# Reference Evapotranspiration by Hargreaves (Temperature Method)

Reference crop evapotranspiration from daily maximum and minimum temperature and extraterrestrial radiation computed for the latitude and day of year.

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Daily maximum temperature | 35.000 | °C |
| Daily minimum temperature | 20.000 | °C |
| Latitude (north positive) | 19.000 | ° |
| Day of the year | 135.00 | |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Extraterrestrial radiation | 39.169 | MJ/m² |
| Reference evapotranspiration (mm per day) | 6.4488 | |
| Inverse relative earth–sun distance | 0.97743 | |
| Solar declination | 18.840 | ° |

**Notes for this case**

• Hargreaves' equation $ET_0$ = 0.0023 × 0.408 R_a (T_mean + 17.8)√(T_max − T_min) needs only temperatures, using the daily temperature range as a stand-in for sunshine and humidity. R_a is computed as in FAO-56 from latitude and day of year (R_a in MJ/m² per day; 0.408 converts it to mm of evaporation). It is a good fallback when humidity, wind and sunshine are missing, but over-predicts in humid climates and under-predicts in windy ones; prefer Penman–Monteith when the data exist.

## Formula and method

$$ET_0 = 0.0023 \times 0.408\, R_a \left(\frac{T_{max} + T_{min}}{2} + 17.8\right) \sqrt{T_{max} - T_{min}}$$

### Variables

| | | |
|---|---|---|
| $T_{max}$ | Daily maximum temperature | K |
| $T_{min}$ | Daily minimum temperature | K |
| $\varphi$ | Latitude (north positive) | rad |
| $J$ | Day of the year | - |
| $R_a$ | Extraterrestrial radiation | J/m² |
| $ET_0$ | Reference evapotranspiration (mm per day) | - |
| $d_r$ | Inverse relative earth–sun distance | - |
| $\delta$ | Solar declination | rad |

### Method and standards

Hargreaves $ET_0$.

### Assumptions and limits

- Daily or monthly average temperatures.

## Report details

| | |
|---|---|
| Report reference | FCC-C0MH-4G85 (the same inputs always give the same reference) |
| Generated | 23 November 2026, 17:35 UTC |
| Calculator | Reference Evapotranspiration by Hargreaves (Temperature Method) |
| 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/irrigation-farm/hargreaves-et0

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.