Operative Temperature from Air and Mean Radiant Temperature

Operative temperature felt by a person from air temperature and mean radiant temperature, weighted by the convective and radiative heat transfer coefficients.

Method: Operative temperature as the h-weighted mean of air and mean radiant temperatures (ASHRAE Handbook—Fundamentals ch. 9)

Input parameters

Unit system: SI

Parameter	Value	Unit
Air temperature	26.000	°C
Mean radiant temperature	36.000	°C
Convective coefficient	3.1000	W/(m²·K)
Radiative coefficient	4.7000	W/(m²·K)

Calculated results

Parameter	Value	Unit
Operative temperature	32.026	°C
Simple average (low air speed)	31.000	°C

Notes for this case

- Near hot surfaces (boiler casings, furnaces) the radiant temperature, not the air, makes it feel hot.

Formula and method

$$T_o = \frac{h_c T_a + h_r \bar{T}_r}{h_c + h_r}$$

Variables

T_a	Air temperature	K
$\bar{T}_r$	Mean radiant temperature	K
h_c	Convective coefficient	W/(m²·K)
h_r	Radiative coefficient	W/(m²·K)
T_o	Operative temperature	K
T_{avg}	Simple average (low air speed)	K

Method and standards

Weighted mean.

Assumptions and limits

- Steady exposure.

References

- Operative temperature as the h-weighted mean of air and mean radiant temperatures (ASHRAE Handbook—Fundamentals ch. 9)

Report details

Report reference	FCC-V1SD-ZAWR (the same inputs always give the same reference)
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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/loads/operative-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.