





4.3 SEDIMENT CONTROL PRACTICES FACT SHEETS (SMP)

Sediment Control Practices	SMP 4.3.1 Silt Fence
 <p>Symbol</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;">SF</div>	
<p>Description</p> <p>Application</p> <p>Design</p>	<p>To detain sediment-laden water, silt fences are used to promote silt deposition behind the fence. These fences are made of filter fabric that has been entrenched, attached to support poles and occasionally supported by a wire fence. Silt fence is intended as a temporary sediment barrier and requires routine maintenance.</p> <ul style="list-style-type: none"> ☑ Silt fence should be used in area accepting sheet flow conditions. ➤ Silt fence should not be used in ditch lines, streams, or other areas of concentrated flows. ➤ Silt fencing can be used along the downstream perimeter, below the toe of a cleared slope, upstream of sediment traps or basins, along streams and channels and around temporary spoil areas. <p>The design criteria for silt fence is as follows:</p> <ul style="list-style-type: none"> ➤ Silt fencing should be installed along the contour. It should not be installed up and down slopes or around the perimeter of large construction sites unless accompanied by measures such as —J Hooks or other methods. ➤ The length of silt fence is determined by the amount of run-off area. The minimum area should not exceed 0.25 acre per 100 linear feet of silt fence. ➤ Spacing of silt fence is variable depending on the slope of land draining to the fence. See Table SMP1-01 for spacing requirements.



City of Berea, KY
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Design

- ☐ Silt fencing must be installed only where water can pond. Specify silt fencing downgradient from bare soil areas with the ends turned up to prevent bypassing.
- Provide adequate setbacks from slope toe for routine maintenance and access.
- Silt fencing can be used where:
 - Non-concentrated sheet flow will occur
 - Protection of adjacent property or nearby surface waters is required
 - The size of the drainage area is no more than ¼ acre per 100 linear feet of silt fence
 - The maximum flow path length above the barrier is 100 feet for slopes less than 2 percent, and 50 feet for slopes up to 10 percent
 - The maximum slope gradient above the barrier is 2H:1V
 - Silt fencing can be used in flat, short swales (i.e. slope is less than 2 percent; length is less than 200 feet) that drain less than 2 acres, if silt fencing is spaced every 50 feet
 - Reinforced silt fence must be required when the contributing slope is longer than 100 feet and greater than 3 percent and the design life of the silt fence is greater than 6 months.

Table SMP01-1. Silt Fence Spacing on Long Slopes

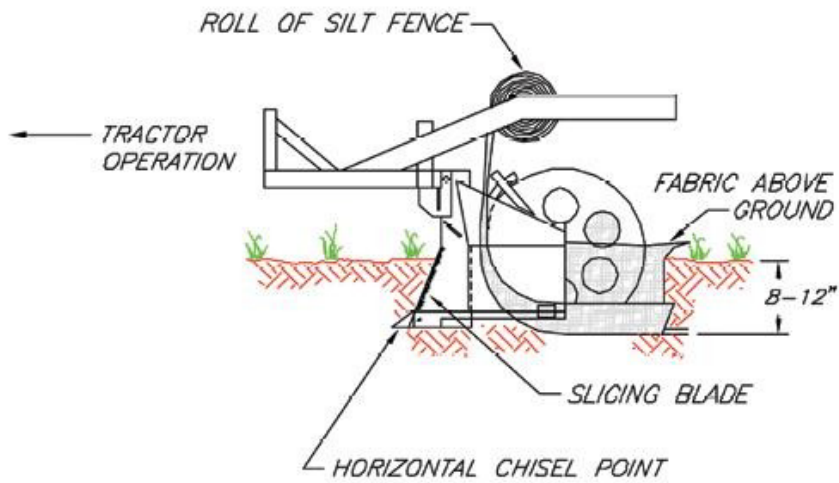
Land Slope	Max. Slope Distance
3% - 5%	100 ft.
5% - 10 %	75 ft.
10% - 20%	50 ft.
20% - 50%	25 ft.

- Silt fences should be located where only shallow pools (i.e., 1.5 feet or less) can form. Their use is limited to situations in which sheet or overland flows are expected.
- Dig a trench on the contour at least 6 inches wide and 6 inches deep below the area to be treated, taking care to install J-hooks where flows will travel along the silt fence. Turn fence ends uphill to trap potential bypasses as needed.
- If posts are already attached to fabric, position the fencing so the posts are installed on the downhill side of the fabric. Drive posts to a depth of 1 foot below the bottom of the trench, against downslope trench wall for extra support. Posts for all silt fencing are spaced 6 feet apart.
- Push fabric into the trench, and spread fabric along trench bottom and sides; backfill the trench and compact the soil. A preferred installation technique is deep, easily- worked soils with minimal rock content involves static slicing of the fence into the ground with a chisel-plow implement such as the *Tommy Silt Fence Machine* or equivalent. The filter fabric is wire-tied directly to the posts with three diagonal ties.
- The height of a silt fence must be 18 inches minimum and 30 inches maximum. Sediment storage height and ponding height must not exceed 18 inches.
- Silt fences placed at the toe of a slope must be set at least 6 feet back from the toe to increase ponding volume and provide room for maintenance.

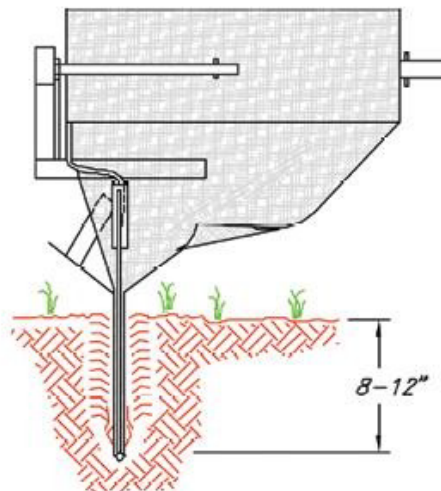


City of Berea, KY Stormwater Best Management Practices

- Maintenance**
- Silt fences and filter barriers must be inspected weekly or every 14 days and after each storm of greater than one-half inch. Any required repairs must be made immediately.
 - Sediment height not to exceed one-third the height of the fence.
 - Perform required maintenance before a storm event.
 - Remove fence when vegetation is established and any sediment stored behind the silt fence has been removed. Silt fences and other temporary controls must be removed before project close out.
- Inspection**
- Silt fence has proper placement.
 - 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.
 - The last 6 feet of the silt fence is turned uphill and secured to the post.
 - Color band of the anchor trench is not visible.
 - Accumulated sediment does not exceed one third the height of the fence or 18 inches maximum.
 - If washaround or underwash occurs then fence should be reset.
 - The removed sediment must be spread and vegetated or otherwise stabilized so that it does not result in muddy runoff to nearby ditches or surface waters.



STATIC SLICING METHOD
SIDE VIEW

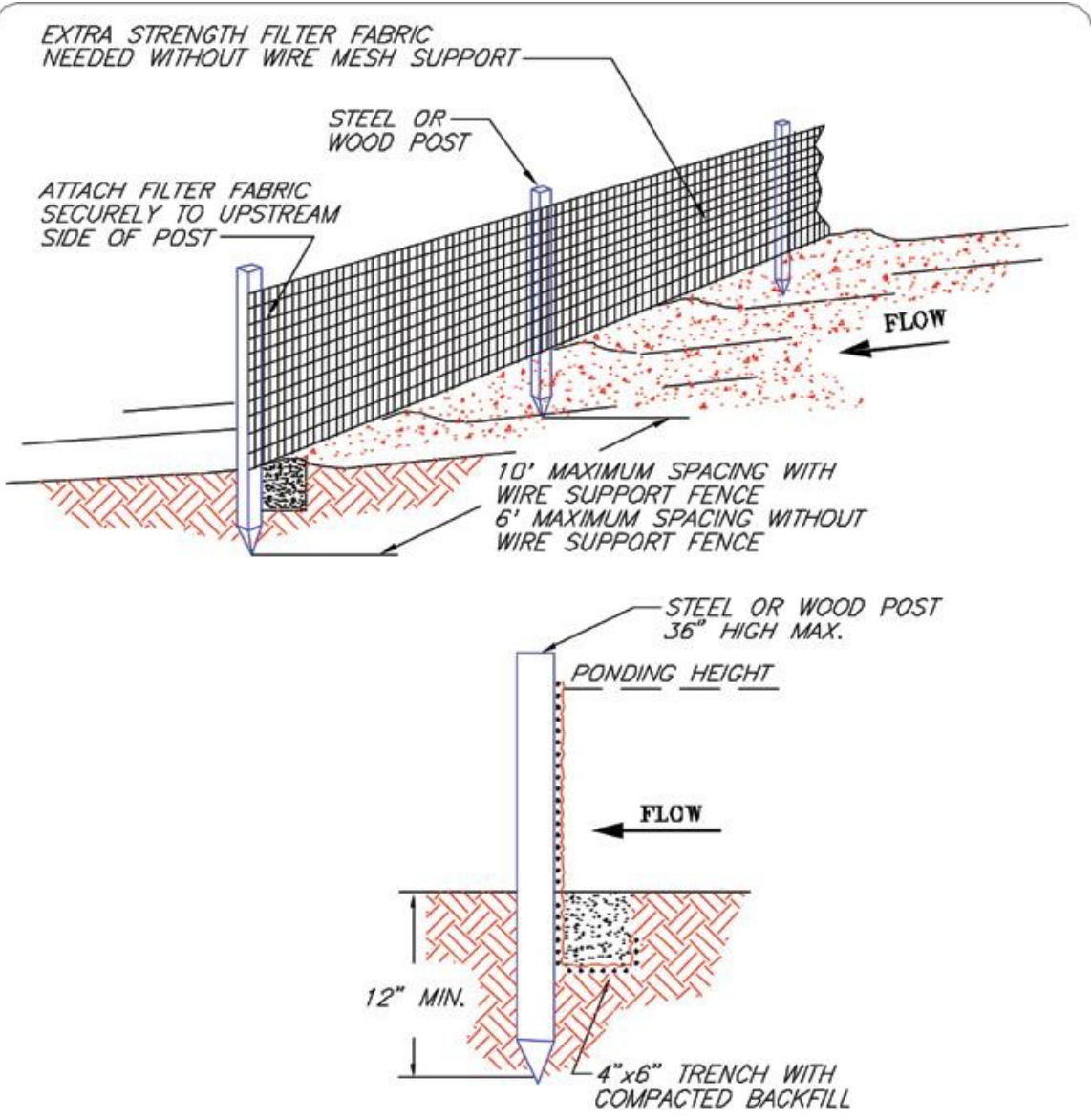


STATIC SLICING METHOD
BACK VIEW

**SILT FENCE
INSTALLATION:
SLICING METHOD**

SOURCE: SALIX APPLIED EARTHCARE –
EROSION DRAW 5.0

Figure EPP01-1. Silt Fence Installation – Slicing Method
Kentucky Construction Site BMP Planning and Technical Specifications



TRENCH DETAIL

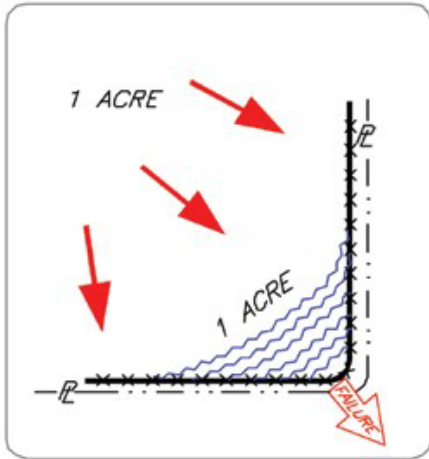
- NOTES:
1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
 2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. 9" MAXIMUM RECOMMENDED STORAGE HEIGHT.
 3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

SOURCE: SALIX APPLIED EARTHCARE -
EROSION DRAW 5.0

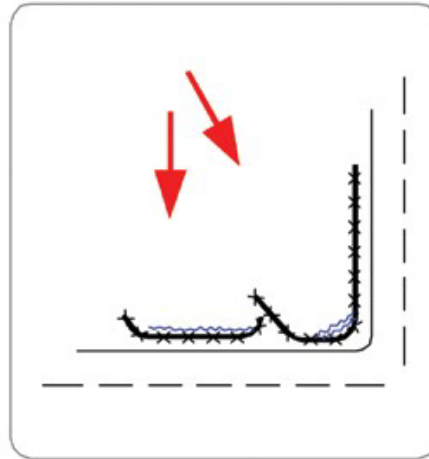
NOT TO SCALE

**SILT FENCE
INSTALLATION:
TRENCH METHOD**

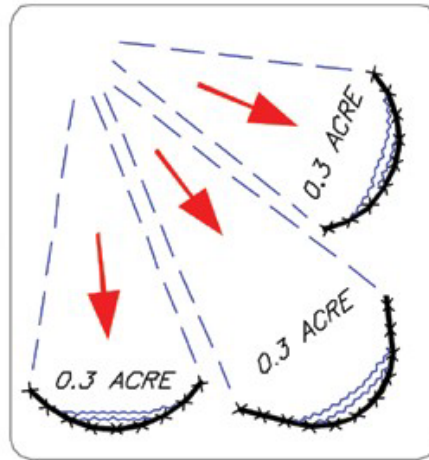
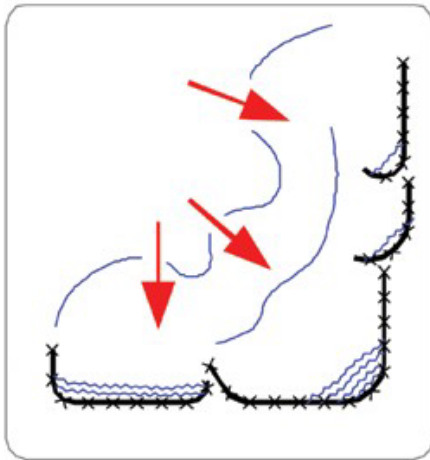
Figure EPP01-2. Silt Fence Installation – Trenching Method
Kentucky Construction Site BMP Planning and Technical Specifications



Incorrect - Do Not layout "perimeter control" silt fences along property lines. All sediment laden runoff will concentrate and overwhelm the system.



Correct - Install J-hooks

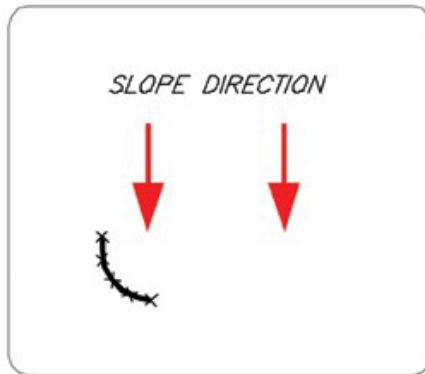
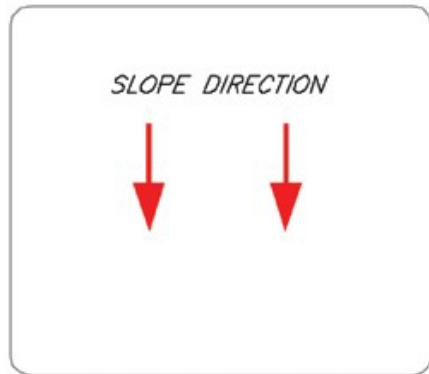


Discreet segments of silt fence, installed with J-hooks will be much more effective.

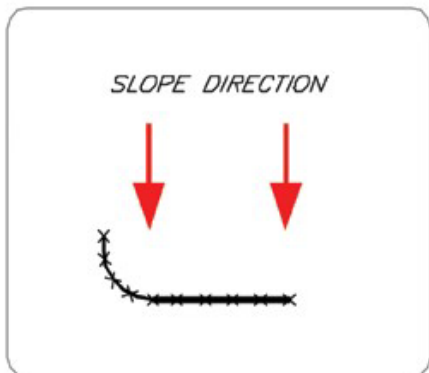
SILT FENCE PLACEMENT FOR PERIMETER CONTROL

SOURCE: SALIX APPLIED EARTHCARE -
EROSION DRAW 5.0

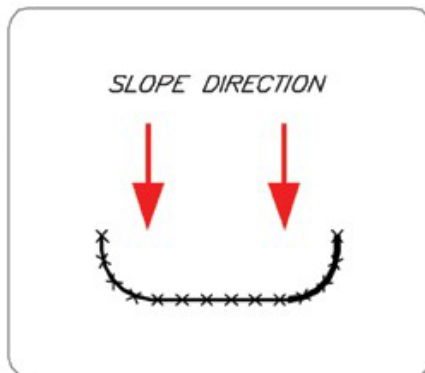
Figure EPP01-3. Silt Fence Perimeter Placement
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STEP 1 – CONSTRUCT LEG



STEP 2 – CONSTRUCT DAM



STEP 3 – CONSTRUCT LEG 2

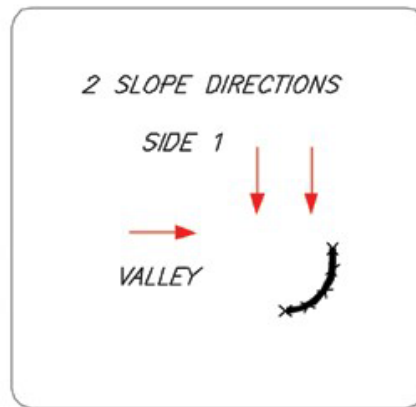
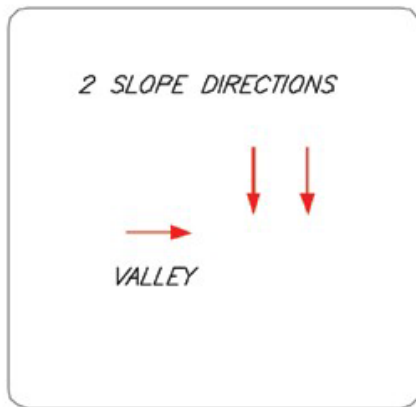
INSTALLATION WITH J-HOOKS INCREASE SILT FENCE EFFICIENCY.

**SILT FENCE:
TYPICAL PLACEMENT
ON SLOPE**

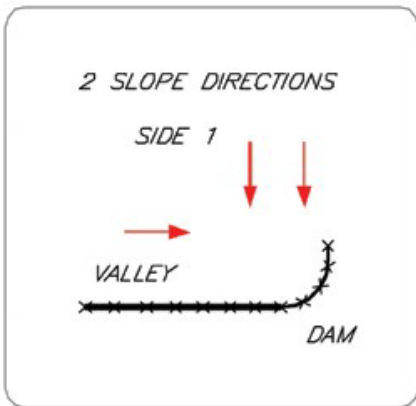
SOURCE: SALIX APPLIED EARTHCARE –
EROSION DRAW 5.0

Figure EPP01-4. Silt Fence Placement on Slopes

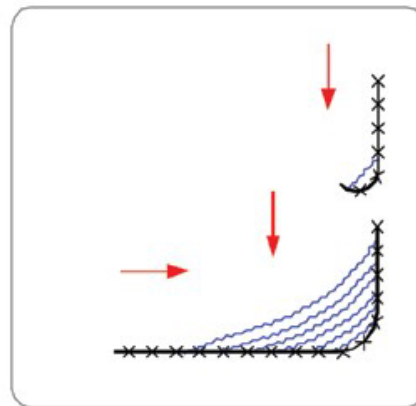
Kentucky Construction Site BMP Planning and Technical Specifications



STEP 1 - CONSTRUCT A DAM



STEP 2 - CONSTRUCT SIDE 2



STEP 3 - CONSTRUCT J-HOOKS AS NEEDED

INSTALLATION WITH J-HOOKS WILL INCREASE SILT FENCE EFFICIENCY AND REDUCE EROSION-CAUSING FAILURES.

**SILT FENCE:
 TYPICAL PLACEMENT
 TWO SLOPES**

SOURCE: SALIX APPLIED EARTHCARE -
 EROSION DRAW 5.0

Figure EPP01-5. Silt Fence Placement on Compound Slope

Kentucky Construction Site BMP Planning and Technical Specifications



Sediment Control Practices

SMP 4.3.2 Rock Filters



Symbol

CB



Description

Filters, brush and berms are used to dissipate sediment in construction runoff by anchoring rock deposits, rolls of fabric and/or brush barriers. These barriers are constructed of rocks $\frac{3}{4}$ to 5 inches in diameter that make up a berm to be placed along a contour. Brush wrapped in filter cloth and anchored to the toe of the slope creates a brush barrier, which acts as another trapping method. Additionally, a continuous roll of fabric that captures sand, rock or native soil is an example of one more method to capture sediment. This BMP is used for sediment trapping and velocity reduction that will aid in significantly reducing sediment.

Application

- Rock filters should be applied near the toe of the slope, along the site perimeter, stream channels, spoil areas, small cleared areas, sediment traps
- Rock filters may also be used as check dams with temporary roads

Design

A filter berm can often be constructed from natural materials, such as brush or rocks. This is generally an efficient operation for the site contractor if these materials are already present on the project site, both timewise and in terms of installation cost. Brush and rock filter berms can also be installed with a geotextile fabric to increase sediment removal filtration and the overall stability of the berm. Wire netting (such as poultry fencing) can also be used to increase the stability for brush or rock berms. Gabions and other wire mattresses can also be used as a rock filter for erosion control.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd) Both types of filter berms are placed along a level contour. Common applications are along the edge of a gravel roadway or 5 to 7 feet beyond the toe of a slope, where overland sheet flow can be detained and ponded. They should not be used in ditches, channels, or streams unless they can withstand predicted flows. Brush or rock filter berms slow the velocity of overland runoff, allowing sediment to settle out or become trapped in the filter. In this manner, the brush and rock filter berms are very similar in function to SMP-01, Check Dams, except that filter berms handle overland sheet flow and check dams handle stormwater runoff channels.

Brush and rock filter berms both contain materials (dirt, leaves, dust, silt) which could potentially cause more pollution than they might remove. These measures should be constructed and managed carefully in order to become effective BMPs. A silt fence or straw bale barrier may be needed as a secondary measure to control dirt and leaves.

- Place filter on downhill edge of bare soil areas.
- Make sure the filter catches all the muddy runoff.
- Turn the ends of the barrier uphill to prevent bypasses
- The goal is to pond runoff, to filter and settle it out
- Install multiple sediment filters on long slopes
- Spacing on long slopes is every 50 to 100 feet
- **Brush Filter (F-B)**

A brush filter berm is composed of brush, small tree limbs, rootmat, grass and leaves, or other material which is commonly generated as waste during the clearing and grubbing stage. The brush filter berm is constructed by piling these materials into a continuous and compacted mound along a level contour which is downhill from a disturbed area. Large logs or tree stumps should generally be avoided as part of the brush filter berm; they cause large voids or gaps in the berm and so defeat the purpose of detaining stormwater. However, large logs by themselves can be used to slow stormwater runoff in wooded areas, along paths and trails, or at the bottom of slopes.

A brush filter berm height of approximately 2-5 feet is recommended to slow or detain stormwater. The minimum height of 2 feet may be used for short slopes less than 100 feet long. A corresponding width is generally 4 to 10 feet, with a shape that can either be triangular or somewhat rounded. Standard dozers or other grading equipment are used to compact and shape the brush filter berm to be more dense. Use rope or sturdy string to shape the brush filter berm and to hold it together.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd)

A geotextile fabric can be used to increase the sediment retention or to provide a more stable brush filter berm. Install the filter fabric into a trench 6 inches deep immediately uphill from the formed berm. Then lay the filter fabric over the front face of the brush filter berm. Secure the filter fabric using staples, stakes, ropes or wires so that the fabric will not be uplifted by winds or storms. Overlap edges of filter fabric by 6 inches.

Brush filter berms are generally not used in developed areas or wherever aesthetics will be of concern. Brush filter berms may also be unpredictable in terms of performance. Since they are composed of natural materials, they may or may not need to be removed after the uphill sites are stabilized. Brush filter berms may provide a habitat for various types of desirable wildlife, or they could harbor pests and rodents in areas where these problems are known to exist.

➤ **Rock Filter (F-R)**

A rock filter berm can be created from natural gravel or rock at the project site, or from imported gravel and rock. It is placed and compacted along a level contour, where sheet flow may be detained and ponded to promote sedimentation. Some type of geotextile fabric or wire screen is recommended to keep the berm shape intact. A gabion or wire mattress may be used to construct a rock filter berm, provided that the gabion wire spacing is compatible with size of aggregate or rock.

Rock filter berms can be used along the downslope edge of roadways or 5 to 7 feet beyond the toe of a slope. Longer rock berms constructed as sheet runoff sediment barriers should be 18" to 30" in height and consist of stone 2-6 inches in diameter. Rock filter berms can also be incorporated as part of a gravel road and other type of unpaved traffic area, in order to prevent stormwater from flowing into paved roads.

Construct a rock filter berm by first placing larger rocks as a base. If available, smaller rocks or gravel are placed on the uphill side of the larger rocks to form a natural filter. Geotextile filter fabric can be underneath the rock filter berm itself, which would adequately anchor the fabric. For areas where concentrated flows may occur, use larger rock without any dust or fine material, placed in a gabion or other type of staked woven-wire mattress.

Maintenance

- Daily Inspection is required when installing in stream beds
- After each heavy rainfall inspect berms
- Maintain berms to guarantee proper utilization
- Inspect for sediment accumulation removing when depth reaches $\frac{1}{4}$ of berm height or 9 inches
- Look for signs of bypassing along the sides, undercutting below the barrier, overtopping, or blowout.
- Make required repairs immediately
- Remove berms upon completion of the project

Inspection

- Sufficient space for ponded water.
- Brush filters are performing.
- Drainage to structure does not exceed 5 acres.



Sediment Control Practices

SMP 4.3.3 Sediment Traps



Symbol

ST



Description

The sediment trap is a control measure that detains sediment-laden runoff from small disturbed areas in an earthen embankment that will allow ponding long enough to allow the sediment to settle within the depression.

Application

- Install detention areas below disturbed vicinities of less than 10 acres.
- Along the perimeter of the site at locations where sediment-laden runoff is discharged off-site or areas where runoff can enter stabilized areas or waterways.
- Temporary sediment traps shall **not** be used in live or continuously-flowing streams. Sediment traps may kill nearby vegetation by excessive sediment or by long periods of submergence.
- Temporary sediment traps only remove coarse particles which settle quickly. Sediment traps are not effective for fine-grained soils such as silt or clay. Additional upstream erosion control measures are necessary.

Design

➤ Volume

Minimum volume of a sediment trap shall be 67 cubic yards per acre for the total drainage area. The volume shall be measured at an elevation equivalent to the spillway invert.

Optimal design volume of sediment trap depends on type of soil, size and slope of drainage area, amount of land disturbance, desired sediment removal efficiency, and desired cleanout frequency. A recommended volume for temporary sediment trap in heavily disturbed areas is 134 cubic yards per acre, which equates to 1 inch of stormwater runoff. Optimal design of this type of sediment trap includes an upper zone of at least 67 cubic yards per acre (to be dewatered using one of the outlet design alternatives) and a lower wet zone for sediment storage and settling.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd) ➤ Location

Traps cannot be placed in blue-line streams or other regulated water unless space limitations or design limitations provide no other feasible option. A USACE Clean Water Act (CWA) section 404 permit is required in these cases.

➤ Shape

The designer should attempt to plan a basin that has a minimum 3:1 length to width ratio.

➤ Slopes

Basin side slopes should be restricted to 4:1 or flatter. However, the permeable, filter, portion should have a maximum cross section of 2:1. Trap berm width at base must be sufficient to support 2H:1V berm.

➤ Emergency Spillway

The emergency overflow outlet of the temporary sediment trap must be stabilized with rock, riprap, geotextile, vegetation or another suitable material which is resistant to erosion. A stable emergency spillway must be installed to safely convey stormwater runoff for the 10-year storm event.

An emergency overflow weir should be provided at an elevation of at least 1.5 feet below the top of embankment, with a minimum freeboard of 1 foot. The minimum bottom width of a trapezoidal section for an emergency overflow weir should be:

4 feet - 1 acre (total drainage area)

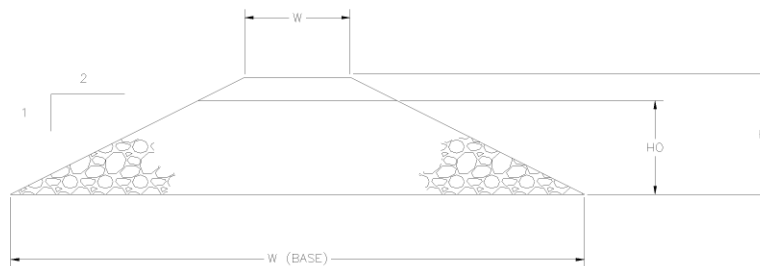
6 feet - 2 acres (total drainage area)

8 feet - 3 acres (total drainage area)

10 feet - 4 acres (total drainage area)

12 feet - 5 acres (total drainage area)

*Drainage areas over 5 acres as designed



- ### Maintenance
- Inspect traps weekly and before and after heavy rainfall.
 - Maintain traps to guarantee correct utilization.
 - Remove sediment after it reaches 1/3 the height of the trap.



City of Berea, KY Stormwater Best Management Practices

- Design (cont'd)**
- Construct traps of rock (KYTC No. 2 mixed with smaller stone), rock-filled fiber bags, or use approved commercial sediment trap products installed and spaced according to manufacturer's instructions.
 - Site sediment traps in areas where they can be maintained (i.e. sediment removed).
 - Set traps back from property lines or water bodies as much as possible.
 - Minimum sediment storage capacity is 134 cubic yards (3600 cubic feet) of upland area drained by the trap. Where space restrictions exist, install multiple traps in a series at least 50 feet apart.
 - Maximum drainage area is 5 acres.
 - Basin flow length should be at least two times the flow width.
 - Recommended traps depth for open areas is 2 feet at the inlet and 4 feet at the outlet.
 - Trap height must be 1.5 feet minimum in ditches, 3-5 feet in open area drainageways.
 - Trap length must be sufficient to tie into upper banks in ditches or high enough to prevent side bypasses in drainageways. Overflows must in the center of the berm.
 - Construct the trap, seed and stabilize before clearing and grading work begins.
 - Embankment shall have a maximum height of 5 feet.
 - The outlet must consist of an overflow spillway wide made of stone (KYTC No. 2 minimum)
 - Any material excavated from the trap must be uniformly spread to a depth no exceeding 3 feet and graded to a continuous slope away from the trap.
 - Field-approved installations should be noted on weekly or bi-weekly inspection reports an on plan documents within 7 days.
- Inspection Checklist**
- Inspect weekly or every 14 days or after a rainfall greater than one-half inch.
 - Constructed traps serve 10 acres or less.
 - Type of outlet structure used matches EPSC plan.
 - Structure is stabilized to prevent erosion.
 - Gage is visible and correctly indicates the depth of the trap.
 - Sediment accumulation does not exceed $\frac{1}{3}$ the height of trap. Plans for sediment trap must indicate the methods for disposing of the sediment removed.
 - Trap is constructed in such a way that no damage occurs to life or property.
 - Trap is maintained
 - Remove upon stabilization or cover of the upland drainage area with vegetation, pavement, and so on.



**City of Berea, KY
Stormwater Best Management Practices**

Sediment Control Practices	SMP 4.3.4 Sediment Basins
<div data-bbox="175 428 302 512" data-label="Image"> </div> <p data-bbox="191 527 277 558">Symbol</p> <div data-bbox="162 632 280 720" data-label="Text"> <p>DB</p> </div>	
<p data-bbox="164 995 298 1026">Description</p> <p data-bbox="164 1178 298 1209">Application</p> <p data-bbox="164 1444 250 1476">Design</p>	<p data-bbox="370 995 1338 1142">Typically temporary sediment/detention basins require the construction of an embankment across the drainage path in order to create a pond to trap sediment and inhibit the potential of downstream flooding. Sediment basins are usually designed by a professionally licensed engineer.</p> <ul data-bbox="370 1178 1338 1402" style="list-style-type: none"> ➤ For disturbed areas between 5 to 10 acres. Areas greater than 10 acres will require a design by a licensed professional engineer. ➤ Collect and store sediment from areas that have been cleared in preparation for construction. ➤ Used in areas where sediment-laden runoff may enter waterways. ➤ Suitable for almost all construction projects. <ul data-bbox="370 1444 1338 1896" style="list-style-type: none"> ➤ The sediment control basin should be designed by a professional engineer licensed in Kentucky using SEDCAD, or another suitable computer program. ➤ It is recommended that the dams be located in a natural drainageway in a deep construction that has a wide area upstream for ponding detained stormwater. ➤ The intent of this BMP is to trap sediment before it leaves the construction area. ➤ Construction phase performance goal is to reduce the total suspended solids by 80 percent for the 10-year, 24-hour storm, or provide a detention time of 24-48 hours for a 10-year 24-hour wet weather event. ➤ Provide a minimum storage capacity of 3600 cf per acre of bare soil. The maximum capacity for the impoundment must not exceed 10 acre-feet. If more impoundment capacity is needed, install basins in a series or site them to intercept tributary drainage areas.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd)

- The ratio of basin flow length to flow width is 2:1.
- Do not locate dams where a failure would result in severe property damage or danger to human life.
- Sediment basins should be designed or modified to drain down slowly for 2-4 days after a storm event. Modify the outlet if necessary to achieve the maximum detention time.
- Minimum drainage area is 5 acres; the maximum drainage area is 120 acres.
- Basin flow length should be at least two times the flow width; the longer, the better. Baffles constructed of filter fabric and metal posts can be used inside the basin to create a longer (e.g., serpentine) flow path between inlet(s) and the outlet.
- Basins that drain more than 10 acres can be designed as retention (rather than detention) basins (i.e. wet ponds). Design outlet to drain top of the pool farthest away from muddy inflows. Incorporating a sediment collection forebay is recommended to aid in maintenance.
- There are three components to the successful design of a sediment basin:
 - Embankment
 - Principal Spillway
 - Emergency Spillway

Embankment Recommendations

- Dam height should not exceed 20 feet.
- Slopes of the embankments for a Class 1 basin shall not be steeper than 3:1 on the upstream side, and not steeper than 5:1 on the downstream side of the basin, in order to allow the area to be safely mowed and maintained. (See SMP-05-01).
- Slopes on either side of the embankment of Class 2 or 3 basins shall not be steeper than 3:1 for, in order to allow the area to be safely mowed and maintained. (See SMP-05-01).
- Provide for a minimum of 1-foot of freeboard for a 100-year 6-hour wet weather event to the top of the embankment.
- The minimum width at the top of the embankment is 12-inches.
- Stabilize the slope with vegetation or rip rap.
- Antiseep collars around discharge pipe are required

Principal Spillway Requirements

- Provide a subsurface drain, a solid riser pipe, or both, with sufficient dewatering holes to allow sufficient detention time. Risers with one-half inch holes every 3 to 6 inches apart are recommended.
- No large holes or slots should appear in the lower two thirds of the riser. Risers with large openings can be modified as described below or wrapped with filter fabric to cover lower openings during the construction period.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd)

- During construction, risers should be modified with an inlet protection dike, pile of stone at the riser base, or other structure to provide longer ponding times (e.g., 1-2 days) for small flow events.
- The outlet pipe diameter shall be a minimum of 12-inches.
- Operational design goal is to reduce the peak flow to predevelopment levels for the 2-year and 10-year, 24-hour storms.
- Trash rack and anti-vortex device on the riser pipe are required.
- Prepare a stabilized apron for the outlet pipe.
- Provide a minimum of one foot of freeboard between the top of the riser pipe and the crest of the spillway.

Emergency Spillway Requirements

- Emergency spillway shall be designed to pass a 100-year 6-hour wet weather event, to the top of the embankment.
- Crest elevation at least one foot above the tip of the riser pipe.
- Rock used for the emergency spillway must be KYTC No. 2 or larger, depending on flow volumes and spillway slope.
- Emergency spillway energy dissipator must be extended at least 4 feet beyond the toe of the dam.

Construction Specifications

- Construct the basin by excavating or building an embankment dike before any clearing or grading work begins.
- Areas under the embankment and any structural works must be cleared, grubbed and stripped of any vegetation and rootmat as shown on the erosion and sediment control plan.
- To facilitate cleanout and restoration, the basin area must be cleared, grubbed and stripped of any vegetation.
- A cut-off trench must be excavated along the centerline of the earth fill embankments. The minimum depth must be 2 feet. The cut-off trench must extend up both abutments to the riser crest elevation.
- Fill material for the embankment must be clean, low-permeability, mineral soil free of roots, woody vegetation, oversized stones, rocks, or other objectionable material.
- Fill material must be placed in 6 inch lifts, continuous layers over the entire length of the fill. Compacting must 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 must be compacted to 95 percent of maximum density and +/- 2 percent of optimum moisture content.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd)

- 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 must be securely attached to the discharge pipe by welding all around. All connections must be watertight.
- The pipe and riser must be placed on a firm, smooth soil foundation. The connection between the riser and the riser base must be watertight. Pervious materials such as sand, gravel, or crushed stone must not be used as backfill around the pipe or antiseep collars.
- The fill material around the pipe spillway must 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 must be placed over the pipe spillway before crossing it with construction equipment.
- Risers might require a rock berm or other flow restrictor during the construction phase to ensure that muddy flows are detained sufficiently to promote settling of sediment.
- Steel base plates must have at least 2.5 feet of compacted earth, stone, or gravel over them to prevent flotation.
- An emergency spillway is required, and must not be installed in fill. Appropriate overflow channel lining and energy dissipator must be constructed.
- Baffles, if used, must be constructed of 4 inch by 4 inch posts and of 4 foot by 8 foot half-inch exterior plywood. The posts must be set at least 3 feet into the ground, no farther apart than 8 feet center to center, and must reach a height 6 inches below the riser crest elevation. Silt fencing with metal posts can also be used if flow velocities in the basin are low and ponding heights during the 2-year, 24-hour storm will not exceed 5 feet.
- The embankment, emergency spillway, incoming channels, and other site features must be stabilized with vegetation and mulched or blanketed immediately following construction.
- Construction operations must be carried out in such a manner that erosion and water pollution will be minimized.
- Local and state requirements must be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.



City of Berea, KY Stormwater Best Management Practices

Maintenance

- Inspect weekly as well as before and after wet weather events greater than one-half inch.
- If incoming flows are exiting the basin quickly because of large holes in the outlet, modify the lower portion of the riser with a stone berm, filter fabric, or other flow restrictor that retains incoming flows for at least 12-24 hours.
- Repair all damages to and within the basin due to construction by the end of the work day.
- Maintain all aspects of the basin (outlet area, outlet structures, etc.).
- Remove sediment when storage is $\frac{1}{2}$ full.
- Ensure that all sediment removed from the basin will not erode from the site. The sediment must 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 must be leveled or otherwise disposed of according to the approved erosion and sediment control plan.
- If the sediment basin is designed to function as a permanent stormwater treatment pond, the basin and riser will be configured to that mode upon stabilization of the upland drainage area. Temporary flow restrictors on risers and other construction phase modifications must be removed.
- Basin failure should not affect loss in life, property, roads, or utilities.

Inspection Checklist

- Structure has appropriate outlet design.
- Stabilized outlet prevents erosion.
- Sediment accumulation does not exceed $\frac{1}{2}$ depth of basin.
- Outlet is free of trash and deleterious materials that will clog the pipe and restrict flow.
- Trash rack and anti-vortex device on riser is free of debris and other deleterious materials that will clog and restrict flow.



City of Berea, KY
Stormwater Best Management Practices

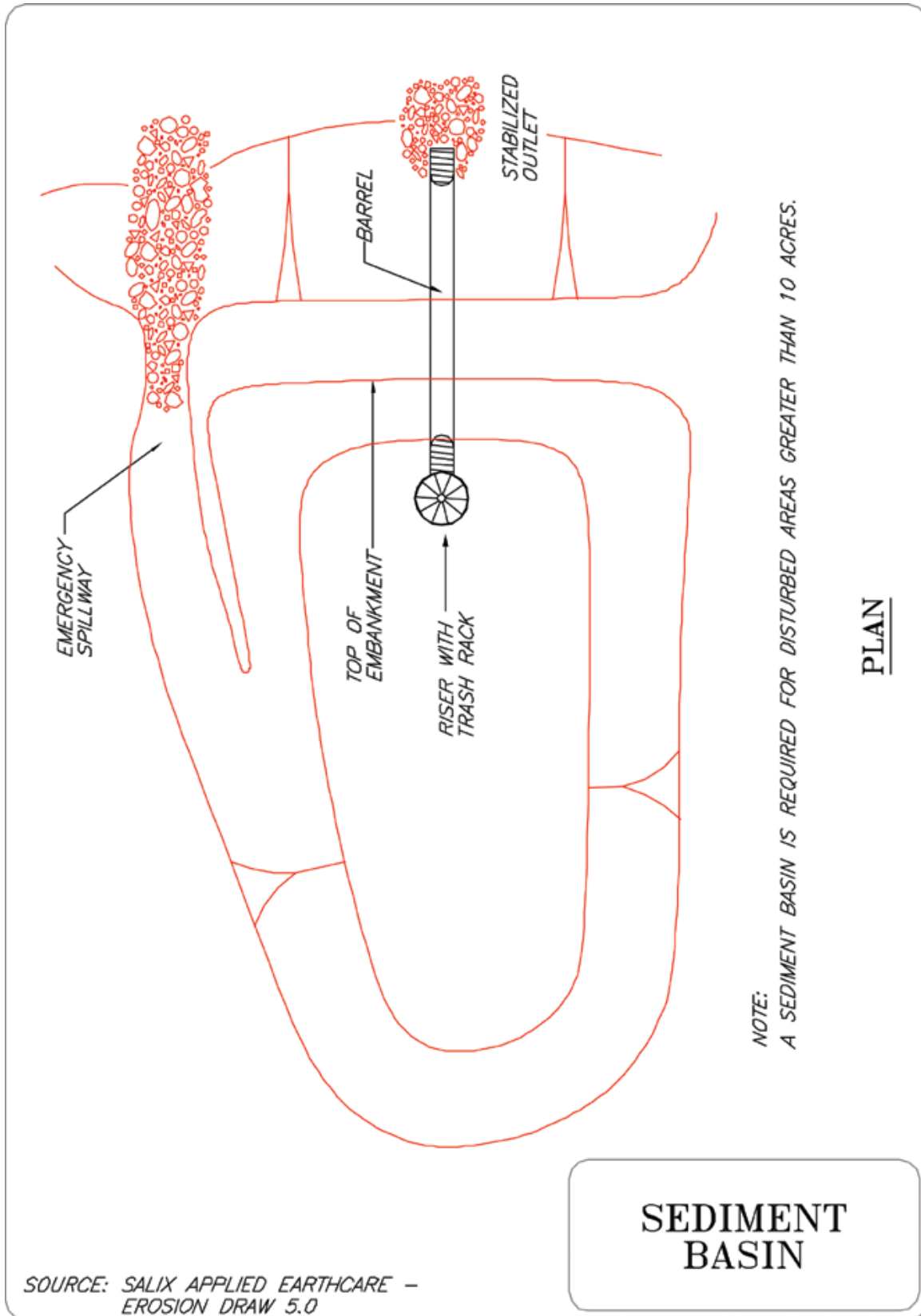
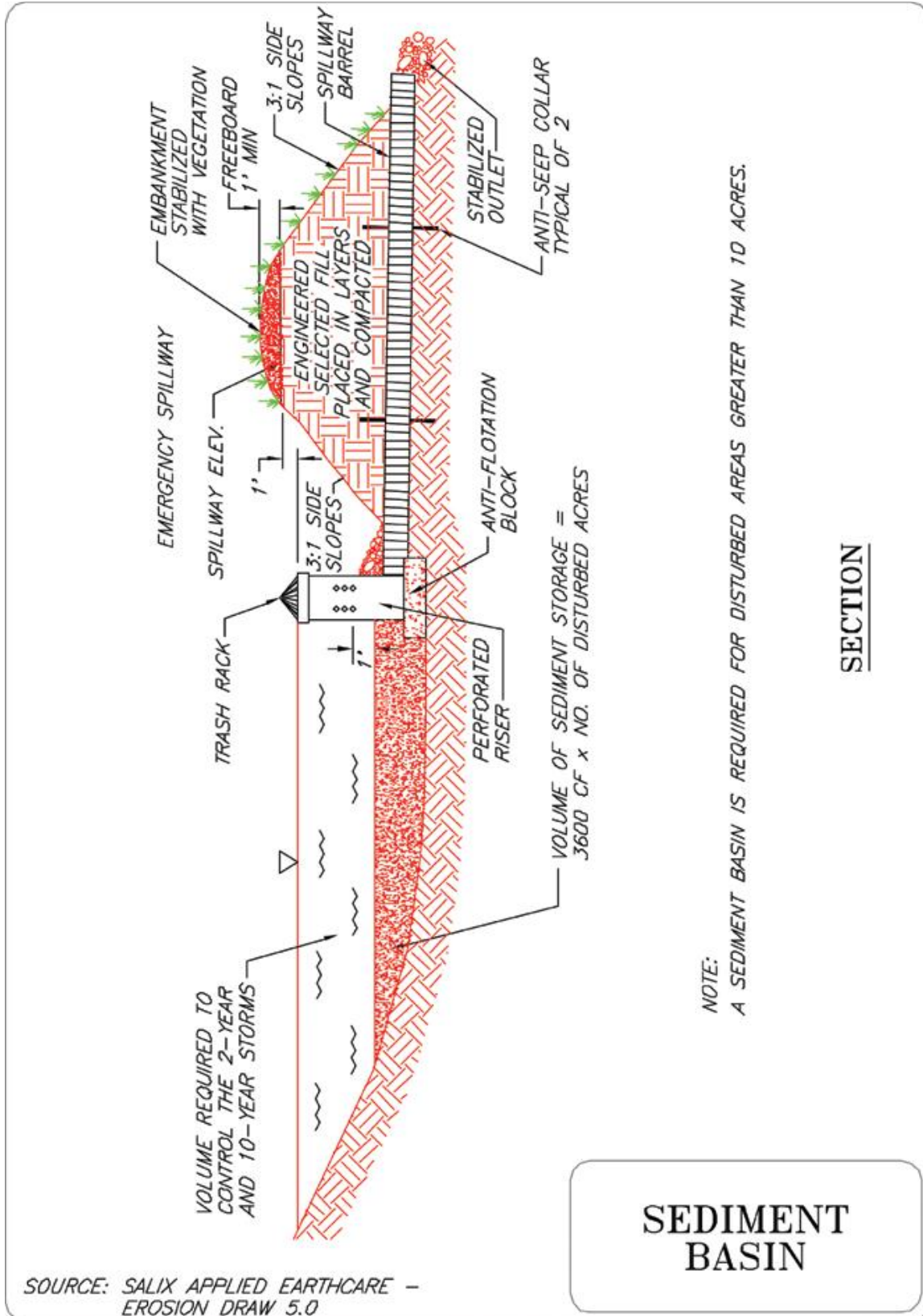


Figure SMP04-1. Sediment Basin Schematic
Kentucky Construction Site BMP Planning and Technical Specifications Manual



NOTE:
A SEDIMENT BASIN IS REQUIRED FOR DISTURBED AREAS GREATER THAN 10 ACRES.

**SEDIMENT
BASIN**

SOURCE: SALIX APPLIED EARTHCARE -
EROSION DRAW 5.0

Figure SMP04-2. Sediment Basin Cross Sectional View'
Kentucky Construction Site BMP Planning and Technical Specifications Manual



Sediment Control Practices

SMP 4.3.5 Diversions

→ TD → TD →
Symbol

TD



Description

These temporary drains offer features such as conveyance for runoff down cut or fill slopes, subsurface drains that drain off excessive soil saturation, minimization of sheet flow over slope surfaces and reduced sedimentation. Once stabilized, diversions require relatively little maintenance.

Application

- Provide drains to prevent slope failures, damage to adjacent property, erosion and sediment control and removes excess water from soil.
- Diversions to catch runoff at the end of an undisturbed slope before entering a bared area, direct runoff, preserve stable conveyance and to prevent overflow.

Design

A diversion prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversions should not adversely impact adjacent properties and must conform to local floodplain management regulations. This practice should not be used in areas with slopes steeper than 10%. The advantages of the temporary earth dike include the ability to handle flows from large tributary areas. Additionally, they are relatively inexpensive to install since the soil material required for construction may be available on-site, and can be constructed as part of the initial grading operations, while the equipment is on-site.

Temporary swales will effectively convey runoff and avoid erosion if constructed and maintained properly:

- Size temporary swales in the same manner as a permanent channel.
- A permanent channel must be designed by a licensed professional civil engineer.
- At a minimum, the swale should conform to predevelopment flow patterns and capacities.
- Construct the swale with an uninterrupted, positive grade to a stabilized outlet.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd) *Drains*

Diversion drains are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost-effective diversion.

- Can be placed on or buried underneath the slope surface.
- Should be anchored at regular intervals of 50 to 100 ft.
- If a slope drain conveys sediment-laden water, direct flows to a sediment trap or basin.
- When using slope drains, limit tributary area to 2 acres per pipe. For larger areas, use a rock-lined channel or a series of pipes.
- Maximum slope generally limited to 2:1 (H: V), as energy dissipation below steeper slopes is difficult.
- Freeboard should be at least 0.5 feet.
- Drain or swale should be laid at a minimum grade of 1%, but not more than 15%.
- The swale must not be overtopped by the 10-year, 24-hour storm, meeting or exceeding the design criteria stated above.
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Triple-seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Direct surface runoff to slope drains with diversion swales, dikes and berms.
- When installing slope drains:
 - Install slope drains perpendicular to slope contours.
 - Compact soil around and under entrance, outlet, and length of pipe.
 - Securely anchor and stabilize pipe and appurtenances into soil.
 - Check to ensure that pipe connections are watertight.
 - Protect inlet and outlet of slope drains: use standard flared end section at entrance for pipe slope drains 12 in. and larger.
 - Protect area around inlet with filter cloth.
 - Protect outlet with geosynthetics and rip-rap or other energy dissipation device. For high-energy discharges, reinforce rip-rap with concrete or use reinforced concrete devices.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd)

- When installing subsurface drains:
 - Slightly slope subsurface drain towards outlet.
 - Check to ensure that pipe connections are watertight.
 - Review relative size of soil and slot/perforation size in the pipe to prevent sediment from entering pipe.
 - Relief drains lower groundwater table. Install parallel to slope and drain to side of slope. Use gridiron, herringbone or random pattern.
 - Interceptor drains prevent excessive soil saturation on sensitive slopes. Install perpendicular to slope and divert discharge to the side of the slope.

Diversions

- Select design flows and safety factor based on careful evaluation of risks due to erosion of the measure, over topping, flow backups, or washout.
- High flow velocities may require the use of a lined ditch, or other methods of stabilization.
- When installing diversion ditches and berms:
 - Protect outlets from erosion.
 - Utilize planned permanent ditches/berms early in construction phase when practicable.
- All dikes and berms should be compacted by earth-moving equipment.
- All dikes should have positive flow to a stabilized outlet.
- Top width may be wider and side slopes may be flatter at crossings for construction traffic.
- Dikes should direct sediment-laden runoff into a sediment trapping device.
- Dikes should be stabilized with vegetation, chemicals, or physical devices.
- Compact any fills to prevent unequal settlement.
- Dikes should remain in place until disturbed areas are permanently stabilized.
- Examine the site for run-on from off-site sources (control off-site flows through or around site).
- Select flow velocity limit based on soil types and drainage flow patterns for each project site
- Establish a maximum flow velocity, shear stress or 3-5 ft/s, for using earth dikes and swales, above which a lined ditch must be used.
- Temporary diversion berms or ditches must be installed as a first step in the land-disturbing activity and must be functional before downslope land disturbance.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd)

- Design an emergency overflow section or bypass area for larger storms that exceed the 10-year design storm.
- Conveyances must be lined or reinforced when velocities exceed allowable limits for soil. Consider use of geotextiles, engineering fabric, vegetation, rip-rap or concrete.
- The berm or ditch must not be overtopped by the 10-year, 24-hour storm, meeting or exceeding the design criteria stated above.
- Maximum slope generally limited to 2:1 (H: V), as energy dissipation below steeper slopes is difficult.

Maintenance

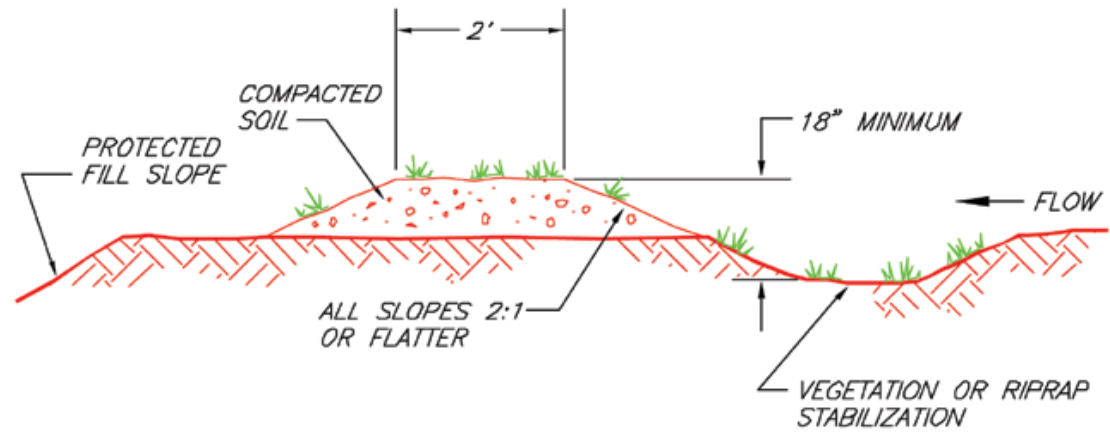
- Inspect drains before and after each storm event greater than one-half inch.
- Inspect weekly and after any repairs are made until drainage area is stabilized
- Maintain drains and swales to eliminate erosion, accumulation of debris and sediment
- Check status of water ponding activities. Remove water if such activities occur
- Temporary conveyances should be removed when surroundings become stable or when the construction is complete
- If vegetation has not been established, reseed damaged and sparse areas immediately. Triple seed (see seeding rates in Section 4.4.1) areas below the flow line, and use erosion control blankets or turf reinforcement mats as necessary.
- Damages caused by construction traffic or other activity must be repaired before the end of each working day.

Inspection

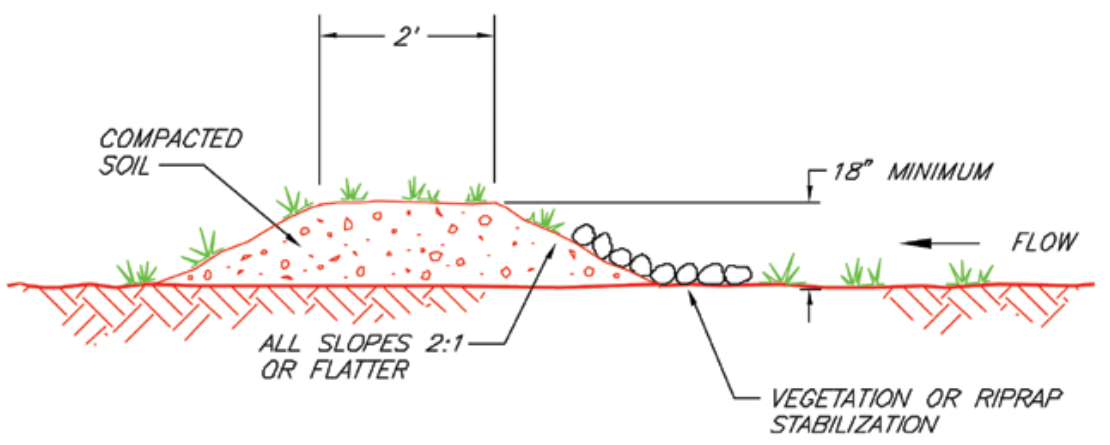
- Routine visit after every heavy rain water event.
- No evidence of washout, accumulated debris and build up in ditches or berms.



City of Berea, KY
Stormwater Best Management Practices



TYPICAL FILL DIVERSION



TYPICAL TEMPORARY DIVERSION DIKE

- NOTES:**
1. THE CHANNEL BEHIND THE DIKE SHALL HAVE POSITIVE GRADE TO A STABILIZED OUTLET.
 2. THE DIKE SHALL BE ADEQUATELY COMPACTED TO PREVENT FAILURE.
 3. THE DIKE SHALL BE STABILIZED WITH TEMPORARY OR PERMANENT SEEDING OR RIPRAP.

SOURCE: SALIX APPLIED EARTHCARE –
EROSION DRAW 5.0

**DIVERSION
CHANNEL**

Figure SMP05-1. Typical Diversion Channel Cross Section
Kentucky Construction Site BMP Planning and Technical Specifications Manual



Sediment Control Practices

SMP 4.3.6 Filter Strips



Symbol

FS



Description

Utilizing vegetation allows soil to be protected from erosion and velocity flow while reducing or preventing discharge of pollutants to the storm system or waterways. This method uses filter strips to accomplish the goal of filtering sediment needing to be settled out of runoff.

Application

- Filter strips should be used only to address potential water quality problems associated with overland (sheet) flow. They are not effective in removing sediment from concentrated flows unless those flows are dispersed on flat ground before discharge into the filter strip. Areas that need immediate cover (such as sodding and plugging) due to having turf prior to construction, areas subject to erosion (graded or cleared areas), and permanent vegetative areas
- Wetlands and/or sensitive water bodies
- Steep and unstable slopes
- Temporary or permanent buffer areas that include the floodway and 50 feet perpendicular to the floodway. If a floodway has not been determined then the buffer must be 25 feet perpendicular from each side of the stream bank, creek, or unnamed waterway under "bank-full conditions" (See EPP-04 Buffer Zones.)
- Area within the buffer must not be cleared. It should be surveyed, flagged and delineated by a colored temporary fence and these instructions explained to each employee on the site

Design

- Cultivate the area then install the irrigation system
- Areas should be excavated and backfilled (plant holes)
- Areas are to be fine graded and rolled prior to sodding
- Sodded areas are to be uniform and smooth (prior to sodding) and distributed with top soil were needed (to even out the area)



**City of Berea, KY
Stormwater Best Management Practices**

**Design
(cont'd)**

Table SMP06-1. Vegetated Filter Strip Width Recommendations for Kentucky

Stream Type	Conditions	Minimum Buffer Width	General Considerations
Urban streams	> 25% imperviousness in drainage area	25 ft each bank	<p>At least two-thirds of the buffer—nearest to the water—should be undisturbed native or natural vegetation.</p> <p>Remainder can be permanent managed vegetation.</p> <p>Avoid turf grass in managed area if possible; use native grasses, wildflower mixes. Mow annually or less.</p>
Suburban streams	10% to 25% imperviousness in drainage area	50 ft each bank	
Rural streams	< 10% imperviousness in drainage area	≥ 60 ft each bank	
Large rivers	Rivers with floodplains > 500 ft wide	> 100 ft each bank	
Wetlands	For sloping sites, add more buffer	25 to 50 ft	
Sinkholes or other karst features	Will vary according to size and flow characteristics	25 to 50 ft radius	

- Sod end of adjacent strips should stagger by half the width or length
- Areas adjacent to sidewalks, concrete headers, header boards and other paved borders shall be 1.5 in-0.25 in below the top grade of the facilities
- Seed beds should be added to fertilizers and added to the correct site condition to slow the velocity of runoff and allow sedimentation to take place
- Roll sod to eliminate air pockets and allow a closer contact with the soil.
- Water sod so that the soil at a minimum depth of 4 feet is moistened
- Do not allow sod to dry out
- Sod should not be planted on slopes that are greater than 3:1 (H:V) if no mowing is to occur
- Vegetate sodded areas
- Do not use buffer strip for vehicular traffic
- All fertilization efforts should follow the outline of the state, county, and/or local government
- If vegetative filter strips are proposed as a sediment control device and they do not already exist, they must be planned and established before initiating general land-disturbing activities if possible.
- Minimum filter strip width should be 25 feet for urban streams, 50–75 feet for suburban and rural streams, and at least 100 feet for large rivers. Plans should show the location, width, and length of filter strips. The type of vegetation and specifications for soil preparation and seeding must be included. If existing vegetation is to be used, plans for protecting or improving it must be provided.
- The width of filter strips expected to treat runoff from long slopes should be at least one-fourth the length of the slope for slopes up to 20 percent and at least half the slope length for steeper areas.



**City of Berea, KY
Stormwater Best Management Practices**

- Design (cont'd)**
- When establishing new seeded areas, consideration must be given to aesthetics and wildlife needs and soil conditions on the site. Native grass and wildflower mixtures are attractive, commercially available, and can be seeded with standard equipment for the most part.
 - It is easier and cheaper to protect and preserve existing areas than to establish new ones. Existing grass wildflower, or grass/legume areas to be used as filter strips should be flagged off as a buffer zone (see the Buffer Zone section). Equipment and vehicular traffic in these areas should be restricted to avoid damage to vegetation. Vegetation should be dense and well established with no bare spots.
 - Seed species for native grass and wildflower mixes are available from county extension and NRCS offices. Specify quality seed mixtures selected on the basis of climate, soils, drainage, shading, and other factors. Note that taller grass mixtures might not be appropriate near residential areas because of security concerns regarding visibility.
 - Specify planting of grasses and forbs at the same time. Seeding rates will vary by species, but should generally be specialized and low, unlike agricultural seeding rates. Consider a cover/nursery crop of annual or short-lived native species (e.g., rye) to protect the site until grasses and wildflowers emerge.
 - Seed should be from current production, no more than one year old, and free of mold or insects and disease. Seed origin should be furnished and have characteristics similar to the site. Seed collected or grown in the region is usually best.

Table SMP06-2. Filter Strip Seeding Mixture and Site Suitability Chart

Seeding Mixture	Seeding Rate Lbs/Acre	Soil Suitability
1. Alfalfa or Red Clover Plus Timothy or Orchardgrass or Bromegrass	10 10 4 6 6	Well Drained
2. Ladino Clover Plus Timothy or Orchardgrass or Bromegrass	½ 4 6 8	Wet or Well Drained
3. Tall Fescue	40	Wet or Well Drained
4. Reed Canarygrass Plus Tall Fescue	15	Wet



City of Berea, KY Stormwater Best Management Practices

Design (cont'd) **Construction Specifications**

When planting filter strips, prepare the seedbed, incorporate fertilizer (if necessary), and apply mulch consistent with the seeding sections of this manual. Filter strips using areas of existing vegetation must be overseeded, as necessary, with the above mixtures to obtain an equivalent density of vegetation. The over seeding must be accomplished before the land disturbing activity if no grading will occur in the area. See the Permanent Seeding section of this manual for further details. For areas to be seeded in native grass and wildflower mixes, use the following approach:

Vegetation removal before seeding—If undesirable vegetation exists on the site, kill with nonselective, nonresidual herbicide, a glyphosate without surfactant if possible. After evidence of kill (7–14 days) mow to 2 inches. Mow or rake off.

Avoid soil disturbance—Avoid deep tillage, which pulls up new weed seed to compromise plantings. Scarify soil no deeper than one-half inch, on the contour, to reduce weed and erosion problems. No-till planters are now available to plant into existing dead stubble. Avoid adding imported topsoils unless it is certified to be weed-free.

Soil amendments—Amendments should be limited because of cost concerns. Fertilizers assist weed growth. Native forbs and grasses, if matched to the site, should establish without fertilizers if moisture is available. Amendments, if used, should be monitored for potential runoff impacts. Addition of peat moss has not proven beneficial to these plantings over time. Addition of native mychorizae has proven beneficial.

Equipment—Follow the seed distributor's instructions for planting. Specialized drills, broadcasters, and hydroseeders are available. Choose carefully and experiment on small areas to determine the best approach. The bottom line is that the seed germinates only if it makes contact with the soil and moisture.

Follow-up—Cover the seed by harrowing, dragging, raking or cultipacking. Mulch with weed-free straw or hay or native grass straw. Use ECBs on long, steep slopes if mulch and netting will not suffice. Avoid irrigation unless experiencing periods of drought, when supplementary watering might be in order. A high (6–8 inches) mowing once or twice during the first season reduces weed competition.

Maintenance

- Inspect weekly after rainfall events until turf is established
- Mowing shall consist of "tall" mowing, weeding and the irrigation system is growing and operating properly
- Fertilize as needed and as indicated by soil testing
- Construction traffic must not be permitted to drive upon filter strips.
- Overseed, repair bare spots, or apply additional mulch as necessary
- Regular liter removal

Inspection

- Practice has been properly mowed and maintained.
- Construction vehicles have been kept off BMP.
- Dead areas have been re-seeded, plugged or re-sodding.
- Underwash turf has been maintained and compacted.



Sediment Control Practices

SMP 4.3.7 Inlet Protection



Symbol

TIP



Description

This practice allows sediment to settle prior to entering into a stormwater catch basin or inlet. The detainment of sediment-laden runoff through filtering devices allows a cleaner runoff to be discharged into the environment.

Application

- Protection of storm drain inlets or catch basins from sedimentation upstream of the inlet.
- Areas where ponds are not encroached into access road or highway traffic.
- Disturbed tributary areas have not yet been permanently stabilized.
- Areas where drainage is 1 acre or less.
- Areas with drainage more than 1 acre must be accompanied by a downstream sediment trap or basin.

Design

Sediment control can be maintained using one of the following practices:

- Filter Fabric Fences
- Block and Gravel Filter
- Gravel and Wire Mesh Filter
- Excavated Inlet Sediment Traps

The ponding area must be relatively flat (less than 1 percent slope) with a sediment storage of 35 cubic yards per disturbed acre. All incoming storm flows must be intercepted and ponded or filtered by the structure, and pass over the structure and into the storm drain without bypasses. Temporary diking around the structure might be necessary to prevent bypass flow. Material can be excavated from inside the sediment storage area for this purpose. Drop inlet bag and frame filters are available from commercial vendors. These devices work very well if installed and maintained properly. Specify frames or filters that fit tightly around inlets and eliminate bypass opportunities. Filters can be reused if they are not damaged and washed out after prior use.



City of Berea, KY Stormwater Best Management Practices

Design (cont'd) 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 X-brace or other support recommended.
- Excavate a trench 4 inches wide and at least 8 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 must 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. Mix various size stone for best results.
- Wire mesh with 2-inch openings can be placed over the drain grating, but it 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.

Maintenance

- Replace or clean clogged fabric or gravel immediately.
- Remove sediment when depth exceeds half the height of the filter or half the depth of the sediment trap or after each significant rainfall (one-half inch in 24 hours) to provide adequate storage volume for the next rain.
- Inspect all inlets and catch basins weekly before and after each rain event greater than one-half inch, and promptly make repairs as needed.
- Inspect once every 24 hours during heavy rainfall events.
- After site is stabilized remove all inlet devices within 30 days.
- Bring disturbed area to final grade and smooth and compact it.
- Clean around and inside the storm drain inlet.
- Deposit the removed sediment in an area that will not contribute sediment off-site and can be permanently stabilized.

Inspection

- Filter fabric stakes are secure.
- Filter fabric is cleaned or replaced to prevent clogging.
- Sediment from behind the fabric less than ½ the height of the silt fence.
- Gravel filter is in working order. No evidence of gravel washing through.
- Do not clean any gravel adjacent to any inlet or waterway.
- Bags are properly maintained.
- No evidence of displacement of the practice.



City of Berea, KY
Stormwater Best Management Practices

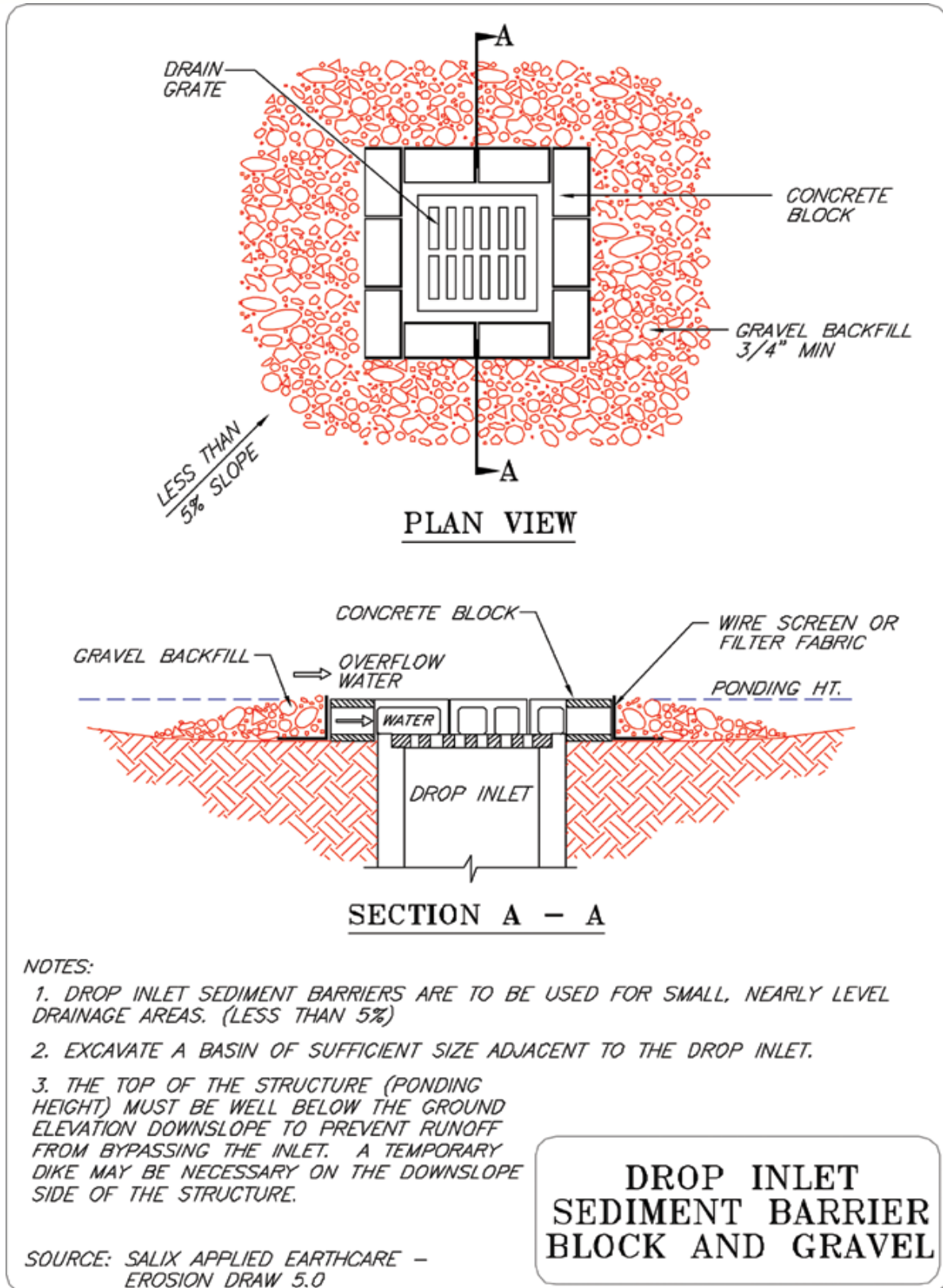


Figure SMP07-1. Block and Gravel Drop Inlet Protection

Kentucky Construction Site BMP Planning and Technical Specifications Manual



Sediment Control Practices

SMP 4.3.8 Slope Drains

SD
Symbol

SD



Description The slope drain is constructed of pipe or lined (rock or concrete) channel that extends from the top of a cut or fill slope to the bottom. This practice is used to direct and intercept storm water runoff to a controlled path to minimize slope erosion.

Application Storm drains may be used on land development sites where slopes are steep or susceptible to erosion.

Design ➤ Pipe capacity should be designed using the 10-year 24-hour storm or size chart listed below.

Drainage Area (acres) Pipe Diameter (in.)

0.5	12
1.5	18
2.5	21
3.5	24
5.0	30

- Use heavy-duty materials such as corrugated plastic pipe or corrugated metal pipe.
- Conduit should be staked down at intervals equal to or less than 10 feet.
- Extend conduit beyond the toe of the slope.
- A standard flared-inlet pipe should be used at the entrance.
- Fittings should be water tight.



City of Berea, KY Stormwater Best Management Practices

- Design (cont'd)**
- **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, staked down, 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**—The pipe should be able to handle peak flow from the 10-year, 24-hour storm. Use 10-inch diameter or larger pipe to convey runoff from areas up to one-third acre; 12-inch or larger pipe for up to half-acre drainage areas, and 18-inch pipe for areas up to one acre. Multiple pipes or channels are often required for large areas, spaced as needed.
 - **Conduit**—Construct the slope drain pipes from heavy-duty, flexible materials such as non-perforated, corrugated plastic pipe, or open top overside drains with tapered inlets, or corrugated metal pipe (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 Tsection fitting can also be used at the inlet. An open top flared inlet for overside drain can 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. (i.e., rock apron or other armoring).

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.



City of Berea, KY Stormwater Best Management Practices

- 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 3H:1V 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.

Maintenance

- Inspect slope drains and supporting diversions weekly and after every significant rainfall and promptly make necessary repairs.
- After stabilization remove temporary measures.
- Re-set or replace displaced stones after wet weather events.
- Remove sediment accumulation from slope drain inlet, channel, and outlet.
- When the protected area has been permanently stabilized, temporary measures can be removed, materials disposed of properly, and all disturbed areas stabilized appropriately

Inspection

- Stones that have been displaced by wet weather events have been re-set and/or replaced.
- Pipe connections are watertight.
- Inlet/outlet has been cleaned and properly maintained.
- Remove sediment accumulation from channel.
- Construction traffic removed from slope drain.



City of Berea, KY
Stormwater Best Management Practices

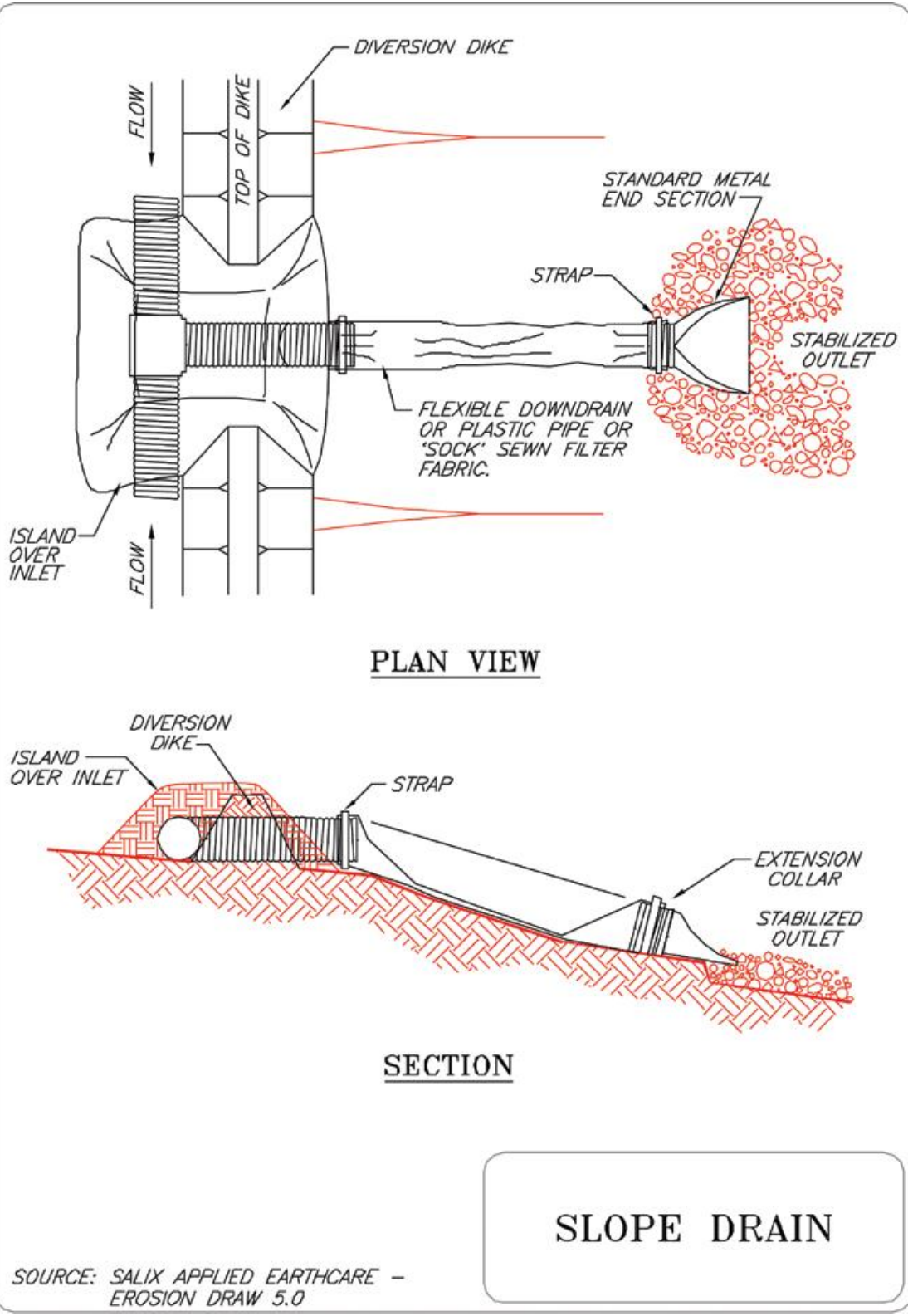


Figure SMP08-1. Slope Drain Installation
Kentucky Construction Site BMP Planning and Technical Specifications Manual