Cooling Coil Load (Sensible, Latent, Total)

Total, sensible and latent load of an air cooling coil from air flow and the entering and leaving states, with sensible heat ratio and condensate flow.

Method: ASHRAE Handbook—Fundamentals ch. 1 Psychrometrics

Input parameters

Unit system: SI

Parameter	Value	Unit
Air flow (at the entering state)	10,000	m³/h
Entering dry bulb	27.000	°C
Entering relative humidity	55.000	%
Leaving dry bulb	13.000	°C
Leaving relative humidity	92.000	%
Barometric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Total coil load	76.129	kW
Sensible load	45.835	kW
Latent load	30.294	kW
Sensible heat ratio	60.207	%
Condensate	42.748	kg/h
Dry-air mass flow	11,533	kg/h

Formula and method

$$\dot{m}_{da} = \frac{\dot{V}}{v_1} \qquad \dot{Q}_t = \dot{m}_{da}(h_1 - h_2) \qquad \dot{Q}_s = \dot{m}_{da}\,[h(T_1, W_2) - h_2] \qquad \dot{Q}_l = \dot{Q}_t - \dot{Q}_s$$

$$SHR = \frac{\dot{Q}_s}{\dot{Q}_t}\ (1 \text{ when } \dot{Q}_t = 0) \qquad \dot{m}_c = \dot{m}_{da} \max(W_1 - W_2,\ 0)$$

Variables

$\dot{V}$	air flow at entering state	m³/s
T_1	entering dry bulb	K
φ_1	entering RH	–
T_2	leaving dry bulb	K
φ_2	leaving RH	–
p	barometric pressure	Pa
$\dot{Q}_t$	total load	W
$\dot{Q}_s$	sensible load	W
$\dot{Q}_l$	latent load	W
SHR	sensible heat ratio	–
$\dot{m}_c$	condensate	kg/s
$\dot{m}_{da}$	dry-air flow	kg/s

h_1, h_2	entering and leaving enthalpy	J/kg
W_1, W_2	humidity ratios	kg/kg
v_1	entering specific volume	m³/kg

Method and standards

Steady-flow energy and moisture balance on dry air with ASHRAE moist-air enthalpy; the enthalpy of the condensate (about 1 % of the load) is neglected.

Assumptions and limits

- Condensate enthalpy neglected; leaving air at or below saturation.

References

• ASHRAE Handbook—Fundamentals ch. 1 Psychrometrics

Report details

Report reference	FCC-QEWN-CRSR (the same inputs always give the same reference)
Generated	17 November 2026, 19:45 UTC
Calculator	Cooling Coil Load (Sensible, Latent, Total)
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 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/cooling-coil-load

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.