Permeability: Constant-Head and Falling-Head Tests

Coefficient of permeability (hydraulic conductivity) from a constant-head test (volume, time, head) or a falling-head test (heads, time, tube and sample areas).

Method: Darcy's law: constant-head k = QL/(Aht); falling-head k = (aL/At) ln(h₁/h₂) (ASTM D2434; IS 2720 Part 17)

Input parameters

Unit system: SI

Parameter	Value	Unit
Test	Falling head	
Sample length	120.00	mm
Sample cross-section	78.500	cm²
Volume collected (constant head)	500.00	mL
Head difference (constant head)	0.50000	m
Standpipe area (falling head)	0.78500	cm²
Initial head	1.0000	m
Final head	0.50000	m
Time	600.00	s

Calculated results

Parameter	Value	Unit
Coefficient of permeability	1.3863e-06	m/s

Notes for this case

- Constant head suits sands and gravels; falling head suits silts and clays.

Formula and method

$$k = \frac{QL}{Aht} \quad \text{or} \quad k = \frac{aL}{At} \ln \frac{h_1}{h_2}$$

Variables

test	Test	-
L	Sample length	m
A	Sample cross-section	m²
Q	Volume collected (constant head)	m³
h	Head difference (constant head)	m
a	Standpipe area (falling head)	m²
h_1	Initial head	m
h_2	Final head	m
t	Time	s
k	Coefficient of permeability	m/s

Method and standards

Darcy's law.

Assumptions and limits

- Saturated laminar flow.

References

- Darcy's law: constant-head k = QL/(Aht); falling-head k = (aL/At) ln(h₁/h₂) (ASTM D2434; IS 2720 Part 17)

Report details

Report reference	FCC-TZ5E-ACTP (the same inputs always give the same reference)
Generated	17 November 2026, 19:48 UTC
Calculator	Permeability: Constant-Head and Falling-Head Tests
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 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/geotechnical/permeability-lab-test

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.