Gravity Thickener for Combined Primary and Waste Activated Sludge

Dry solids of two sludge streams, combined flow and concentration, thickener area from the solids loading, hydraulic loading and diameter of each unit.

Input parameters

Unit system: SI

Parameter	Value	Unit
Primary sludge flow	150.00	m³/d
Primary sludge specific gravity	1.0200	
Primary sludge solids	4.0000	%
Waste activated sludge flow	0	m³/d
WAS specific gravity	1.0000	
WAS solids	0	%
Combined sludge specific gravity	1.0200	
Solids loading	120.00	kg/(m²·d)
Number of thickeners	1.0000	

Calculated results

Parameter	Value	Unit
Primary dry solids	6,120.0	kg/d
WAS dry solids	0	kg/d
Combined dry solids	6,120.0	kg/d
Combined flow	150.00	m³/d
Combined solids	4.0000	%
Total area	51.000	m²
Hydraulic loading	2.9412	m/d
Diameter of each thickener	8.0582	m

Notes for this case

• The solids loadings: primary sludge 100-150 kg/m²·d, waste activated alone 20-40, primary plus WAS at 0.5-1.5 % solids 25-70. Hydraulic loadings below about 15-30 m³/m²·d risk septic, odorous conditions; add dilution water if needed. Units over 20 m diameter are unusual.

Formula and method

$$M_i = Q_i\, SG_i\, \rho_w\, P_i, \quad P = \frac{M_1 + M_2}{(Q_1 + Q_2) SG_m \rho_w}, \quad A = \frac{M}{SL}, \quad D = \sqrt{\frac{4A}{n\pi}}$$

Variables

Q_1	Primary sludge flow	m³/s
SG_1	Primary sludge specific gravity	-
P_1	Primary sludge solids	-
Q_2	Waste activated sludge flow	m³/s
SG_2	WAS specific gravity	-

P_2	WAS solids	-
SG_m	Combined sludge specific gravity	-
SL	Solids loading	kg/(m²·s)
n	Number of thickeners	-
M_1	Primary dry solids	kg/s
M_2	WAS dry solids	kg/s
M	Combined dry solids	kg/s
Q	Combined flow	m³/s
P	Combined solids	-
A	Total area	m²
HL	Hydraulic loading	m/s
D	Diameter of each thickener	m

Method and standards

Solids-loading design of gravity thickeners.

Assumptions and limits

- Typical-value design; settling tests are better.

Report details

Report reference	FCC-0B1W-5DVV (the same inputs always give the same reference)
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Calculator	Gravity Thickener for Combined Primary and Waste Activated Sludge
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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/gravity-thickener-design

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.