environment 21
Global Stormwater Solutions
P.O. Box 55 | East Pembroke | NY 14056
Phone: 1-800-809-2801 | Fax: 1-800-809-2801
www.env21.com | enveng@env21.com
Technology That Separates

STORM BULLETIN 2

PARAMETERS FOR SIZING BMP'S

Hydrodynamic sedimentation is used to remove sediment from stormwater. Performance of a sedimentation system is based on removal of the "critical particle". The application of Stokes Law allows for particle size and specific gravity to be converted to a "critical particle settling velocity", Vc.

Pollutant wash-off events are sporadic and inconsistent. This is the reason for the term Best Management Practice (BMP). A Stormwater BMP is one of the components of a stormwater conveyance system. Accepted empirical parameters for hydrology and hydraulics are used for sizing stormwater chambers, sewers, and open channels. BMP sizing is not precise and requires Engineering Judgment.

Factors that affect estimates of the pollutant wash-off and transport process:

1. Rainfall intensity on sediment scour and transport
2. Scour of pavement sediment by moving traffic
3. Pollutant composition and mass as determined by local soil composition and volume/type of traffic
4. Pavement condition and maintenance schedule
5. Particle transport on paved surfaces, in curb gutters, and in storm sewers
6. Additional flow from roofs and private driveways
7. Regression analysis is used to correlate scattered data from pollutant wash-off events.

Determining the Surface Overflow Rate (SOR):
The following expression can be used for a sedimentation basin with flow rate Q and water surface area B: Vc/e = Q/B = flow rate / basin surface area = Surface Overflow Rate (SOR).

Determining the Unit Water Quality Flow Rate (QC) for wash-off of the critical particle: Regulatory Agency guidelines can be used to estimate a Water Quality Flow Rate = Q for a contributing catch area = C. In a detention basin the liquid holdup from storm water detention can reduce the basin flow rate to approximately 5-20% of the Water Quality Flow Rate.

Determining the ability of the Basin Surface Area/Contributing Catch Area (B/C) to remove the critical particle: Combining the terms Q/B and Q/C gives the value for B/C, where (Q/C) / (Q/B) =B/C = Basin Surface Area / Contributing Catch Area. The Basin Surface Area hydraulic efficiency is reduced if there is poor flow distribution and/or excessive turbulence.

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Determining the performance of Stormwater treatment chambers and detention basins and the effect of B/C:

Stormwater treatment chamber and detention basin performance can be estimated using the following empirical parameters:

1. 80% removal/control of the critical particle
2. Water Quality Flow Rate = 0.50-1.0 ft^3/sec/ impervious acre
3. Detention basin flow rate = 5-20 % of the Water Quality Flow Rate
4. Basin Surface Area hydraulic efficiency = 50%.
5. Particle specific gravity ranges from 1.6 to 2.6
6. B/C for sediment stratification in upstream piping = 20

Combining these empirical parameters results in the following values for B/C and critical particle size:

B/C provided by basin		**Critical particle diameter**	
Acres/ impervious acre	ft^2/ impervious acre	Basin type	microns
0.0005	20	Chamber w/ internal baffles	50 – 90 (fine sand)
0.0060	260	Detention basin/ chambers	20 – 50 (medium silt)
0.0170	740	Detention basin/ chambers	5 (clay)

Sizing guidelines for sedimentation chambers with internal baffles: Chambers with internal baffles are available from several vendors. When the B/C is used for sizing of the chamber it is typically in the range of 10-30 ft^2/impervious acre. This equates to removal of critical particles with diameters of 80-130 µ. Smaller particles will also be removed but the estimated control is less.