

**Table 3.2, Limiting Velocities and
Tractive Forces for Open
Channels, from “Applied Hydrology
and Sedimentology for
Disturbed Areas”**

**Table 8-4, Allowable Velocities,
from Part 654,
National Engineering Handbook**

(3 Pages)

**TRAINING MATERIALS
FOR
SURFACE WATER MODELING
COURSE**

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FROM**

**APPLIED HYDROLOGY
AND SEDIMENTOLOGY FOR
DISTURBED AREAS**

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velocity does not exceed the values of permissible velocity shown in Table 3.2.

Table 3.2 Limiting Velocities and Tractive Forces for Open Channels.
(Straight after Aging)

Material	n	For Clear Water		Water Transporting Colloidal Silts	
		Velocity, fps	Tractive Force, psf	Velocity, fps	Tractive Force, psf
Fine sand colloidal	0.020	1.50	0.027	2.50	0.075
Sandy loam noncolloidal	0.020	1.75	0.037	2.50	0.075
Silt loam noncolloidal	0.020	2.00	0.048	3.00	0.110
Alluvial silts noncolloidal	0.020	2.00	0.048	3.50	0.150
Ordinary firm loam	0.020	2.50	0.075	3.50	0.150
Volcanic ash	0.020	2.50	0.075	3.50	0.150
Stiff clay very colloidal	0.025	3.75	0.260	5.00	0.460
Alluvial silts colloidal	0.025	3.75	0.260	5.00	0.460
Shales and hardpans	0.025	6.00	0.670	6.00	0.670
Fine gravel	0.020	2.50	0.075	5.00	0.320
Graded loam to cobbles when noncolloidal	0.030	3.75	0.380	5.00	0.660
Graded silts to cobbles when colloidal	0.030	4.00	0.430	5.50	0.800
Coarse gravel noncolloidal	0.025	4.00	0.300	6.00	0.670
Cobbles and shingles	0.035	5.00	0.910	5.50	1.100

From Lane (1955).

When using the limiting tractive force concept, a channel with adequate capacity and having an average shear stress τ given by equation 3.18 that is less than the values tabulated in Table 3.2 is sought. For channels in noncohesive materials, the particles on the channel sides may move due to the combined force exerted by the flowing water and the weight component of the particles down the side of the channel. Chow (1959) should be referred to for a treatment of tractive force considerations and noncohesive materials. In cohesive materials, the cohesion generally is much greater than the gravity component so that average shear based on equation 3.18 can be used in design.

Table 8-4 Allowable velocities

Channel material	Mean channel velocity	
	(ft/s)	(m/s)
Fine sand	2.0	0.61
Coarse sand	4.0	1.22
Fine gravel	6.0	1.83
Earth		
Sandy silt	2.0	0.61
Silt clay	3.5	1.07
Clay	6.0	1.83
Grass-lined earth (slopes <5%)		
Bermudagrass		
Sandy silt	6.0	1.83
Silt clay	8.0	2.44
Kentucky bluegrass		
Sandy silt	5.0	1.52
Silt clay	7.0	2.13
Poor rock (usually sedimentary)	10.0	3.05
Soft sandstone	8.0	2.44
Soft shale	3.5	1.07
Good rock (usually igneous or hard metamorphic)	20.0	6.08

Figure 8-3 Allowable velocity-depth grain chart

