

SCOUR PROTECTION

Outlet Velocity (fps)	Req'd Protection
0 - 6	Vegetation
6 - 8	12" Class II Riprap on 6" Granular Filter
8 - 10	18" Class III Riprap on 9" Granular Filter
10 - 12	24" Class IV Riprap on 12" Granular Filter
> 12	Consider Using Energy Dissipation

MANNING'S N VALUE

Pipe Material	Laboratory Value	Design Value
Concrete Pipe/Box	0.009 - 0.010	0.012 - 0.013
Plastic (Smooth Integral Wall)	0.009	0.011 - 0.012
Corrugated PE With Liner	12" 0.010*	0.012 - 0.013
	18" 0.012*	0.014 - 0.016
	24" 0.014*	0.017 - 0.018
	36" 0.018*	0.022 - 0.023
Spiral Rib - Metal	0.012 - 0.013	0.016 - 0.018**
Corrugated Metal 2 2/3" x 1/2"	0.022 - 0.027	0.029***
3" x 1"	0.027 - 0.028	0.034***
5" x 1"	0.025 - 0.026	0.031

* Extrapolated

** Included factor for installation and aging

*** Historical use has been 0.024 for 2 2/3" x 1/2" and 0.027 for 3" x 1"