Well Yield by the Thiem Equation (Confined and Unconfined)

Steady yield of a pumped well in a confined or unconfined aquifer from permeability, aquifer thickness, drawdown, well radius and radius of influence (Thiem).

Method: Thiem (1906) steady radial flow; Dupuit–Forchheimer for unconfined aquifers; Sichardt radius of influence (empirical)

Input parameters

Unit system: SI

Parameter	Value	Unit
Aquifer	Unconfined (water table)	
Hydraulic conductivity	2.0000e-04	m/s
Aquifer thickness (confined) or saturated thickness (unconfined)	20.000	m
Drawdown at the well	4.0000	m
Well radius	150.00	mm
Radius of influence	300.00	m
Confined only: static head above the top of the aquifer (0 = not checked)	0	m

Calculated results

Parameter	Value	Unit
Well yield	42.853	m³/h
Sichardt estimate of the radius of influence 3000 s √K	169.71	m

Notes for this case

- Sichardt's estimate (s in m, K in m/s) is a rough empirical guide; a pumping test gives the real radius.

Formula and method

$$Q = \frac{2\pi K b s_w}{\ln(R/r_w)} \ \text{(confined)}, \quad Q = \frac{\pi K (H^2 - h_w^2)}{\ln(R/r_w)} \ \text{(unconfined)}$$

Variables

$\mathrm{aquifer}$	Aquifer	-
K	Hydraulic conductivity	m/s
b/H	Aquifer thickness (confined) or saturated thickness (unconfined)	m
s_w	Drawdown at the well	m
r_w	Well radius	m
R	Radius of influence	m
h_c	Confined: static head above the top of the aquifer (0 = not checked)	m
h_w	Unconfined: water depth in the well, H − s_w	m
Q	Well yield	m³/s
R_S	Sichardt estimate of the radius of influence 3000 s √K	m

Method and standards

Radial steady flow.

Assumptions and limits

- The confined equation holds only while the water level stays above the top of the aquifer. Enter the static head above the aquifer top to have the page warn when the drawdown exceeds it.
- Steady, homogeneous, fully penetrating well.

References

• Thiem (1906) steady radial flow; Dupuit–Forchheimer for unconfined aquifers; Sichardt radius of influence (empirical)

Report details

Report reference	FCC-T2SK-5EXN (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Well Yield by the Thiem Equation (Confined and Unconfined)
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/civil/hydraulics/well-yield-thiem

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.