Plate (Lamella) Settler: Critical Settling Velocity by Flow Pattern

Fluid velocity between inclined plates and the smallest settling velocity fully removed for counter-current, co-current or cross-flow plate settlers.

Input parameters

Unit system: SI

Parameter	Value	Unit
Flow pattern	Co-current (downflow)	
Plate length in the flow direction	2.0000	m
Perpendicular spacing between plates	50.000	mm
Plate angle from horizontal	75.000	°
Flow to the plate pack	360.00	m³/h
Plate width	2.0000	m
Number of plate channels	50.000	

Calculated results

Parameter	Value	Unit
Mean fluid velocity between the plates	20.000	mm/s
Critical settling to fluid velocity ratio	0.10653	
Critical settling velocity (smallest fully removed)	7.6703	m/h
Projected (horizontal) plate area	51.764	m²
Loading on the projected area	6.9547	m/h

Notes for this case

• Laminar flow with uniform velocity between plates. Angles of 55–60° are used so the sludge slides off; keep the channel Reynolds number below about 2,000 and expect real performance below the ideal value because of uneven flow distribution.

Formula and method

$$\frac{v_s}{v_f} = \frac{d}{L_p \cos\theta + d\sin\theta}\ (\mathrm{counter-current}),\quad \frac{d}{L_p \cos\theta - d\sin\theta}\ (\mathrm{co-current}),\quad \frac{d}{L_p \cos\theta}\ (\mathrm{cross-flow})$$

$$v_f = \frac{Q}{nwd}$$

Variables

flow	Flow pattern	-
L_p	Plate length in the flow direction	m
d	Perpendicular spacing between plates	m
θ	Plate angle from horizontal	rad
Q	Flow to the plate pack	m³/s
w	Plate width	m
n	Number of plate channels	-
v_f	Mean fluid velocity between the plates	m/s
v_s/v_f	Critical settling to fluid velocity ratio	-
v_s	Critical settling velocity (smallest fully removed)	m/s

A_p	Projected (horizontal) plate area	m²
Q/A_p	Loading on the projected area	m/s

Method and standards

Ideal-settling trajectory analysis between parallel inclined plates.

Assumptions and limits

- Laminar, uniform flow; discrete particles.

Report details

Report reference	FCC-9QKS-55G1 (the same inputs always give the same reference)
Generated	23 November 2026, 17:34 UTC
Calculator	Plate (Lamella) Settler: Critical Settling Velocity by Flow Pattern
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/environmental/drinking-water/plate-settler-design

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.