Discrete Particle Removal in an Ideal Settling Basin

Fraction of particles removed in an ideal sedimentation basin from a settling-velocity distribution of up to eight classes and the overflow rate.

Input parameters

Unit system: SI

Parameter	Value	Unit
Overflow rate (critical velocity)	1.2000	m/h
Width of each velocity class	0.50000	m/h
Particles in class 1 (lowest velocities)	30.000	
Particles in class 2	50.000	
Particles in class 3	90.000	
Particles in class 4	110.00	
Particles in class 5	100.00	
Particles in class 6	70.000	
Particles in class 7	30.000	
Particles in class 8	20.000	

Calculated results

Parameter	Value	Unit
Fraction of particles removed	91.500	%
Particles in	500.00	
Particles removed	457.50	
Particles remaining in the effluent	42.500	

Notes for this case

• Classes run from zero upwards in equal steps; each is represented by its mid-point velocity. Particles faster than the overflow rate are all removed; slower ones in the ratio v/v_c (Hazen's ideal basin). Real basins remove less because of turbulence, short-circuiting and density currents.

Formula and method

$$R = \frac{\sum_i \min\left(1, \frac{v_{n_i}}{v_c}\right) n_i}{\sum_i n_i}$$

Variables

v_c	Overflow rate (critical velocity)	m/s
Δv	Width of each velocity class	m/s
n_1	Particles in class 1 (lowest velocities)	-
n_2	Particles in class 2	-
n_3	Particles in class 3	-
n_4	Particles in class 4	-
n_5	Particles in class 5	-
n_6	Particles in class 6	-
n_7	Particles in class 7	-
n_8	Particles in class 8	-

R	Fraction of particles removed	-
$\sum n_i$	Particles in	-
$\sum n_r$	Particles removed	-
$\sum n_e$	Particles remaining in the effluent	-

Method and standards

Ideal (Hazen) settling basin for discrete particles.

Assumptions and limits

- Discrete, non-flocculating particles; quiescent ideal basin.

Report details

Report reference	FCC-R9YF-7KPR (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/environmental/wastewater/ideal-settling-removal-distribution

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.