Solar Heat Gain Through Windows (SHGC Method)

Solar heat gain and conduction heat gain through glazing from its area, solar heat gain coefficient, incident solar irradiance, shading and U-value.

Method: ASHRAE Handbook—Fundamentals; ch. 15 Fenestration (SHGC method)

Input parameters

Unit system: SI

Parameter	Value	Unit
Glazed area	10.000	m²
Solar heat gain coefficient of the glazing	40.000	%
Solar irradiance on the glass	600.00	W/m²
Share not blocked by external shading	100.00	%
U-value of the window	2.8000	W/(m²·K)
Outdoor temperature	35.000	°C
Indoor temperature	24.000	°C

Calculated results

Parameter	Value	Unit
Solar heat gain	2,400.0	W
Conduction heat gain	308.00	W
Total heat gain through the glazing	2,708.0	W

Notes for this case

- Instantaneous gain; the cooling load it causes lags behind as the room stores heat. Irradiance on the glass depends on orientation, hour and site: take it from a solar data source.

Formula and method

$$Q_s = A \cdot SHGC \cdot I \cdot f_s$$

$$Q_c = UA(T_o - T_i), \quad Q = Q_s + Q_c$$

Variables

A	Glazed area	m²
$SHGC$	Solar heat gain coefficient of the glazing	-
I	Solar irradiance on the glass	W/m²
f_s	Share not blocked by external shading	-
U	U-value of the window	W/(m²·K)
T_o	Outdoor temperature	K
T_i	Indoor temperature	K
Q_s	Solar heat gain	W
Q_c	Conduction heat gain	W
Q	Total heat gain through the glazing	W

Method and standards

The ASHRAE solar heat gain coefficient method: solar gain is the irradiance on the glass times the SHGC and the unshaded share; conduction is U A ΔT.

Assumptions and limits

- Instantaneous gain; storage lag not included.

- One SHGC on the total irradiance. ASHRAE splits it into the direct beam (with the angle-dependent SHGC) and diffuse (with the hemispherical SHGC); one value is a simplification.

References

• ASHRAE Handbook—Fundamentals
• ch. 15 Fenestration (SHGC method)

Report details

Report reference	FCC-RJ90-857N (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/hvac/loads/glazing-solar-heat-gain

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.