Reference Evapotranspiration ET_0 (FAO-56 Penman–Monteith)

Daily reference crop evapotranspiration by the FAO-56 Penman–Monteith equation from temperatures, humidity, wind, solar radiation, altitude, latitude and date.

Method: FAO-56 Penman–Monteith reference evapotranspiration

Input parameters

Unit system: SI

Parameter	Value	Unit
Maximum air temperature	33.000	°C
Minimum air temperature	21.000	°C
Maximum relative humidity	80.000	%
Minimum relative humidity	35.000	%
Mean wind speed at 2 m	2.5000	m/s
Solar radiation	24.000	MJ/(m²·d)
Altitude above sea level	300.00	m
Latitude (south negative)	18.000	°
Day of the year (1–366)	120.00	

Calculated results

Parameter	Value	Unit
Reference evapotranspiration	6.4147	mm/d
Extraterrestrial radiation	38.708	MJ/(m²·d)
Net radiation	14.000	MJ/(m²·d)
Vapour pressure deficit	1.8835	kPa
Slope of the vapour pressure curve	0.20916	
Psychrometric constant (kPa/°C)	0.065039	

Notes for this case

- FAO-56 daily Penman–Monteith for a 0.12 m grass reference crop (albedo 0.23), soil heat flux neglected for daily steps. Crop water use is ET_0 times the crop coefficient K_c.

Formula and method

$$ET_0 = \frac{0.408\Delta(R_n - G) + \gamma\frac{900}{T+273}u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

Variables

T_{max}	Maximum air temperature	K
T_{min}	Minimum air temperature	K
RH_{max}	Maximum relative humidity	-
RH_{min}	Minimum relative humidity	-
u_2	Mean wind speed at 2 m	m/s
R_s	Solar radiation	W/m²
z	Altitude above sea level	m

φ	Latitude (south negative)	rad
J	Day of the year (1–366)	-
ET_0	Reference evapotranspiration	m/s
R_a	Extraterrestrial radiation	W/m²
R_n	Net radiation	W/m²
$e_s - e_a$	Vapour pressure deficit	Pa
Δ	Slope of the vapour pressure curve	-
γ	Psychrometric constant (kPa/°C)	-

Method and standards

FAO-56 Penman–Monteith equation.

Assumptions and limits

- Daily time step, well-watered reference grass, weather measured at 2 m.

References

FAO-56 Penman–Monteith reference evapotranspiration

Report details

Report reference	FCC-VVAC-YA1A (the same inputs always give the same reference)
Generated	23 November 2026, 17:42 UTC
Calculator	Reference Evapotranspiration ET_0 (FAO-56 Penman–Monteith)
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/civil/hydraulics/reference-evapotranspiration-fao56

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.