Dual-media Filter: Anthracite Size to Avoid Intermixing

Effective size of the upper filter medium that settles at the same rate as the lower medium, so dual-media layers stay separate after backwash.

Input parameters

Unit system: SI

Parameter	Value	Unit
Effective size of the lower (heavier) medium	0.45000	mm
Specific gravity of the lower medium (sand 2.65)	2.6500	
Specific gravity of the upper medium (anthracite 1.7)	1.5000	
Water specific gravity	1.0000	

Calculated results

Parameter	Value	Unit
Effective size of the upper medium	0.99784	mm
Size ratio	2.2174	

Notes for this case

- Equal settling in the intermediate flow regime gives the 0.667 exponent. Choosing a slightly larger anthracite keeps a sharper interface; some intermixing at the boundary is acceptable and even helpful.

Formula and method

$$d_1 = d_2 \left(\frac{\rho_2 - \rho_w}{\rho_1 - \rho_w} \right)^{0.667}$$

Variables

d_2	Effective size of the lower (heavier) medium	m
SG_2	Specific gravity of the lower medium (sand 2.65)	-
SG_1	Specific gravity of the upper medium (anthracite 1.7)	-
SG_w	Water specific gravity	-
d_1	Effective size of the upper medium	m
d_1/d_2	Size ratio	-

Method and standards

Equal settling velocity of the two media.

Assumptions and limits

- Intermediate settling regime.

Report details

Report reference	FCC-BBRS-J251 (the same inputs always give the same reference)
Generated	23 November 2026, 17:42 UTC
Calculator	Dual-media Filter: Anthracite Size to Avoid Intermixing
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/wastewater/dual-media-filter-intermixing-size

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.