Adaptive Thermal Comfort Temperature from Outdoor Temperature

Optimum indoor operative temperature and acceptable range for naturally ventilated buildings from the running mean outdoor temperature (adaptive model).

Method: Adaptive comfort model (de Dear and Brager; Nicol and Humphreys); CIBSE Guide A; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Adaptive model	European form: 0.33·θ_rm + 18.8	
Mean outdoor temperature yesterday	22.000	°C
Two days ago	21.000	°C
Three days ago	20.000	°C
Four days ago	19.000	°C
Five days ago	20.000	°C
Six days ago	18.000	°C
Seven days ago	17.000	°C
Acceptable band half-width	3.0000	K

Calculated results

Parameter	Value	Unit
Running mean outdoor temperature	20.289	°C
Optimum comfort temperature	25.496	°C
Lower acceptable limit	22.496	°C
Upper acceptable limit	28.496	°C

Notes for this case

• Running mean (θ_ed−1 + 0.8θ_ed−2 + 0.6θ_ed−3 + 0.5θ_ed−4 + 0.4θ_ed−5 + 0.3θ_ed−6 + 0.2θ_ed−7)/3.8, used for both forms. For occupants who can open windows and adapt clothing; not for mechanically cooled buildings. Bands of about ±2, ±3 and ±4 K correspond to high, normal and moderate expectation.

Formula and method

$$\theta_{rm} = \frac{\theta_{ed-1} + 0.8\theta_{ed-2} + \ldots + 0.2\theta_{ed-7}}{3.8}, \quad \theta_c = 0.33\theta_{rm} + 18.8$$

Variables

model	Adaptive model	-
θ_{ed-1}	Mean outdoor temperature yesterday	K
θ_{ed-2}	Two days ago	K
θ_{ed-3}	Three days ago	K
θ_{ed-4}	Four days ago	K
θ_{ed-5}	Five days ago	K
θ_{ed-6}	Six days ago	K
θ_{ed-7}	Seven days ago	K

$\pm\Delta$	Acceptable band half-width	K
θ_{rm}	Running mean outdoor temperature	K
θ_c	Optimum comfort temperature	K
θ_{low}	Lower acceptable limit	K
θ_{up}	Upper acceptable limit	K

Method and standards

Adaptive model.

Assumptions and limits

- Sedentary occupants with adaptive opportunities.

References

Adaptive comfort model (de Dear and Brager; Nicol and Humphreys), CIBSE Guide A, Environmental Design (CIBSE)

Report details

Report reference	FCC-TP8D-3G6E (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Adaptive Thermal Comfort Temperature from Outdoor Temperature
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/adaptive-comfort-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.