRC 200, Section 4.5.1.1 http://www.nfrc.org/software.aspx.
8. Total Allowed SHGC of the Non-Rated Site-Built Fenestration: This value is filled based on the equation ((Center of glass SHGC x 0.86) + 0.08). ((C07 x 0.86)+0.08)

D. Combined Solar Heat Gain Coefficient Calculation and Shading Device Calculation

1. Tag/Identification: Filled from Section A.
2. $SHGC_{max}$: This value is filled based on the maximum SHGC listed in A04, A07, B07 or C07.
3. $SHGC_{min}$: This value is filled based on the minimum SHGC listed in A04, A07, B07 or C07.
4. Total Combined Adjusted SHGC with Exterior Shading Device: This value is filled based on the equation $(((SHGC_{max} \times 0.2875) + 0.75) \times SHGC_{min})$

Documentation Declaration Statements

1. The person who prepared the CF1R will sign and complete the fields for their name, company (if applicable), address, phone number, certification information (if applicable), date and signature (may be electronic).
2. The person who is assuming responsibility for the project being built to comply with Title 24, Part 6, will complete the fields for their name, company (if applicable), address, phone number, license number (if applicable), date and signature (may be electronic).

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

FRAME TYPE	PRODUCT	GLAZING	FENESTRATION PRODUCT SHGC		
			Single Pane SHGC	Double Pane SHGC	Glass Block 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.

TABLE S-1

Exterior Shading Device		$SHGC_{Exterior\ Shade}$
1	Standard Bug Screens	0.76
2	Exterior Sunscreens with Weave 53 x 16/inch	0.30
3	Louvered Sunscreens w/Louvers as Wide as Openings	0.27
4	Low Sun Angle (LSA) Louvered Sunscreens	0.13
5	Vertical Roller or Shades or Retractable or Drop Arm/Marquisolette or Operable Awnings	0.13
6	Roll Down Blinds or Slats	0.13
7	None (for skylights only)	1.00