

### CHANNEL EROSION CONTROL MATRIX (Concentrated Flow Application)

TYPE OF EROSION CONTROL DEVICE	PERMISSIBLE SHEAR LB/FT.F.	DITCH GRADE															REMARKS		
		< 2%			2% - 4%			4% - 6%			6% - 9%*			9% - 12%*					
		Max. Length (ft.)			Max. Length (ft.)			Max. Length (ft.)			Max. Length (ft.)			Max. Length (ft.)					
		300	600	1200	300	600	1200	300	600	1200	300	600	1200	300	600	1200			
Seed with properly anchored mulch	0.6	█	█														Anchor mulch per specifications.		
Sod ditch checks with seed and mulch	N/A	█	█	█	█	C										Install one ditch check for every 1 foot of drop. Sod stakes required.			
Temporary ditch checks (hay bales or approved manufactured alternatives listed in the WisDOT PAL)	N/A	█	█	█	█	█										Install one ditch check for every 2 feet of drop. Maximum 200' spacing. Not recommended for slopes less than 1%.			
Sod ditch liner	1.0	█	█	█													Upstream end must be buried. Additional sod stakes required.		
Double netted light duty (WisDOT Class I Type B) erosion mat	1.5	█	█	█	█	█										Only mat type products allowed.			
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	1.5	█	█	█	█	█										Upstream end must be buried. Additional sod stakes required. Two bid items needed.			
Stone or rock ditch checks, or Rock-Filled Filter Bags	N/A	█	█	█	█	█	█	█	█	█							Use No. 2 coarse aggregate, railroad ballast, or breaker run. Install one ditch check for every 2 feet of drop. Use in conjunction with a channel lining.		
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	2.0	█	█	█	█	█	█	█	⊗	█									
Heavy duty synthetic (WisDOT Class III Type A) erosion mat or turf reinforcement mat (WisDOT Class III Type B)	2.0	█	█	█	█	█	█	█	█	█							Germination may be a problem with Class III Type A mats. An ECRM is required for initial erosion protection for Class III Type B mats.		
Heavy duty synthetic turf reinforcement (WisDOT Class III Type C) mat	3.5	█	█	█	█	█	█	█	█	█	█							An ECRM is required for initial erosion protection. Contact manufacturer if higher shears are needed.	
Riprap ditch checks	N/A	█	█	█	█	█	█	█	█	█	█	█	█	█	█				Place top of downstream ditch check level with bottom of upstream ditch check. Use in conjunction with a channel lining.
Heavy duty synthetic turf reinforcement (Class III Type D) mat	5	█	█	█	█	█	█	█	█	█	█	█	█	█	█				An ECRM is required for initial erosion protection. Contact manufacturer if higher shears are needed.
Light riprap	4	█	█	█	█	█	█	█	█	█	█	█	█	█	█				Outfalling, overtopping and scour need to be
Medium riprap	5	█	█	█	█	█	█	█	█	█	█	█	█	█	█				addressed. Use 2' minimum ditch depth.
Heavy riprap	8	█	█	█	█	█	█	█	█	█	█	█	█	█	█				

Riprap measures apply to all ditch types. Use of these measure requires engineering judgement and design.




### CHANNEL EROSION CONTROL MATRIX (cont.) (Concentrated Flow Application)

TYPE OF EROSION CONTROL DEVICE	PERMISSIBLE SHEAR STRESS (lb./sq. ft.)	DITCH GRADE															REMARKS	
		< 2%			2% - 4%			4% - 6%			6% - 9%*			9% - 12%*				
		Max. Length (ft.)			Max. Length (ft.)			Max. Length (ft.)			Max. Length (ft.)			Max. Length (ft.)				
		300	600	1200	300	600	1200	300	600	1200	300	600	1200	300	600	1200		
Grouted rip rap	N/A	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Address outfalling, overtopping and scour. Line with Grotex fabric Type "HR", (see Chap. 10, Const. Detail and special provision). Use 2' minimum ditch depth.
Articulated Concrete Block Type A	5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	ACBs apply to all ditch types. Use of these measures requires engineering judgement and design.	
Articulated Concrete Block Type B	10	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Articulated Concrete Block Type C	15	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Articulated Concrete Block Type D	20	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Articulated Concrete Block Type E	30	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Standard Ditch Section		<p>Erosion control for ditches not conforming to the typical at right, that complies with FDM procedures 11-15-1 Figures 6 &amp; 7, should be designed according to FDM Chapter 13.</p>																
<p><b>KEY</b></p> <p>Effective range of device for Sandy or Clayey Soil: <span style="display: inline-block; width: 20px; height: 10px; background-color: black; vertical-align: middle;"></span></p> <p>Device applicable, may not be cost effective: <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; vertical-align: middle;"></span></p> <p>"C" effective for clayey soil only</p> <p>Not applicable. Use in conjunction with other BMPs: <span style="display: inline-block; width: 20px; height: 20px; border: 1px solid black; border-radius: 50%; vertical-align: middle;"></span></p> <p>ECRM - Erosion control revegetation mat. All Class I and II mats are ECRMs.                      TRM - Turf reinforcement mat.                      FDM - Wisconsin DOT Facilities Development Manual                      BMP - Best Management Practice                      PAL - See Note 6</p> <p>* For ditch grades over 9% special design considerations may be required.                      ** Soils that are not sandy should be treated as clay soils.</p>		<p><b>NOTES</b></p> <p>1) Ditch flow rates used to develop bar chart are based on a 60 ft. right of way from pavement centerline and a 2-Yr. rainfall event for temporary liners or a 25-Yr. rainfall event for permanent (Class III mat or riprap) liners. If the drainage area extends outside the 60 foot right of way or unusual flows are expected, use the shear stress column values to determine the suitability of a liner. See FDM procedures in Chapter 10 and in Section 13-30-10.</p> <p>2) Erosion mats shall extend upslope 1.0 ft. min. vertically from the ditch bottom or 8' higher than the design flow depth. There shall be no joints within 18' of the low point.</p> <p>3) Cost shall be a consideration in the selection of these devices.</p> <p>4) Add sediment traps at the bottom of channel slopes.</p> <p>5) Refer to FDM Chapter 10 for any channels exceeding the limits shown.</p> <p>6) Approved materials for erosion products are referenced from the Wisconsin Department of Transportation Erosion Control Product Acceptability Lists (PAL), found at <a href="https://wisconsin.gov/Pages/doing-business/consultants/cnsit-rsres/tools/pal/default.aspx">https://wisconsin.gov/Pages/doing-business/consultants/cnsit-rsres/tools/pal/default.aspx</a></p> <p>7) On long or steep channels that require a higher class mat, use the appropriate lower class mat for the first 300 ft to 600 ft of the channel.</p> <p>8) Effective erosion control involves minimizing the amount of time soil is exposed and the selection of a combination of practices, and not reliance on just one practice.</p>																

### SLOPE EROSION CONTROL MATRIX

TYPE OF EROSION CONTROL	SLOPE																		REMARKS			
	6:1 or flatter (7)						4:1			3:1			2.5:1			2:1				1:1		
	SLOPE LENGTH						SLOPE LENGTH			SLOPE LENGTH			SLOPE LENGTH			SLOPE LENGTH						
	0-30'	30-60'	60-120'	0-30'	30-60'	60-120'	0-30'	30-60'	60-120'	0-30'	30-60'	60-120'	0-30'	30-60'	60-120'	0-30'	30-60'	60-120'				
Seed with properly anchored mulch																						
Single netted light duty (WisDOT Class I Type A) erosion mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
Light duty single netted 100% biodegradable (WisDOT Urban Type A) erosion mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Use only 100% biodegradable anchors for urban mats.		
Light duty double netted 100% biodegradable (WisDOT Urban Type B) erosion mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Use only 100% biodegradable anchors for urban mats.		
Bonded Mulch (WisDOT Type A Soil Stabilizer)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	May be applied over Class III Type B, C, or D mats in place of erosion control revegetation mats.		
Polymer (WisDOT Type B Soil Stabilizer)	Used in conjunction with other BMPs effective up to a 2:1 slope. Not effective in sand. When used alone effective up to a 3:1 slope. Stand alone use appropriate for earthen stock piles, temporary, and late season applications																					
Double netted light duty (WisDOT Class I Type B) erosion mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⊗		
Sod	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⊗		
Medium duty coconut erosion mat (WisDOT Class II Type B or C)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
Sod reinforced with a double netted jute (WisDOT Class II Type A) erosion mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⊗		
Heavy duty synthetic erosion control revegetation mat (WisDOT Class III Type A)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Germination may be a problem with Class III Type A mats		
Riprap	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Angle of repose must be considered, see FDM Chapter 13.		
Heavy duty synthetic turf reinforcement (WisDOT Class III Type B or C) mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	A soil stabilizer or ECRM will be required for initial erosion protection.		
Heavy duty synthetic turf reinforcement (WisDOT Class III Type D) mat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	A soil stabilizer or ECRM will be required for initial erosion protection.		
Slope paving or grouted riprap	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Consider clear zone requirements. Only use in limited circumstances such as overflow areas near bridges.		

**SLOPE EROSION CONTROL MATRIX (cont.)**

Benches	Consider benches when cuts exceed 20', bench at approximately 15' vertical intervals to collect and drain water. Treat benches as channels (ditches). Adjust elevations to provide drainage. Consider flumes at transitions.
Intercepting embankments	Used to intercept runoff from abutting lands. Flumes may be necessary to direct runoff.
Silt fence	Used at toe of slopes to intercept and detain small amounts of sediment
Temporary ditch checks or Erosion bales	Used at toe of slopes to intercept and detain small amounts of sediment
Slope drains/flumes	May be necessary on slopes (see channel matrix for design guidance).
Sediment traps	Used to trap sediment laden runoff. Could be used at the inlet or outlet end of slope drain.
<p><b>KEY:</b></p> <p>Not applicable. Use in conjunction with other BMPs: </p> <p>Effective range of device for Sandy or Clayey Soil: Device applicable, may not be cost effective:  </p> <p>* Soils that are not sandy should be treated as clay soils.</p> <p>ECRM - Erosion control revegetation mat. All Class I and II mats are ECRMs. TRM - Turf reinforcement mat. FDM - WisDOT Facilities Development Manual PAL - See Note 5</p> <p><b>NOTES</b></p> <ol style="list-style-type: none"> <li>1) Cost shall be a consideration in the selection of these devices.</li> <li>2) Designers should review FDM Chapter 10 prior to selection of erosion mats.</li> <li>3) Install intercepting ditches to limit slope lengths to 15' vertical intervals. (See FDM Chapter 10)</li> <li>4) Refer to FDM Chapter 10 for any slopes exceeding the limits shown.</li> <li>5) Approved materials for erosion products are referenced from the Wisconsin Department of Transportation Erosion Control Product Acceptability List (PAL), found at the <a href="https://wisconsindot.gov/Pages/doing-business/consultants/cnslt-rsrcs/tools/pal/default.aspx">https://wisconsindot.gov/Pages/doing-business/consultants/cnslt-rsrcs/tools/pal/default.aspx</a></li> <li>6) On steeper slopes that require a higher class mat, use the appropriate lower class mat or seed and mulch for the first 30 ft to 60 ft of the slope.</li> <li>7) Unless project conditions require otherwise, seed and mulch all slopes that are flatter than a 5% grade, regardless of length. If practicable, bench the slopes.</li> <li>8) Effective erosion control involves minimizing the amount of time soil is exposed and the selection of a combination of practices, and not reliance on just one practice.</li> </ol>	