Cascade Post-aeration Height for a Dissolved Oxygen Target

Height of a step cascade that raises dissolved oxygen in treated effluent from its initial to its required value, by Barrett's deficit-ratio equation.

Input parameters

Unit system: SI

Parameter	Value	Unit
Dissolved oxygen saturation at the water temperature	10.070	mg/L
Dissolved oxygen entering	2.0000	mg/L
Required final dissolved oxygen	7.0000	mg/L
Water temperature	15.000	°C
Water quality factor (0.8 treated effluent)	0.80000	
Weir geometry factor	Free weir, 1.0	
Step height	0.25000	m

Calculated results

Parameter	Value	Unit
Deficit ratio	2.6287	
Cascade height	3.3369	m
Number of steps	14.000	

Notes for this case

- Design for the warmest water: saturation falls with temperature, so the deficit ratio and the height rise. The typical cascades are 2-5 m high with 150-300 mm steps.

Formula and method

$$R = \frac{C_s - C_o}{C_s - C}, \quad H = \frac{R - 1}{0.361\, ab(1 + 0.046T)}$$

Variables

C_s	Dissolved oxygen saturation at the water temperature	kg/m³
C_o	Dissolved oxygen entering	kg/m³
C	Required final dissolved oxygen	kg/m³
T	Water temperature	K
a	Water quality factor (0.8 treated effluent)	-
b	Weir geometry factor	-
h_s	Step height	m
R	Deficit ratio	-
H	Cascade height	m
N	Number of steps	-

Method and standards

Barrett's cascade aeration equation (SI form).

Assumptions and limits

- Empirical; T in °C.

Report details

Report reference	FCC-FDEC-AET1 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Cascade Post-aeration Height for a Dissolved Oxygen Target
Method last reviewed	17 November 2026
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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/cascade-postaeration-height

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.