HARDIN COUNTY FISCAL COURT

BEST MANAGEMENT PRACTICES HANDBOOK

2005

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Best Management Practices

BMP Selection Guidelines

Guidelines for selecting BMPs for construction sites are contained in the tables on the following pages. Each BMP is listed along with its purpose and application, relative effectiveness, and relative cost of installation and maintenance. The reader is also encouraged to review the KY Erosion Prevention and Sediment Control Field Guide.

The guide describes the erosion and sediment control process, beginning with sections on pre-project planning and operational activities. The rest of the guide discusses erosion prevention and sediment control by starting at the top of the hill, above the project site, and proceeding down the slope through the bare soil area, ditches and channels, traps and basins, and on down to the waterways below.

For state highway projects, the KY Transportation Cabinet Specifications for Road and Bridge Construction should be consulted. Sections 212, 213, and 214 address erosion control, water pollution control, and geotextile construction, respectively.

Forestry operations should consult the KY Forest Practice Guidelines for Water Quality Management, the complete handbook of the Best Management Practices required under the Forest Conservation Act.

Construction Site BMP Guidelines

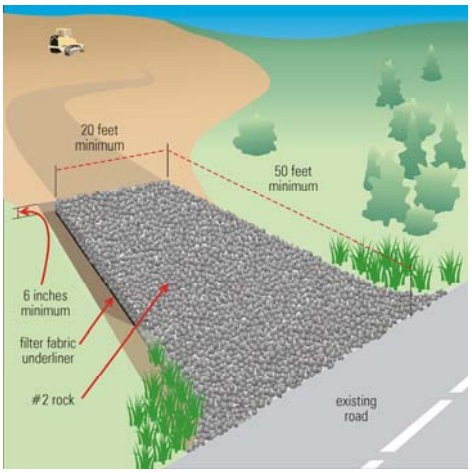
BMP	Purpose and Application	Relative Effectiveness	Relative Installation and Maintenance Cost
Construction Entrance	To keep sediment from being tracked onto public streets. A rock driveway of No. 2 stone is constructed where traffic leaves the site.	High	Moderate
Temporary Seeding	Provide temporary vegetation and reduce erosion. Must be applied within 14 days to areas where work has temporarily stopped for 21 days or more.	High	Low
Permanent Seeding	Provide permanent vegetation and reduce erosion. Must be applied within 14 days to areas that have reached final grade.	High	Low
Mulching	Reduce erosion, foster the growth of grass, and keep the soil moist.	High	Low
Silt Fence	Provide a place for water to pond and silt to fall out.	Moderate	Moderate
Brush, Rock, and Commercial Barriers	Same as silt fence.	Moderate	Moderate
Erosion Control Blankets and Mats	Prevent erosion, promote the growth of grass by holding the seed in place, and keep the soil moist. Required for slopes greater than 3:1 and channel velocities greater than 5 feet per second.	High	High
Surface Roughening	Slow the velocity of water flowing down a slope and keep the seed and mulch in place. A dozer is operated up and down the slope to create small depressions with the tracks.	Moderate	Low
Slope Drain	Transport water down the face of a slope without causing erosion. A pipe or concrete lined channel may be used.	Moderate	High
Curb Inlet Sediment Barrier	Create a small ponding area for the silt to settle out at the front of the inlet using rock bags or similar products.	Low	High
Drop Inlet Sediment Barrier	Create a small ponding area for the silt to settle out around the perimeter of the drop inlet using rock or silt fence.	Low	High
Culvert Inlet Sediment Barrier	Create a small ponding area for the silt to settle out at the culvert entrance using rock.	Low	High
Pipe Outlet Energy Dissipator	Reduce the velocity of water exiting a pipe using a rock apron.	Low	High

BMP	Purpose and Application	Relative Effectiveness	Relative Installation and Maintenance Cost
Rock Lined Channel	Prevent channel erosion using rock.	High	High
Grass-Lined Channel	Prevent channel erosion using vegetation.	High	High
Check Dam	Reduce the channel velocity and trap sediment	Low	High
Sediment Trap	Trap sediment by collecting it in a small depression and slowly discharging it.	Low	Moderate
Sediment Basin	Trap sediment by collecting it in a basin and slowly discharging it. Required for disturbed drainage areas of more than 10 acres.	Moderate	High
Stream Crossing	Protect stream banks and bottoms from erosion by constructing a span of culverts.	Moderate	Moderate

Construction Entrance

Definition

A temporary gravel construction entrance is a stabilized pad of crushed stone located at any point where traffic enters or leaves a construction site onto a public right-of-way, street, alley, sidewalk, or parking area.



Purpose

A stabilized construction entrance is intended to reduce off-site sedimentation by eliminating the tracking or flowing of sediment onto public rights-of-way.

Design Criteria

Construction plans shall limit traffic to properly constructed and stabilized entrances. The entrance shall be located to minimize the impact to streams and storm drains.

Construction Specifications

- The aggregate size for construction of the pad shall be 2-3 inch stone. Place the gravel to the specific grade and dimensions shown on the plans, and smooth it.

- The thickness of the pad shall not be less than 6 inches. Use geotextile fabrics, if necessary, to improve stability of the foundation in locations subject to seepage or high water table.

- The width of the pad shall not be less than the full width of all points of ingress or egress and in any case shall not be less than 12 feet wide.

- The length of the pad shall be as required, but not less than 50 feet.

- Locate construction entrances and exits to limit sediment leaving the site and to provide for maximum utility by all construction vehicles. Avoid entrances that have steep grades and entrances at curves in public roads.

- The entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand, and repair and/or maintenance of any measures used to trap sediment.

- All sediment spilled, dropped, washed or tracked onto public rights-of-way shall be removed immediately.

- Provide drainage to carry water to a sediment trap or other suitable outlet.

- When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public rights-of-way. 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.

- All sediment shall be prevented from entering any storm drain, ditch or watercourse through use of sand bags, gravel, or other approved methods.

Inspection and Maintenance

- Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site.

- Replace gravel material when surface voids are visible.

- Inspect any structure used to trap sediment and clean it out as necessary.

- Immediately remove all objectionable materials spilled, washed, or tracked onto public roadways. Remove all sediment deposited on paved roadways within 24 hours.

Soil Stabilization

Temporary Seeding

Definition

Temporary seeding uses rapid growing grass to stabilize disturbed areas that have not reached final grade. Areas that will be inactive for 21 days or more must be seeded and mulched within 14 days of reaching temporary grade.

Purpose

1. To reduce problems associated with mud or dust from bare soil surfaces during construction.

2. To reduce sediment runoff to downstream areas and/or groundwater basins and improve the visual resources of the construction area.

Design Criteria

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 quick plant growth.

Construction Specifications

Site Preparation

- Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and anchoring.

- Install the needed erosion control practices prior to seeding such as diversions and berms.

Seedbed Preparation

- Spread lime (in lieu of a soil test recommendation) on acid soil (pH 5.5 or lower) and subsoil at a rate of one ton per acre of agricultural ground limestone. For best results, make a soil test. This can reduce expense of unneeded lime and fertilizer and potential excess nutrient loss through runoff and leaching.

- Fertilizer (in lieu of a soil test recommendation) shall be applied at a rate of 800 pounds per acre of 10-10-10 analysis or equivalent.

- Work the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of two inches. On sloping areas, the final operation shall be on the contour.

Seeding Rates

March 1 to October 31	Per 1,000 Square Feet	Per Acre
1. Oats	3 lbs.	120 lbs.
2. Perennial Ryegrass	1 lbs.	40 lbs.
3. Tall Fescue	1 lbs.	40 lbs.
4. Wheat	3 lbs.	120 lbs.
5. Annual Rye	3 lbs.	120 lbs.

November 1 to February 28	Per 1,000 Square Feet	Per Acre
1. Annual Rye	3 lbs.	120 lbs.
2. Wheat	3 lbs.	120 lbs.
3. Perennial Ryegrass	1 lb.	40 lbs.
4. Tall Fescue	3 lbs.	120 lbs.

- Apply the seed uniformly with a cyclone seeder, drill, cyclone, seeder, or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed no deeper than one-fourth inch to one-half inch.

- When feasible, except where a cyclone type seeder is used, the seedbed should be firmed following seeding operations with a cyclone, roller, or light drag. On sloping land, seeding operations should be on the contour wherever possible.

Maintenance

Water the soil until the grass is firmly established. This is especially true when seedings are made late in the planting season, in abnormally dry and hot season, or on adverse sites.

Permanent Seeding

Definition

Permanent seeding is the establishment of permanent, perennial grass cover on disturbed areas. Permanent seeding shall be applied to disturbed areas within 14 days of reaching final grade.

Purpose

1. To reduce problems associated with mud or dust from bare soil surfaces during construction.

2. To reduce sediment runoff to downstream areas and/or groundwater basins and improve the visual resources of the construction area.

Design Criteria

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 quick plant growth.

Construction Specifications

Site Preparation

- Soil material should be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of porous sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.

- Where compacted soils occur, they should be broken up sufficiently to create a favorable rooting depth of 6-8 inches.

- Stockpile topsoil to apply to sites that are otherwise unsuited for establishing vegetation.

- Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring, and maintenance. After the grading operation, spread topsoil where needed.

- Install the needed erosion control practices such as diversions and berms.

Seedbed Preparation

- Spread lime (in lieu of a soil test recommendation) on acid soil and subsoil, at a rate of one ton per acre of agricultural ground limestone. For best results, make a soil test. This can reduce expense of unneeded lime and fertilizer and potential excess nutrient loss through runoff and leaching.

- Fertilizer (in lieu of a soil test recommendation) shall be applied at a rate of 800 pounds per acre of 10-10-10 analysis. For best results, make a soil test.

- Work the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or other suitable field equipment to a depth of 4 inches. On sloping land, the final operation shall be on the contour.

Suggested Seeding Rates

Seed species & mixtures	Seeding rate/acre	Per 1000 sq ft
Seed and seed mixtures for relatively flat or slightly sloping areas		
Perennial ryegrass	25 to 35 lbs	1 lb
+ tall fescue	15 to 30 lbs	1 lb
Tall fescue	40 to 50 lbs	1.5 lb
+ ladino or white clover	1 to 2 lbs	2 oz
Steep slopes, banks, cuts, and other low maintenance areas (not mowed)		
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
Lawns and other high traffic or high maintenance areas (mowed)		
Bluegrass	105 to 140 lbs	3 lb
Perennial ryegrass (turf)	45 to 60 lbs	2 lb
+ bluegrass	70 to 90 lbs	2.5 lb
Tall fescue (turf type)	130 to 170 lbs	4 lb
+ bluegrass	20 to 30 lbs	1 lb
Ditches and other areas of concentrated water flows		
Perennial ryegrass	100 to 150 lbs	3 lb
+ white or 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 or ladino clover	1 to 2 lbs	2oz
Tall fescue	100 to 150 lbs	3 lb
+ ladino or white clover	1 to 2 lbs	2 oz
Tall fescue	100 to 150 lbs	3 lb
+ perennial ryegrass	15 to 20 lbs	0.5 lb
+ Kentucky bluegrass	15 to 20 lbs	0.5 lb

KYTC Seed Mixes

Mixture Type	Seed Mixture
Mixture No. I	75% Kentucky 31 Tall Fescue 10% Red Top 5% White Dutch Clover 10% Ryegrass (perennial)
Mixture No. III	30% Kentucky 31 Tall Fescue 15% Red Top 15% Partridge Pea 20% Sericea Lespedeza 10% Sweet Clover – Yellow 10% Ryegrass

KYTC does not specify the seeding rate. Instead, they require that sufficient seed be applied to ensure a dense, uniform vegetative cover.

Maintenance

- Water the soil until the grass is firmly established. This is especially true when seedings are made late in the planting season, in abnormally dry and hot season, or on adverse sites.

- Inspect all seeded areas for failures and make necessary repairs, replacements, reseedings, and remulching within the planting season.

- If stand is inadequate, (less than 85 percent groundcover) overseed, fertilize, using half of rates originally applied, and mulch.

- If stand is more than 60 percent damaged, reestablish following original seedbed preparation methods, seeding and mulching recommendations and apply lime and fertilizer as needed according to a soil test.

Mulching

Definition

Mulching is the application of a protective layer of straw or other suitable material to the soil surface. Straw mulch and/or hydromulch is also used in conjunction with seeding and hydroseeding of critical areas for the establishment of temporary or permanent vegetation. Mulching with straw or fiber mulches is commonly used as a temporary measure to protect bare or disturbed soil areas that have not been seeded.

Purpose

To temporarily stabilize bare and disturbed soils, to protect the soil surface from raindrop impact, to increase infiltration, to conserve moisture, to prevent soil compaction or crusting, and to decrease runoff. Mulching also fosters growth of vegetation by protecting the seeds from predators, reducing evaporation, and insulating the soil.

Design Criteria

Mulch can be applied to any site where soil has been disturbed and the protective vegetation has been removed. The most common use of a mulch is to provide temporary stabilization of soil, usually until permanent stabilizing vegetation is established. Where mulches are used to compliment vegetation establishment, they should be designed to last as long as it takes to establish effective vegetative erosion control.

Where mulches are used as surface cover only (i.e. bark, wood chips, or straw mulch cover) the serviceable duration of the application and maintenance requirements, including augmentation or replication should be specified.

On steep slopes, greater than 2.5:1, or where the mulch is susceptible to movement by wind or water, the mulch material should be hydraulically applied or the straw mulch should be

appropriately anchored. Hydraulic fiber mulches and/or tackifying agents are used effectively to bind the straw together and prevent displacement by wind or rain.

Construction Specifications

Straw

Straw is an excellent mulch material. Because of its length and bulk, it is highly effective in reducing the impact of raindrops and in moderating the microclimate of the soil surface. Straw mulch can be applied by hand on small sites and blown on by machine on large sites. Straw blowers have a range of about 50 feet. Some commercial models advertise a range up to 85 feet and a capacity of 15 tons/hr.

Mulch should not be applied more than 2 inches deep on seeded sites, unless it is incorporated into the soil by tracking, disking, or other 'punching in' techniques. If the straw is applied at rates higher than 3 tons/acre, the mulch may be too dense for the sunlight and seedlings to penetrate.

Prior to mulching, install any needed erosion and sediment control practices such as diversions, grade stabilization structures, berms, dikes, grass-lined channels and sediment basins.

- Obtain clean wheat, barley, oat, or rice straw in order to prevent the spread of noxious weeds. Avoid moldy, compacted straw because it tends to clump and is not distributed evenly.

- The straw shall be evenly distributed by hand or machine to the desired depth of 2-4 inches and should cover the exposed area to a uniform depth.

- Approximately one bale (approximately 80 lbs) of straw covers 1000 ft^2 adequately. The soil surface should be barely visible through the straw mulch. On steep or high wind sites, straw must be anchored to keep it from blowing away.

- For seeded sites, apply: 1.5-2 tons/acre, 1-2 inches deep, covering 80% of the soil surface.

- For unseeded sites: 2-3 tons/acre, 2-4 inches deep, covering 90% of the soil surface.

Anchoring

Mulch must be anchored immediately to minimize loss by wind or water. Straw mulch is commonly anchored by:

- crimping, tracking, disking, or punching into the soil;

- covering with a netting;

- spraying with asphaltic or organic tackifier;

- tacking with cellulose fiber mulch at a rate of 750 lbs/ac

Crimping

- On small sites, where straw has been distributed by hand, it can be anchored by hand punching it into the soil every 1-2 feet with a dull, round-nosed shovel. A sharp shovel will merely cut the straw and not anchor it.

- A mulch anchoring tool is a tractor drawn implement designed to punch and anchor mulch into the top 2-8 inches of soil. This practice affords maximum erosion control but is limited to flatter slopes where equipment can operate safely.

- Tracking is the process of cutting straw into the soil using a bulldozer or other equipment that runs on cleated tracks. Tracking is used primarily on slopes 3:1 or flatter where this type of equipment can safely operate. This is an effective way to crimp straw on fill slopes. Tracking equipment must operate up and down the slope so the cleat tracks are perpendicular to flow.

Nettings

- Nettings of biodegradable paper, plastic or cotton netting can be used to cover straw mulch. Netting should be specified judiciously since birds, snakes and other wildlife can get trapped in the nettings.

Tackifiers

- Polymer tackifiers are generally applied at rates of 40-60 lbs/ac, however manufacturers recommendations vary.

- Organic tackifiers are generally applied at rates of 80-120 lbs/acre, however manufacturer's recommendations vary.

- Applications of liquid mulch binders shall be heavier at edges, in valleys, and at crests of banks and other areas where the mulch may be moved by wind or water. All other areas shall have a uniform application of the tackifier.

<u>Wood Chips or Bark</u>

- Apply at a rate of approximately 6 tons/acre.

- The mulch should be evenly distributed across the soil surface to a depth of 2-3 inches.

- If decomposition, soil building and re-vegetation are desirable, increase the application rate of nitrogen fertilizer by 20 lbs. of N/acre, to compensate for the temporary diversion (loss) of available N to the soil microbes.

Hydraulic Mulches from Recycled Paper

This mulch is made from recycled newsprint, magazine, or other waste paper sources. This type of mulch is to be mixed in a hydraulic application machine (hydroseeder) and applied as a liquid slurry that contains the recommended rates of seed and fertilizer for the site. It can be specified with or without a tackifier.

- Apply at rate of 1.5 tons/ac, mixed with seed and fertilizer, at recommended rates, in order to achieve uniform, effective coverage.

- Paper mulch used to tack and bind straw mulch can be specified at a lower rate, 750 lbs/ac.

Hydraulic Mulches from Wood Fiber

This type of mulch is manufactured from wood waste. This type of mulch is also to be mixed in a hydraulic application machine (hydroseeder) and applied as a liquid slurry that contains the recommended rates of seed and fertilizer for the site. A wood fiber mulch can be manufactured containing a tackifier in each bag or specified without a tackifier.

Hydraulic Mulches from Wood and Paper Fiber

These combination mulches are generally comprised of 70% wood fiber and 30% paper fiber, manufactured from lumber mill waste, virgin wood chips, recycled newsprint, office paper and other waste paper. The mulch is mixed in a hydraulic application machine (hydroseeder) and applied as a slurry in combination with the recommended seed and fertilizer. The mulch can be specified with or without a tackifier.

Recommendations

Wood, paper or combination fiber mulches are typically applied with a hydraulic applicator (hydroseeder) at a minimum rate of 1.5 tons/ac.

A typical construction specification and application for mulch is as follows:

- Moisture content (total weight basis) not to exceed 12% +/- 3%.

- Organic matter content (oven dry weight basis) is 98% minimum.

- Inorganic matter (ash) content (oven dried basis) 2% maximum.

- pH at 3% consistently in water should be 4.9.

- Fiber shall be dyed to aid visual metering during application. The dye shall be biodegradable and shall not inhibit plant growth.

- Water holding capacity (oven dried basis) minimum 1.0 gal/lb of fiber.

- The mulch shall be mixed with seed and fertilizer as specified and applied at a rate recommended by the manufacturer in order to achieve uniform, effective coverage and provide adequate distribution of seed.

Inspection and Maintenance

If properly applied and anchored, little additional maintenance is required during the first few months. After high winds, or significant rainstorms, mulched areas should be checked for adequate cover and re-mulched if necessary. Mulch needs to last until vegetation develops to provide permanent erosion resistant cover. Straw mulch can last from 6 months to 3 years.

Sediment Barriers

Silt Fence

Definition

A silt fence is a temporary sediment barrier consisting of filter fabric entrenched into the soil and attached to supporting posts. Silt fence installed with a trencher or by slicing is the most effective installation method to ensure against common silt fence failures.

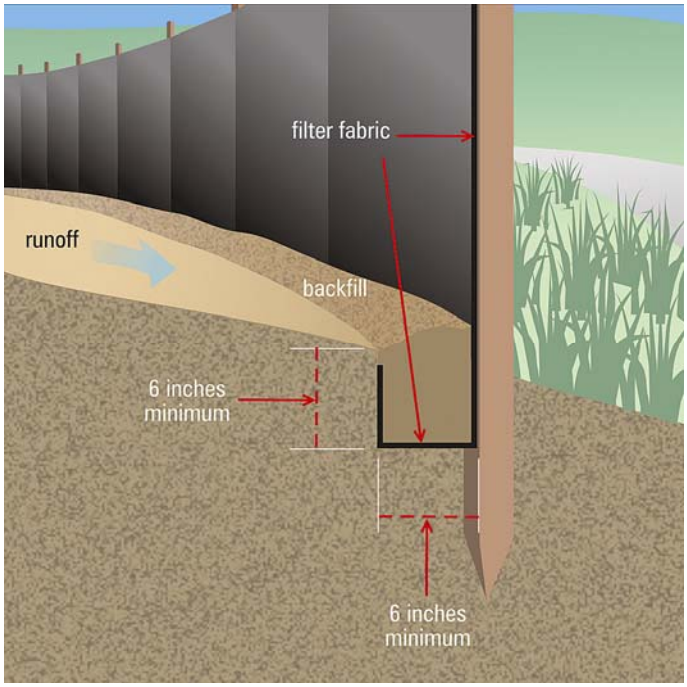
Purpose

Silt fence is a sediment control practice. Silt fence is intended to be installed where sediment-laden water can pond, thus allowing the sediment to fall out of suspension and separate from the runoff. Reasons for the high failure rate of improperly designed and installed silt fence include:

- Improper placement on the site
- Allowing excessive drainage area to the silt fence structure
- Shallow trenches with little or no soil compaction
- Inadequate attachment to posts
- Failure to maintain the silt fence after installation
- Installing silt fence along property boundaries, producing "concentrated" runoff

Design Criteria

Silt fence must only be installed where water can pond. Silt fence can be used where:



- non-concentrated sheet flow will occur;
- protection of adjacent property or "waters" of the United States is required;
- the size of the drainage area is no more than 1/4 acre per 100 linear feet of silt fence;
- the maximum flow path length above the barrier is 100 feet;
- the maximum slope gradient above the barrier is 2:1;
- small swales are carrying silt, the slope is less than 2%, and the drainage area is less than 2 acres (again, sheet flow only);

Silt Fence should not be used:

- around the perimeter of the construction site, unless J-hooks are used. Long continuous runs of silt fence will divert and concentrate sediment-laden runoff and almost certainly result in failure. A good "rule of thumb" is to drain no more than 1/3 acre of disturbed area into each discrete J-hook;
- in streams or channels. Silt fences cannot handle the volumes generated by channel flows. When installed across a concentrated flow path, undercutting or "end cutting" of the fence often occurs.

Construction Specifications

Silt fences have a useful life of one season. Their principal mode of action is to slow and pond the water and allow soil particles to settle. Silt fences are not designed to withstand high heads of water, and therefore should be located where only shallow pools can form. Their use is limited to situations in which sheet or overland flows are expected.

- Install silt fence material into a trench, 6" wide and at least 6" deep, with vertical sides. A preferred installation technique involves static slicing with an implement such as the "Tommy Silt Fence Machine" or equivalent.

- The trench must be backfilled and compacted.

- Install silt fences with J-hooks to reduce the drainage area that any segment will impound

- Silt fences placed at the toe of a slope shall be set at least 6 feet from the toe in order to increase ponding volume.

- The height of a silt fence shall not exceed 36 inches. Storage height and ponding height shall never exceed 18 inches.

- The ends of the fence should be turned uphill.

- Place the posts on the downstream side of the fabric.

- The filter fabric is wire-tied directly to the posts with three diagonal ties.

Inspection and Maintenance

- Inspect fence for proper installation and compaction by pulling up on the fence while kicking the toe of the fabric. If the fence comes out of the ground, do not "accept" the installation.

- If there are long, linear runs of silt fence without J-hooks, do not "accept" the installation.

- Silt fences and filter barriers shall be inspected weekly and after each storm of greater than 0.5 inches. Any required repairs shall be made immediately.

- Sediment should be removed when it reaches 1/3 height of the fence or 9 inches maximum.

- The removed sediment shall be spread and vegetated or otherwise stabilized.

- Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized and any sediment stored behind the silt fence has been removed.

Brush, Rock, and Commercial Sediment Barriers

Definition

Brush, rock, and commercial barriers can be used as a temporary sediment barrier instead of a silt fence.

Purpose

The purpose of any sediment barrier is to provide a place where sediment-laden water can pond, thus allowing the sediment to fall out of suspension and separate from the runoff.

Design Criteria

Sediment barriers should be installed where non-concentrated sheet flow will occur. They should not be used in streams or channels.

Construction Specifications

Brush cleared from the site can make an excellent sediment filter if it is properly placed and built up well. Brush barriers are installed on the contour and are 2–5 feet high and 4–10 feet wide at the base. They should be walked down with a loader or dozer to compress the material in the brush barrier.

A rock berm can provide an effective and low maintenance sediment barrier. The berm should be 18" to 30" in height and consist of stone 2"-6" in diameter.

Fiber rolls and other commercial products made from coconut fiber, plastic, wood shavings, compost, or other material can also be used as sediment barriers on slopes flatter than 10:1. Follow manufacturers' installation instructions and ensure that sediment filter spacing on slopes is correct.

Inspection and Maintenance

- Sediment barriers should be inspected weekly and after each rainfall of greater than 0.5 inches. Any required repairs shall be made immediately.

- Sediment should be removed when it reaches 1/3 height of the fence or 9 inches maximum.

- The removed sediment shall be spread and vegetated or otherwise stabilized.

- Sediment barriers should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized and any sediment stored behind the barrier has been removed.

Slope Protection

Erosion Control Blankets and Mats

Definition

The installation of protective mulch blankets or soil stabilization mats (turf reinforcement mats) to the prepared soil surface of a steep slope, channel or shoreline.

Purpose

Erosion control blankets are used to temporarily stabilize and protect disturbed soil from raindrop impact and surface erosion, to increase infiltration, decrease compaction and soil crusting, and to conserve soil moisture. Mulching with erosion control blankets will increase the germination rates for grasses and legumes and promote vegetation establishment. Erosion control blankets also protect seeds from predators, reduce desiccation and evaporation by insulating the soil and seed environment.

Some types of erosion control blankets and turf reinforcement mats are specifically designed to stabilize channelized flow areas. These blankets and mats can aid the establishment of vegetation in waterways and increase the maximum permissible velocity of the given channel by reinforcing the soil and vegetation to resist the forces of erosion during runoff events. Stems, roots and rhizomes of the vegetation become intertwined with the mat, reinforcing the vegetation and anchoring the mat.

Design Criteria

The table at the end of this section provides guidance on the application of various blankets and mats.

An erosion control blanket or mat should be used in all drainage channels and in the following conditions:

- Slopes and disturbed soils where mulch must be anchored and other methods such as crimping or tackifying are not feasible nor adequate.

- Steep slopes, generally steeper than 3:1.

- Slopes where erosion hazard is high.

- Critical slopes adjacent to sensitive areas such as streams and wetlands.

- Disturbed soil areas where planting is likely to be slow in providing adequate protective cover.

Erosion control blankets and turf reinforcement matting can be applied to problem areas to supplement nature's erosion control system (vegetation) in its initial establishment and in providing a safe and 'natural' conveyance for high velocity stormwater runoff. These products are being used today in many applications where previously a structural lining or armoring would have been required. Care must be taken to choose the type of blanket or matting that is appropriate for the specific needs of a project. There are many soil stabilization products available today and it is very difficult to cover all the advantages, disadvantages and specifications of all the manufactured blankets and mats. Therefore, as with many erosion control type products, there is no substitute for a thorough understanding of manufacturer's instructions and recommendations and a site visit by a designer or plan reviewer to verify a product's appropriateness.

Construction Specifications

Erosion control blankets are generally a machine produced mat of organic, biodegradable mulch such as straw, curled wood fiber (excelsior), coconut fiber or a combination thereof, evenly distributed on or between photodegradable polypropylene or biodegradable natural fiber netting. Synthetic erosion control blankets are a machine produced mat of ultraviolet stabilized synthetic fibers and filaments. The nettings and mulch material are stitched to ensure integrity and the blankets are provided in rolls for ease of handling and installation.

Soil stabilization and turf reinforcement mats are high strength, flexible, machine produced, three dimensional matrix of nylon, polyethylene, polypropylene or polyvinyl chloride that have ultra violet (UV) stabilizers added to the compounds to ensure endurance and provide permanent vegetation stabilization.

Site Preparation

- Proper site preparation is essential to ensure complete contact of the protection matting with the soil.

- Grade and shape area of installation.

- Remove all rocks, clods, vegetative or other obstructions so that the installed blankets, or mats will have direct contact with the soil.

- Prepare seedbed by loosening 2-3 inches of topsoil above final grade.

- Incorporate amendments, such as lime and fertilizer, into soil according to soil test and the seeding plan.

Seeding:

- Seed area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all check slots and other areas disturbed during installation must be reseeded.

- Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats to the ground surface. Wire staples should be a minimum of 11 gauge. Metal stake pins should be 3/16 inch diameter steel with a 1 1/2 inch steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface. All anchors should be 6-8 inches long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

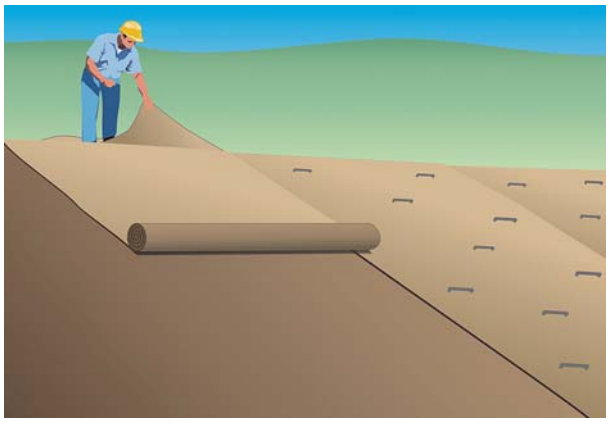
Installation on Slopes

- Begin at the top of the slope and anchor the blanket in a 6 inch deep x 6 inch wide trench. Backfill trench and tamp earth firmly.

- Unroll blanket downslope in the direction of the water flow.

- The edges of adjacent parallel rolls must be overlapped 2-3 inches and be stapled every 3 feet.

- When blankets must be spliced, place blankets end over end (shingle style) with 6-inch overlap. Staple through overlapped area, approximately 12 inches apart.

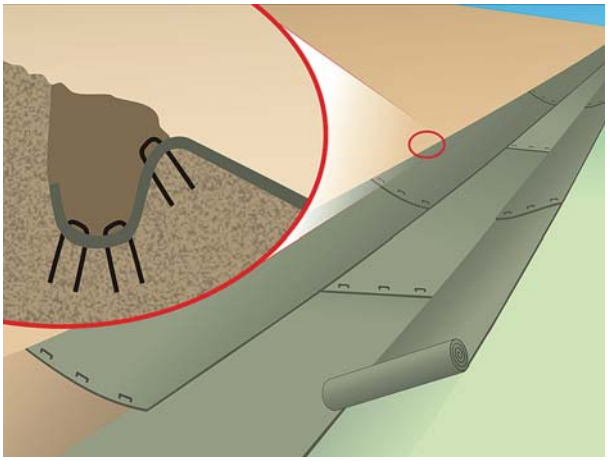


- Lay blankets loosely and maintain direct contact with the soil - do not stretch.

- Blankets shall be stapled sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 to 2:1, require two staples per square yard. Moderate slopes, 2:1 to 3:1, require 1-2 staples per square yard (1 staple 3' o.c.). Gentle slopes require one staple per square yard.

Installation in channels

- Dig initial anchor trench 12 inches deep and 6 inches wide across the channel at the lower end of the project area.



- Excavate intermittent check slots, 6 inches deep and 6 inches wide across the channel at 25-30 foot intervals along the channel.

- Cut longitudinal channel anchor slots 4 inches deep and 4 inches wide along each side of the installation to bury edges of matting. Whenever possible extend matting 2-3 inches above the crest of channel side slopes.

- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 1-foot intervals. **Note**: matting will initially be upside down in anchor trench.

- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 inches.

- Secure these initial ends of mats with anchors at 1-foot intervals, backfill and compact soil.

- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench.

- Unroll adjacent mats upstream in similar fashion, maintaining a 3-inch overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 1-inch intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.

- Alternate method for noncritical installations: place two rows of anchors on 6-inch centers at 25-30 feet intervals in lieu of excavated check slots.

- Shingle-lap spliced ends by a minimum of 1 foot with upstream mat on top to prevent uplifting by water or begin new rolls in a check slot. Anchor overlapped area by placing two rows of anchors, 1 foot apart on 1-foot intervals.

- Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soil.

- Anchor, fill and compact upstream end of mat in a 12 inch x 6 inch terminal trench.

- Secure mat to ground surface using U-shaped wire staples geotextile pins or wooden stakes.

- Seed and fill turf reinforcement matting with soil, if specified.

Soil filling (if specified for turf reinforcement)

- After seeding, spread and lightly rake 1/2-3/4 inches of fine topsoil into the mat apertures to completely fill mat thickness. Use backside of rake or other flat implement.

- Spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.

- Do not drive tracked or heavy equipment over mat.

- Avoid any traffic over matting if loose or wet soil conditions exist.

- Use shovels, rakes or brooms for fine grading and touch up.

- Smooth out soil filling, just exposing top netting of matrix.

Inspection and Maintenance

- All blanket and mats should be inspected periodically following installation.

- Inspect installation after significant rainstorms to check for erosion and undermining. Any failure should be repaired immediately.

- If washout or breakage occurs, re-install the material after repairing the damage to the slope or drainageway.

ECTC Standard Specification for Temporary Rolled Erosion Control Products

For use where natural vegetation alone will provide permanent erosion protection

Type	Product Description	Material Composition	Slope Applications*		Channel Applications*	Minimum Tensile Strength[1]
			Maximum Gradient	C Factor [2, 5]	Permissible Shear Stress [3, 4, 6]	
ULTRA SHORT-TERM – Typical 3-month Functional Longevity						
1.A	Mulch Control Nets	A photodegradable synthetic mesh or woven biodegradable natural fiber netting.	5:1 (H:V)	< 0.10 @ 5:1	= 0.25 lbs/ft^2	5 lbs/ft
1.B	Netless Rolled Erosion Control Blankets	Natural and/or polymer fibers mechanically interlocked and/or chemically adhered together to form a RECP.	4:1 (H:V)	< 0.10 @ 4:1	= 0.5 lbs/ft^2	5 lbs/ft
1.C	Single-net Erosion Control Blankets & Open Weave Textiles	Processed degradable natural and/or polymer fibers mechanically bound together by a single rapidly degrading, synthetic or natural fiber netting or an open weave textile of processed rapidly degrading natural or polymer yarns or twines woven into a continuous matrix.	3:1 (H:V)	< 0.15 @ 3:1	= 1.5 lbs/ft^2	50 lbs/ft
1.D	Double-net Erosion Control Blankets	Processed degradable natural and/or polymer fibers mechanically bound together between two rapidly degrading, synthetic or natural fiber nettings.	2:1 (H:V)	< 0.20 @ 2:1	= 1.75 lbs/ft^2	75 lbs/ft
SHORT-TERM - Typical 12-month Functional Longevity						
2.A	Mulch Control Nets	A photodegradable synthetic mesh or woven biodegradable natural fiber netting.	5:1 (H:V)	< 0.10 @ 5:1	= 0.25 lbs/ft^2	5 lbs/ft
2.B	Netless Rolled Erosion Control Blankets	Natural and/or polymer fibers mechanically interlocked and/or chemically adhered together to form a RECP.	4:1 (H:V)	< 0.10 @ 4:1	= 0.5 lbs/ft^2	5 lbs/ft
2.C	Single-net Erosion Control Blankets & Open Weave Textiles	An erosion control blanket composed of processed degradable natural or polymer fibers mechanically bound together by a single degradable synthetic or natural fiber netting to form a co ntinuous matrix or an open weave textile composed of processed degradable natural or polymer yarns or twines woven into a continuous matrix.	3:1 (H:V)	< 0.15 @ 3:1	= 1.5 lbs/ft^2	50 lbs/ft
2.D	Double-net Erosion Control Blankets	Processed degradable natural and/or polymer fibers mechanically bound together between two degradable, synthetic or natural fiber nettings.	2:1 (H:V)	< 0.20 @ 2:1	= 1.75 lbs/ft^2	75 lbs/ft

SOURCE: Erosion Control Technology Council (ECTC), 2003.

EXTENDED-TERM - Typical 24-month Functional Longevity						
Type	**Product Description**	**Material Composition**	**Slope Applications***		**Channel Applications***	**Minimum Tensile Strength[1]**
			Maximum Gradient	C Factor [2, 5]	Permissible Shear Stress [3, 4, 6]	
3.A	Mulch Control Nets	A slow degrading synthetic mesh or woven natural fiber netting.	5:1 (H:V)	< 0.10 @ 5:1	= 0.25 lbs/ft^2	25 lbs/ft
3.B	Erosion Control Blankets & Open Weave Textiles	An erosion control blanket composed of processed slow degrading natural or polymer fibers mechanically bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix or an open weave textile composed of processed slow degrading natural or polymer yarns or twines woven into a continuous matrix.	1.5:1 (H:V)	< 0.25 @ 1.5:1	= 2.00 lbs/ft^2	100 lbs/ft
LONG-TERM - Typical 36-month Functional Longevity						
Type	**Product Description**	**Material Composition**	**Slope Applications***		**Channel Applications***	**Minimum Tensile Strength[1]**
			Maximum Gradient	C Factor, [2, 5]	Permissible Shear Stress [3, 4, 6]	
4	Erosion Control Blankets & Open Weave Textiles	An erosion control blanket composed of processed slow degrading natural or polymer fibers mechanically bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix or an open weave textile composed of processed slow degrading natural or polymer yarns or twines woven into a continuous matrix.	1:1 (H:V)	< 0.25 @ 1:1	= 2.25 lbs/ft^2	125 lbs/ft

NOTES:

* *"C" factor and shear stress for Types 1.A., 2.A. and 3.A mulch control nettings must be obtained with netting used in conjunction with pre-applied mulch material.*

1 *Minimum Average Roll Values when tested in the machine direction using ECTC Modified ASTM D 5035.*

2 *"C" Factor calculated as ratio of soil loss from RECP protected slope (tested at specified or greater gradient, H:V) to ratio of soil loss from unprotected (control) plot in large-scale testing .These performance test values should be supported by periodic bench scale testing under similar test conditions using ECTC Test Method # 2.*

3 *Minimum shear stress RECP (unvegetated) can sustain without physical damage or excess erosion (0.5 in soil loss) during a 30-minute flow event in large-scale testing. These performance test values should be supported by periodic bench scale testing under similar test conditions and failure criteria using ECTC Test Method #3.*

4 *The permissible shear stress levels established for each performance category are based on historical experience with products characterized by Manning's roughness coefficients in the range of 0.01 - 0.05.*

5 *Acceptable large-scale test methods may include ASTM D6459 or other independent testing deemed acceptable by the engineer.*

6 *Acceptable large-scale testing protocol may include ASTM D6460 or other independent testing deemed acceptable by the engineer.*

SOURCE: Erosion Control Technology Council (ECTC), 2003.

ECTC Standard Specification for Permanent Rolled Erosion Control Products

For applications in channels and on slopes not exceeding 0.5:1 (H:V) where vegetation alone will not sustain expected flow conditions and/or provide sufficient long-term erosion protection

Type[1]	Product Description	Material Composition	Minimum Tensile Strength [2, 3]	Minimum Thickness (ASTM D 6525)	UV Stability (ASTM D 4355 @ 500 Hours)	Channel Applications Permissible Shear Stress [4, 5]
5.A	Turf Reinforcement Mat	Long term, non-degradable rolled erosion control product composed of UV stabilized, non-degradable, synthetic fibers, filaments, nettings and/or wire mesh processed into three dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature, natural vegetation. Turf reinforcement mats provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix.	125 lbs/ft	0.25 inches	80%	= 6.0 lbs/ft^2
5.B	Turf Reinforcement Mat		150 lbs/ft	0.25 inches	80%	= 8.0 lbs/ft^2
5.C	Turf Reinforcement Mat		175 lbs/ft	0.25 inches	80%	= 10.0 lbs/ft^2

NOTES:

1 For TRMs containing degradable components, al property values must be obtained on the non-degradable portion of the matting alone.

2 Minimum Average Rol Values, machine direction only for tensile strength determination using ASTM D6818 (Supercedes Mod. ASTM D5035 for RECPs)

3 Field conditions with high loading and/or high survivability requirements may warrant the use of a TRM with a tensile strength of 3,000 lb/ft or greater.

4 Shear stress that fuLly vegetated TRM can sustain without physical damage or excess erosion (0.5 in) soil loss) during a 30-minute flow event in large scale testing.

5 Acceptable large-scale testing protocol may include ASTM D6460 or other independent testing deemed acceptable by the engineer.

SOURCE: Erosion Control Technology Council (ECTC), 2003.

Surface Roughening

Definition

Surface Roughening is a technique for roughening a bare soil surface with furrows running across the slope, stair stepping, or tracking with construction equipment.

Purpose

Surface Roughening is intended to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for sediment trapping. All construction slopes require surface roughening to facilitate long-term stabilization with vegetation, particularly slopes steeper than 3:1.

Rough slope surfaces are preferred because they aid the establishment of vegetation, improve water infiltration, and decrease runoff velocity. Graded areas with smooth, hard surfaces may be initially attractive, but such surfaces increase the potential for erosion. A rough, loose soil surface gives a mulching effect that provides more favorable moisture conditions than hard, smooth surfaces; this 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, furrowing, 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.

Construction Specifications:

Cut Slope Roughening

- Stair-step grade or groove the cut slopes that are steeper than 3:1.

- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.

- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.

- Do not make individual vertical cuts more than 2 feet high in soft materials or more than 3 feet high in rocky materials.

- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening

- Place fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches, and make sure each lift is properly compacted.

- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches deep.

- Use grooving or tracking to roughen the face of the slopes, if necessary.

- Apply seed, fertilizer and straw mulch then track or punch in the mulch with the bulldozer.

- Do not blade or scrape the final slope face.

Cuts, Fills, and Graded Areas

- Make mowed slopes no steeper than 3:1.

- Roughen these areas to 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 inches, and not less than 1 inch deep).

- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.

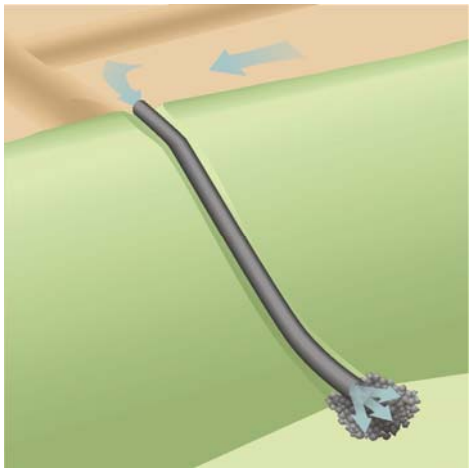
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

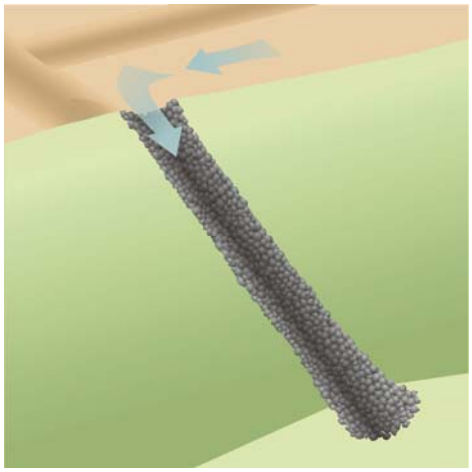
Immediately seed and mulch roughened areas to obtain optimum seed germination and growth.

Inspection and Maintenance

Periodically check the seeded slopes for rills and washes. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.

Slope Drain





Definition

A slope drain is a pipe or lined (rock or concrete) channel extending from the top to the bottom of a cut or fill slope.

Purpose

To convey concentrated runoff down the face of a cut or fill slope without causing erosion. Temporary slope drains are generally used in conjunction with diversions to convey runoff down a slope until permanent water disposal measures can be installed.

Design Criteria

General

It is very important that these temporary structures be sized, installed, and maintained properly, because their failure will usually result in severe erosion of the slope.

The entrance section to the drain should be well-entrenched and stable so that surface water can enter freely. The drain should extend downslope beyond the toe of the slope to a stable area or appropriately stabilized outlet.

Pipe Capacity

Peak flow from the 10-year 24-hour storm.

Conduit

Construct slope drain pipes from heavy-duty, flexible materials such as non-perforated, corrugated plastic pipe, or open top overside drains with tapered inlets, or CMP. Install

reinforced, hold-down grommets or stakes to anchor the conduit at intervals not to exceed 10 feet with the outlet end securely fastened in place. CMP or corrugated plastic pipe must have one anchor assembly for every 20 feet of slope drain. The conduit must extend beyond the toe of the slope.

Entrance

Construct the entrance to the slope drain of a standard flared-inlet section of pipe with a minimum 6-inch metal toe plate. Make all fittings watertight. A standard T-section fitting may also be used at the inlet. An open top flared inlet for overside drain may also be used.

Temporary Diversion

Generally, use an earthen diversion with a dike ridge or berm to direct surface runoff into the temporary slope drain. Make the height of the ridge over the drain conduit a minimum of 1.5 feet and at least 6 inches higher than the adjoining ridge on either side. The lowest point of the diversion ridge should be a minimum of 1 foot above the top of the drain so that design flow can freely enter the pipe.

Outlet Protection

Protect the outlet of the slope drain from erosion with an energy dissipator.

Construction Specifications

A common failure of slope drains is caused by water saturating the soil and seeping along the pipe. Proper backfilling around and under the pipe haunches with stable soil material and hand compacting in 6 inch lifts to achieve firm contact between the pipe and the soil at all points will reduce this type of failure.

- Place slope drains on undisturbed soil or well-compacted fill at locations and elevations shown on the plans.
- Slightly slope the section of pipe under the dike toward its outlet.
- Compact the soil under and around the entrance section in lifts not to exceed 6 inches.
- Ensure that fill over the drain at the top of the slope has a minimum depth of 1.5 feet and a minimum top width of 4 feet. The sides should have a 3:1 slope.
- Ensure that all slope drain connections are watertight.
- Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet apart.

- Extend the drain beyond the toe of the slope and adequately protect the outlet from erosion.

- Make the settled, compacted dike ridge no less than 1 foot higher than the top of the pipe inlet.

- Immediately stabilize all disturbed areas following construction.

Inspection and Maintenance

Inspect the slope drain and supporting diversions after every significant rainfall and promptly make necessary repairs. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

Inlets, Pipes, and Culverts

Curb Inlet Sediment Barrier

Definition

Curb inlet sediment barriers are temporary barriers constructed from concrete block and gravel or gravel filled sandbags.

Purpose

Curb inlet sediment barriers are intended to reduce the sediment discharged into storm drains by ponding the runoff and allowing the sediment to settle out. The structures allow for overflow from high runoff events and the gravel allows the area to dewater rapidly.

Design Criteria

There is no formal design. The sediment barriers can be used at curb inlets on gently sloping, paved streets where:

- water can pond and allow sediment to separate out of suspension;
- runoff is relatively low, less than 0.5 ft^3/sec

Once the small catchment areas behind the sandbags or block and gravel fill with sediment, future sediment-laden runoff will enter the storm drain without being desilted. Therefore, sediment must be removed from these structures during or after each storm. Additional storage can be obtained by constructing a series of sandbag barriers along the gutter so that each barrier traps small amounts of sediment.

Construction Specifications

General

- Place the barriers on gently sloping streets where water can pond.
- The barriers must allow for overflow from a severe storm event. Slope runoff shall be allowed to flow over blocks and gravel and not be bypassed over the curb. A spillway shall be constructed with the sandbag structures to allow overflow.
- The sandbag should be of woven-type geotextile fabric since burlap bags deteriorate rapidly.
- The sandbags shall be filled with 3/4 inch drain rock or 1/4 inch pea gravel.
- The sandbags shall be placed in a curved row from the top of curb at least 3 feet into the street. The row should be curved at the ends, pointing uphill.
- Several layers of bags should be overlapped and packed tightly.
- Leave a one-sandbag gap in the top row to act as a spillway.

Block and Gravel Type Barriers

- Place two concrete blocks on their sides perpendicular to the curb at either end of the inlet opening. These will serve as spacer blocks.
- Place concrete blocks on their sides across the front of the inlet and abutting the spacer blocks. The openings in the blocks should face outward, not upward.
- Cut a 2 by 4 inch stud the length of the curb inlet plus the width of the two spacer blocks. Place the stud through the outer hole of each spacer block to help keep the front blocks in place.
- Place wire mesh over the outside vertical face (open ends) of the concrete blocks to prevent stone from being washed through the blocks.
- Use chicken wire, hardware cloth with 1/2 inch openings, or filter fabric.
- Place 3/4 -1 1/3 inch gravel against the wire to the top of the barrier.

Inspection and Maintenance

- Inspect and clean barrier weekly and after each rainfall greater than 0.5 inches and remove sediment from behind sandbag structure.

- Any sediment and gravel shall be immediately removed from the traveled way of roads.

- The removed sediment shall be placed where it cannot enter a storm drain, stream, or be transported off site.

- If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced.

Drop Inlet Sediment Barrier

Definition

A drop inlet sediment barrier is a temporary barrier placed around a drop inlet. The sediment barrier may be constructed of silt fence, gravel and stone, or block and gravel. Straw bales should not be used.

Purpose

Drop inlet sediment barriers are intended to prevent sediment from entering the storm drains during construction operations. This practice allows early use of the storm drain system. Sediment-laden runoff is ponded before entering the storm drain, thus allowing some sediment to fall out of suspension.

Design Criteria

- The contributing drainage area should be one-acre maximum. The ponding area shall be relatively flat (less than 1% slope) with a sediment storage of 35 yds^3 per disturbed acre.

- The top elevation of the sediment structure must be at least 6 inches lower than the surrounding ground elevation downslope from the inlet. It is important that all storm flows pass over the structure and into the storm drain, and not past the structure. Temporary diking below the structure may be necessary to prevent bypass flow. Material may be excavated from inside the sediment pool for this purpose.

Construction Specifications

Silt Fence Sediment Barrier

- Support posts for a silt fence must be steel fence posts or 2 by 4 inch wood, length 3-foot minimum, spacing 3-foot maximum, with a top frame support recommended.

- Excavate a trench 4 inches wide and 6 inches deep and bury the bottom of the silt fence in the trench.

- Backfill the trench with gravel or soil. Compact the backfill well.

- The height of the silt fence shall be a 1.5-foot maximum, measured from the top of the inlet.

Gravel Doughnut

- Keep the stone slope toward the inlet at 3:1 or flatter or use concrete blocks to help prevent the stone from being washed into the drop inlet. A minimum 1-foot wide level area set 4 inches below the drop inlet crest will add further protection against the entrance of material.

- Stone on the slope toward the inlet should be 3 inches or larger for stability, and 1 inch or smaller on the slope away from the inlet to control flow rate.

- Wire mesh with 2-inch openings may be placed over the drain grating, but must be inspected frequently to avoid blockage by trash. If concrete blocks are used the openings should be covered with wire screen or filter fabric.

Inspection and Maintenance

- Inspect the barrier weekly and after each rainfall greater then 0.5 inches and promptly make repairs as needed.

- Sediment shall be removed after each significant rainfall (0.5 inches in 24 hours) to provide adequate storage volume for the next rain.

- The removed sediment shall be deposited in an area that will not contribute sediment off-site and can be permanently stabilized.

- For gravel filters: If the gravel becomes clogged with sediment it must be carefully removed from the inlet and either cleaned or replaced.

Culvert Inlet Sediment Barrier

Definition

A culvert inlet sediment barrier is a temporary rock barrier at a culvert inlet.

Purpose

The purpose of the barrier is to reduce the amount of sediment that enters the culvert by creating a small ponding area for the sediment to settle out.

Design Criteria

The barrier should surround all sides of the culvert that receives runoff and should be placed a minimum of 4 feet from the culvert. The barrier must be designed to ensure that adjacent property will not be damaged by the ponded water.

Construction Specifications

The stone should be KYTC Class II Channel Lining. The upstream face of the barrier should consist of smaller stone such as KYTC No. 57 to decrease the flow rate through the stone. A geotextile should be placed between the stone and the soil.

Inspection and Maintenance

The barrier should be inspected weekly and after every rainfall greater than 0.5". The barrier must be kept free of trash and debris, and sediment should be removed when it reaches one-half the height of the barrier. The barrier should be removed the disturbed area has been stabilized.

Pipe Outlet Energy Dissipator

Definition

An energy dissipator is a structure designed to control erosion at the outlet of a channel or pipe.

Purpose

To prevent erosion at the outlet of a channel or pipe by reducing the velocity of flow and dissipating the energy.

Design Criteria

Capacity

10-year 24-hour peak flow

Tailwater Depth

Determine the depth of the tailwater immediately below the pipe outlet based on the design discharge plus other contributing flows. If the tailwater depth is less than half the diameter of the outlet pipe and the receiving stream is sufficiently wide to accept the divergence of flow, it is classed as a minimum tailwater condition.

If the tailwater depth is greater than half the pipe diameter, it is classed as a maximum tailwater condition. Pipes that outlet onto broad flat areas with no defined channel may be assumed to have a minimum tailwater condition unless site conditions indicate otherwise.

Apron Size

See the table below.

Grade

There should be no overfall at the end of the apron; that is, the elevation of the top of the apron, at the downstream end, should be the same as the elevation of the bottom of the receiving channel or the adjacent ground if there is no channel.

Alignment

The apron should be straight throughout its entire length, but if a curve is necessary to align the apron with the receiving stream, locate the curve in the upstream section of riprap.

Materials

Ensure that riprap consists of a well-graded mixture of stone. Larger stone should predominate, with sufficient smaller sizes to fill the voids between the stones. The diameter of the largest stone size should be no greater than 1.5 times the d_{50} size.

Thickness

The minimum thickness of riprap shall be 1.5 times the maximum stone diameter.

Stone Quality

Select stone for riprap from fieldstone or quarry stone. The stone should be hard, angular, and highly weather-resistant. The specific gravity of the individual stones should be at least 2.5.

Filter

Install a filter to prevent soil movement through the openings in the riprap. The filter should consist of a graded gravel layer or a synthetic filter cloth.

Construction Specifications

- Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.

- The riprap and gravel filter must conform to the specified grading limits shown on the plans.

- Filter cloth, when used, must meet design requirements and be properly protected from punching or tearing during installation. Repair any damaged fabric by removing the riprap and placing another piece of filter cloth over the damaged area.

- All connecting joints should overlap a minimum of 1 foot. If the damage is extensive, replace the entire filter cloth.

- Riprap may be placed by equipment, but take care to avoid damaging the filter.

- The minimum thickness of the riprap should be 1.5 times the maximum stone diameter.

- Riprap may be field stone or rough quarry stone. It should be hard, angular, highly weather-resistant and well graded.

- Construct the apron with no overfall at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.

- Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.

- Immediately after construction, stabilize all disturbed areas with vegetation.

Inspection and Maintenance

Inspect riprap outlet structures weekly and after every rainfall greater than 0.5 inches to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

Table of Riprap Apron Dimensions

The tables below can be used to determine the length, width, and D_{50} stone size of a riprap apron based on circular culverts flowing full.

Riprap Aprons for Low Tailwater (downstream flow depth < 0.5 x pipe diameter)															
Culvert Diameter	Lowest Value			Intermediate Values to Interpolate From									Highest Value		
	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}
	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In
12”	4	7	6	6	10	6	9	13	6	12	16	7	14	17	8.5
15”	6.5	8	6	10	12	6	15	16	7	20	18	10	25	20	12
18”	10	9	6	15	14	6	20	17	7	30	22	11	40	25	14
21”	15	11	6	25	18	7	35	22	10	45	26	13	60	29	18
24”	21	13	6	35	20	8.5	50	26	12	65	30	16	80	33	19
27”	27	14	6	50	24	9.5	70	29	14	90	34	18	110	37	22
30”	36	16	6	60	25	9.5	90	33	15.5	120	38	20	140	41	24
36”	56	20	7	100	32	13	140	40	18	180	45	23	220	50	28
42”	82	22	8.5	120	32	12	160	39	17	200	45	20	260	52	26
48”	120	26	10	170	37	14	220	46	19	270	54	23	320	64	37

Source: Knoxville Engineering Department

L_A = Apron Length
Apron Width = L_A+ Culvert Diameter

Riprap Aprons for High Tailwater (downstream flow depth > 0.5 x pipe diameter)															
Culvert Diameter	Lowest Value			Intermediate Values to Interpolate From									Highest Value		
	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}	Q	L_A	D_{50}
	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In	Cfs	Ft	In
12”	4	8	6	6	18	6	9	28	6	12	36	7	14	40	8
15”	7	8	6	10	20	6	15	34	6	20	42	7.5	25	50	10
18”	10	8	6	15	22	6	20	34	6	30	50	9	40	60	11
21”	15	8	6	25	32	6	35	48	7	45	58	11	60	72	14
24”	20	8	6	35	36	6	50	55	8.5	65	68	12	80	80	15
27”	27	10	6	50	41	6	70	58	10	90	70	14	110	82	17
30”	36	11	6	60	42	6	90	64	11	120	80	15	140	90	18
36”	56	13	6	100	60	7	140	85	13	180	104	18	220	120	23
42”	82	15	6	120	50	6	160	75	10	200	96	14	260	120	19
48”	120	20	6	170	58	7	220	85	12	270	105	16	320	120	20

Source: Knoxville Engineering Department

L_A = Apron Length
Apron Width = 0.4 L_A+ Culvert Diameter

Channels and Ditches

Rock Lined Channel

Definition

Rock-lined channels are channels or roadside ditches lined with rock or riprap.

Purpose

To convey concentrated surface runoff without erosion. Grass lining with an erosion control blanket is recommended instead of rock. Rock lining may be necessary in the following conditions:

- design velocity exceeds 2 ft/sec such that channel lining is required, but conditions are not suitable for vegetative protection.
- roadside ditches or drainage channels greater than 2% and located in highly erodible soils that have a low maximum permissible velocity.
- channel design velocity exceeds that allowable for a grass-lined channel.
- the channel will continue to down-cut without protection because it is adjusting to increased flow or a new base line (outlet elevation).

Design Criteria

The channel shall be designed to carry the 10 year - 24 hour peak flow using the formula below:

$Q = VA$, where

Q = flow
V = velocity
A = flow area

The Manning equation below shall be used to determine the velocity:

$V = 1.486(R)^{2/3}S^{1/2}/n$, where
V=velocity
R=flow area/wetted perimeter
S=slope in feet/foot
$n = 0.0395\ (D_{50})^{1/6}$

The maximum depth shall be determined from the following equation or Exhibit 1:

$D_{max} = \tau / (62.4*S)$, where
D_{max} = maximum depth of flow
S = slope in feet/foot
τ = maximum tractive force of the liner in lbs/ft^2

The values for KYTC channel lining are shown below:

KYTC Channel Lining	D_{50}	Shear Lb/ft.^{2}	Manning's n
Class I	0.2	1.0	0.0302
Class II	0.5	2.5	0.0352
Class III	1.0	5.0	0.0395

- Side slopes shall be 2:1 or flatter.
- Riprap thickness: T = 1.5 times the stone diameter or as shown on the plans; 6 inch thick minimum.
- Foundation: Extra-strength filter fabric or an aggregate filter layer, if required.
- Outlet must be stable.

Construction Specifications

- Excavate cross section to the grades shown on plans. Overcut for thickness of rock and filter.
- Place filter fabric or gravel filter layer, and rock as soon as the foundation is prepared.
- Place rock so it forms a dense, uniform, well-graded mass with few voids. Hand placement may be necessary to obtain good size distribution.

- No overfall of channel construction should exist. Grass-lined channels with riprap bottoms must have a smooth contact between riprap and vegetation.

- Channel outlet shall be stabilized.

Inspection and Maintenance

- Inspect channels weekly and after rainfalls greater than 0.5 inches Remove debris and make needed repairs where stones have been displaced. Take care not to restrict the flow area when stones are replaced.

- Give special attention to outlets and points where any concentrated flow enters the channel. Repair eroded areas promptly. Check for sediment accumulation, piping, bank instability, and scour holes and repair promptly.

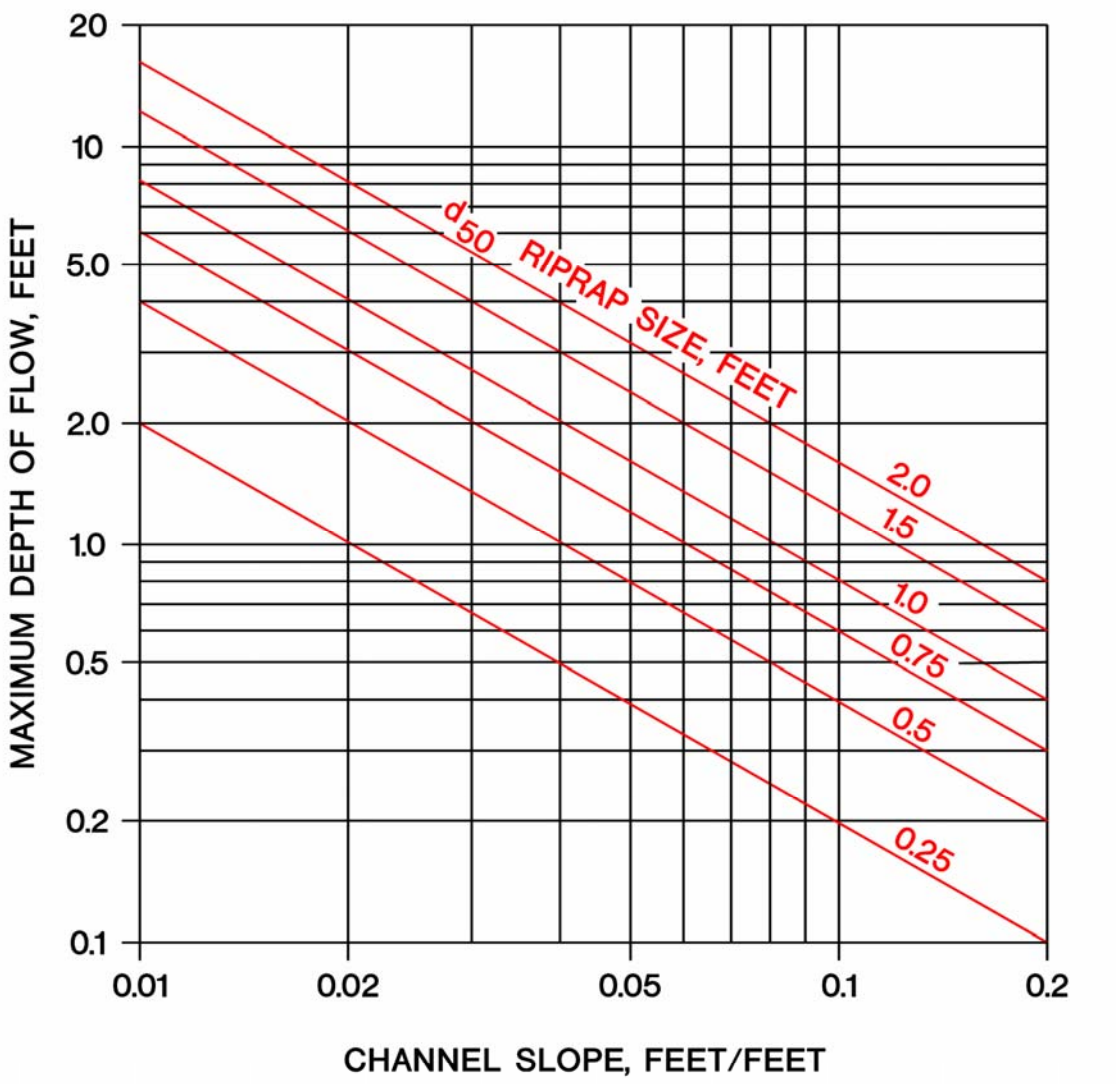


EXHIBIT 1
MAXIMUM DEPTH OF FLOW FOR RIPRAP LINED CHANNELS

Grass-Lined Channel

Definition

Vegetation lining a natural or constructed waterway, swale or dike to protect it from erosion.

Purpose

Grass protection of channels reduces erosion by lowering water velocity over the soil surface and by binding soil particles with roots.

Grass-lined channels should be used where:

- A vegetative lining can provide sufficient stability for the channel grade by increasing maximum permissible velocity;
- Slopes are generally less than 5%;
- Site conditions required to establish vegetation i.e., climate, soils and topography are present.

Design Criteria

General

- Grass-lined channels resemble natural systems and are usually preferred where design velocities are suitable. Select appropriate vegetation and construct channels early in the construction schedule before grading and paving increase runoff rates.
- Generally, grass-lined channels are constructed in stable, low areas to conform with the natural drainage system, but they may also be needed along roadways or property

boundaries. To reduce erosion potential, design the channel to avoid sharp bends and steep grades.

- The channel cross section should be wide and shallow with relatively flat side slopes so surface water can enter over the vegetated banks without erosion. Riprap may be needed to protect the channel banks at intersections where flow velocities approach allowable limits and turbulence may occur. Cross-section designs include:

  V-shaped Channels

  Generally used where the quantity of water is relatively small, such as roadside ditches. The V-shaped cross section is desirable because of difficulty stabilizing the bottom, where velocities may be high. A grass or sod lining will suffice where velocities are low or rock or riprap lining may be necessary.

  Parabolic Grass Channels

  Often used where larger flows are expected and sufficient space is available. The shape is pleasing and may best fit site conditions. Riprap should be used where higher velocities are expected and where some dissipation of energy (velocity) is desired. Combinations of grass with riprap centers or turf reinforcement mat centers are useful where there is a continuous low flow in the channel.

  Trapezoidal Grass Channels

  Used where runoff volumes are large and slope is low so that velocities are non-erosive to vegetated linings. Trapezoidal channels generally have concrete or riprap lined center for low flow.

- Grass-lined channels must not be subject to sedimentation from disturbed areas.

- An established grass-lined channel resembles natural drainage systems and is usually preferred if design velocities are below 5 ft/sec.

- Channels with design velocities greater than 2 ft/sec will require that turf reinforcement mats or erosion control blankets be installed at the time of seeding to provide stability until the vegetation is fully established. It may also be necessary to divert water from the channel until vegetation is established or to line the channel with sod.

- Whenever design velocities exceed 4 ft/sec a permanent type of erosion control blanket or turf reinforcement mat will be necessary.

- Sediment traps may be needed at channel inlets and outlets to prevent sedimentation.

Capacity

The channel shall be designed to carry the 10 year - 24 hour peak flow using the formula below:

$Q = VA$, where
- Q = flow
- V = velocity
- A = flow area

The Manning equation below shall be used to determine the velocity:

$V = 1.486(R)^{2/3}S^{1/2}/n$, where
- V=velocity
- R=flow area/wetted perimeter
- S=slope in feet/foot
- n= 0.045 for grass

The maximum depth shall be determined from the following equation:

$Dmax = \tau / (62.4*S)$, where
- $Dmax$ = maximum depth of flow
- S = slope in feet/foot
- τ = maximum tractive force of the liner in lbs/ft^2

The maximum shear stress for various liners is shown below:

Maximum Shear Stress of Liners

Material	Shear lb/ft^2
Dense sod, fair condition (Class D/E), moderately cohesive soil	0.35
Bermuda grass, fair stand < 12 cm tall, dormant	0.9
Bermuda grass, good stand <12 cm tall, dormant	1.1
Bermuda grass, excellent stand 20 cm tall, dormant	2.7
Bermuda grass, excellent stand 20 cm tall, green	2.8
Bermuda grass, excellent stand >20 cm tall, green	3.2
Turf (immediately after construction)	0.2
Turf (after 3-4 seasons)	2.04
Turf reinforcement mat, permanent	8
Straw reinforcement mat, temporary	0.45
Jute mat	0.45
Straw with net	1.45
Curled wood net	1.55
Synthetic mat	2

Source: Salix Applied Earthcare – Erosion Draw 5.0

Cross-section

The channel shape may be parabolic, trapezoidal, or V-shaped, depending on need and site conditions.

Side Slopes

Grassed channel side slopes generally are constructed 3:1 or flatter to aid in the establishment of vegetation and for maintenance.

Grade

Generally restricted to slopes 5% or less. Either a uniform or gradually increasing grade is preferred to avoid sedimentation.

Construction Specifications

See the specifications for seeding and erosion control blankets.

Inspection and Maintenance

- During the initial establishment, grass-lined channels should be repaired and grass re-established if necessary.

- After grass has become established, the channel should be checked periodically to determine if the channel is withstanding flow velocities without damage.

- Check the channel for debris, scour, or erosion and immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes and make repairs immediately.

- Remove all significant sediment accumulations to maintain the designed carrying capacity.

- Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel.

- Permanent grassed waterways should be seasonally maintained by mowing or irrigating, depending on the type of vegetation selected.

Check Dam

Definition

A rock check dam is a small temporary dam constructed across a swale or channel.

Purpose

The purpose of a check dam is to reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or channel. This practice also traps sediment.

Design Criteria

Check dams shall be limited to use in small, open channels that drain 10 acres or less. Check dams shall not be used in streams. Check dams are especially applicable where the slope of channels is close to the maximum for a grass lining.

The maximum height of a check dam shall be three feet above the ground on which the rock is placed.

The center of the check dam above the flat portion of the channel shall be at least 6 inches lower than the outer edges.

The maximum spacing between rock check dams in a ditch should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

Construction Specifications

Stone check dams shall be constructed of KYTC Class 2 channel lining.

Stone shall be placed by hand or mechanically as necessary to achieve complete coverage of the ditch and to ensure that the center of the dam is at least 6 inches lower than the outer edges.

Check dams must be removed when their useful life has been completed. In temporary ditches and swales, check dams shall be removed and the ditch filled in when it is no longer needed. In permanent channels, check dams shall be removed when a permanent lining can be installed. In the case of grass-lined ditches, check dams shall be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the check dams shall be seeded and mulched or sodded (depending upon velocity) immediately after check dams are removed.

If stone check dams are used in grass-lined channels that will be mowed, care shall be taken to remove all stone from the channel when the dam is removed. This shall include any stone that has washed downstream.

Inspection and Maintenance

Regular inspections shall be made to ensure that the measure is in good working order and the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam shall be corrected immediately, and the dam shall be extended beyond the repaired area.

Check dams shall be checked for sediment accumulation weekly and after each rainfall greater than 0.5 inches. Sediment shall be removed when it reaches one-half of the original height.

Check dams shall remain in place and operational until the drainage area and channel are completely stabilized, or up to 30 days after the permanent site stabilization is achieved.

Sediment Trap and Basin

Sediment Trap

Definition

A sediment trap is formed by excavation or constructing a small embankment to retain sediment. Sediment traps are considered temporary structures. They should not be placed in flowing streams.

Purpose

Sediment traps shall be used where physical site conditions or other restrictions prevent other erosion control measures from adequately controlling erosion and sedimentation. Sediment traps may be used down slope from construction operations that expose areas to erosion.

Design Criteria

General

- Minimum sediment storage capacity of 3600 cubic feet per acre of bare soil
- Maximum drainage area of 5 acres
- Basin flow length should be at least 2 times the flow width
- Trap depth shall be at least 2 feet at the inlet and 4 feet at the outlet
- Trap width shall be at least 10 feet

- Trap length shall be at least 30 feet
- Construct the trap before clearing and grading work begins

Embankment requirements

- Maximum height of 5 feet
- Maximum inside and outside slopes of 2:1

Outlet requirements

- The outlet shall consist of an overflow spillway at least 4 feet wide made of stone.

Construction Specifications

The area to be excavated shall be cleared of all trees, stumps, roots, brush, boulders, and debris. All topsoil containing excessive amounts of organic matter shall be removed.

Seeding, fertilizing, and mulching of the material taken from the excavation shall comply with the applicable soil stabilization sections of this manual.

Any material excavated from the trap shall be uniformly spread to a depth not exceeding 3 feet and graded to a continuous slope away from the trap.

Inspection and Maintenance

The trap shall be inspected weekly and after every rainfall greater than 0.5 inches. Sediment shall be removed from the trap when the capacity is reduced to 50 percent of the design volume. Plans for the sediment trap shall indicate the methods for disposing of sediment removed from the pond.

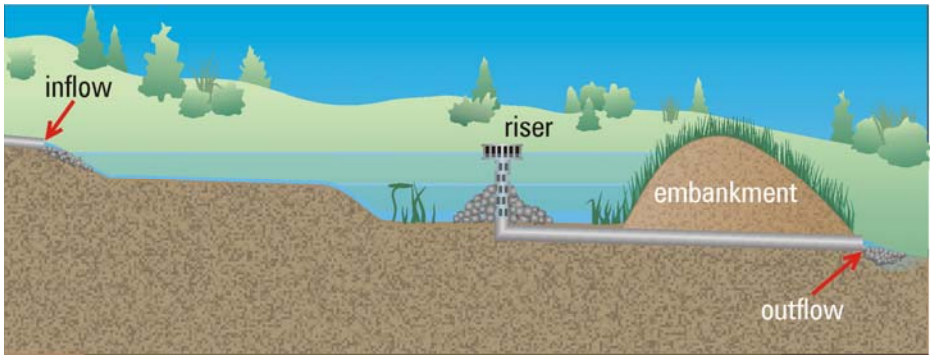
Sediment Basin

Definition

A sediment basin is a pond created by excavation in construction of an embankment and designed to retain or detain runoff sufficiently to allow excess sediment to settle. Sediment basins shall be designed by a professional engineer licensed in Kentucky.

Purpose

The sediment basin is intended to collect and store sediment from sites that are cleared and/or graded during construction or for extended periods of time before permanent vegetation is re-established or before permanent drainage structures are completed. It is intended to trap sediment before it leaves the construction site. The basin is temporary, with a design life of 12 to 18 months, and is to be maintained until the site area is permanently stabilized.



Basins should be located at the stormwater outlet from the site, not in any natural or undisturbed stream. Use of temporary dikes, pipes and/or channels may be necessary to divert runoff from disturbed areas into the basin and to divert runoff originating from undisturbed areas around the basin.

Design Criteria

The basin should be designed using SEDCAD or other computer program. The design criteria are listed below:

General

- Minimum sediment storage capacity of 3600 cubic feet per acre of bare soil
- Reduce the total suspended solids by 80% for the 10-year 24-hour storm, or provide a detention time of 24 to 48 hours for the 10-year 24-hour storm
- Minimum drainage area of 5 acres
- Maximum drainage area of 100 acres
- Basin flow length should be at least 2 times the flow width
- Construct the basin before clearing and grading work begins

Embankment requirements

- Maximum inside and outside slopes of 3:1
- Minimum 1 foot freeboard during the 100-year 6-hour storm
- Antiseep collars are required
- Minimum top width of 12 feet

Principal spillway (riser and barrel) requirements

- Use a subsurface drain and/or a solid riser pipe with sufficient dewatering holes to provide sufficient detention time
- Reduce the peak flow to pre-development levels for the 2-year and 10-year 24-hour storms
- Minimum pipe outlet of 8 inches
- Anti-vortex and trash rack required
- Minimum 1 foot freeboard from top of riser to crest of emergency spillway

Emergency spillway requirements

- Designed to pass the 100-year 6-hour post development peak flow
- Crest elevation at least one foot above the tip of the riser pipe
- Minimum 1 foot freeboard during the 100-year 6-hour storm to the top of the embankment

KY Division of Water Dam Safety Requirements

The sediment basin may have to be designed in accordance with dam safety requirements of the KY Division of Water. A dam is defined as any impounding structure that is either 25 feet in height, measured from the downstream toe to the crest, or has a maximum impounding capacity of 50 acre-feet of water. Structures that do not meet these criteria but have the potential to cause significant property damage or pose a threat to loss of life in the downstream area are regulated in the same manner as dams.

Construction Specifications

- Construct the basin by excavating or building an embankment before any clearing or grading work begins.
- Areas under the embankment and any structural works shall be cleared, grubbed and stripped of any vegetation and rootmat as shown on the erosion and sediment control plan.
- In order to facilitate cleanout and restoration, the basin area shall be cleared, grubbed and stripped of any vegetation.
- A cut-off trench shall be excavated along the centerline of the earth fill embankments. The minimum depth shall be 2 feet. The cut-off trench shall extend up both abutments to the riser crest elevation.
- Fill material for the embankment should be clean mineral soil free of roots, woody vegetation, oversized stones, rocks or other objectionable material.
- Fill material shall be placed in 6 inch lifts, continuous layers over the entire length of the fill. Compacting shall be obtained by routing the hauling equipment over the fill so that the entire surface of each layer of the fill is traversed by at least one wheel or tread track of the equipment, or by the use of a compactor. Each layer shall be compacted to 95 percent of maximum density and +/- 2 percent of optimum moisture content.
- The embankment should be constructed to an elevation of 10 percent higher than the design height to allow for settlement if compacting is achieved with hauling equipment. If compactors are used for compacting, the overbuild may be reduced to not less than 5 percent.

- The principle spillway riser shall be securely attached to the discharge pipe by welding all around. All connections shall be watertight.

- The pipe and riser shall be placed on a firm, smooth soil foundation. The connection between the riser and the riser base shall be watertight. Pervious materials such as sand, gravel or crushed stone shall not be used as backfill around the pipe or anti-seep collars.

- The fill material around the pipe spillway shall be placed in 4-inch layers and compacted under the shoulders and around the pipe to at least the same density as the adjacent embankment. A minimum of 2 feet of compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment.

- Steel base plates shall have at least 2 1/2 feet of compacted earth, stone or gravel over them to prevent flotation.

- The emergency spillway shall not be installed in fill.

- Baffles, if used, shall be constructed of 4 inch by 4 inch posts and of 4 foot by 8 foot - ½ inch exterior plywood. The posts shall be set at least 3 feet into the ground, no farther apart than 8 feet center to center, and shall reach a height 6 inches below the riser crest elevation.

- The embankment and emergency spillway shall be stabilized with vegetation immediately following construction.

- Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized.

- Local and state requirements shall be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.

Inspection and Maintenance

- Inspect weekly and after each rainfall greater than 0.5 inches.

- All damages caused by soil erosion or construction equipment shall be repaired before the end of each working day.

- Remove sediment when the sediment storage zone is half full. This sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment or in or adjacent to a stream or floodplain.

- When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment

deposit shall be leveled or otherwise disposed of in accordance with the approved erosion and sediment control plan.

Stream Crossing

Definition

A temporary stream crossing is a temporary structural span installed across a flowing stream use by construction traffic. Structures may include bridges, round pipes, or pipe arches.

Purpose

The purpose of a temporary stream crossing is to provide a means for construction traffic to cross flowing streams without damaging the channel or banks and to keep sediment generated by construction traffic out of the stream.

Design Criteria

- Temporary stream crossings are applicable to flowing streams with drainage areas less than one square mile. Structures that must handle flow from larger drainage areas shall be designed as permanent structures by a licensed professional engineer.

- Temporary stream crossings shall be planned to be in service for the shortest practical period of time and to be removed as soon as their function is completed.

- Such structures are subject to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (404 permits) and the KY Division of Water (401 certification).

- The span shall be designed to withstand the expected loads from heavy construction equipment that will cross the structure.

- The structure shall be large enough to convey the peak flow expected from a 2-year storm without appreciably altering the stream flow characteristics. The structure may be a span, a culvert, or multiple culverts. The minimum sized culvert shall be 24 inches.

- Where culverts are installed, compacted soil or rock shall be used to form the crossing. The depth of soil or rock cover over the culvert shall be equal to one-half the diameter of the culvert or 12 inches, whichever is greater. The sides of the fill shall be protected from erosion using the mulching and seeding erosion control measures specified in this manual.

- The slope of the culvert shall be at least 0.25 inch per foot.

Material Specifications

- When using a culvert crossing, the top of a compacted earth fill shall be covered with six inches of KYTC No. 2 stone.

- No. 2 stone shall also be used for the stone pads forming the crossing approaches.

Construction Specifications

- Clearing and excavation of the streambed and banks shall be kept to a minimum.

- The structure shall be removed as soon as it is no longer necessary for project construction.

- Upon removal of the structure, the stream shall immediately be reshaped to its original cross section and properly stabilized.

- The approaches to the structure shall consist of stone pads with a minimum thickness of 6 inches, a minimum width equal to the width of the structure and a minimum approach length of 25 feet on each side.

Maintenance

- The structure shall be inspected after every rainfall greater than 0.5 inches and at least once a week and all damages repaired immediately.

Appendix A
General Permit for Construction Activities

FACT SHEET
GENERAL KPDES PERMIT FOR STORMWATER POINT SOURCE DISCHARGES CONSTRUCTION ACTIVITIES

KPDES No.: KYR10 Date: July 22, 2002

1. COVERAGE UNDER THIS GENERAL PERMIT

Area of Coverage:

This permit covers all areas of the Commonwealth of Kentucky.

Discharges Eligible for Coverage:

This permit covers all new and existing stormwater discharges associated with construction activity. Only construction activities that disturb five (5)acres or more are required to have coverage under this permit. Beginning in March 2003, construction activities that disturb one (1) acre or more are also required to have coverage under this permit.

Limitations on Coverage:

This permit does not authorize discharges that:

1. Are subject to an existing individual KPDES permit or application,

2. Are subject to a promulgated stormwater effluent guideline or standard,

3. The Director has determined to be or may reasonably be expected to be contributing to a violation of a water quality standard or to the impairment of a 303(d) listed water, or

4. Are into a surface water that has been classified as an Exceptional or Outstanding or National Resource Water.

3. REQUIREMENTS FOR GENERAL PERMIT COVERAGE

Notice of Intent:

A signed copy of a Notice of Intent (NOI) form must be submitted to the following address 48 hours before construction activity begins:

Kentucky Division of Water
KPDES Branch
Inventory and Data Management Section
14 Reilly Road
Frankfort, Kentucky 40601

vb

Unless notified by the Director to the contrary, owners or operators who submit the above notification are authorized to discharge stormwater associated with construction activity under the terms and conditions of this permit. Discharge may begin 48 hours after the NOI is postmarked, even if the permittee has not yet received a copy of the general permit from the Division of Water.

Notice of Termination:

When all stormwater discharges associated with construction activity are eliminated and the site has been finally stabilized, the owner or operator must submit a signed copy of a Notice of Termination (NOT) form in order to end coverage under this general permit and nullify its requirements. NOTs are to be sent to the above address.

Change of Ownership:

When the owner or operator of a site covered by this permit changes, the new owner or operator must submit a notice 48 hours before the change in order to transfer coverage under this general permit. Change of ownership notices arête be sent to the above address.

3. ADDITIONAL INFORMATION

Municipal Notification:

Sites which discharge stormwater associated with construction activity to a municipal separate storm sewer system (MS4) shall submit a signed copy of the NOI to the operator of the MS4 48 hours before construction activity begins.

Other Stormwater Discharges:

Stormwater discharges authorized by this permit may be combined with othersources of stormwater that are not associated with construction activity ifthe resulting discharge is in compliance with this permit.

4. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

No monitoring is required.

5. JUSTIFICATION OF PERMIT CONDITIONS

The following regulations are pursuant to KRS 224.10-100, 224.70-100, and224.70-110.

Best Management Practices:

This requirement is consistent with 401 KAR 5:065, Section 2(10).

Antidegradation:

The conditions of 401 KAR 5:029, Section 1(1) will be satisfied by coverage under this permit. A review under Section 1(2), (3), and (4) will not be applicable.

6. COMPLIANCE SCHEDULE

The permittee shall achieve compliance with all requirements upon notification of coverage under this general permit.

7. PERMIT DURATION

This permit is valid for five (5) years. Upon issuance of a new general permit, the permittee will have coverage automatically renewed. A new NOI or other notification is not necessary.

1. PERMIT INFORMATION

The application, draft permit, fact sheet, public notice, comments received, and additional information is available from the Division of Water at 14 Reilly Road, Frankfort Office Park, Frankfort, Kentucky 40601.

9. REFERENCES AND CITED DOCUMENTS

All material and documents referenced or cited in this fact sheet are part of the permit information as described above and are readily available at the Division of Water Central Office. Information regarding these materials may be obtained from the person listed below.

10. CONTACT

Additional information concerning this permit may be obtained from Ronnie Thompson at the address noted in Item 8 or at (502) 564-2225, extension 423.

11. PUBLIC NOTICE INFORMATION

Please refer to the attached Final Permit Decision Cover Letter or Public Notice for details regarding the procedures for a final permit decision, deadline for comments, and other information required by 401 KAR 5:075,Sections 12 and 4(2)(e).

PERMIT NO.: KYR10

GENERAL KPDES PERMIT FOR STORMWATER POINT SOURCE DISCHARGES

CONSTRUCTION ACTIVITIES

In compliance with the provisions of the Kentucky Revised Statutes Chapter 224and pursuant to 401 KAR 5:055, Section 5, the following discharges are authorized:

All new and existing stormwater discharges associated with construction activity that are required to have a permit pursuant to 401 KAR 5:055, Section 1and KRS 224.16-050.

Specifically excluded from authorization under this permit are operations that:

1. Are subject to an existing individual KPDES permit or application,

2. Are subject to a promulgated stormwater effluent guideline or standard,

3. The Director has determined to be or may reasonably be expected to be contributing to a violation of a water quality standard or to the impairment of a 303(d) listed water, or

4. Are into a surface water that has been classified as an Exceptional or Outstanding or National Resource Water.

The receiving water for any discharge authorized by this permit is located within the political boundaries of the Commonwealth of Kentucky. Such authorization is in accordance with the effluent limitations and other conditions set forth in PARTS I, II, III, and IV hereof. This permit consists of this cover sheet, PART I 1 page, PART II 1 page, PART III 1 page, and PART IV4 pages.

This permit shall become effective on October 1, 2002.

This permit and the authorization to discharge shall expire at midnight, September 30, 2007.

Date Signed

Jeffrey W. Pratt, Director
Division of Water

Robert W. Logan
Commissioner

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
Division of Water, Frankfort Office Park, 14 Reilly Road
Frankfort, Kentucky 40601

A. Effluent Limitations and Monitoring Requirements

No monitoring is required.

B. Schedule of Compliance

The permittee shall achieve compliance with all requirements upon notification of coverage under this general permit.

STANDARD CONDITIONS FOR KPDES PERMIT

The permittee is also advised that all KPDES permit conditions in KPDES Regulation 401 KAR 5:065, Section 1 will apply to all discharges authorized by this permit.

This permit has been issued under the provisions of KRS Chapter 224 and regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal, and local agencies.

PART III

OTHER REQUIREMENTS

A. Retention of Records:

The permittee shall keep the Best Management Practices (BMP) plan developed in accordance with PART IV of this permit one (1) year after coverage under this permit ends. This period may be extended by request of the Director at anytime.

B. Reopener Clause:

This permit shall be modified, or alternatively revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under401 KAR 5:050 through 5:080 and KRS 224 if the effluent standard or limitation so issued or approved:

1. Contains different conditions or is otherwise more stringent than any effluent limitation in this permit; or

2. Controls any pollutant not limited in this permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of KRS Chapter 224 when applicable.

C. Other Discharges:

All discharges covered by this permit shall be composed entirely of stormwater except for discharges from fire fighting activities, fire hydrant flushing, potable water sources, waterline flushing, irrigation or lawn watering, detergent free building or pavement washing where spills or leaks of toxic materials have not occurred or have been completely removed, air conditioning condensation, natural springs, and uncontaminated ground water sources.

This permit can only authorize stormwater discharges from construction activity that are mixed with stormwater discharges from other industrial activity, including dedicated asphalt and concrete plants, if the other industrial activity discharge is in compliance with a different KPDES permit.

D. Releases in Excess of Reportable Quantities:

The presence of hazardous substances or oil in the stormwater discharge shall be minimized in accordance with the BMP plan. Coverage under this permit does not relieve the permittee of the reporting requirements of 40 CFR Part 117 and40 CFR Part 302.

PART IV

BEST MANAGEMENT PRACTICES

A stormwater Best Management Practices (BMP) plan shall be developed in accordance with good engineering practices for each site covered by this permit. The BMP plan shall identify potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the site. The BMP plan shall describe and ensure the implementation of practices that are to be used to reduce the pollutants in stormwater discharges and to assure compliance with the terms and conditions of this permit. Facilities must implement the BMP plan required by this PART as a condition of this permit.

The BMP plan shall:

1. Be completed before submittal of the NOI for coverage under this permit.

2. Be implemented beginning with the initiation of construction activities.

Signature and Plan Review:

The BMP plan shall be signed in accordance with PART II and shall be kept onsite.

The permittee shall make the BMP plan available upon request to the Director, to a state or local agency approving sediment, erosion, grading or stormwater management plans, or in the case of a stormwater discharge to a MS4 with a KPDES permit, to the operator of the system.

After a review, the permittee may be notified that the BMP plan does not meet the minimum requirements of this PART. In that case, the permittee shall modify the BMP plan within seven (7) days of notification and shall submit a written certification that the requested changes have been made.

BMP plans required by this permit are considered reports that shall be made available to the public, upon written request by the public, in accordance with Section 308(b) of the Clean Water Act (CWA). However, the permittee may claim any portion of the BMP plan as confidential, in accordance with 40 CFR Part 2.

Plan Modification:

The permittee shall modify the BMP plan when there is a change in design, construction, operation, or maintenance of the site which has a significant effect on the potential for the discharge of pollutants to waters of the Commonwealth and shall implement the changes within seven (7) days.

Modification for Ineffectiveness:

The permittee shall amend the BMP plan if it proves to be ineffective in controlling the discharge of pollutants to waters of the Commonwealth and shall implement the changes within seven (7) days.

Minimum Requirements:

The BMP plan shall include, as a minimum, Items A through H.

A. Site Description:

The BMP plan shall include a clear description of the nature of the construction activity, the order of major soil disturbing activities, estimates of the total project area and the total disturbed area, the post construction runoff coefficient, any existing data describing soil condition or discharge quality, receiving water name, and a site map. The site map shall indicate drainage patterns and show approximate slopes after grading, areas of disturbance, the location of control measures, surface waters or wetlands, and stormwater discharge locations.

B. Sediment and Erosion Control Measures:

The BMP plan shall include a clear description of what sediment and erosion control measures will be used and when they will be implemented. (For example, perimeter controls for one (1) portion of the site will be installed after the necessary clearing and grubbing, but before clearing and grubbing the remaining portions of the site. Perimeter controls will be actively maintained until upward portions of the site are stabilized). The following control measures shall be used as a minimum.

1. Soil Stabilization Practices - Existing vegetation shall be preserved where possible. All disturbed areas of the site shall be stabilized. Stabilization shall begin within 14days on areas of the site where construction activities have permanently or temporarily (for 21 days or more) ceased. When snow cover causes delays, stabilization shall begin as soon as possible.

   Stabilization practices include seeding, mulching, placing sod, planting trees or shrubs, and using geotextile fabrics and other appropriate measures.

2. Perimeter Structural Practices -Silt fences or other equivalent structural practices shall be used on all side and down slope borders of the site. Alternatively, a sediment basin shall be used that provides 3,600 cubic feet of storage capacity per disturbed acre drained. For common drainage locations that serve more than ten (10) disturbed acres at one time, a sediment basin must be used if possible.

   Structural practices include protecting drain inlets and outlets and using silt fences, earthen dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, reinforced soil retaining systems, gabions, sediment basins and other appropriate measures. The installation of these devices may be subject to Section 404of the CWA.

3. Stormwater Management Devices - Management devices shall be installed during construction to control the pollutants in stormwater discharges that will occur after construction has been completed. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive flow so that the original physical and biological characteristics and functions of the receiving waters, such as the hydroperiod and hydrodynamics, are maintained and protected. When considering stormwater management devices, the goal should be 80% removal of Total Suspended Solids that exceed predevelopment levels. If this goal is not met, the permittee shall provide justification for refusing each device based on site conditions.

Management devices include velocity dissipation devices, stormwater retention and detention basins, wet ponds, vegetated swales and natural depressions used for flow reduction, runoff infiltration devices, sequential systems that combine several devices and other appropriate measures. The installation of these devices may be subject to Section404 of the CWA.

The permittee is not responsible for the maintenance of these devices once discharges associated with construction activity have been eliminated.

C. Other Control Measures:

No solid materials, including building materials, shall be discharged to waters of the Commonwealth, except as authorized by a Section 404 permit.

Off-site vehicle sediment tracking and dust generation shall be minimized.

Waste disposal methods and sanitary sewer or septic systems shall comply with applicable state or local regulations.

D. Other State or Local Plans:

The BMP plan shall include any requirements specified in sediment and erosion control plans, stormwater management plans or permits that have been approved by other state or local officials. Upon submittal of the NOI, other requirements for surface water protection are incorporated by reference into and are enforceable under this permit (even if they are not specifically included in the BMP plan required by this permit). This provision does not apply to master or comprehensive plans, non-enforceable guidelines or technical guidance documents that are not identified in a specific plan or permit issued for the construction site by state or local officials.

E. Maintenance:

The BMP plan shall include a clear description of the maintenance procedures necessary to keep the control measures in good and effective operating condition.

F. Inspections:

Qualified personnel shall inspect all stormwater control measures, discharge locations, vehicle exits, disturbed areas of the construction site and material storage areas at least once every seven (7) days (and within 24 hours of the end of a storm that is 0.5 inches or greater) and areas that have been temporarily or finally stabilized at least once a month. Revisions to the BMP plan based on the results of the inspection shall be implemented within seven(7) days.

Control measures shall be inspected to ensure correct operation. Accessible discharge locations shall be inspected to ensure that velocity dissipation devices are effective in preventing significant impacts to receiving waters. Vehicle exits shall be inspected for evidence of, or the potential for, off-site sediment tracking. Disturbed areas and material storage areas that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system.

A report summarizing the scope of the inspection, names and qualifications of personnel making the inspection, the date of the inspection, major observations relating to the implementation of the BMP plan, and any corrective actions taken shall be made and kept as part of the BMP plan for at least three (3) years after the date of inspection, or until one (1) year after coverage under this permit ends. The report shall be signed in accordance with Part II of this permit.

G. Non-Stormwater Discharges:

The BMP plan shall identify and ensure the implementation of appropriate pollution prevention measures for any non-stormwater component of a discharge as listed in PART III C, except for flows from fire fighting activities.

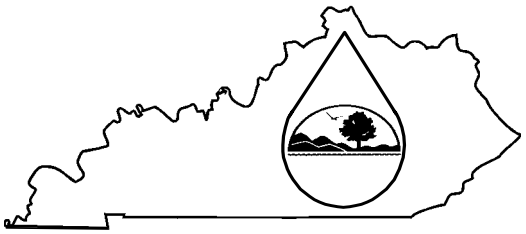
H. Contractors and Subcontractors:

The BMP plan shall clearly state the contractor or subcontractors that will implement each control measure identified in the BMP plan. All contractors and subcontractors identified in the BMP plan must sign a copy of the certification statement below in accordance with PART II of this permit before conducting any professional service at the site:

> "I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the stormwater discharges associated with industrial activity from the construction site identified as part of this certification."

The certification must include the name and title of the person providing the signature, the name, address, and telephone number of the contracted firm, the address, or other identifying description of the site and the date the certification is made. All certification statements must be included in the BMP plan.

KPDES FORM NOI-SW



Kentucky Pollutant Discharge Elimination System (KPDES)

Notice of Intent (NOI) for Stormwater Discharges Associated with Industrial Activity Under the KPDES General Permit

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by a KPDES permit issued for stormwater discharges associated with industrial activity. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM (See Instructions on back)

I. Facility Operator Information

Name:		**Phone:**	
Address:		**Status of Owner/Operator:**	
City, State, Zip Code:			

II. Facility/Site Location Information

Name:			
Address:			
City, State, Zip Code:			
County:			
Site Latitude: (degrees/minutes/seconds)		**Site Longitude: (degrees/minutes/seconds)**	

III. Site Activity Information

MS4 Operator Name:							
Receiving Water Body:							
Are there existing quantitative data?	**Yes** ☐ **If Yes, submit with this form.** **No** ☐						
SIC or Designated Activity Code Primary	**8741**	**2nd**		**3rd**		**4th**	
If this facility is a member of a Group Application, enter Group Application Number:							
If you have other existing KPDES Permits, enter Permit Numbers:							

IV. Additional Information Required FOR CONSTRUCTION ACTIVITIES ONLY

Project Start Date:		**Completion Date:**	
Estimated Area to be disturbed (in acres):			
Is the Stormwater Pollution Prevention Plan in Compliance with State and/or Local Sediment and Erosion Plans?	**Yes** ☐ **No** ☐		

V. Certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed or Typed Name:			
Signature:		**Date:**	

Kentucky Pollutant Discharge Elimination System (KPDES)
Instructions
Notice of Intent (NOI) for Stormwater Discharges Associated with Industrial Activity
To Be Covered Under The KPDES General Permit

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a stormwater discharge must submit a NOI to obtain coverage under the KPDES Stormwater General Permit. If you have questions about whether you need a permit under the KPDES Stormwater program, or if you need information as to whether a particular program is administered by the state agency, call the Stormwater Contact, Industrial Section, Kentucky Division of Water at (502) 564-3410.

WHERE TO FILE NOI FORM

NOIs must be sent to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
Frankfort Office Park
14 Reilly Road
Frankfort, KY 40601

COMPLETING THE FORM

Type or print legibly in the appropriate areas only. If you have any questions regarding the completion of this form call the Stormwater Contact, Industrial Section, at (502) 564-3410.

SECTION I - FACILITY OPERATOR INFORMATION

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same as the name of the facility. The responsible party is the legal entity that controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Enter the appropriate letter to indicate the legal status of the operator of the facility.

F = Federal M = Public (other than federal or state)
S = State P = Private

SECTION II - FACILITY/SITE LOCATION INFORMATION

Enter the facility's or site's official or legal name and complete street address, including city, state, and ZIP code.

SECTION III - SITE ACTIVITY INFORMATION

If the stormwater discharges to a municipal separate storm sewer system (MS4), enter the name of the operator of the MS4 (e.g., municipality name, county name) and the receiving water of the discharge from the MS4. (A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by a state, city, town, borough, county, parish, district, association, or other public body which is designed or used for collecting or conveying stormwater.)

If the facility discharges stormwater directly to receiving water(s), enter the name of the receiving water.

Indicate whether or not the owner or operator of the facility has existing quantitative data that represent the characteristics and concentration of pollutants in stormwater discharges. If data is available submit with this form.

List, in descending order of significance, up to four 4-digit standard industrial classification (SIC) codes that best describe the principal products or services provided at the facility or site identified in Section II of this application.

If the facility listed in Section II has participated in Part 1 of an approved stormwater group application and a group number has been assigned, enter the group application number in the space provided.

If there are other KPDES permits presently issued for the facility or site listed in Section II, list the permit numbers.

SECTION IV - ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION ACTIVITIES ONLY

Construction activities must complete Section IV in addition of Sections I through III. Only construction activities need to complete Section IV.

Enter the project start date and the estimated completion date for the entire development plan.

Provide an estimate of the total number of acres of the site on which soil will be disturbed (round to the nearest acre).

Indicate whether the stormwater pollution prevention plan for the site is in compliance with approved state and/or local sediment and erosion plans, permits, or stormwater management plans.

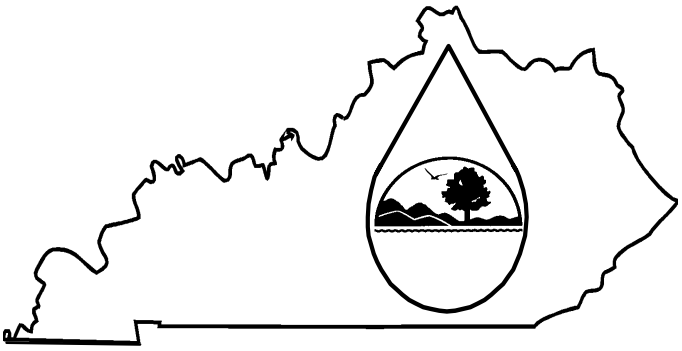
SECTION V - CERTIFICATION

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer,which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authroity to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, Federal, or other public facility: by either a principal executive officer or ranking elected official.



Kentucky Pollutant Discharge Elimination System (KPDES)

NOTICE OF TERMINATION (NOT)

of Coverage Under the KPDES General Permit for Stormwater Discharges Associated with Industrial Activity

Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge stormwater associated with industrial activity under the KPDES program.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.
(Please see instructions on back before completing this form.)

I. PERMIT INFORMATION
KPDES Stormwater General Permit Number:
Check here if you are no longer the Operator of the Facility: ☐
Check here if the Stormwater Discharge is Being Terminated: ☐
II. FACILITY OPERATOR INFORMATION
Name:
Address:
City/State/Zip Code:
Telephone Number:
III. FACILITY/SITE LOCATION INFORMATION
Name:
Address:
City/State/Zip Code:

Certification: I certify under penalty of law that all stormwater discharges associated with industrial activity from the identified facility that are authorized by a KPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge stormwater associated with industrial activity under this general permit, and that discharging pollutants in stormwater associated with industrial activity of waters of the Commonwealth is unlawful under the Clean Water Act and Kentucky Regulations where the discharge is not authorized by a KPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Kentucky Revised Statutes.

NAME (Print or Type)	TITLE
SIGNATURE	DATE

INSTRUCTIONS
NOTICE OF TERMINATION (NOT) OF COVERAGE UNDER THE KPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

Who May File a Notice of Termination (NOT) Form
Permittees who are presently covered under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Stormwater Discharges Associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any stormwater discharges associated with industrial activity as defined in the stormwater regulations at 40 CFR 122.26 (b)(14), or when they are no longer the operator of the facilities.

For construction activities, elimination of all stormwater discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all stormwater discharges associated with industrial activity from the construction site that are authorized by a KPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles have been employed.

Where to File NOT Form
Send this form to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Completing the Form
Type or print legibly in the appropriate areas and according to the instructions given for each section. If you have questions about this form, call the Stormwater Contact, Industrial Section, at (502) 564-3410.

Section I - Permit Information
Enter the existing KPDES Stormwater General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, **call the Stormwater Contact, Industrial Section at (502) 564-3410.**

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, check the corresponding box.

If all stormwater discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II - Facility Operator Information
Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III - Facility/Site Location Information
Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code. If the facility lacks a street address, indicate the state, the latitude and longitude of the facility to the nearest 15 seconds, or the quater, section, township, and range (to the nearest quarter section) of the approximate center of the site.

Section IV - Certification
Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, State, Federal, or other public facility: by either a principal executive