Hydrometer Analysis: Particle Diameter by Stokes' Law

Equivalent particle diameter at a hydrometer reading time from effective depth, water viscosity and solids specific gravity by Stokes' law, and the percent finer.

Method: Stokes' law sedimentation analysis

Input parameters

Unit system: SI

Parameter	Value	Unit
Effective depth	140.00	mm
Time since start	30.000	min
Water viscosity at test temperature	1.0000	mPa·s
Specific gravity of solids	2.7000	
Corrected hydrometer reading (g/L)	18.000	
Dry soil mass in 1 L suspension (g)	50.000	

Calculated results

Parameter	Value	Unit
Settling velocity	0.077778	mm/s
Equivalent particle diameter	9.1639	µm
Percent finer than D	57.176	%

Notes for this case

• Stokes: D = √[18ηv/((G_s − 1)ρ_wg)] with v = L/t, L the effective depth from the hydrometer calibration at that reading. Percent finer for a 152H-type hydrometer reading in g/L: P = [G_s/(G_s − 1)]·R_c/W_s, with R_c already corrected for temperature, meniscus and dispersant. Valid for about 0.2–50 µm.

Formula and method

$$D = \sqrt{\frac{18\eta L/t}{(G_s - 1)\rho_w g}}, \quad P = \frac{G_s}{G_s - 1}\frac{R_c}{W_s}$$

Variables

L	Effective depth	m
t	Time since start	s
η	Water viscosity at test temperature	Pa·s
G_s	Specific gravity of solids	-
R_c	Corrected hydrometer reading (g/L)	-
W_s	Dry soil mass in 1 L suspension (g)	-
v	Settling velocity	m/s
D	Equivalent particle diameter	m
P	Percent finer than D	-

Method and standards

Hydrometer.

Assumptions and limits

- Spherical particles; laminar settling; dilute suspension.

References

Stokes' law sedimentation analysis

Report details

Report reference	FCC-VCBS-2CGX (the same inputs always give the same reference)
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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/hydrometer-particle-size

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Reopens the calculator with the inputs of this report.