



Solar Heat Gain Coefficient Worksheet		WS-3R
Residential		(Page 1 of 2)
Site Address:	Enforcement Agency:	Date:

Items 1 through 4 must be completed for glazing/shading combinations by using the Default Table for Fenestration Products (Table 116-B of the Standards), NFRC certified data, or Solar Heat Gain Coefficients Used for Exterior Shading Attachments (Table S-1 below) for the specific conditions indicated (#1a or #1b or #3).

General Information

1a. For Fenestration Products w/NFRC testing and labels: $SHGC_{fen} =$ _____

OR

1b. For Fenestration Products without NFRC testing and labels (Table 116-B of the Standards): $SHGC_{fen} =$ _____

1c. Frame Type

1d. Product Type

1e. Glazing Type

1f. Single/Double Pane

metal, non-metal,
metal w/thermal break

operable/fixed

(visibly) tinted
clear (not visibly tinted)

single pane/double pane

2. Skylight (Y/N) _____

(A skylight is fenestration mounted on a roof surface at a slope less than 60° from the horizon.)

Combined Exterior Shade with Fenestration

3. $SHGC_{Exterior\ Shade} =$ _____ Exterior Shade Type: _____
(If no exterior shade, assume standard bug screens, $SHGC_{Exterior\ Shade} = 0.76$ for ordinary windows. This requirement does not apply to skylights where $SHGC_{Exterior\ Shade}$ is assumed to be 1.00. If another exterior shade is substituted for bug screens, use one of the values from Table S-1.

4. $[(\text{_____} \times 0.2875) + 0.75] \times \text{_____} =$ Total SHGC
 $SHGC_{max}$ $SHGC_{min}$

Where:

$SHGC_{max}$ = Larger of (#1a or #1b) or #3

$SHGC_{min}$ = Smaller of (#1a or #1b) or #3

Note: Calculated Solar Heat Gain Coefficient values for Total SHGC may be used directly for prescriptive packages.

- Package C Target Value for Total SHGC is 0.40 for Climate Zones 2 through 15
- Package D Target Value for Total SHGC is 0.40 for Climate Zones 2, 4 through 14 and 0.35 in Climate Zone 15
- Package E Target Value for Total SHGC is 0.40 for Climate Zones 2, 3, 5, 6, 8 through 10, and 0.25 in Climate Zones 4, 7, 11, 12, 14, and 15, and 0.30 in Climate Zone 13.

Table S-1: Solar Heat Gain Coefficients Used for Permanently Installed Exterior Shading Attachments for WS-3R^{1,2}

Exterior Shading Device³

With Single Pane
Clear Glass & Metal Framing⁴

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/Drop Arm/Marquisolette and Operable Awnings ²	0.13
6) Roll Down Blinds or Slats	0.13
7) None (for skylights only)	1.00

Notes:

1. These values may be used on line 3 of the Solar Heat Gain Coefficient (SHGC) Worksheet (WS-3R) to calculate exterior shading with other glazing types and combined interior and exterior shading with glazing.
2. Exterior operable awnings (canvas, plastic or metal), except those that roll vertically down and cover the entire window, should be treated as overhangs (use the SHGC equation) for the purposes of compliance with the Standards. See Fixed Shading Devices and Exterior Shading Devices in the Residential compliance Manual, Chapter 3.
3. Standard bug screens must be assumed for all fenestration unless replaced by other exterior shading attachments. The solar heat gain coefficient listed for bug screens is an area-weighted value that assumes that the screens are only on operable windows. The solar heat gain coefficient of any other exterior shade screens applied only to some window areas must be area-weighted with the solar heat gain coefficient

SOLAR HEAT GAIN COEFFICIENT WORKSHEET: RESIDENTIAL

CEC-WS-3R (Revised 08/09)

CALIFORNIA ENERGY COMMISSION



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of standard bug screens for all other glazing (see Form WS-2R). Different shading conditions may also be modeled explicitly in the computer performance method.

4. *Reference glass for determining solar heat gain coefficients is 1/8 inch double strength (DSS) glass.*



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Instructions for WS-3R

The following explains how to calculate solar heat gain coefficients on WS-3R. The number of each item below corresponds to the appropriate item on WS-3R.

Enter either:

- 1a. For products with NFRC testing and labels, enter the product's labeled SHGC as #1a. $SHGC_{fen}$

OR

1b.	Enter the default $SHGC_{fen}$ from Table 116-B of the Standards corresponding to the fenestration characteristics described in entries 1c, 1d, 1e, and 1f. Entries for 1c, 1d, 1e, and 1f are only needed if 1b is entered for $SHGC_{fen}$.
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If 1b is entered, then:

1c	Describe the Frame Type [metal, metal w/thermal break, or non-metal (non-metal includes both vinyl and wood)].
1d	The Product Type (operable or fixed).
1e	The glazing type (tinted or uncoated). Note that tints or coatings that cannot be easily observed by the building official must be classified as "uncoated." Tints must be easily visible to the naked eye.
1f	Single or double pane glazing.

2. For skylights mounted on a roof surface, enter "Y," otherwise enter "N." A skylight is fenestration mounted at a slope less than 60° from the horizon.
3. Describe the exterior shading device in the space provided (e.g., roll down awning). List $SHGC_{Exterior\ Shade}$, the SHGC of the exterior shade with 1/8" clear single pane glass and metal framing, from Table S-1. If a single window or skylight has multiple exterior shades (i.e., shade screens and awnings) use the one shading device with the lower SHGC.

If no exterior shade is proposed, assume standard bug screens with a SHGC of 0.76 (or a SHGC of 1.00 for horizontal glazing). This applies to the full area of fixed fenestration products as well as operable.

4. Calculate $SHGC_{Shade\ Open}$ using values from Items 3 and either 1a or 1b. The result is the combined SHGC of the fenestration product and exterior device with the interior *shade open*.