

Sand Filter Calculations

Known Items:	Diameter	Height
30 gal drum	19.5	29.5
55 gal drum	23.75	34.5

play sand	\$ 3.47
filter sand	\$ 5.48
size-cu.ft.	0.5

(for 50 lb bag)

Cylinder Choice	
Choose if cylinder or rectangle	cylinder

	Diameter	Height	
Enter cylinder dimensions	23.75	34.5	inches

Rectangle Choice			
	length	width	height

Enter rectangle				inches
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Choices Regardless of Shape	
Choose head height	10

Enter size of gravel bag	0.5	price:	\$ 3.47	each
Enter size of sand bag	0.5	price:	\$ 5.48	each

Choose sand Type	filter sand
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Enter data in green cells only
Blue cells are results of calculations
Yellow cells are known data and constants

Calculating safe daily flow rate	
Enter maximum need	300 gal/day

Required sq.ft.	0.85	sq.ft for Maximum flow
	1.70	sq.ft for minimum flow

Chosen sq. ft.	3.08	safe
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There is no lower limit on flow. Lower is better.

Material List Derived from Choices:

Materials		
Number of gravel bags:	2	Sieving play sand is hard labor Play sand has loss from sieving it. Filter sand is cleaner and more uniform Filter sand should be used if possible
Number of sand bags:	10	
Cost of gravel:	\$ 6.94	
Cost of sand:	\$ 54.80	
Total media cost:	\$ 61.74	

Range of safe flows				
Low flow	15.10	Gal/hr	0.25	Gal/min
Maximum flow	22.65	Gal/hr	0.38	Gal/min
Low flow	60.4	quarts/hr	32.2	oz/min
Maximum flow	90.6	quarts/hr	48.3	oz/min
Do not exceed maximum flow rates!				

Media Depth:	24.5	inches
Tap height from bottom:	26	inches
Head in ft:	0.83	inches
pressure:	0.36	PSI

Minimum media safe height:	15.75	safe
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Capacity check-low flow:	362.4	adequate
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Yield of Filter	
362.4	Gal/day
543.6	Gal/day

Slow Sand Filter Calculations

Enter parameters in the green cells. Gold cells are constants.

liters/sq.meters		
low flow	maximum	Safe limits
200	300	liters/msq/hr
4.9	7.4	gals/sq. ft/hr
0.08	0.12	gals/min/sq.ft
117.8	176.7	gals/day/sq.ft

10.7639	sq. ft	0.264172	gals	1 meter=	3.28084	ft.	0.433	ft head to psi
2.30665	psi /ft		from head	3.7854	Liter / gal			

Enter dimensions of filter to calculate:

Diameter in feet	sq. ft surface	
1.98	3.08	sq. ft.
length		
0	0	0

safe media depth	
0.73	0.4

Best	Minimum	
2.4	1.3	feet
28.7	15.7	inches

**(not recommended)
for contaminated
water sources**

Safe flow rate: round rectangle

gals/hr low flow	15.1	0.0
gals/hr max flow	22.7	0.0
gals/min low flow	0.3	0.0
gals/min max flow	0.4	0.0
gals/day low flow	362.4	0.0
gals/day max flow	543.6	0.0
Calculate desired size of filter		
Desired flow/day		Liters
300	gals/day	1135.62
0.85	sq. ft. high	
1.70	sq. ft. low	

Total height:	2.88	feet
inches:	34.5	inches

Low flow is better, but it is not the minimum rate.

The slower the better filtration. The max are safety limits and not design requirements. **DO NOT**

Exceed the maximum rate!

head height:	Best	Minimum	feet
	0.5	1.6	
	5.8	18.8	inches

Isn't your labor to sieve bags of sand worth spending slightly more for filter sand? Filter sand is already graded to be used in a water filter.

Chosen head:	10	inches
media depth:	24.5	inches
tap depth:	26	inches from bottom
Head in ft:	0.83	ft.
pressure:	0.36	psi

Calculate feet from inches:

29.5	inches =	2.46	feet
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Calculate media

Gravel	1.00	cu.ft.	0.5	cu.ft/bag	\$ 3.47	2	\$ 6.94
Sand	5	cu.ft.	0.5	cu.ft/bag			
Bags	10	bags					
play sand (loss)	12.5	bags	\$ 3.47	\$ 43.38			
filter sand (no loss)	10	bags	\$ 5.48	\$ 54.80	diff:	\$ 11.43	

Home Depot costs

sand chosen	\$ 5.48
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