Domestic Sewage Treatment Plant (STP) Sizing

Sewage flow, BOD load and the volumes and areas of equalisation, aeration and settling tanks for a building or township STP of the extended-aeration type.

Method: Flow; load and detention-time sizing of a package STP

Input parameters

Unit system: SI

Parameter	Value	Unit
Population served	1,000.0	
Water supply per person per day (litres)	135.00	
Share of water returned as sewage	80.000	%
Peak factor	3.0000	
Raw sewage BOD	250.00	mg/L
Equalisation storage	8.0000	h
Aeration tank detention time	18.000	h
Settling tank surface loading	15.000	m/d

Calculated results

Parameter	Value	Unit
Average sewage flow	108.00	m³/d
Peak flow	13.500	m³/h
BOD load	27.000	kg/d
Equalisation tank volume	36.000	m³
Aeration tank volume	81.000	m³
Settling tank area	7.2000	m²

Notes for this case

• About 80 % of the water supplied returns as sewage. Peak flows of 2.5–3.5 times average are smoothed in an equalisation tank holding several hours of flow. An extended-aeration tank with 16–24 h detention gives a low sludge yield and stable treatment; the settling tank is sized on the average surface loading (about 12–20 m³/m² per day) and checked at peak. BOD load (flow × concentration) sets the air demand. Confirm with the local discharge standards and the regulator's design norms.

Formula and method

$$Q = Nqf_s, \quad V_{eq} = Qt_{eq}, \quad V_a = Qt_a, \quad A_s = \frac{Q}{v_o}$$

Variables

N	Population served	-
q	Water supply per person per day (litres)	-
f_s	Share of water returned as sewage	-
k_p	Peak factor	-
BOD	Raw sewage BOD	kg/m³
t_{eq}	Equalisation storage	s
t_a	Aeration tank detention time	s
v_o	Settling tank surface loading	m/s
Q	Average sewage flow	m³/s

Q_p	Peak flow	m³/s
L_{BOD}	BOD load	kg/s
V_{eq}	Equalisation tank volume	m³
V_a	Aeration tank volume	m³
A_s	Settling tank area	m²

Method and standards

STP sizing.

Assumptions and limits

- Extended-aeration process; steady average flow.

References

Flow, load and detention-time sizing of a package STP

Report details

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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/domestic-stp-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.