Solar Water Heater: Collector Area for Daily Hot Water

Collector area of a solar water heater for a daily hot water volume from cold and hot temperatures, daily solar radiation on the collector and system efficiency.

Method: Energy balance A = Q/(ηH); water enthalpies from IAPWS-IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Hot water per day	2,000.0	L
Cold water temperature	20.000	°C
Hot water temperature	60.000	°C
Daily solar radiation on the collector plane (kWh/m² per day) In kWh/m² per day, from your site's radiation data. Data in MJ/m² per day must be divided by 3.6 first.	5.5000	
Average system efficiency	45.000	%

Calculated results

Parameter	Value	Unit
Heat per day	92.725	kWh
Collector area	37.465	m²

Notes for this case

- Size on the radiation of the month you design for; winter needs more area or backup heat.

Formula and method

$$A = \frac{\rho V (h_h - h_c)}{\eta H}$$

Variables

V	Hot water per day	m³
T_c	Cold water temperature	K
T_h	Hot water temperature	K
H	Daily solar radiation on the collector plane, in kWh/m² per day	-
ρ	Density of the cold water (IF97)	kg/m³
h_h, h_c	Enthalpy of the hot and cold water at 3 bar(a) (IF97)	J/kg
η	Average system efficiency	-
Q	Heat per day	J
A	Collector area	m²

Method and standards

Energy balance.

Assumptions and limits

- Daily average.
- H is entered as a number in kWh/m² per day; radiation tables in MJ/m² per day must be divided by 3.6 first, otherwise the area comes out 3.6 times too small.

References

- Energy balance A = Q/(ηH); water enthalpies from IAPWS-IF97

Report details

Report reference	FCC-WEH5-G80E (the same inputs always give the same reference)
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Calculator	Solar Water Heater: Collector Area for Daily Hot Water
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/chillers/solar-water-heater-area

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.