Radiant Ceiling or Panel Heating and Cooling Capacity

Heat flux and capacity of a radiant panel from its surface temperature, the mean radiant temperature, air temperature, emissivity and convection.

Method: Radiant and convective panel exchange

Input parameters

Unit system: SI

Parameter	Value	Unit
Panel surface temperature	18.000	°C
Mean temperature of other surfaces	26.000	°C
Room air temperature	25.000	°C
Panel emissivity	90.000	%
Convective coefficient	2.5000	W/(m²·K)
Active panel area	60.000	m²

Calculated results

Parameter	Value	Unit
Radiant flux (positive: into the panel = cooling)	41.996	W/m²
Convective flux	17.500	W/m²
Total flux	59.496	W/m²
Panel capacity	3.5698	kW
Radiant share	70.586	%

Notes for this case

• q_r = εσ(AUST⁴ − T_p⁴), q_c = h_c(T_a − T_p); positive values are heat into the panel (cooling the room), negative values heating. Cooled ceilings reach about 60–100 W/m², limited by the dew point (keep the surface 1–2 K above it); heated ceilings about 100–150 W/m². h_c is small for heated ceilings (about 0.2–1 W/(m²·K)) and larger for cooled ceilings (about 2–3).

Formula and method

$$q = \varepsilon\sigma\left(T_{AUST}^4 - T_p^4\right) + h_c(T_a - T_p)$$

Variables

T_p	Panel surface temperature	K
T_{AUST}	Mean temperature of other surfaces	K
T_a	Room air temperature	K
ε	Panel emissivity	-
h_c	Convective coefficient	W/(m²·K)
A	Active panel area	m²
q_r	Radiant flux (positive: into the panel = cooling)	W/m²
q_c	Convective flux	W/m²
q	Total flux	W/m²
$\dot{Q}$	Panel capacity	W
q_r/q	Radiant share	-

Method and standards

Radiant panels.

Assumptions and limits

- Panel sees the room as one grey surface at AUST.

References

Radiant and convective panel exchange

Report details

Report reference	FCC-132X-3BM7 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Radiant Ceiling or Panel Heating and Cooling Capacity
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/radiant-panel-capacity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.