
	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.1</b>															
<b>Activity: Construction Road Stabilization (CRS)</b>																	
<b>PLANNING CONSIDERATIONS:</b>  <b>Design Life:</b> 2 yrs  <b>Acreage Needed:</b> Variable  <b>Estimated Unit Cost:</b> Medium  <b>Monthly Maintenance:</b> Negligible	<p style="text-align: center;"><b>Target Pollutants</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>Significant ♦</td> <td>Partial ♦</td> <td>Low or Unknown ♦</td> </tr> <tr> <td>Sediment ♦</td> <td>Heavy Metals ♦</td> <td>Nutrients ♦</td> </tr> <tr> <td>Oil &amp; Grease ♦</td> <td>Bacteria &amp; Viruses ♦</td> <td>Oxygen Demanding Substances ♦</td> </tr> <tr> <td></td> <td>Floatable Materials ♦</td> <td>Toxic Materials ♦</td> </tr> <tr> <td></td> <td></td> <td>Construction Waste ♦</td> </tr> </table>	Significant ♦	Partial ♦	Low or Unknown ♦	Sediment ♦	Heavy Metals ♦	Nutrients ♦	Oil & Grease ♦	Bacteria & Viruses ♦	Oxygen Demanding Substances ♦		Floatable Materials ♦	Toxic Materials ♦			Construction Waste ♦	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <b>CRS</b> </div>
Significant ♦	Partial ♦	Low or Unknown ♦															
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	Floatable Materials ♦	Toxic Materials ♦															
		Construction Waste ♦															
<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>	<p>Construction vehicles frequently use access roads, subdivision roads, parking areas and other on-site transportation routes that are not accessible to the public. Construction specifications and drawings should demonstrate methods and practices to stabilize these routes to reduce erosion between the time of initial grading and final stabilization.</p> <ul style="list-style-type: none"> <li>➤ Temporary construction traffic routes, phased construction projects and off-site road access.</li> <li>➤ Detour roads for local or temporary construction traffic.</li> <li>➤ Construction during wet weather.</li> <li>➤ Construction roads utilizing a temporary stream crossing must be indicated and approved.</li> </ul> <p>Road should follow topographic contours to reduce erosion of the roadway.</p> <ul style="list-style-type: none"> <li>➤ Gravel roads should be of sufficient thickness to support construction traffic. Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.</li> </ul>																

**Design Considerations for Construction Road Stabilization**

- All existing vegetation (trees, bushes, ground cover) shall be retained as long as feasibly practicable to reduce the exposure of disturbed grounds. Removal of vegetation should be phased in concurrence with relative construction activities within the vicinity.
- The implementation of this BMP depends largely on climate and weather conditions. Alternative routes should be established to incorporate these measures to account for conditions such as dry areas, wet conditions and other circumstances that would inhabit a safe and stable route for construction traffic. Permanent roads and parking areas should be paved as soon as possible after grading. The early application of gravel or chemical stabilization may solve potential erosion and stability problems where construction will be phased. Temporary gravel roadways should be considered during the wet weather seasons and on slopes greater than 5 percent.
- When gravel roads are needed, a minimum 6-in. course of 2 to 3-in. crushed rock, gravel base, or crushed surfacing base course should be applied immediately after grading or the completion of utility installation within the right-of-way. Chemical stabilization may also be used upon compacted native sub-grade. These chemical controls should be applied per the manufacturer's directions.
- Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section, or one side in the case of super-elevated section. Simple gravel berms without a trench can also be used.
- Installed inlets should be protected to prevent sediment-laden water from entering the storm sewer system.

**Temporary Roads and Parking Areas**

- **Grade**
  - The gradient and vertical-horizontal alignment should be designed according to the intended traffic patterns.
  - Grades for temporary roads should not exceed 10% for lengths less than 200 LF.
  - Frequent grade changes can reduce erosion and improve sediment control.
  - Grades for parking areas should not exceed 4%.
- **Width**
  - The radius for temporary roads should not be less than 35-feet for standard construction vehicles, and 50-feet for tractor trailers.
  - Temporary road widths should not be less than 14-feet for one-way traffic, 20-feet for two-way traffic.
  - Temporary roads should include two shoulders with a minimum width of two feet on each side.
- **Side Slopes**
  - All cuts and/or fills should be graded at a slope of 2:1 whenever possible.
  - A slope of 3:1 should be used whenever machined mowing will be used to maintain ground cover.
- **Drainage**
  - The design and capacity of all drainage structures should be consistent with sound engineering principles and suitable for the type of road that will be eventually permanent.
  - Structures should withstand flows from a 25-year, 24-hour storm event.

**Design Considerations (cont'd)**

- **Stabilization**
  - Install a 6-inch layer of coarse aggregate immediately after grading or utility installation within the right-of-way.
  - For added stability, a geotextile should be installed beneath the base stone.
  - All adjacent drainage swales, cuts, and fills shall be properly seeded or sodded.
- **Permanent Roads and Parking Areas**
  - Permanent roads and parking areas should be designed to the codes and standards of the local authority and the Kentucky Transportation Cabinet.
  - Permanent roads should have an initial base coarse of gravel immediately after site grading.

**Maintenance**

- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.
- Remove silt and debris from road side ditches and swales to prevent clogging or damming.
- Inspect weekly, and after each rain event and repair any eroded areas immediately.

**Inspection Checklist**

- Gravel roads are preventing mud and dirt from leaving project area.
- Dirt and gravel roads do not show signs of erosion, including but not limited to, rill and gully erosion.
- All stream crossings are maintained as mandated by the appropriate general or individual permit.



**Installation  
Procedures for  
Tire Washing  
Facility**

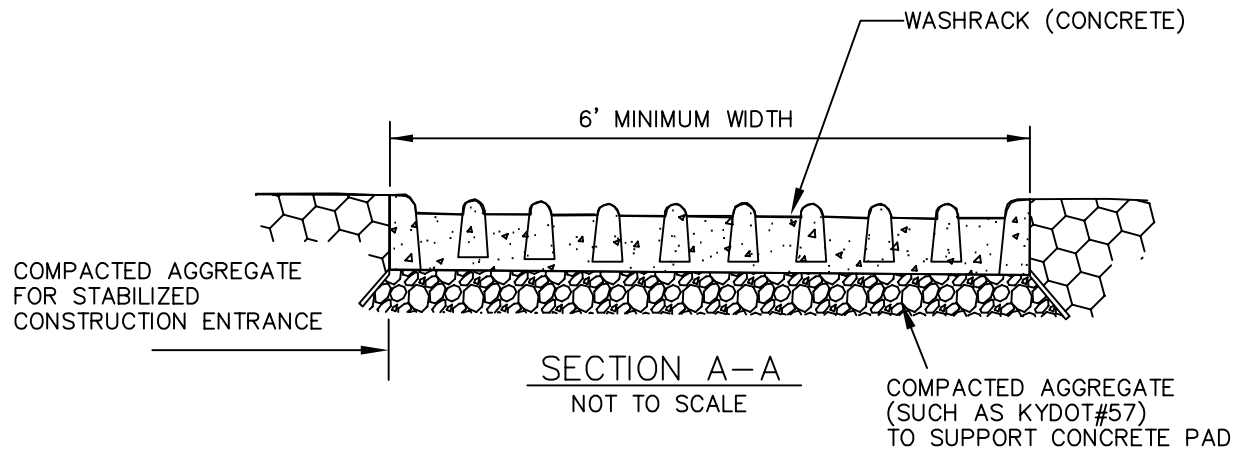
- A geotextile underliner must be placed under the entire length and width of the stabilized entrance, but not under the wash rack.
- Place a layer of KTC No. 1 or No. 2 stone across the full width of the exit and construct on level ground with a minimum thickness of 6-inches.
- The length of the stabilized entrance shall be as required based on the application, unless approved otherwise by the City Engineer.
- The width of the pad shall be a minimum of 12-feet, unless approved otherwise by the City Engineer.
- If a swale is required, then it shall meet specific requirements needed to carry the wash runoff to a sediment-trapping device.

**Maintenance**

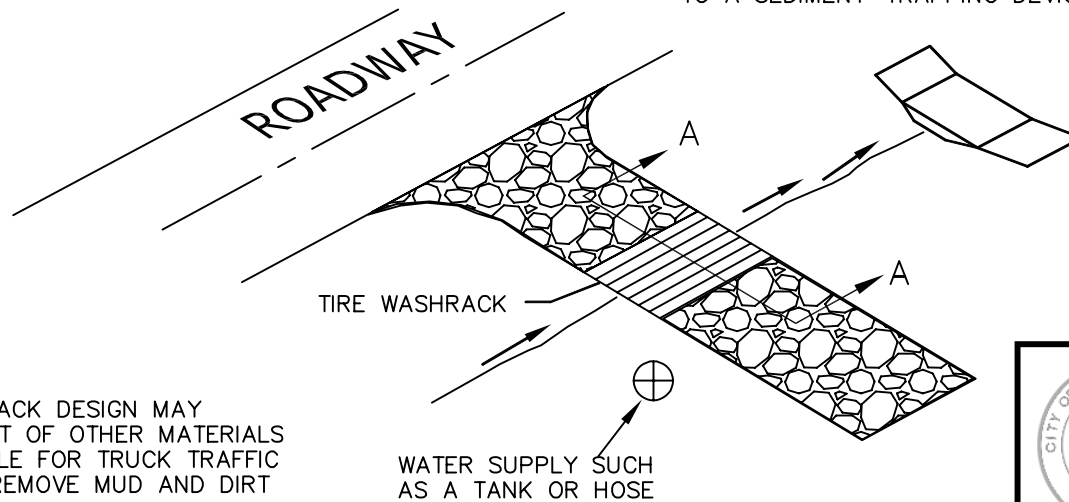
- Remove accumulated sediment to maintain system performance, in the wash rack and/or sediment trap.
- Inspect at the end of each shift or workday for damage and repair as needed.
- Remove any mud tracked onto adjacent roadway by sweeping or scraping as necessary.

**Inspection  
Checklist**

- Vehicles are leaving the site through designated construction exit(s).
- Mud, dust or dirt is removed prior to exit onto the adjacent road.
- The construction exit is sufficiently maintained to prevent mud, dirt, fines and dust from being tracked off-site.
- Stones under wash rack have been maintained and free of deleterious materials.



SWALE OR DITCH TO CARRY RUNOFF  
TO A SEDIMENT-TRAPPING DEVICE



NOTE:  
WASHRACK DESIGN MAY  
CONSIST OF OTHER MATERIALS  
SUITABLE FOR TRUCK TRAFFIC  
THAT REMOVE MUD AND DIRT



City of Berea  
Stormwater Manual

Tire Washing Details

EPP 4.2.2

SOURCE: LOUISVILLE MSD & TDEC

## CONSTRUCTION SPECIFICATIONS

Aggregate Size: Stone should be in accordance with KTC NO. 1 or NO. 2 stone specifications (1.5 to 3.5 inch stone), washed, and well graded.

Pad Thickness: The gravel pad should have a minimum thickness of 6 inches.

Pad Length and Width: At a minimum, the width should equal full width of all points of vehicular egress, but not less than 20 feet wide. Pad length should be no less than 50 feet.

Washing: If the action of the vehicle traveling over the gravel pad does not sufficiently remove the material, the tires should be washed prior to exit onto public roadways. When washing is required, the wash rack should be designed for the anticipated traffic loads and placed on level ground, on a pad of coarse aggregate (such as KTC #57). A typical wash rack is shown in Figure 2. The wash rack design may consist of other materials suitable for truck traffic that remove mud and dirt. The wash rack should have provisions that intercept the sediment-laden runoff and direct it into a sediment trap or sediment basin.

Location: The exit should be located wherever traffic will be leaving a construction site directly onto a public roadway.

It is recommended that the exit area be excavated to a depth of 3 inches and be cleared of all vegetation and roots.

Waterbar Diversion: On sites where the grade toward the public roadway is greater than 2%, a waterbar diversion 6 to 8 inches high with 3:1 side slopes should be constructed across the foundation of the construction exit to prevent storm water runoff from leaving the site.


Geotextile: The geotextile under-liner must be placed the full length and width of the exit.

## INSPECTIONS



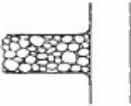
Inspections of construction exit should be made at the end of each shift or workday.

## MAINTENANCE

The exit should be maintained in a condition that will prevent tracking or flow of material onto public rights-of-way. This may require periodic top dressing with fresh stone, as conditions demand, and repair and/or clean out of any structures to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles or site onto roadways or into storm drains must be removed immediately.

	<b>City of Berea Stormwater Manual</b>
<b>Tire Washing Details</b>	
	<b>EPP 4.2.2</b>

SOURCE: LOUISVILLE MSD & TDEC

	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.3</b>										
<b>Activity: Stabilized Construction Entrance (SCE)</b>												
<b>PLANNING CONSIDERATIONS:</b>  <b>Design Life:</b> 1 yr  <b>Acreage Needed:</b> Minimal  <b>Estimated Unit Cost:</b> Low  <b>Monthly Maintenance:</b> 60% of Installation		  <div style="border: 1px solid black; padding: 5px; display: inline-block;"><b>SCE</b></div>										
<b>Target Pollutants</b>												
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<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>  <b>Installation Procedures</b>	<p>The construction entrance practice receives all incoming and outgoing traffic of the construction site. By stabilizing the construction entrance there will be a significant reduction in the amount of sediment to and from public right-of-ways, streets, alleys, sidewalks or parking areas. The construction entrance practice is a stabilized pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving. This management practice is likely to create a significant reduction in sediment, nutrients, toxic materials, and oil and grease.</p> <ul style="list-style-type: none"> <li>▶ All points of construction ingress and egress.</li> <li>▶ Unpaved areas where sediment tracking occurs from site onto paved or public roads.</li> </ul> <ul style="list-style-type: none"> <li>▶ Construct on level ground where possible.</li> <li>▶ Stones should be sized as to remove mud from tires from the construction site.</li> <li>▶ Provide ample turning radii as part of entrance.</li> <li>▶ Should be used in conjunction with street sweeping on adjacent public right-of-way.</li> <li>▶ Limit egress to the designated construction exit(s) by installing perimeter fencing.</li> <li>▶ Wash rack may be included to increase efficiency of removing dirt from tires.</li> </ul> <ul style="list-style-type: none"> <li>▶ A Geotextile underliner must be used under the entire length and width of the stabilized entrance.</li> <li>▶ Construct sediment barriers, such as check dams, to prevent sediment from entering into the storm water sewer system, ditch, or waterway.</li> <li>▶ Construct entrance with KTC No. 1 or No. 2 stone. Do not use #57s, 410 "traffic bound", or DGA-for entrance / exit pads leading to paved roads.</li> <li>▶ The length of the stabilized entrance shall be as required based on the application, unless approved otherwise by the City Engineer.</li> </ul>											

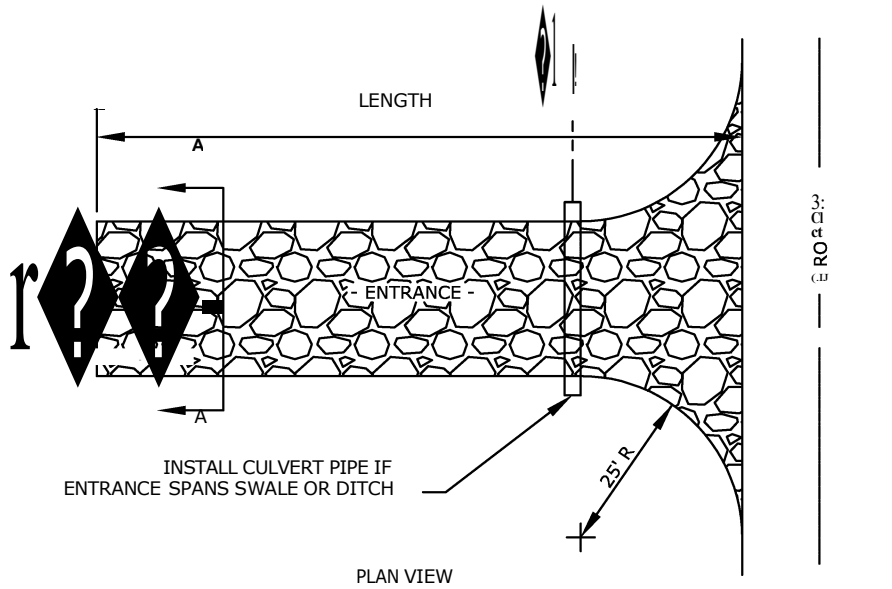
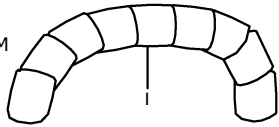
**Activity: Stabilized Construction Entrance**

**EPP 4.2.3**

- Maintenance**
- ▶ Inspect weekly and after each rainfall.
  - ▶ Periodically requires addition of stones for top; add gravel material when soil sub grade becomes visible.
  - ▶ Remove all mud or sediment deposited on paved roadways as necessary.
  - ▶ Stir aggregate with back-hoe on a weekly basis or as required based on construction activity.

- Inspection Checklist**
- D** Entrance/exits are exclusively used by all traffic.
  - D** Construction exit is sufficiently maintained to prevent mud, dirt, and dust from being tracked off-site, and stone has been stirred with back-hoe.

STONE BAG CHECK DAM



PLAN VIEW

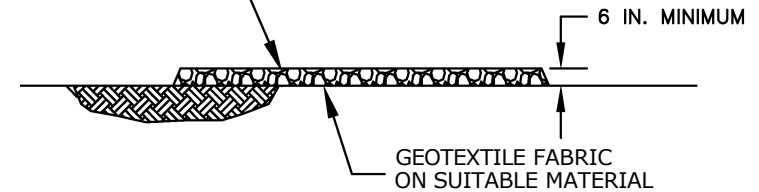
NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OF FLOWING OF SEDIMENT ONTO PUBLIC RIGHT OF WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT OF WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.
4. CLEANING OF ROADWAY IS REQUIRED IF MUD AND SEDIMENT ENTERS ROADWAY.

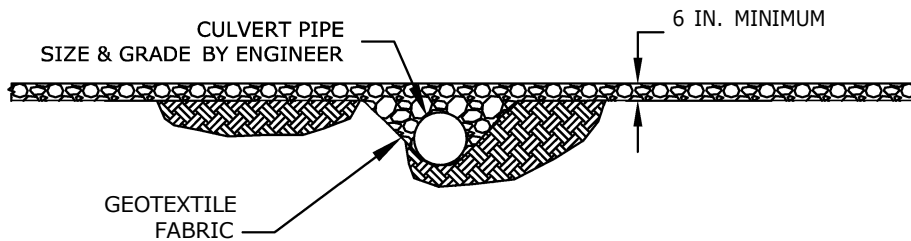
SIZING NOTES:

- (1) WIDTH:  
AS DETAILED IN CITY OF BOWLING GREEN TRAFFIC MANUAL
- (2) LENGTH:
  - (a) RESIDENTIAL LOTS 25' OR LESS WITH APPROVAL OF PUBLIC WORKS
  - (b) COMERICAL 100'
  - (c) SUBDIVISION 100'

:TC NO.1 OR NO. 2 STONE



**SECTION "A-A"**



**CULVERT DETAIL**

SOURCE: LOUISVILLE MSD & TDEC



City of Berea  
Stormwater Manual

Construction Entrance

EPP 4.2.3

Installation:

Remove all vegetation and any objectionable material from the foundation area.

Divert all surface runoff and drainage from stones to a sediment trap or basin.

Install a geotextile fabric prior to placing any stone.

Install a culvert pipe across the entrance when needed to provide positive drainage.

The entrance shall consist of KTC No.1 or NO. 2 Aggregate or larger with a minimum thickness of 6-inches.

Inspection and Maintenance:

Inspect entrances every seven (7) calendar days and within 24-hours after each rainfall event that produces 1/2-Inches or more of precipitation, or after heavy use. Check for mud and sediment buildup and pad integrity. Make daily Inspections during periods of wet weather.

Maintenance is required more frequently in wet weather conditions.

Reshape the stone pad as needed for drainage and runoff control.

Maintain aggregate as needed and as directed by the Inspector. The stone in the entrance should be maintained or replaced whenever the entrance fails to reduce mud being carried off-site by vehicles. Frequent maintenance will extend the useful life of stone.


Immediately remove mud and sediment tracked or washed onto public roads by brushing or sweeping. Flushing should only be used when the water can be discharged to a sediment trap or basin.

Repair any broken pavement immediately.

Inspect and clean sediment traps immediately following each rainfall.

Dispose of sediment in a suitable area in such a matter that it will not erode.

Remove stabilized construction entrances as soon as they are no longer needed to provide access to the site. Bring the disturbed area to grade, and stabilize it using appropriate permanent stabilization methods.

	<b>City of Berea Stormwater Manual</b>
<b>Construction Entrance</b>	
	<b>EPP 4.2.3</b>

*SOURCE: LOUISVILLE MSD & TDEC*



**Approach****General Buffers**

- ▶ A sufficient width should be selected to promote plantings' growth and to serve as a filter of overland flow entering the zone.

**Vegetated Riparian Buffers**



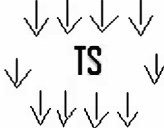

- ▶ Prior to structuring the zone, careful consideration should be given to its intent and purpose and how it should be enhanced to meet the requirements of the buffer zone. Stream characteristics such as width, slope, depth and the topography of the surrounding vicinity should be considered.
- ▶ Stream buffers must at least include the floodway plus 50 feet perpendicular to the floodway. If a floodway has not been determined, the buffer must be at least 25 feet perpendicular from each side of the stream bank, creek, or unnamed waterway, under "bank-full" conditions.
- ▶ Stream buffers are typically 50 feet wide for flat lying areas.
- ▶ A buffer should be increased 2 feet in width for every 1% of slope perpendicular to the centerline of the stream.
- ▶ If existing vegetation is disturbed or removed, a new multipurpose buffer should be created using the three following zones:
  - Zone 1 - the first 20-feet adjacent to the stream should include trees and shrubs spaced 6-10 feet apart to provide stabilization of the bank deep into the soil.
  - Zone 2 - The next 10-feet should consist of managed forest for chemical absorption and wildlife habitat.
  - Zone 3 - the upper 20-feet should be comprised of grasses for sediment and chemical capture as well as noise reduction.

**Maintenance**

- ▶ Inspect sod installations weekly and after significant storm events, until the turf is established, and routinely thereafter.
- ▶ Maintenance shall consist of mowing, weeding, and ensuring that the irrigation system is operating properly and as designed to sustain growth.
- ▶ Inspect buffer strips weekly and after significant storm events until vegetation is established, and routinely thereafter. Repair eroded or damaged areas as needed to maintain original purpose and effectiveness of the buffer strip.
- ▶ Provisions to maintain and protect new plantings from native wildlife should be incorporated with the design documents and drawings.

**Inspection Checklist**

- D** Sod is properly maintained and watered.
- D** Buffer strips are properly maintained.
- D** Plantings are sufficiently protecting from wildlife.
- D** Significant rainstorm events have not deteriorated buffer zone.

	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.5</b>															
<b>PLANNING CONSIDERATIONS:</b>  Design Life: 1 yr  Acreage Needed: As Needed  Estimated Unit Cost: Low  Annual Maintenance: 20% of Capital Costs																	
	<b>Target Pollutants</b>																
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		Construction Waste ◊															

**Installation/  
Applications**

**Seed bed Preparation**

- Prepare area to be seeded.
- Apply seed, fertilizer, and lime as required
- Apply mulch as specified in [EPP-4.2.10](#).
- Grade as needed to permit the use of conventional equipment for seedbed preparation, fertilization and seeding.
- Apply to bare or denuded areas, soil stockpiles, if they will not be used for more than 21 consecutive days.
- Soil material should be capable of supporting permanent vegetation and have at least 25% silt and clay to sufficiently hold moisture during establishment.
- In compacted areas, soil should be loosened to a depth of 6-8 inches.
- Protect areas against seed wash-out using surface roughening diversions or terraces.
- Soil should be analyzed for fertilizer and lime requirements.

**Conventional Seeding**

- Work lime and fertilizer into the soil with disk harrow, springhooth harrow or like equipment to a depth of 2 inches.
- Apply seeding uniformly with a cyclone or drill. Seed no deeper than ¼" to ½".
- Weather conditions should be taken into account when seeding areas. Seeding should not take place during adverse weather conditions.

**Hydroseeding**

A practice of applying a hydraulic spray that seeds, fertilizes and tacks in a single step.

- Prepare a homogenous mixture in a slurry tank: Seed (inoculated if needed), fertilizer, wood cellulose or wood pulp fiber mulch, and water. (Ordinary mulch is not suitable for hydroseeding).
- Apply within one hour after mixture is prepared. The application rate should be approximately 35 lbs per 1000 sq ft.
- Spray in two, orthogonal directions (i.e. north/south and east/west) for an even distribution of the hydroseed mixture.
- A straw mulch can be applied after hydroseeding at a rate of 100 lbs per 1000 sq. ft.

The chart below displays the recommended rates for temporary seeding.

**Seeding Rates**

<b>March 1 to October 31</b>	<b>Per 1000 SF</b>	<b>Per Acre</b>
Oats	3 lbs	120 lbs
Perennial Ryegrass	1 lbs	40 lbs
Tall Fescue	1 lbs	40 lbs
Wheat	1 lbs	40 lbs
Annual Rye	3 lbs	120 lbs
<hr/>		
<b>November 1 to February 28 Annual</b>	<b>Per 1000 SF</b>	<b>Per Acre</b>
Rye	3 lbs	120 lbs
Wheat	3 lbs	120 lbs
Perennial Ryegrass	1 lbs	40 lbs
Tall Fescue	3 lbs	120 lbs

Source: Kentucky ESPC Field Guide

**Activity: Temporary Seeding**



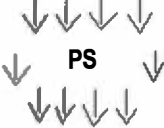

**EPP 4.2.5**

**Maintenance**

- Inspect frequently during the first six weeks following planting to assure that appropriate moisture levels are maintained and determine if stands are uniform and dense.
- Water until grass is thoroughly established, especially during dry, hot seasons or adverse conditions.
- Check for damage caused by equipment or heavy rains. Damaged areas should be repaired, fertilized, seeded, and mulched. Tack or tie down mulch as necessary.

**Inspection Checklist**

- Area is watered daily until stabilization has taken place.
- After stabilization, water as needed.
- Heavy equipment has not been used within area.
- Washout areas have been repaired.
- Vegetative coverage is (check one):  20-40%  40-60%  60-80%  80-100%

	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.6</b>
<b>Activity: Permanent Seeding (PS)</b>		
<b>PLANNING CONSIDERATIONS:</b>  Design Life: Permanent  Acreage Needed: As Needed  Estimated Unit Cost: Low  Annual Maintenance: 20% of Capital Costs		
	Target Pollutants	
	Significant ♦                      Partial ♦                      Low or Unknown ◊	
	Sediment ♦    Heavy Metals ◊    Nutrients ◊                      Oxygen Demanding Substances ◊    Toxic Oil & Grease ◊    Bacteria & Viruses ◊                      Materials ◊    Floatable Materials ◊    Construction Waste ◊	
<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>	Permanent seeding establishes a permanent ground cover over disturbed areas. This practice can greatly reduce erosion from a disturbed area.  ➤ Permanent seeding can be used to reduce sediment runoff from disturbed areas during construction.  ➤ Permanent seeding can reduce air born pollutants arising from construction disturbances.  ➤ <u>Conventional Seeding</u> Common methods of application include: disc, cultivator, broadcasting, and no-till drilling.  ➤ <u>Hydroseeding</u> Hydroseeding uses a mixture of mulch, seed, and tactifier which is sprayed over a disturbed area for coverage.  ➤ Permanent seeding shall be applied to disturbed areas within 14 days of final grading unless Temporary Seeding - <a href="#">EPP 4.2.5</a> , is to be used in the interim.  ➤ This practice can be used in conjunction with other BMPs to reduce erosion during and after construction.	

Installation Procedures

Conventional Method

- Soil material should be capable of supporting permanent vegetation and have at least 25 % silt and clay to sufficiently hold moisture during establishment.
- In compacted areas, soil should be loosened to a depth of 6-8 inches.
- The area shall be protected from excess runoff as necessary with diversions or berms.
- Plant species shall be selected on the basis of quick germination, growth, and time of year to be seeded.
- Fertilizer, lime, seedbed preparation, seed coverage, mulch, and irrigation shall be used as necessary to promote early establishment.
- Weather conditions should be taken into account when seeding areas. Seeding should not take place during or under pending adverse weather conditions.

*Seeding*

- Soil should be analyzed for fertilizer and lime requirements.
- Prepare seedbed with agricultural ground limestone, at a rate of 1 ton per acre, or as determined by soil testing.
- Use a 10-10-10 fertilizer shall be applied at a rate of 800 lbs per acre, or as determined by soil testing.
- Work lime and fertilizer into the soil with disk harrow, springtooth harrow or like equipment to a depth of 4 inches.
- Protect areas against seed wash-out using surface roughening diversions or terraces.
- See [Table EPP-4.2.6](#), Suggested Seeding Rates, on the following page.
- Apply mulch as specified in [EPP 4.2.10](#).

Hydroseeding

A practice of applying a hydraulic spray that seeds, fertilizes and tacks in a single step.

- Prepare a homogenous mixture in a slurry tank: Seed (inoculated if needed), fertilizer, wood cellulose or wood pulp fiber mulch, and water. (Ordinary mulch is not suitable for hydroseeding).
- Apply within one hour after mixture is prepared. The application rate should be approximately 35 lbs per 1000 sq ft.
- Spray in two, orthogonal directions (i.e. north/south and east/west) for an even distribution of the hydroseed mixture.
- A straw mulch can be applied after hydroseeding at a rate of 100 lbs per 1000 sq. ft.

Maintenance

- Water soil until the grass is firmly established, especially if seedlings are made late in the planting season.
- Inspect all seeded areas for failures and make necessary repairs.
- If stand is inadequate (less than 80% coverage) overseed, fertilize, using half of the original rates.
- If stand is more than 60% damaged, reestablish following original seedbed preparation methods, seeding and mulching recommendation and apply lime and fertilizer as needed according to a new soil test.

**Inspection Checklist**

- Area is watered daily until stabilization has taken place.
- D** Area has been maintained (watered, repaired) since stabilization.
- Heavy equipment has not been used within area.
- D** Eroded areas have been regarded and re-established.

**Table EPP-4.2.6  
Suggested Seeding Rates**

<i>Recommended Seed Blend for Kentucky</i>		
<b>Seed Species and Mixtures</b>	<b>Seeding Rate / Acre</b>	<b>Per 1000 sq. ft.</b>
<i>Seed and seed mixtures for relatively flat or slightly sloping areas</i>		
Perennial ryegrass	25 to 35 lbs.	1 lb.
+ tall fescue	15 to 30 lbs.	1 lb.
Tall fescue	40 to 50 lbs.	1.5 lbs.
+ ladino or white clover	1 to 2 lbs.	2 oz.
<i>Steep slopes, banks, cuts, and other low maintenance areas (not mowed)</i>		
Smooth bromegrass	25 to 35 lbs.	1 lb.
+ red clover	10 to 20 lbs.	0.5 lb.
Tall fescue	40 to 50 lbs.	1 lb.
+ white or ladino clover	1 to 2 lbs.	2 oz.
Orchardgrass	20 to 30 lbs.	1 lb.
+ red clover	10 to 20 lbs.	0.5 lb.
+ ladino clover	1 to 2 lbs.	2 oz.
Crownvetch	10 to 12 lbs.	0.25 lb.
+ tall fescue	20 to 30 lbs.	1 lb.
<i>Lawns and other high traffic or high maintenance areas (mowed)</i>		
Bluegrass	105 to 140 lbs.	3 lbs.
Perennial ryegrass (turf)	45 to 60 lbs.	2 lbs.
+ bluegrass	70 to 90 lbs.	2.5 lbs.
Tall fescue (turf type)	130 to 170 lbs.	4 lbs.
+ bluegrass	20 to 30 lbs.	1 lb.
<i>Ditches and other areas of concentrated water flows</i>		
Perennial ryegrass	100 to 150 lbs.	3 lbs.
+ white of ladino clover	1 to 2 lbs.	2 oz.
Kentucky bluegrass	20 lbs.	0.5 lb.
+ smooth bromegrass	10 lbs.	0.25 lb.
+ switchgrass	3 lbs.	2 oz.
+ timothy	4 lbs.	0.25 lb.
+ perennial ryegrass	10 lbs.	0.25 lb.
+ white of ladino clover	1 to 2 lbs.	2 oz.
Tall fescue	100 to 150 lbs.	3 lbs.
+ ladino or white clover	1 to 2 lbs.	2 oz.
Tall fescue	100 to 150 lbs.	3 lbs.
+ perennial ryegrass	15 to 20 lbs.	0.5 lb.
+ Kentucky bluegrass	15 to 20 lbs.	0.5 lb.

Source: Kentucky ESPC Field Guide



**Installation Procedures (cont'd)***Sod Bed Preparation*

- Soil should be analyzed for fertilizer and lime requirements.
- Use a 10-10-10 fertilizer shall be applied at a rate of 1,000 lbs per acre, or as determined by soil testing.
- Work lime and fertilizer into the soil with disk harrow, springtooth harrow or like equipment to a depth of 4 inches.
- Clear vicinity of deleterious materials and stones greater than 4" in diameter prior to laying sod.
- Loosen the top one-inch of soil prior to saying the sod pieces.

*Handling*

- Sod should be kept moist and covered during transport and preparation.
- Sod should be free of noxious and secondary weeds and secured from good, thick growing stands.
- Sod should be mowed to a height between 2-4 inches.

*Placement*

- Do not place sod in freezing conditions (ambient temperatures less than 32° F.)
- Sod shall be placed and pressed together such that it will be continuous.
- The outer edges of the sod placed along curbing or side walks shall be sufficiently deep so that the surface water will flow over onto the top of the sod.
- In swales and ditches, lay sod strips perpendicularly to the centerline of the channel.
- In steep channels, wood stakes should be used to secure the sod strips.
- On slopes 3:1 or steeper, the sod shall be rolled or tamped, then secured with chicken wire or jute mesh over the sod for protection over critical areas. The stakes should secure the sod and the net and be spaced no further than 18" apart. The size of the stakes shall be approximately ½" x ¾" x 12". The netting or mesh shall be stapled on the side of each stake within two inches of the top of the stake. The stake would then be driven flush with the top of the sod.
- The sod shall be tamped or rolled after placement and then watered.

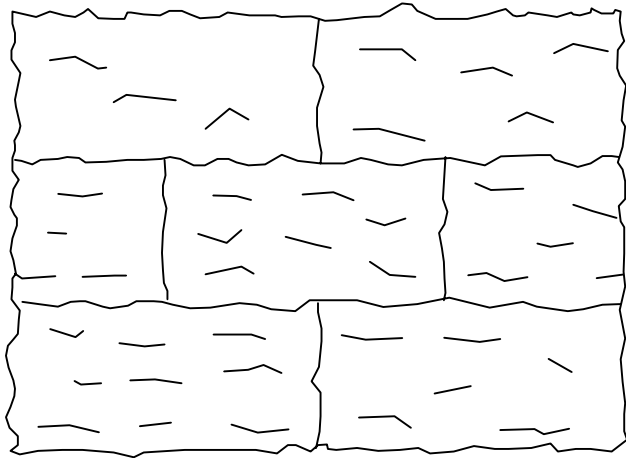
**Maintenance**

- Sod should be kept moist for at least the first three weeks, until properly rooted.
- Sod areas where original placement does not establish or take root.
- Do not mow for the first three weeks.
- Once mowing begins, cutting height should be 3" or greater.
- Fertilize and mow grasses once established.

**Inspection Checklist**

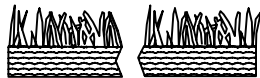
- Sodded areas are properly watered and maintained.
- Heavy construction equipment has been prohibited from crossing sodded areas.
- Sodded areas are mowed once established.

FLOW ↓

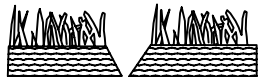


SHAPE AND SMOOTH SOIL SURFACE TO FINAL GRADE. WORK PRESCRIBED LIME AND FERTILIZER INTO THE SOIL.

LAY SOD IN A STAGGERED PATTERN. BUTT THE STRIPS TIGHTLY AGAINST EACH OTHER. DO NOT LEAVE SPACES AND DO NOT OVERLAP. A SHARPENED MASON'S TROWL IS A HANDY TOOL FOR TUCKING DOWN THE ENDS AND TRIMMING PIECES.



CORRECT



INCORRECT

BUTTING - ANGLED ENDS CAUSED BY THE AUTOMATIC SOD CUTTER MUST BE MATCHED CORRECTLY.



City of Berea  
Stormwater Manual

Sodding Detail

SOURCE: LOUISVILLE MSD

EPP 4.2.7

## **Sodding Standard**

### Installation:

Shape and smooth the soil surface to final grade in accordance with the approved grading plan.

Add lime to reach a soil pH value required by the specific grass. Fertilize according to a soil test or in the absence of a test use available nitrogen, phosphorous and potash as prescribed for permanent seeding. Work lime and fertilizer into the soil 3- to 6-inches deep and smooth the surface.

Clear the soil surface of trash, debris, roots, branches, stones and soil clods in excess of 2-inches of length or diameter. Rake soil surface to break crust just before laying sod, or irrigate soil lightly if the soil is dry. Do not install sod on hot, dry soil, compacted clay, frozen soil, gravel, or soil than has been treated with pesticides.

Sod should be harvested, delivered, and installed within a period of 36 hours. Store rolls of sod in the shade during installation. Sod should be free of weeds and be of uniform thickness (approximately 1-inch) and should have a dense root mat for mechanical strength.

Lay strips of sod beginning at the lowest area to be sodded with the longest dimension of the strip perpendicular to the slope, and stagger in a brick-like pattern. Wedge strips securely in place. Square the ends of each strip to provide for a close, tight fit. Match angled ends correctly to prevent voids.

Roll or compact immediately after installation to ensure firm contact with the underlying topsoil.

Irrigate the sod until the soil is wet to a depth of 4-inches, and keep moist until grass takes root.

If placed on steep slopes, sod should be laid with staggered joints and/or be pegged and stapled. In areas such as steep slopes or next to running waterways, chicken wire, jute, or other netting can be placed over the sod for extra protection against lifting.


### Inspection and Maintenance:

Watering may be necessary after planting and during periods of intense heat and/or lack of rain (drought). Keep soil moist to a depth of 2-inches until sod is fully rooted.




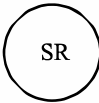
Mow to a height of 2- to 3-inches after sod is well-rooted (2-3 weeks). Do not remove more than 1/3 of the shoot in anyone mowing.

Permanent, fine turf areas require yearly applications of fertilizer and lime.

Inspect the sod frequently after it is first installed, especially after large storm events, until it has established a permanent cover.

	<b>City of Berea Stormwater Manual</b>
<b>Sodding Detail</b>	
	<b>EPP 4.2.7</b>

SOURCE: LOUISVILLE MSD

	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.8</b>																		
<b>PLANNING CONSIDERATIONS:</b>  Design Life: 1 yr  Acreage Needed: Minimal  Estimated Unit Cost: Medium  Monthly Maintenance: 10% of Installation																				
	<p style="text-align: center;"><b>Target Pollutants</b></p> <table border="0" style="width: 100%; text-align: center;"> <tr> <td>Significant ♦</td> <td>Partial ♦</td> <td>Low or Unknown ◊</td> </tr> <tr> <td>Sediment ♦</td> <td>Heavy Metals ◊</td> <td>Nutrients ◊</td> </tr> <tr> <td>Oil &amp; Grease ◊</td> <td>Bacteria &amp; Viruses ◊</td> <td>Oxygen Demanding Substances ◊</td> </tr> <tr> <td></td> <td></td> <td>Toxic Materials ◊</td> </tr> <tr> <td></td> <td></td> <td>Floatable Materials ◊</td> </tr> <tr> <td></td> <td></td> <td>Construction Waste ◊</td> </tr> </table>	Significant ♦	Partial ♦	Low or Unknown ◊	Sediment ♦	Heavy Metals ◊	Nutrients ◊	Oil & Grease ◊	Bacteria & Viruses ◊	Oxygen Demanding Substances ◊			Toxic Materials ◊			Floatable Materials ◊			Construction Waste ◊	
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<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>	<p>This BMP corrects the affects of runoff velocities, sediment trapping and sheet flow length by constructing small furrows across a slope, and utilizing construction equipment to track soil surface. The primary function of surface roughening is to temporarily stabilize a slope until it can receive permanent vegetation.</p> <ul style="list-style-type: none"> <li>➤ All exposed construction slopes.</li> <li>➤ Exposed soils where seeding, planting, and mulching will benefit from surface roughening.</li> <li>➤ Areas that have the potential for erosion of clay (smooth, hard surfaces), silt or sand sized particles.</li> </ul> <p>Roughening methods include:</p> <ul style="list-style-type: none"> <li>➤ Terracing, (see <a href="#">EPP 4.2.13</a>)</li> <li>➤ Fill Slope Roughening</li> <li>➤ Grooving</li> <li>➤ Roughening with tracked machinery</li> </ul> <p>Factors to be considered in choosing a method are</p> <ul style="list-style-type: none"> <li>➤ Slope steepness</li> <li>➤ Mowing requirements</li> <li>➤ Soil type</li> </ul>																			

**Installation Procedures**

**Fill Slope Roughening**

- Place fill slopes with a gradient steeper than 3:1 (H:V) in lifts not to exceed 8 in., and make sure each lift is properly compacted.
- The face of the slope should consist of loose, uncompacted fill 4 in. to 6 in. deep.
- Use grooving, furrowing, or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer and mulch then track or punch in the mulch. See Permanent Seeding (EPP 4.2.6), Temporary Seeding (EPP 4.2.5), and Mulching (EPP 4.2.10) BMPs.
- Do not blade or scrape the final slope face.

**Grooving - Cuts, Fills, and Graded Areas**

- Slopes that will be maintained by mowing should be no steeper than 3:1 (H:V).
- To roughen these areas, create shallow grooves by normal tilling, disking, harrowing, or use a cultipacker-seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 10 in. apart and 3 in. deep.
- Excessive roughness is undesirable where mowing is planned.
- Practice should be used on slopes no longer than 200 feet.

**Furrowing**

- Slope no greater than 3:1 (H:V)
- Use equipment to cut a 6" deep furrow while placing cut material below furrow
- Cut furrows along the contour and at a minimum spacing of 50'.
- Practice should not be used on slope longer than 200 feet.

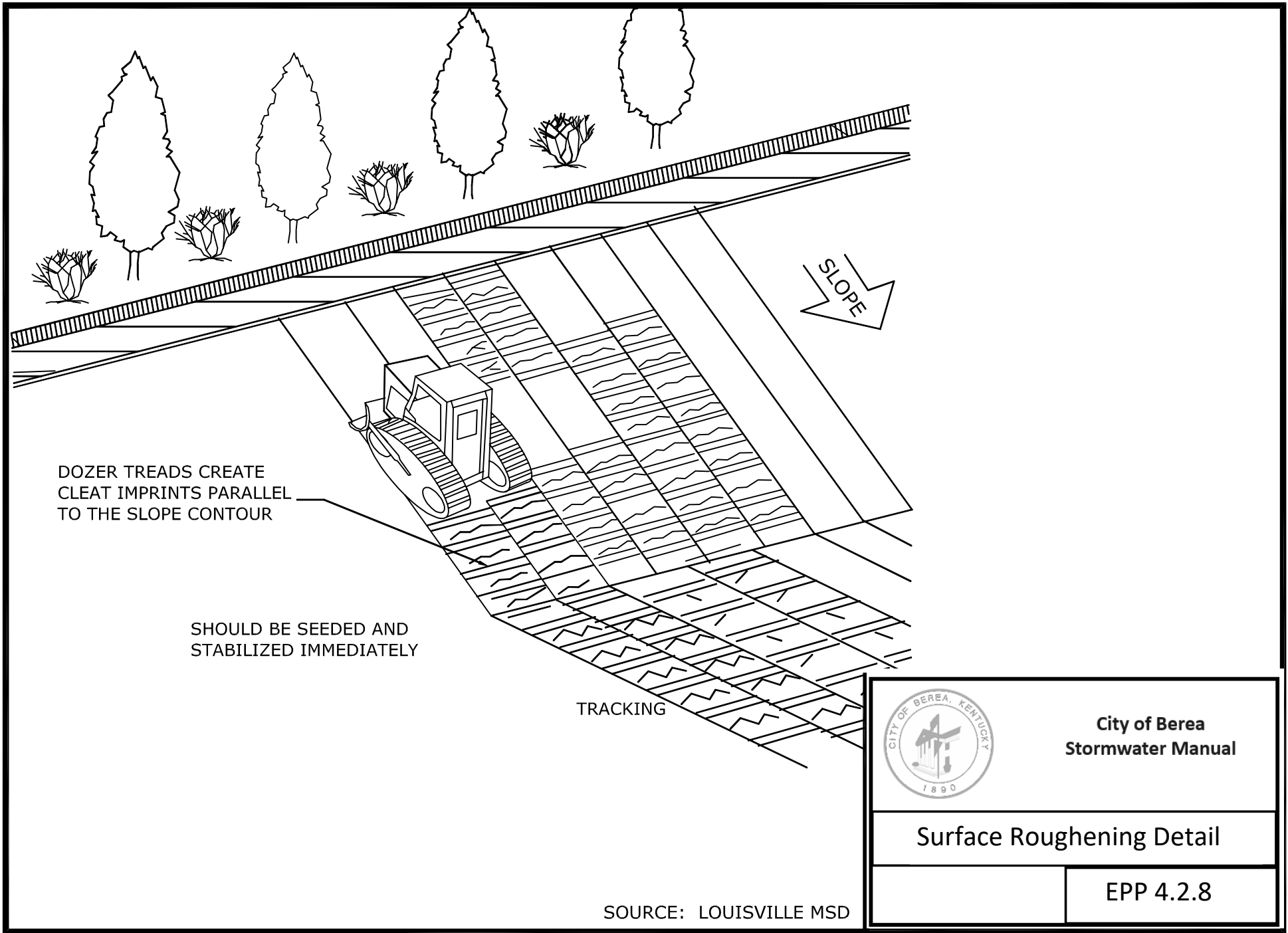
**Roughening with Tracked Machinery**

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil, running with the contours of the slope. Do not back blade during the final grading operation.
- Seed and mulch roughened areas to obtain optimum seed germination and growth.
- Periodically check the seeded or planted slopes for rills and washes, particularly after significant storm events, greater than 0.5 in.
- Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.

**Maintenance**

**Inspection Checklist**

- Surface roughened areas inspected after recent wet weather events.
- Rills and washed areas have been re-roughened and re-seeded.
- Practice is maintained and properly functioning; other practices are not required.



DOZER TREADS CREATE  
CLEAT IMPRINTS PARALLEL  
TO THE SLOPE CONTOUR

SHOULD BE SEEDED AND  
STABILIZED IMMEDIATELY

TRACKING

SLOPE



City of Berea  
Stormwater Manual

Surface Roughening Detail

EPP 4.2.8

SOURCE: LOUISVILLE MSD

Usage:

To slow erosion, surface roughening by tracking should be done as soon as possible after the vegetation has been removed from the slope.

Tracking can be used with seeding, planting and temporary mulching to stabilize an area.

Tracking should be performed immediately after grading activities have ceased (temporarily or permanently) in an area.

Installation:

It is important to avoid excessive compacting of the soil surface when tracking because soil compaction inhibits vegetation growth and causes higher runoff rates. As few passes as possible should be made with the machinery in order to minimize compaction.

Surface roughened areas by the means of tracking should be seeded and mulched within 14 days.

Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces ½ - inches or more of precipitation.

If rills (small watercourses that have steep sides and are usually only a few inches deep) appear, they should be re-graded and re-seeded immediately.



**City of Berea  
Stormwater Manual**

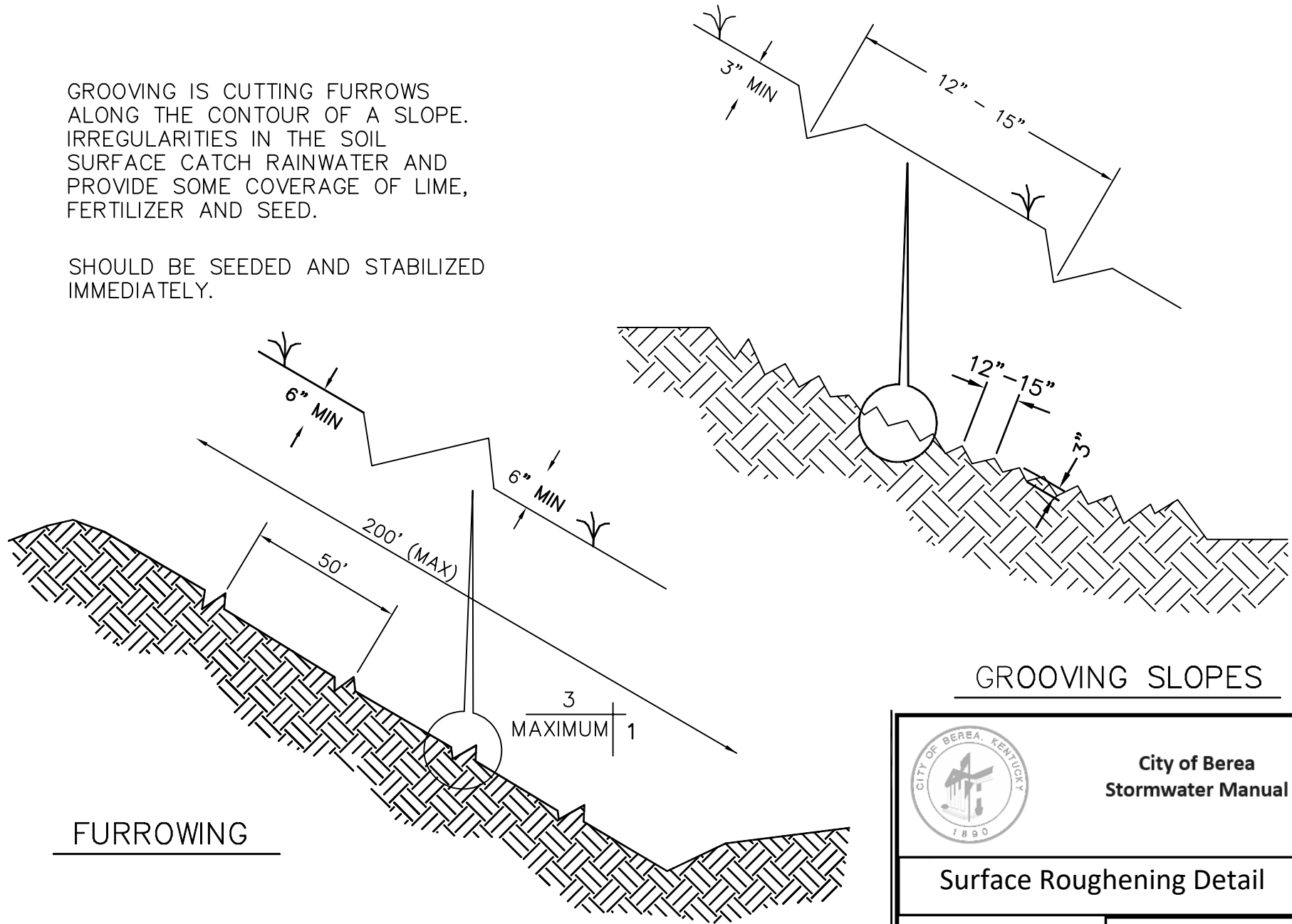
**Surface Roughening Detail**

**EPP 4.2.8**

SOURCE: LOUISVILLE MSD


GROOVING IS CUTTING FURROWS ALONG THE CONTOUR OF A SLOPE. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND PROVIDE SOME COVERAGE OF LIME, FERTILIZER AND SEED.

SHOULD BE SEEDED AND STABILIZED IMMEDIATELY.



GROOVING SLOPES

FURROWING

	<p><b>City of Berea Stormwater Manual</b></p>
	<p><b>Surface Roughening Detail</b></p>
<p><b>EPP 4.2.8</b></p>	

SOURCE: LOUISVILLE MSD

Usage:

To slow erosion, slope grooving should be done within 7 days after the vegetation has been removed from the slope.

Slope Grooving can be used with seeding and planting to stabilize an area.

Installation:

Slope Grooving may be installed with any appropriate implement that can be safely operated on the slope and will not cause undue compaction. Suggested implements include discs, chisel plows and the teeth on a front-end loader bucket. Such grooves should be a minimum of 3-inches deep and no further than 15-inches apart.


Areas that are graded in this manner should be seeded within 14 days.



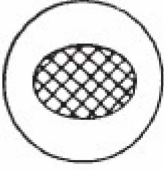

Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces 1/2-inches or more of precipitation.

If rills (small watercourses that have steep sides and are usually only a few inches deep) appear, they should be re-graded and re-seeded immediately.

*SOURCE: LOUISVILLE MSD*

	<b>City of Berea Stormwater Manual</b>
<b>Surface Roughening Detail</b>	
	<b>EPP 4.2.8</b>

	<p><b>City of Berea, Kentucky</b>  <b>Stormwater Best Management Practices (BMPs)</b>  <b>Erosion Prevention Practices (EPPs)</b></p>	<p><b>EPP 4.2.9</b></p>						
<p><b>PLANNING CONSIDERATIONS:</b></p> <p>Design Life: Permanent</p> <p>Acreage Needed: Varies</p> <p>Estimated Unit Cost: Medium</p> <p>Monthly Maintenance: 10% of Capital Cost</p>								
	<p style="text-align: center;"><b>Target Pollutants</b></p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Significant ♦</td> <td style="text-align: center;">Partial ♦</td> <td style="text-align: center;">Low or Unknown ◊</td> </tr> <tr> <td>Sediment ♦ Oil &amp; Grease ♦</td> <td>Heavy Metals ♦ Bacteria &amp; Viruses ◊</td> <td>Nutrients ♦ Oxygen Demanding Substances ♦ Toxic Materials ◊ Floatable Materials ♦ Construction Waste ◊</td> </tr> </table>	Significant ♦	Partial ♦	Low or Unknown ◊	Sediment ♦ Oil & Grease ♦	Heavy Metals ♦ Bacteria & Viruses ◊	Nutrients ♦ Oxygen Demanding Substances ♦ Toxic Materials ◊ Floatable Materials ♦ Construction Waste ◊	
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<p><b>Description</b></p> <p><b>Suitable Applications</b></p> <p><b>Approach</b></p>	<p>Topsoil is used to enhance the final product of a construction site area. This act is done to support temporary and permanent seeding, as well as aiding in erosion control methods. By implementing this BMP, a reduction in construction waste and some reduction in sediment will occur.</p> <ul style="list-style-type: none"> <li>➤ Where construction activities expose subsoil layers that may not be able to support vegetative growth.</li> <li>➤ Areas where reusing and preserving topsoil increases the success rate of new vegetation.</li> </ul> <ul style="list-style-type: none"> <li>➤ Compost used on site as a recycled aspect of construction clearing.</li> <li>➤ Verify proper placement of down slope sediment control practices prior to removing topsoil. Strip topsoil only from those areas that will be disturbed by excavation, filling, road building, or compaction by equipment. Normally, 4 to 6 inches are stripped for topsoil use.</li> <li>➤ Position topsoil stockpiles where they will not erode, block drainage, or interfere with site work.</li> <li>➤ Before topsoil is applied to the site, disk the subsoil to insure topsoil bonding. Apply a minimum of 4 inches of topsoil evenly.</li> <li>➤ If site is excavated down to rock, such as sandstone or shale, 8 to 12 inches of topsoil is recommended for good plant growth.</li> </ul>							

**Activity: Top Soiling****EPP 4.2.9****Installation Procedures**





- Strip topsoil 4 to 6 in. from areas to be disturbed by excavation, filling, road building or compaction by equipment and preserve for later use.
- Disk the subsoil to insure topsoil bonding before applying to site. Applying a minimum of 4 in. of topsoil evenly.
- Apply seeding & mulch or sod after final grading.

**Maintenance**

- Maintain areas where vegetation has been re-established to remedy erosion and damage or vegetation failure by frequently checking the newly applied topsoil.

**Inspection Checklist**

- Effective management practices such as netting, temporary seeding, mulch and other traditional methods are used to ensure correct storage of the soil. If these practices are not available, other equivalent practices are to be enforced.
- Appropriate layer of topsoil has been established.
- Storage piles do not interfere with site drainage.

	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.10</b>										
<b>PLANNING CONSIDERATIONS:</b>  <b>Design Life:</b> 6-12 Months  <b>Acreage Needed:</b> None  <b>Estimated Unit Cost:</b> Low  <b>Monthly Maintenance:</b> 60% of Installation												
	<b>Target Pollutants</b>											
	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Significant ♦</td> <td style="text-align: center;">Partial ♦</td> <td style="text-align: center;">Low or Unknown ◊</td> </tr> </table>	Significant ♦	Partial ♦	Low or Unknown ◊								
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Sediment ♦	Heavy Metals ◊	Nutrients ♦	Oxygen Demanding Substances ◊	Toxic Materials								
Oil & Grease ◊	Bacteria & Viruses ◊		Floatable Materials ◊	Construction Waste ◊								
<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>	<p>To secure temporary or permanently seeded areas, mulching is used as a stabilizer. There are several types of mulches to be utilized, some of which include organic materials, straw, wood chips, and bark or other wood fibers. This management practice has the possibility to significantly reduce sediment and partial reduction of nutrients.</p> <ul style="list-style-type: none"> <li>➤ Temporary stabilization of freshly seeded and planted areas, sometimes during periods of unsuitable vegetative growth.</li> <li>➤ Temporary stabilization of areas that cannot be seeded or planted (e.g., insufficient rain, steep slope, non-growth season).</li> <li>➤ Areas which have been permanently seeded to assist in retaining moisture, and to hold seeding.</li> <li>➤ On areas to increase the survival of temporary and/or permanent vegetative cover. As</li> <li>➤ short term, non-vegetative ground cover on steepened slopes to reduce rainfall impact, decrease the velocity of sheet flow, and settle out sediment.</li> <li>➤ As ground cover around established plants, such as trees or shrubs, and on unprotected flat to minor slopes.</li> <li>➤ Apply to planting areas where slopes are 2.5:1 (H:V) or less steep. Tacking agents or devices may be necessary for steeper slopes.</li> <li>➤ Areas where climatic conditions require soil moisture retention aid to avoid cracking.</li> </ul> <p>The term "mulch" is commonly used to describe a variety of materials, such as:</p> <ul style="list-style-type: none"> <li>○ Shredded tree bark and other woody materials, to protect trees and shrubs.</li> <li>○ Straw or hay, scattered across a slope or disturbed area.</li> <li>○ Peat mulch, used in planting trees and shrubs.</li> </ul> <p><a href="#">Table EPP-10-01</a> has a recommended application rate for various types of mulches.</p>											

Approach  
(cont'd)

#### Vegetative Fibers (Straw)

Loose hay or straw are the most common mulch materials used in conjunction with direct seeding of soil. Straw mulch is preferable over hay mulch, which may contain weeds and other objectionable material. Straw mulch is the short-term protection most commonly used with seeding. Wheat or oat straw is recommended from the current season's crop (less than 12 months old). Average fiber length should exceed 6 in.

Straw mulch is applied immediately after seeding, whether by machine or by hand distribution. Anchor the mulch in place using a tacking agent, plastic netting, or punching into the soil mechanically. Plastic netting requires wire staples, wooden stakes, or plastic stakes. If the slopes are too steep for netting, then tacking agents should be selected on the basis of longevity and the ability to hold the fibers in place.

#### Anchoring

- Crimping, tracking, disking, or punching into soil
  - Small areas - Hand punch mulch 2-3 inches into the loose soil.
  - Larger areas - Use mulching tool on tractor to punch and anchor mulch 2-8 inches into the soil.
  - Tracking - Cut straw into soil by using a bulldozer with cleated tracks, placed such that the cleat marks are perpendicular to the runoff.
  - Typically used on slopes 3:1 or flatter for safe operation of equipment.
  
- Covering with netting or mat
  - Nettings or biodegradable paper, plastic or cotton netting can be used to cover straw mulch. The safety of animals (small birds, snakes and other wildlife) should be considered when selecting materials for this measure.
  
- Spraying tackifiers (Polymer or Organic)
  - Polymer tackifiers are typically applied at a rate of 40-60 lbs/acre, or per manufacturer's recommendations.
  - Organic tackifiers are typically applied at a rate of 80-120 lbs/acre, or per manufacturer's recommendations.
  
- Cellulose fiber mulch
  - Can be tacked at a rate of 750 lbs/acre

#### Shredded Vegetation

"Green" mulch is produced by recycling of vegetation trimmings such as grass, shrubs, and trees. Methods of application are generally by hand, although pneumatic methods are currently being developed. It can be used as a temporary ground cover with or without seeding. The green mulch in place with a tacking agent on steep slopes and in areas where overland sheet flow is anticipated. The quality of green mulch may vary, and there is a strong potential for establishing unwanted weeds and plants.

Approach  
(cont'd)

**Wood and Bark Chips**

Wood and bark chips are suitable for landscaped areas that will not be closely mowed. Wood and bark chips may require nitrogen treatment to prevent nutrient deficiency. Bark chips do not require additional nitrogen fertilizer.

If there is a wood source near the project site, wood and bark chips can be very inexpensive. Caution must be used on steep slopes, since both wood and bark chips tend to wash down slopes exceeding 6 percent. Wood and bark chips are also used around trees and shrubs, or in ornamental or landscape gardens. A typical rate for placing wood and bark chip mulch is 6 tons per acre, at a depth of 2-3 inches.

**Hydraulic Mulch**

Hydraulic mulch can be made from virgin wood fibers or from recycled waste paper sources (newsprint, magazine). There are also mulches available which are a combination. In general, virgin wood fibers contain a longer fiber length than recycled paper mulch.

Hydraulic mulch is mixed in a hydraulic application machine (such as a hydroseeder or a mulch blower) and then applied as liquid slurry. The hydroseeder slurry contains recommended rates of seed and fertilizer for the site, usually specified with a tacking agent. Slurry must be constantly agitated to keep the proper application rate and achieve uniform effective coverage.

**Table EPP-10-01  
Recommended Rates for Mulching Materials**

<b>Mulch Product</b>	<b>Application Rate</b>
Straw or Hay	1 ½ tons per acre
Wood Chips, Bark, Sawdust	5 - 8 tons per acre
Hydraulic mulches and soil binders	1 ½ - 2 tons per acre

Maintenance

- Must be inspected weekly and after rain for damage or deterioration.
- Inspect after episodes of high winds.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction that the soils are not being reworked. Inspect before expected rainstorms and repair any damaged ground cover and re-mulch exposed areas of bare soil.

Inspection  
Checklist

- All disturbed areas are properly covered per plans and specifications.
- Straw mulch has been properly crimped.
- Mulch has been replaced following intense wet weather events or episodes of high winds.



**Approach  
(cont'd)**

Permanent Erosion Control Matting

Consist of permanent, non-degradable, three-dimensional plastic structures that are filled with soil prior to planting.

- Typically used to stabilize concentrated flow areas where velocities are between 5 and 10 ft/sec.
- Linings should be designed and selected by a professional experienced in the use of these materials
- Provides the same benefits as erosion control blankets
- Protects channels from erosion within high capacity storm water conveyance channels.
- Filters fine sediment during lower flow stormwater events

**Installation  
Procedures**

**Always follow the manufacturer's recommendations for orientation, overlapping, entrenching, and securing blankets and mats.**

Temporary Blankets

Some of the pertinent characteristics required in some machine produced temporary blankets are found in [Table EPP-11-01](#)

**Table EPP-11-01  
Temporary Blanket Characteristics**

<b>Blanket</b>	<b>Materials</b>	<b>Mesh</b>	<b>Minimum Thickness</b>	<b>Minimum Dry Weight</b>
Straw	weed-free straw from agricultural crops	5/16" x 5/16"	3/8"	0.5 lbs/sy
Excelsior	curled wood excelsior (80% fibers are six inches or longer)	1 1/2" x 3"	1/4"	0.8 lbs/sy
Coconut Fiber	100% coconut fiber	5/8" x 5/8"	1/4"	0.5 lbs/sy
Wood Fiber	reprocessed wood fibers	5/8" x 3/4"	N/A	0.35 lbs/sy
Jute Mesh	woven root fiber or yarn	N/A	N/A	1 lbs/sy

All blankets should have a minimum width of 48 inches

- Blankets are typically installed vertically from top to bottom of slopes.
- Trim blankets as needed to optimize coverage.
- In areas of concentrated flows, such as the bottom of a ditch, orient blanket in the same direction of the flow.
- Entrench blanket at the top and bottom of the slope.
- Overlap vertical joints at least 3 inches
- Staples should be used to anchor blankets. Do not use stakes.

**Installation Procedures (cont'd)**

Permanent Matting

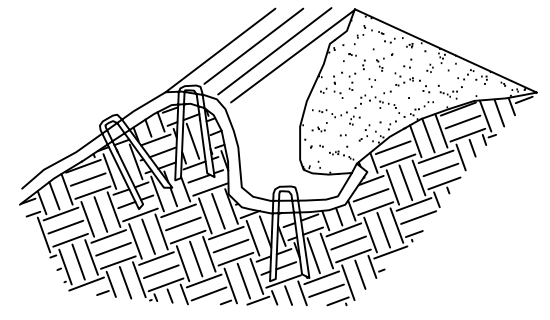
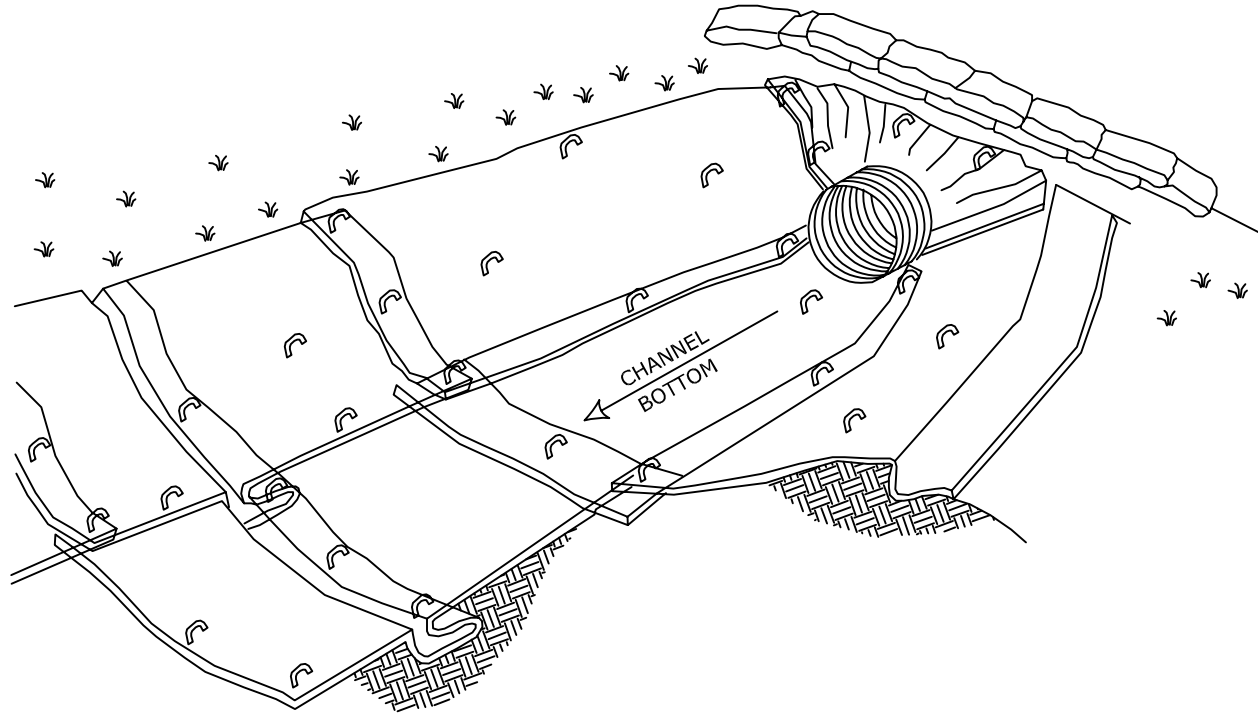
- Consists of webs, nettings, monofilaments or fibers that are entangled to form a strong and dimensionally stable matrix.
- Maintain shape before, during and after installation.
- Resistant to ultraviolet degradation
- Inert to chemicals in a natural soil environment.
- Begin installing permanent matting in storm conveyances at the bottom of the slopes and progress upstream.
- Staples or stakes can be used to anchor mats.

**Maintenance**

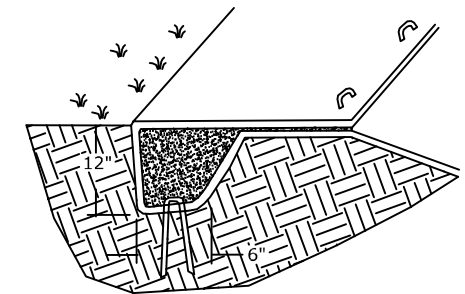
- Inspect erosion control matting before (if anticipated) and within 24 hours following rainfall events to check for movement of topsoil, mulch or erosion. Continue checking until vegetation is firmly established.
- Inspect blankets or mats at least every 14 days.
- Repair or replace netting that has been washed out, broken, eroded, and/or needing surface repair, re-seeding, re-sodding, re-mulching or topsoil replacement.

**Inspection Checklist**

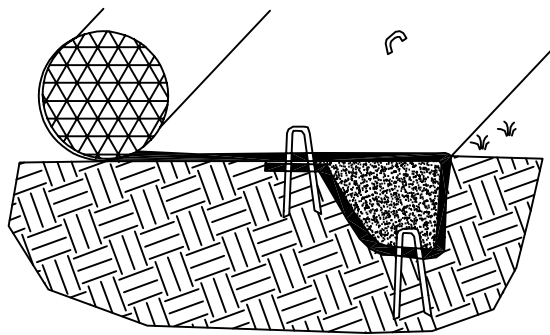
- Channel grades are adequately managing runoff velocity.
- Staples are appropriately spaced to avoid loss of seed, topsoil and mulch to stormwater runoff and winds.
- Nets are adequately covered or anchored to prevent erosion, washout, and poor plant establishment.



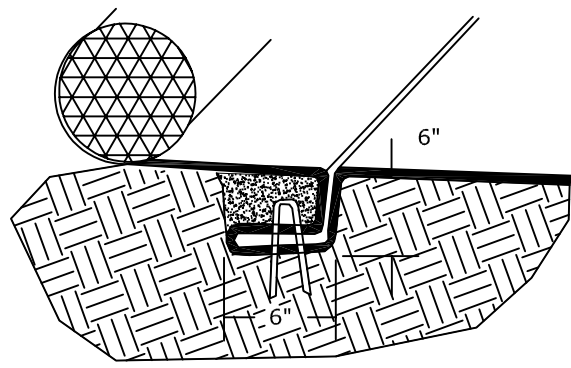
LONGITUDINAL ANCHOR TRENCH



TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH



INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

1. CHECK SLOTS TO BE CONSTRUCTED PER MANUFACTURERS SPECIFICATIONS.
2. STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.

FIGURE 1

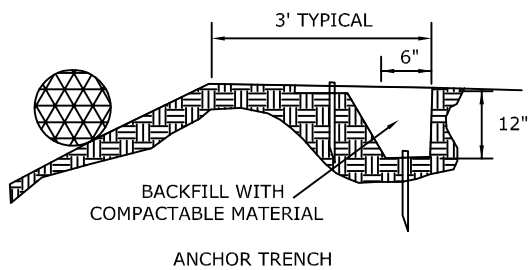
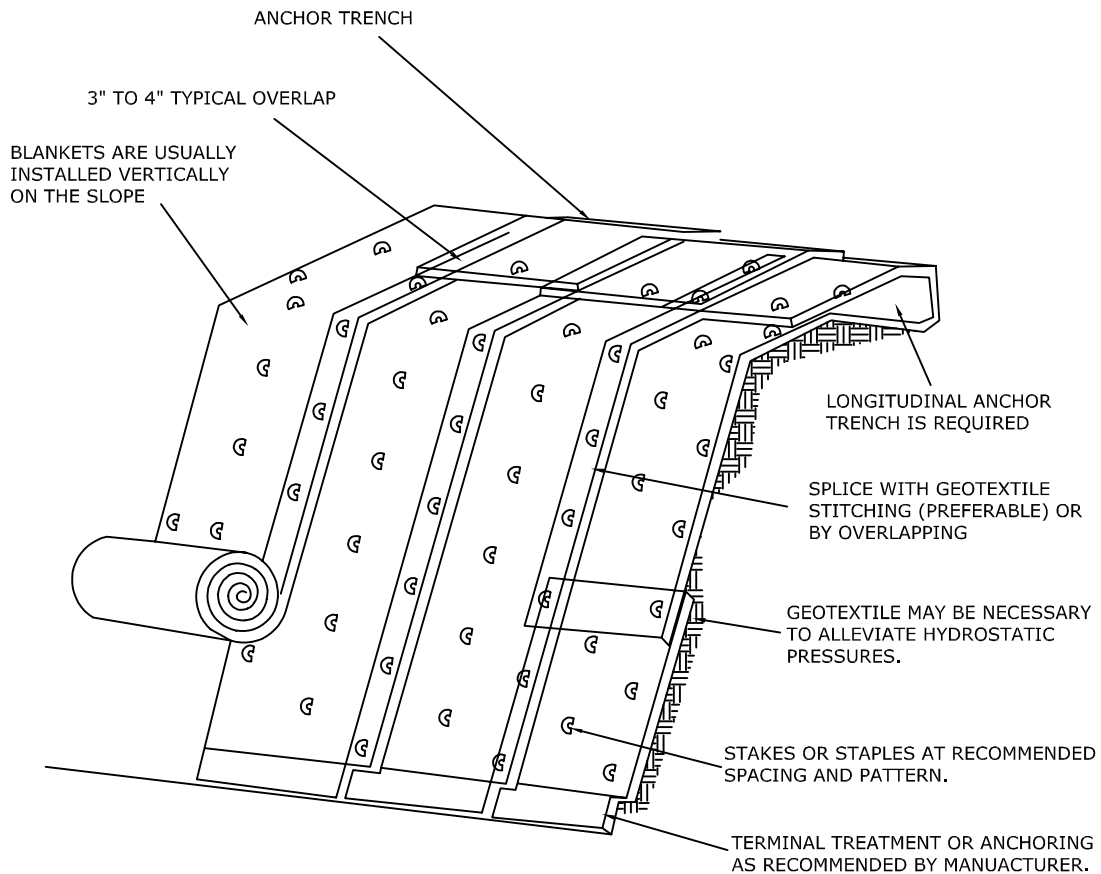
SOURCE: LOUISVILLE MSD  
TDEC



City of Berea  
Stormwater Manual

Netting & Mat Details

EPP 4.2.11



NOTES:

1. STITCHING BLANKET SEAMS IS PREFERABLE TO OVERLAPPING BLANKET SETAMS.
2. STAKING OR STAPLING LAYOUT SHALL CONFORM TO MANUFACTURER'S RECOMMENDATIONS FOR SLOPE AND GRADE.

FIGURE 2

SOURCE: LOUISVILLE MSD  
TDEC

	<p><b>City of Berea</b> <b>Stormwater Manual</b></p>
<p><b>Netting &amp; Mat Details</b></p>	
<p><b>EPP 4.2.11</b></p>	

## CONDITIONS

Matting and blankets can be applied to steep slopes where erosion hazards are high and conventional seeding is likely to be too slow in providing adequate protective cover. Concentrated flow areas, all slopes steeper than 2.5:1, with a height of ten feet or greater, and cuts and fills within stream buffers, should be stabilized with the appropriate erosion control matting or blanket. Maintenance of the final vegetative cover must be considered when choosing blankets versus matting.

## PLANNING CONSIDERATIONS

Care must be taken to choose the type of blanket or matting which is most appropriate for the specific needs of a project. Manufacturer's recommendations should be followed when choosing products.

### Temporary Erosion Control Blankets

This includes rolled erosion control blankets consisting of a plastic netting which covers and is intertwined with a natural organic or manmade mulch; or, a jute mesh which is typically homogenous in design and can act alone as a soil stabilization blanket. Temporary blankets as a minimum should be used to stabilize concentrated flow areas with a velocity less than 5 ft/sec and slopes 2.5:1 or steeper with a height of 10 feet or greater. Because temporary blankets will deteriorate in a short period of time, they provide no long-term erosion prevention protection when used alone.

Benefits of using temporary erosion control blankets include the following:

- Protection of the seed and soil from raindrop impact and subsequent displacement
- Thermal consistency and moisture retention for seedbed area
- More complete and faster germination of grasses and legumes

### Permanent Erosion Control Matting

Consists of a permanent, non-degradable, three-dimensional plastic structure that is filled with soil prior to planting. These mats are also known as turf reinforcing mats. Roots penetrate the matrix, forming a continuous anchorage for vegetation. Matting should be used when a vegetative lining is desired in storm water conveyance channels where the projected or designed velocity is between about five and ten feet per second. These velocities are suggestions only. Concentrated flow channel linings should be designed by a professional experienced in the use of these materials, and according to the manufacturer's recommendations.

Benefits of using erosion control matting include the following:

- All of the benefits gained from using erosion control blankets
- Provides erosion protection from flows of high capacity storm water conveyance channels
- Acts as a filter for fine sediment during lower flow storm water events

## CONSTRUCTION SPECIFICATIONS

All blanket and matting materials should be nontoxic to vegetation and to the germination of seed. Netting should be intertwined with the mulching material/fiber to maximize strength and provide for ease of handling.

SOURCE: LOUISVILLE MSD  
TDEC



**City of Berea  
Stormwater Manual**

**Netting & Mat Details**

**EPP 4.2.11**

## Temporary Blankets

Machine produced temporary blankets should have a consistent thickness with the organic material evenly distributed over the entire blanket area. All blankets should have a minimum width of 48 inches. Machine produced temporary blankets include the following:

1. Straw blankets are temporary blankets that consist of weed-free straw from agricultural crops formed into a blanket. Blankets with a top side of biodegradable plastic mesh size of 5/16 x 5/16 inch and sewn to the straw with biodegradable thread are appropriate for slopes. The blanket should have a minimum thickness of 3/8 inch and minimum dry weight of 0.5 pounds per square yard.

**Site Preparation:** After the site has been shaped and graded to the approved design, prepare a friable seedbed relatively free from clods and rocks more than one inch in diameter, and any foreign material that will prevent contact of the blanket or mat with the soil surface.

**Temporary Blankets:** Erosion control blankets should generally be installed vertically from the top of the slope to the bottom (See Figure 2). Trim blankets as necessary to fit the area to be covered. For slopes shallower than 2:1, and with a height of twice the width of the blanket roll or less, up to a maximum height of 16 feet, the blanket may be applied horizontally across the slope. For use in concentrated flow areas, place the blanket in the direction of the water flow. Always entrench the blanket beyond the top and bottom of the slope and at any horizontal joint a minimum of 6 inches, or per manufacturer's recommendation. Overlap vertical joints at least 3 inches, or per manufacturer's recommendation.

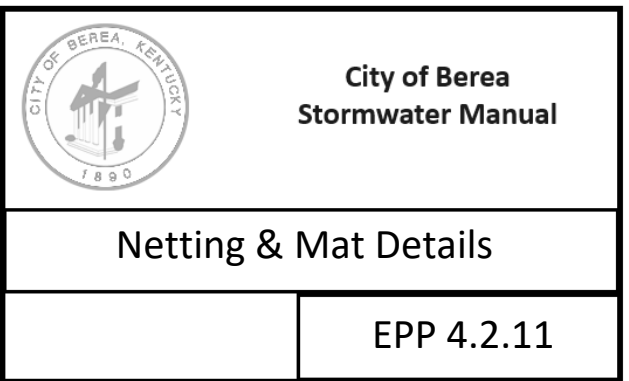
**Permanent Matting:** When installing permanent matting in a storm water conveyance channel, begin at the bottom of the slope and progress upstream, centering the mat in the middle of the channel. Shingle upstream layer over downstream layer, overlapping 3 feet. Overlap 3 inches minimum along longitudinal seams. Entrench the upper and lower edges beyond the slope (See Figure 1).

**Staples:** Staples should be used to anchor temporary blankets, and either staples or stakes should be used to anchor permanent matting. Follow manufacturer's recommendations for stapling or staking pattern and frequency.

**Planting:** Seed and any necessary soil amendments should be applied prior to installation of temporary blankets. For permanent mats, the area should be brought to final grade, and any soil amendments tilled or plowed into the soil surface. After the permanent mat has been installed and backfilled with topsoil, the area should be seeded and mulched.

## MAINTENANCE

Inspections of blankets and matting should be made before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every fourteen calendar days. Blanket and matting inspections should identify washed out areas, areas needing additional staples, and/or additional areas needing blankets or matting. Maintenance needs identified in inspections or by other means shall be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.



SOURCE: LOUISVILLE MSD  
TDEC

Netting & Mat Details

EPP 4.2.11

ON STEEP SLOPES, APPLY STRIPS OF NETTING PARALLEL TO THE DIRECTIONS OF FLOW AND ANCHOR AS PER MANUFACTURER'S SPECIFICATIONS (SLOPES GREATER THAN 1:1)

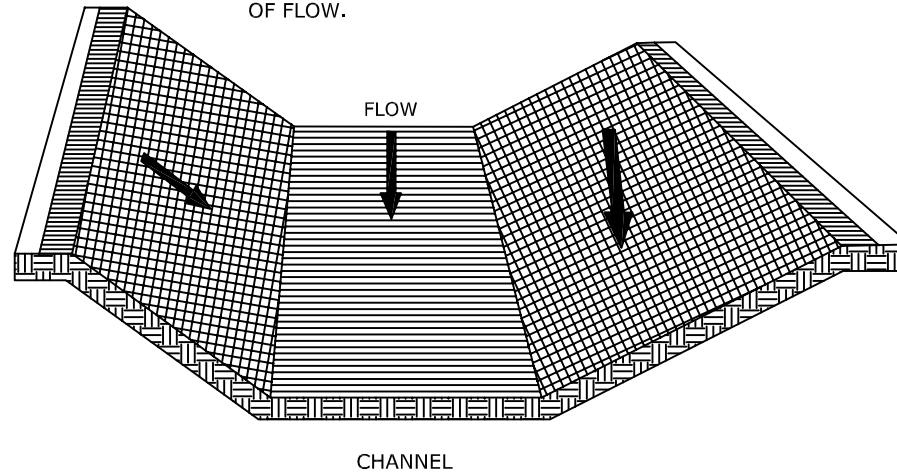
STEEP SLOPE

IN CHANNELS, APPLY NETTING PARALLEL TO THE DIRECTION OF FLOW.

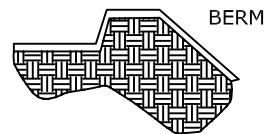
SHALLOW SLOPE

LAY FROM BOTTOM UP W/4" LAP. KEY IN AT TOP OF SLOPE/BERM.

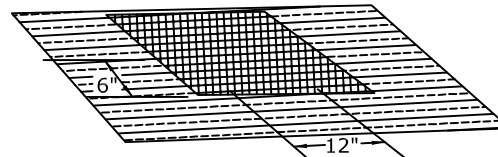
ON SHALLOW SLOPES, STRIPS OF NETTING MAY BE APPLIED ACROSS THE SLOPE. (SLOPES UP TO 1:1)



WHERE THERE IS A BERM AT THE TOP OF THE SLOPE, BRING THE NETTING OVER THE BERM AND ANCHOR IT BEHIND THE BERM.



BRING NETTING DOWN TO LEVEL AREA BEFORE TERMINATING THE INSTALLATION.



SOURCE: LOUISVILLE MSD



City of Berea  
Stormwater Manual

## Netting & Mat Details

EPP 4.2.11

Installation:

The proper installation of netting and matting is different for each product, therefore the recommended installation procedure from the manufacturer should be followed.

Overlap the edges of each strip at least 4-inches and staple every 3-feet down the center of the overlap when overlapping separate strips of netting and matting,

Bring netting and matting down to a level area before terminating the installation. Turn the ends under at least 6-inches and staple the end of the matting at 12-inch intervals.

Netting and Matting must be applied so that it is in complete contact with the soil. If not, erosion will occur beneath it.


Netting should be securely anchored to the soil as recommended by the manufacturer guidelines. Mulch binders should be applied at rates recommended by the manufacturer.

Inspection and Maintenance:




Areas protected by netting and matting should be checked for dislocation or failure every seven (7) calendar days and within 24-hours after each rainfall event that produces \*-inches or more of precipitation.

Regular inspections should take place until grasses are firmly established.

If washouts or breakage occurs, re-install netting and matting as necessary after repairing any slope damage.

	<b>City of Berea Stormwater Manual</b>
<b>Netting &amp; Mat Details</b>	
	<b>EPP 4.2.11</b>

SOURCE: LOUISVILLE MSD

	<b>City of Berea, Kentucky</b> <b>Stormwater Best Management Practices (BMPs)</b> <b>Erosion Prevention Practices (EPPs)</b>	<b>EPP 4.2.12</b>
	<b>Activity: Geo textiles (G)</b>	
<b>PLANNING CONSIDERATIONS:</b>  Design Life: N/A  Acreage Needed: None  Estimated Unit Cost: Low  Monthly Maintenance: N/A		
		<div style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 0 auto;">G</div>
	<b>Target Pollutants</b>	
	<div style="display: flex; justify-content: space-around;"> <span>Significant ♦</span> <span>Partial ♦</span> <span>Low or Unknown ◊</span> </div>	
	<div style="display: flex; justify-content: space-around;"> <span>Sediment ♦    Heavy Metals ◊    Nutrients ◊ Oil &amp; Grease ◊    Bacteria &amp; Viruses ◊</span> <span>Oxygen Demanding Substances ◊    Toxic Materials ◊ Floatable Materials ◊    Construction Waste</span> </div>	
<b>Description</b>  <b>Suitable Applications</b>  <b>Approach</b>	<p>Geotextiles are woven or non-woven fabrics, applied between surfaces or materials, to reduce flow velocities, release runoff as sheet flow, remove some sediment from runoff and are likely to create a significant reduction in sediment. Runoff and pollution caused by construction activities can be prevented or reduced with this BMP.</p> <ul style="list-style-type: none"> <li>➤ Construction sites desiring stability for disturbed soils.</li> <li>➤ Sloppy area where anchoring must take place.</li> <li>➤ Slopes steeper than 3:1 (H:V) and/or where erosion hazard is high.</li> <li>➤ Slow growing vegetated areas.</li> <li>➤ Critical slopes adjacent to sensitive areas (streams, wetlands, etc.).</li> </ul> <p>Geotextiles provide stabilization, filtration, and separation properties. This BMP may be used when there is a need for separation between two materials or mediums that are likely to otherwise interfere with one another.</p> <ul style="list-style-type: none"> <li>➤ Separating subsoil from aggregate within a subsurface drain.</li> <li>➤ Separating subsoil from aggregate placed at the soil surface.</li> <li>➤ Stabilization of soil surface during temporary stream diversion.</li> <li>➤ Prevent buildup of hydrostatic pressure behind gabions, decorative, or retaining walls.</li> </ul> <p>This BMP does not require design or selection by a professional experienced in geotextile applications. However, if hydrostatic pressure becomes a concern for stability of a retaining wall, then a professional should be consulted.</p> <p>Geotextiles should be selected based on the standard specifications detailed in MSHTO M288.</p>	

**Installation  
Procedures**

Geotextiles should be non-toxic to vegetation, and inert to soil chemicals. The materials selected should meet or exceed requirements of strength, resistance to distortion, permittivity, and resistance to ultraviolet degradation.

**Geotextiles should be installed according to the specifications of the manufacturer.**

- Site preparation should include removal of rocks, clods, debris greater than 1" and any voids.
- The material should be loosely placed with no wrinkles, folds or distortions.
- The fabric should be in direct contact with the soil.
- Overlap sheets by placing the next consecutive sheet upstream on top of the downstream sheet.
- Fabric may require field joining with stakes or staples.
- Do not dump aggregate onto fabric from height greater than five feet. Aggregate should be placed to prevent damage.
- Damaged section may be repaired by placing a piece that overlaps the damaged area by at least 1 foot.

**Maintenance**

- Inspection to occur periodically, if any portion of the material is damaged, immediate correction is required.
- Inspections may occur prior to any anticipated wet weather events.
- Inspection to occur after significant rain storms to check for erosion and undermining.
- Repairs to the slope and re-installation should occur as a result of wash-out or breakage.
- Perform maintenance as required by the manufacturer.

**Inspection  
Checklist**

- Site is adequately prepared (grading or shaping, rocks, vegetation and debris removal, etc.).
- Seeding meets geotextile requirements.
- Anchoring is established at an acceptable depth.
- Anchoring trenches are used at the top and bottom of slopes.
- Trenches start, join and terminate geotextiles placed in channels.
- Soil filling is even and flat.



**Installation Procedures**

Graded areas with smooth, hard surfaces give a false impression of "finished grading" and a job "well done". It is difficult to establish vegetation on such surfaces due to reduced water infiltration and the potential for erosion. Rough slope surfaces with uneven soil and rocks left in place may appear unattractive or unfinished at first, but they encourage water infiltration, speed the establishment of vegetation, and decrease runoff velocity. Rough, loose soil surfaces give lime, fertilizer, and seed some natural coverage. Niches in the surface provide microclimates which generally provide a more favorable moisture level that aids seed germination.

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, and tracking. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

1. Disturbed areas which will not require mowing may be stair-step graded, grooved, or left rough after filling.
2. Graded areas steeper than 3:1 (H:V) should be stair-stepped with benches. The stair-stepping will help vegetation become attached and also trap soil eroded from the slopes above. Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material which sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment.
3. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the step in towards the slope.
4. Do not make individual vertical cuts more than 24 in. (600 mm) high in soft materials or more than 3 ft. (1 m) high in rocky materials.
5. Groove the slope using machinery to create a series of ridges and depressions that run across the slope and on the contour.

***Fill Slope Roughening***

- Place fill slopes with a gradient steeper than 3:1 (H:V) in lifts not to exceed 8 in. (200 mm), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4 in. (100 mm) to 6 in. (150 mm). This is not to be confused with proper compaction necessary for slope stabilization.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer, and mulch and then track or crimp in the mulch. See [EPP 4.2.5](#), [EPP 4.2.10](#): Temporary Seeding and Mulching, respectively.
- Do not blade or scrape the final slope face.

***Cuts, Fills, and Graded Areas***

- Slopes that will be maintained by mowing should be no steeper than 3:1 (H:V).
- To roughen these areas, create shallow grooves by normal tilling, disking, harrowing, or use a mechanical seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 10 in. (250 mm), and not less than 1 in. (25 mm) deep.
- Excessive roughness is undesirable where mowing is planned.

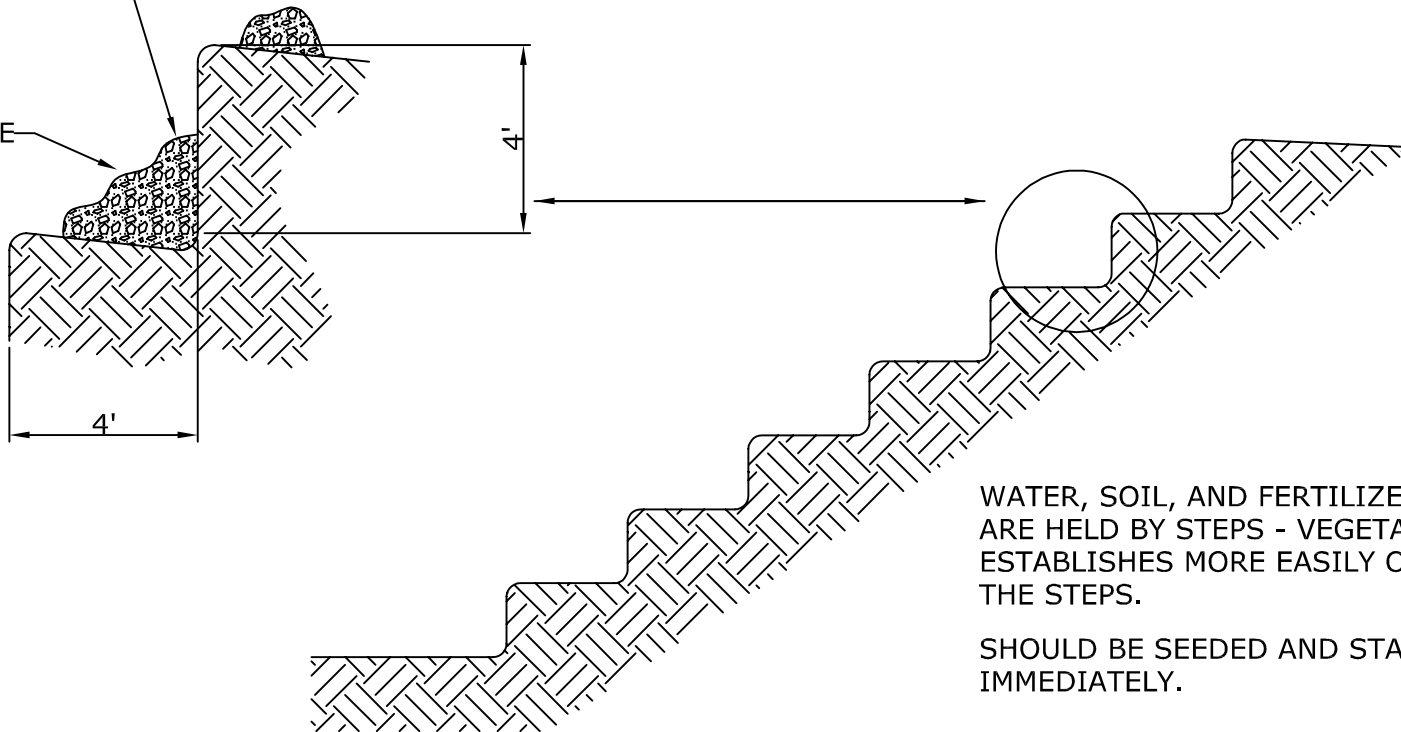
**Activity: Terracing****EPP 4.2.13**

- Maintenance**
- Periodically check the seeded or planted slopes for rills and washes, particularly after significant storm events greater than 0.5 in. (12 mm). Fill these areas slightly above the original grade, then re-seed and mulch as soon as possible.
  - Inspect roughened slopes weekly and after rainfall for excessive erosion.

- Inspection Checklist**
- Furrows at least 6 in. deep.
  - Furrows are spaced no more than 50 ft. apart.
  - Horizontal distance is greater than vertical distance on stepped slopes. Stepped
  - slopes or terraced slopes cut so that they drain in on themselves.

DEBRIS FROM SLOPE  
ABOVE IS CAUGHT  
BY STEPS

DRAINAGE



WATER, SOIL, AND FERTILIZER  
ARE HELD BY STEPS - VEGETATION  
ESTABLISHES MORE EASILY ON  
THE STEPS.

SHOULD BE SEEDED AND STABILIZED  
IMMEDIATELY.

STAIR STEPPING CUT SLOPES



City of Berea  
Stormwater Manual

Terracing Details

EPP 4.2.13

SOURCE: LOUISVILLE MSD

Usage:

To slow erosion, stair step grading should be done within 7 days after the vegetation has been removed from the slope.

Stair-step grading can be used with seeding, and planting to stabilize an area.

Installation:

Stair-step grading may be carried out on any material soft enough to be moved with a bulldozer. The ratio of vertical cut distance to horizontal distance should not be steeper than 1: 1 and the horizontal portion of the "step" should slope towards the vertical wall.

Areas that are graded in this manner should be seeded within 14 days.

Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces ½ - inches or more of precipitation.

If rills (small watercourses that have steep sides and are usually only a few inches deep) appear, they should be re-graded and re-seeded immediately.



**City of Berea  
Stormwater Manual**

**Terracing Details**

**EPP 4.2.13**

*SOURCE: LOUISVILLE MSD*