MEDIA FILTER CALCULATOR

These calculators size the area of the media filter system needed to treat the Water Quality Volume (WQv) or the Water Quality Flow Rate (WQf).

Input cell =		User enters value
Default value =		User should only change value if able to provide explanation for adjustment
Calculation cell =		User should not change cell

CALCULATOR

Media Filter Calculator - by Water Quality Volume

1	Water Quality Volume - WQv	2500	cubic feet
2	Sedimentation Chamber for Pretreatment?	Yes	pretreatment is highly recommended
3	Desired WQv Drawdown Time	24	hours (recommend 24 to 48)
4	Depth of Filter Media - d	1.5	feet (recommend 1.5 ft)
5	Porosity of Filter Media - n	0.35	recommend 0.35
	Hydraulic Conductivity of Filter Media - k	2	in/hr (recommend design value of 2 for sand, 1 if no pretreatment)
6	Max Ponding Depth above Filter - Pd	1	feet (typically 0.5 to 2 ft)
7	Fill Time - T	1	hours (0-2 hours, recommend 1)

8	**Minimum Filter Area Calculator**	**469**	square feet
9	Volume Stored in Filter Chamber	573	cubic feet
	Required Storage Volume in Sed Chamber	1,927	cubic feet (Sedimentation chamber must store remaining WQv)
10	Sed Chamber - Live Volume Storage Depth	2.0	feet (typically 1 to 3 feet)
11	**Sed Chamber - Area Calculator**	**964**	square feet

12	Area Draining to Filter	25,000	square feet
13	Sizing Ratio (BMP Area/Drainage Area)	5.7%	typically 3 to 6% of the impervious drainage area

14	Calculated WQv Drain Time	24	hours (if less than desired drawdown time, install outlet control)
15	Ave. Discharge Rate for Desired Drain Time	13	gpm (discharge rate through underdrain system)

Media Filter Calculator - by Water Quality Flow Rate

16	Water Quality Flow - WQf	0.1	cubic feet per second (cfs)
17	Treatment Capacity of Media	1	gpm/ft^2 (capacity should be provided by manufacturer)
18	Minimum Filter Area	45	square feet

INSTRUCTIONS

For volume-based sizing, use steps 1 through 15 to determine the required area of the media filter system. Volume-based filters provide a storage area to capture the WQv, and the filter area is sized to drain the WQv within the desired drain time.

Filters sized using a flow-based approach are typically proprietary filters. It is recommended that the manufacturer's instructions be used to size these systems. However, a simplified calculator has also been provided in steps 16 through 18 for added guidance.

Step	To Determine The Required Area for Volume-Based Media Filters
1	Enter the Water Quality Volume (WQv) for the drainage management area (DMA). The WQv is calculated in Step 14 of the Water Quality Volume and Water Quality Flow Rate Calculator.
2	Select Yes or No for whether a sedimentation chamber is included in the design. Pretreatment is highly recommended for media filters.
3	Enter the desired drain time for the system. Recommended drain time is between 24 to 48 hours.
4	Enter the depth of the filter media. This is typically between 1.5 and 2 feet.
5	The default porosity and the design hydraulic conductivity of the filter media are entered here. The conductivity is based on using sand media. Unless another media is used, changing these default values is not recommended.
6	Enter the max ponding depth above the filter. This is typically 6 to 18 inches. At least 2" of freeboard should be provided between the max ponding depth and the overflow elevation.
7	The default value for fill time is 1 hour. Changing this value is not recommended.
8	The minimum filter area required to drain the WQv within the desired drain time is calculated here.
9	The amount of the WQv stored in the filter chamber is calculated. The remaining WQv must be stored in the sedimentation chamber.
10	Enter the depth of the live storage volume in the sedimentation chamber. This is typically 1 to 3 feet.
11	The required sedimentation chamber area needed to store the remainder of the WQv is calculated here.
12	Enter the square footage of the area draining to the media filter system (see Water Quality Volume and Water Quality Flow Rate Calculator for area).
13	The ratio of the BMP area to the DMA is calculated here as a check of the sizing. The size of media filters is typically between 3 to 6% of the impervious drainage area.
14	The time needed to drain the WQv is calculated here. If the drain time is less than the desired time entered in Step 3, use outlet control, such as an orifice, to control the outflow.
15	For underdrained systems, the average discharge rate is calculated here based on the desired drain time.

	To Determine The Required Area for Flow-Based Media Filters
16	Enter the Water Quality Flow Rate (WQf) for the drainage management area. The WQf is calculated in Step 13 of the Water Quality Volume and Water Quality Flow Rate Calculator.
17	Enter the treatment capacity of the filter media. The capacity is typically provided by the manufacturer in gpm/ft^2. A capacity around 1 gpm/ft^2 is typical of zeolite/perlite/granular activated carbon (ZPG) filters.
18	The minimum filter area is calculated here. Pretreatment should also be provided. Use the manufacturer's instructions to determine if other factors (e.g., expected sediment loading) will require an increased filter area.

DEFINITIONS

Water Quality Volume (WQv)	The runoff volume to be managed by the stormwater BMP such that treatment requirements are met. The WQv is calculated by the Water Quality Volume and Water Quality Flow Rate Calculator.
Water Quality Flow Rate (WQf)	The required flow rate to be managed by the stormwater BMP such that the treatment requirements are met. The WQf is calculated by the Water Quality Volume and Water Quality Flow Rate Calculator.
Infiltration Rate (f)	The rate of water entry into the soil, generally expressed as inches/hour, and determined by geotechnical tests or estimated from soil maps. It equals the hydraulic conductivity of the soil times the hydraulic gradient.
Porosity (n)	Volume of void space to total volume. This is expressed as a ratio, e.g. 0.35 means that one cubic foot of gravel contains 0.35 cubic feet of empty space.
Fill Time (T)	The time taken for water quality storm to fill the media filter storage area.
Ponding Depth (Pd)	The depth above the filter surface where runoff is ponded temporarily before filtering through the media.
Depth of Engineered Soil (d)	The depth of the filter media.
Hydraulic Conductivity (k)	Measure of the ease in which water moves through a porous media, generally expressed as inches/hour.
Drain Time (t)	The time for the storage area to drain the water quality volume.