CITY OF Springfield
ENVIRONMENTAL SERVICES

Best Management Practices (BMP) Manual for Land Disturbance Activity

Revised December 2014

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INTRODUCTION

Like many cities nationwide, Springfield's stormwater drainage system flows directly into local streams and lakes. When it rains, stormwater picks up and carries sediment and other pollutants into these waterways where it can affect water quality and the health of fish and other aquatic life. The federal Clean Water Act was amended in 1987 to enact regulations to address the water quality impact of polluted runoff from construction sites and other sources. These federal regulations are implemented through state and local agencies. Sites in Springfield that disturb 1 acre or greater, and sites that disturb less than 1 acre that are part of a larger common plan of development are required to obtain a land disturbance permit from both the Missouri Department of Natural Resources (MDNR) and the City of Springfield Department of Environmental Services. The state and local permits require a site-specific Stormwater Pollution Prevention Plan (SWPPP) that details the design, installation, and maintenance of effective BMPs to minimize the discharge of pollutants. Per the state permit, the SWPPP shall provide the following general information for each BMP that will be used:

- Physical description of the BMP
- Site and physical conditions that must be met for effective use of the BMP
- BMP installation/construction procedures, including typical drawings
- Operation and maintenance procedures for the BMP.

The purpose of this manual is to provide general information for each BMP for SWPPP preparers to utilize in the SWPPP. SWPPP preparers should supplement this general information with site-specific information for each BMP in a SWPPP, including as applicable: phasing, product types, site-specific or manufacturer's details, and site-specific conditions for removal. Manufacturer's specifications, if available, should be followed when selecting and designing BMPs. Detailed guidance on BMP design, installation, and maintenance can also be found in MDNR's guide titled, "Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri and Kansas." This guide is available at http://www.dnr.mo.gov/env/wpp/wpcp-guide.htm. Sites less than 1 acre that are not required to have a land disturbance permit and SWPPP should also install basic BMPs to minimize the discharge of sediment and should refer to this manual, the MDNR guide, and manufacturer's specifications for BMP design, selection, installation, and maintenance. This manual is not comprehensive; other BMPs may be acceptable.

PHASING/SEQUENCING

DEFINITION & PURPOSE

Phasing involves developing a schedule that includes the sequencing of construction activities with the implementation of construction site BMPs. The purpose of phasing is to reduce the amount and duration of soil exposed to erosion and to implement and maintain BMPs in coordination with the sequence of construction activities.

CONDITIONS FOR EFFECTIVE USE

A schedule of the sequence and timing of construction activities is a permit requirement for all sites that disturb 1 acre or greater and must be provided in Section 2.4 - Sequencing and Estimated Dates of Construction Activities in the City's SWPPP template. Projects should be phased when possible to reduce the amount and duration of soil exposed at any one time. The phasing plan should be developed during project design. Disturbed areas in one phase should be stabilized before disturbing subsequent phases. When possible, land disturbance and construction in and around waterways should be scheduled during dry weather.

INSTALLATION/CONSTRUCTION PROCEDURES

The phasing schedule should follow the format in Section 2.4 - Sequencing and Estimated Dates of Construction Activities in the City's SWPPP template.

OPERATION & MAINTENANCE PROCEDURES

During inspections, verify that work is progressing in accordance with the phasing shown in the SWPPP and that BMPs are installed prior to the start of each construction phase. If phasing has changed, update Section 2.4 of the SWPPP, the site plan, and document the update in Appendix D - SWPPP Amendment Log.

PRESERVATION OF EXISTING VEGETATION

DEFINITION & PURPOSE

Permanent preservation of existing vegetation and topsoil minimizes the area of disturbance, reducing the need for erosion and sediment control BMPs and the potential for violations. It also provides a financial benefit by reducing the cost of grading, BMPs, topsoil, and seeding. Preserved areas can provide long-term stormwater benefits through increased absorption of rainfall compared to turf grass areas with compacted soil.

CONDITIONS FOR EFFECTIVE USE

Preservation of existing vegetation requires planning and should be the first step in the design process. The site should be surveyed to identify high quality soils, trees, vegetation, and steep slopes to be preserved. The site improvements, including any temporary roadways, should be designed around these features and follow existing contours to reduce cutting and filling. Sediment control BMPs such as compost filter sock or silt fence may be desirable to protect the preservation area from significant sediment accumulation.

INSTALLATION/CONSTRUCTION PROCEDURES

Protection of preservation areas with temporary construction fencing and any sediment control BMPs shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities. Construction materials, equipment storage, and parking areas should be located outside of protected areas where they will not cause root compaction.

OPERATION & MAINTENANCE PROCEDURES

During weekly and rain event inspections, verify that temporary construction fencing and any sediment control BMPs to protect preservation areas are still in place and operational. If the area to be preserved is adjusted during construction, update the site plan and document the update in Appendix D – SWPPP Amendment Log.

SITE CONDITIONS FOR REMOVAL

Temporary fencing and any sediment control BMPs shall be removed after final stabilization of the site has occurred.

COMPANION BMPs

- Tree Preservation

TREE PRESERVATION

CITY OF Springfield ENVIRONMENTAL SERVICES

DEFINITION & PURPOSE

Tree preservation is the process of protecting trees from damage related to construction activity. Tree preservation provides erosion control and long-term stormwater benefits by intercepting and absorbing rainfall. Trees also increase property values and the marketability of a development. Additional benefits of trees include improved air quality, shading of buildings, and habitat for birds and people.

CONDITIONS FOR EFFECTIVE USE

Tree preservation requires planning and should be the first step in the design process. The site should be surveyed to identify trees to be preserved based upon their size, species, condition, location, historical significance, or any combination of these factors. The site improvements, including any temporary roadways, should be designed around these trees. The site should also be designed to follow existing contours as much as possible. Cutting and filling can make it difficult to avoid grading within tree protection zones, reducing the number of trees that can be effectively preserved.

INSTALLATION/CONSTRUCTION PROCEDURES

Marking and fencing of trees shall be done prior to the commencement of clearing and grubbing operations or other soil-disturbing activities. Sites requiring a City Land Disturbance Permit, tree protection fencing shall be installed prior to issuance of the permit. The critical root zone is generally 10 feet beyond the dripline of a tree. Fencing shall be located to protect as much of the critical root zone as possible. If the entire critical root zone cannot be protected, work may encroach into this zone on one side of the tree. Fencing should be at least 4 feet high and supported at a maximum of 10 foot intervals by metal T-posts or other approved methods sufficient to keep the fence upright and in place. T-posts shall be a minimum of 2 feet in the ground. In some cases, a layer of wood chip mulch may be used for temporary road access and to reduce compaction in and near tree protection areas. When used for this purpose, at least 12 inches of chips should be applied where vehicles will travel or park. Mulching may also be utilized within the tree protection zone during construction to protect the soil from compaction, conserve soil moisture and moderate soil temperature. Spread wood chips to a depth of 4 inches, leaving the trunk clear of mulch. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

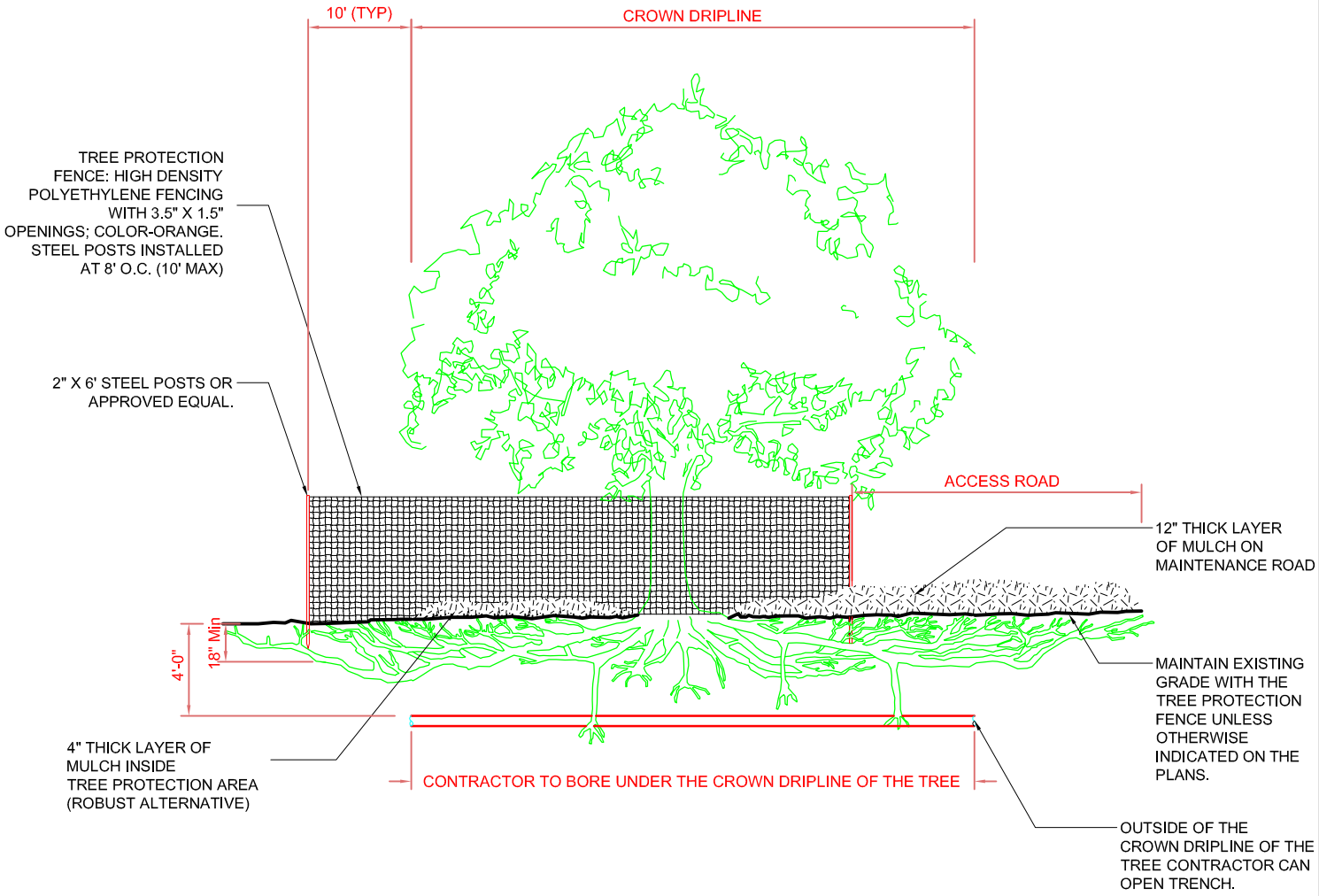
At a minimum, inspect weekly for areas where fence has fallen and/or needs repair. No equipment, materials, and/or debris shall be stored within the tree protection zone fencing. When work requires encroaching within the tree preservation zone, a certified arborist shall be consulted before proceeding with construction activities.

SITE CONDITIONS FOR REMOVAL

Temporary fencing shall be removed after final stabilization of the site has been achieved.

COMPANION BMPs

- Preservation of Existing Vegetation and Mulching



NOTES:

1- MAINTAIN TREE PROTECTION FENCING 10' BEYOND DRIPLINE (IN ALL DIRECTIONS).

2- NO EQUIPMENT, MATERIALS, AND/OR DEBRIS SHALL BE STORED WITHIN THE TREE PROTECTION FENCING. THIS INCLUDES DURING FENCE INSTALLATION AND REMOVAL.

3- NO PRUNING SHALL BE PERFORMED EXCEPT BY OR IN THE PRESENCE OF AN APPROVED ARBORIST.

4- IF PROJECT REQUIRES AN ACCESS ROAD WITHIN THE DRIPLINE OF A TREE, PROVIDE A MINIMUM 12" OF MULCH FOR THE ACCESS ROAD.

5- IF CONSTRUCTION ACTIVITIES REQUIRE WORK TO CROSS THE DRIPLINE, BORE MINIMUM 4' BELOW GROUND SURFACE THE DISTANCE OF THE DRIPLINE. IF BORING 4' CANNOT BE ACHIEVED CONTACT ARBORIST IMMEDIATELY TO MONITOR WORK.

ROOT PRUNING NOTES:

1- ROOT PRUNING SHOULD BE COORDINATED WITH THE TREE PROTECTION FENCING. IN SOME CASES, THAT FENCE LINE IS ON THE ROOT CUT, AND PROVISIONS FOR ROOT PRUNING MAY NEED TO BE ACCOMMODATED BEFORE FENCE IS ERECTED.

2- CAREFULLY EXPOSE ROOTS WITHIN THE LIMITS OF CONSTRUCTION AND MARK FOR PRUNING. PROPOSED ROOT CUTS SHALL BE REVIEWED BY AN ARBORIST PRIOR TO TRENCHING, EXCAVATING, OR CUTTING TO DETERMINE THE IMPACT ON ANY STRUCTURAL CRITICAL ROOTS AND THE CLOSEST POINT TO THE TREES THAT SOIL MAY BE DISTURBED.

3- ROOT PRUNING CAN BE ACCOMPLISHED WITH CIRCULAR SAWS OF VARYING TYPES AND/OR A ROTARY-TYPE STUMP GRINDER TO A DEPTH OF 18" OR TO THE MAXIMUM DEPTH OF THE REQUIRED GRADING CUT, WHICHEVER IS LESS. SAW BLADE AND GRINDER TEETH SHOULD BE SHARPENED PRIOR TO USE. TRENCHING MACHINES ARE NOT ALLOWED IN ROOT PRUNING OPERATIONS.

4- ROOTS OVER 1 INCH IN DIAMETER MUST BE CLEANLY AND SHARPLY CUT WITH A HAND SAW.

5- PRUNING CUTS SHOULD BE FLUSH WITH THE SIDE OF THE TRENCH CLOSEST TO THE TREE.

6- AN ARBORIST SHOULD REVIEW ANY ROOTS OVER 2 INCHES IN DIAMETER ENCOUNTERED DURING EXCAVATION AND/OR CONSTRUCTION ACTIVITIES TO DETERMINE STRUCTURAL STABILITY OF THE TREE.

Modified from International Society of Arboriculture

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City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES

TREE PROTECTION FENCING

Issued: 06–01–2014

Revised:

VEGETATED FILTER STRIP

DEFINITION & PURPOSE

Vegetated filter strips are areas of vegetation that are used as sediment control practices during construction. Vegetation slows down stormwater runoff and filters out sediment.

CONDITIONS FOR EFFECTIVE USE

Vegetated filter strips are appropriate where a strip of existing vegetation can be left in place in downhill areas to provide sediment control in place of or in addition to other sediment control BMPs. They should be used in areas of sheet flow only. Level spreaders may be needed to ensure sheet flow. Filter strip width and length should be determined based on the size and slope of the drainage area and type of vegetation. See MDNR Guide Section 6-201. If the vegetated filter strip is part of a preservation area (see Preservation of Existing Vegetation), additional sediment control BMPs may be desired to protect the preservation area from excessive sediment deposition. Vegetated filter strips installed as a permanent stormwater quality control measure should not be used as a sediment control BMP.

INSTALLATION/CONSTRUCTION PROCEDURES

Existing vegetation that will be used as a vegetated filter strip should be marked the width and length shown on the plans prior to construction and designated as no disturbance. It may be desirable to fence off the filter strip to protect it from construction activities.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Verify that the vegetated filter strip has not been removed or damaged by construction activities. Remove excessive sediment accumulation if needed for functionality. Seed areas of erosion or dead vegetation as needed. Install additional BMPs if the vegetated filter strip becomes ineffective, and update the site plan and Appendix D – SWPPP Amendment Log.

SITE CONDITIONS FOR REMOVAL

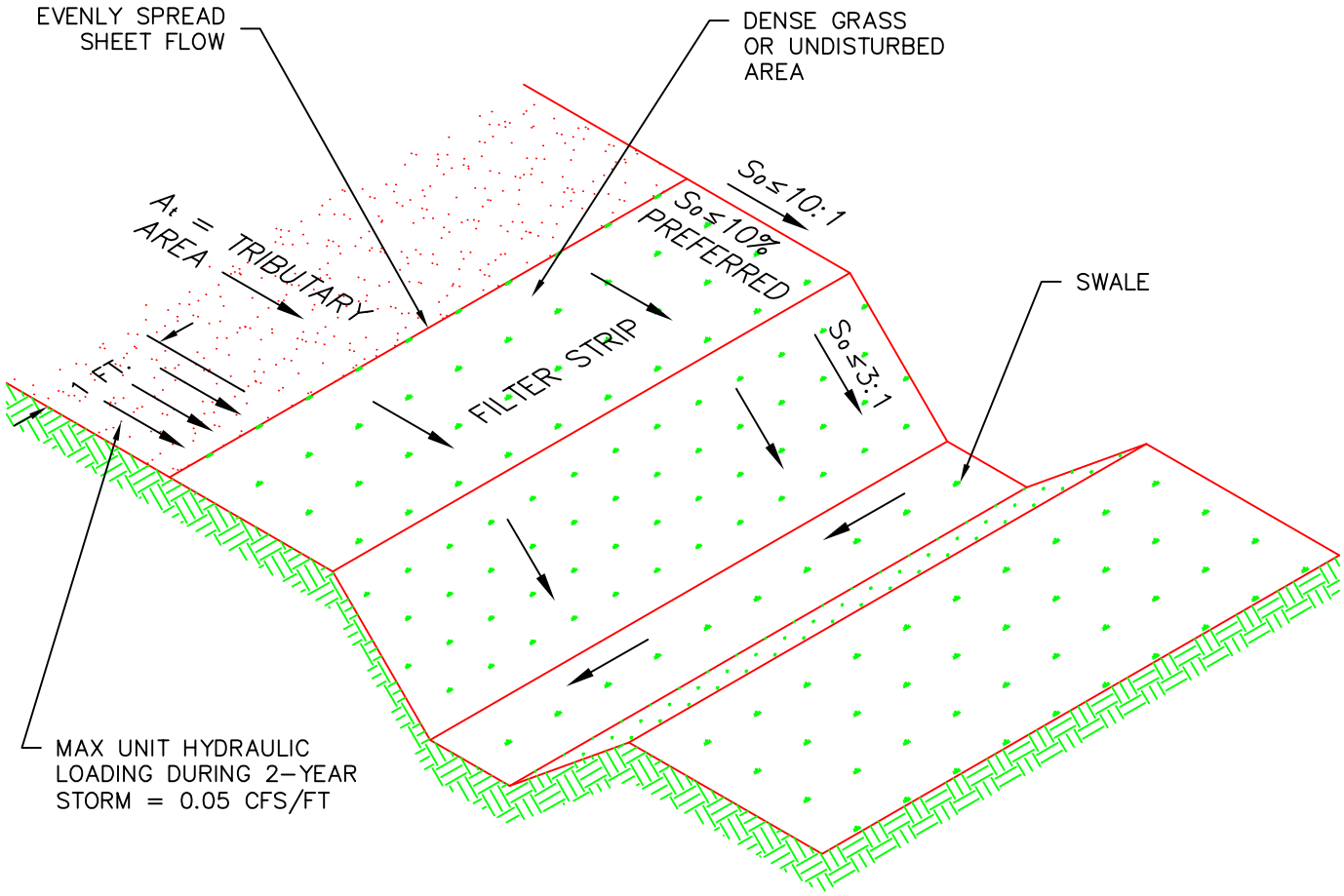
The vegetated filter strip should remain in place until the drainage area is stabilized, at which point it is typically replaced with permanent vegetation or, in the case of a phased site, replaced with improvements. The SWPPP should provide site-specific information on removal/replacement of the vegetated filter strip.

ROBUST ALTERNATIVES

- Compost Filter Sock and Silt Fence

COMPANION BMPs

- Preservation of Existing Vegetation



REFER TO SPRINGFIELD WATER QUALITY PROTECTION POLICY FOR FURTHER DESIGN CRITERIA

ADAPTED FROM DENVER URBAN DRAINAGE & FLOOD CONTROL DISTRICT – DRAINAGE CRITERIA MANUAL

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
VEGETATIVE FILTER STRIP		Issued: 10-01-2008 Revised: 06-01-2014	

EROSION CONTROL BLANKETS

DEFINITION & PURPOSE

An erosion control blanket (ECB) is a blanket of synthetic or natural fibers to protect soil from the erosive impact of precipitation and overland flow, typically on slopes and in channels. ECBs also retain moisture and facilitate establishment of vegetation. Erosion control blankets are also sometimes referred to as Rolled Erosion Control Products (RECPs).

CONDITIONS FOR EFFECTIVE USE

Factors in the selection of ECB include soil conditions, steepness and length of slope, sheer stress, and type and duration of protection needed to establish desired vegetation. Products are available for a variety of uses and longevity, typically from 3 months to 36 months. Manufacturer's specifications should be followed in ECB selection. See MDNR Guide Section 6-97 for general guidance on ECB use and selection.

INSTALLATION/CONSTRUCTION PROCEDURES

The type of ECB shown on the plans should be installed immediately after completion of a phase of grading and/or seeding. Follow manufacturer's specifications for installation, particularly noting requirements for check slots, fastening devices (staples), and the need for firm contact with soil. See Manufacturer's Detail or Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

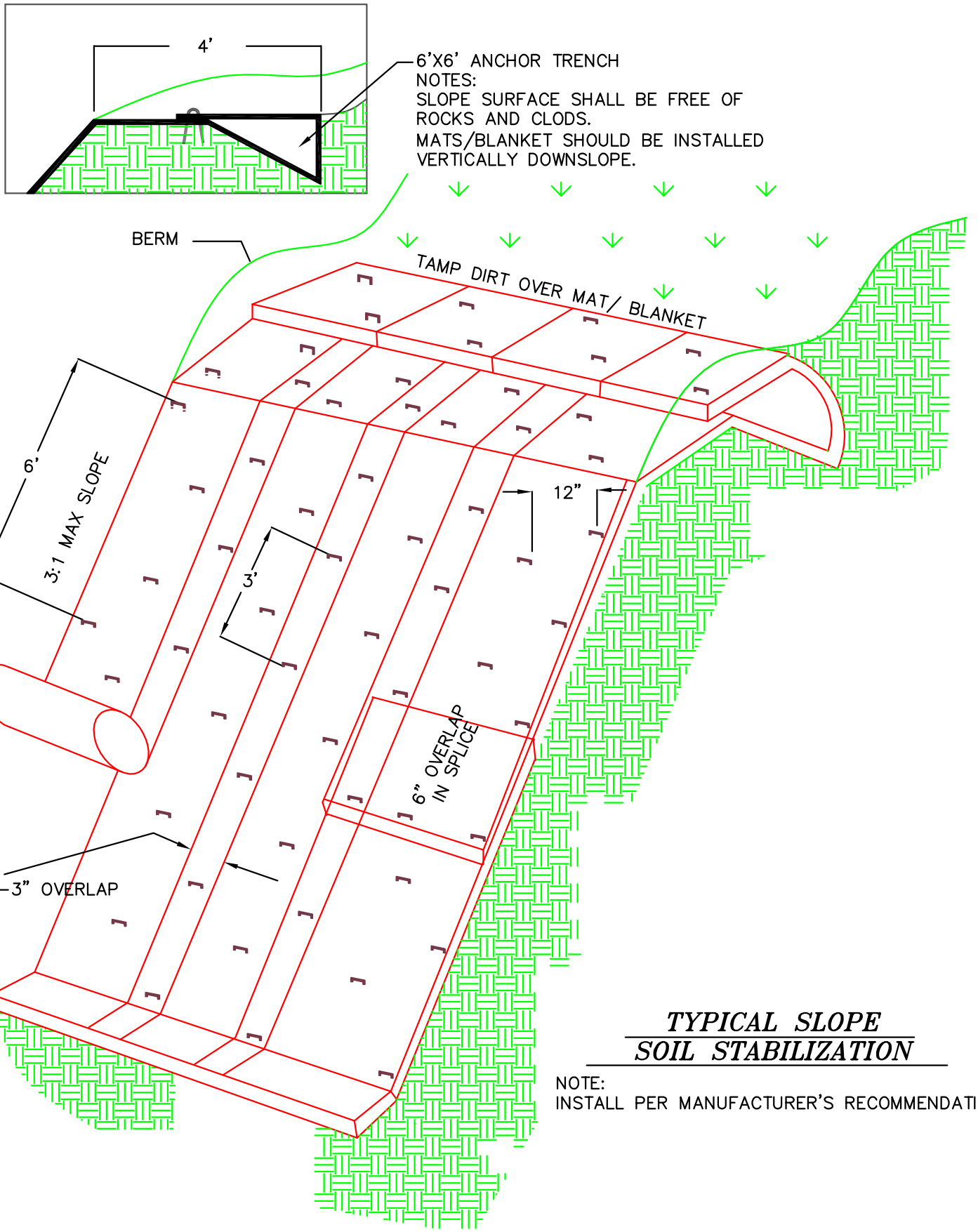
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site until adequate vegetation is established. Repair erosion and/or undermining at top of slope. Repair undermining beneath blankets. Pull back the blankets, fill and compact eroded area, re-seed and then firmly secure the blankets. Reposition or replace blankets that have moved along the slope or have been damaged.

SITE CONDITIONS FOR REMOVAL

ECB is typically left in place and designed to degrade over time.

ROBUST ALTERNATIVES

- Turf reinforcement mat



TYPICAL SLOPE SOIL STABILIZATION

NOTE:
INSTALL PER MANUFACTURER'S RECOMMENDATION

Modified from California Stormwater BMP Handbook

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City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES
EROSION CONTROL BLANKETS		Issued: 10–01–2008 Revised: 06–01–2014	

TURF REINFORCEMENT MAT

DEFINITION & PURPOSE

A turf reinforcement mat (TRM) is a rolled mat of non-degradable synthetic material that provides a matrix to greatly reinforce the root system of the desired vegetation for permanent erosion protection in high flow channels and on critical slopes.

CONDITIONS FOR EFFECTIVE USE

Factors in the selection of TRM include soil conditions, steepness and length of slope, depth of flow, runoff velocities, and time required to establish desired vegetation. Manufacturer's recommendations should be followed in TRM selection. See MDNR Guide Section 6-97 for general guidance on TRM use and selection.

INSTALLATION/CONSTRUCTION PROCEDURES

The type of TRM shown on the plans should be installed immediately after completion of a phase of grading and/or seeding. Follow manufacturer's specifications for installation, particularly noting requirements for check slots, fastening devices (staples), and the need for firm contact with soil. See Manufacturer's Detail or Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site until adequate vegetation is established. Repair erosion and/or undermining at the top of the slope. Repair undermining beneath mats. Pull back the mats, fill and compact eroded area, seed and then secure mats firmly. Reposition or replace mats that have moved along the slope or channel and secure firmly. Replace damaged mats.

SITE CONDITIONS FOR REMOVAL

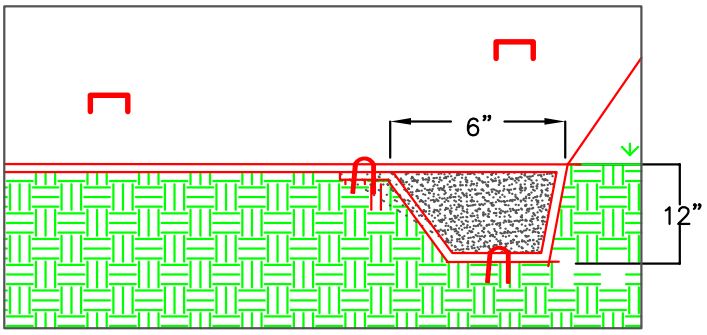
TRMs are left in place permanently.

ROBUST ALTERNATIVES

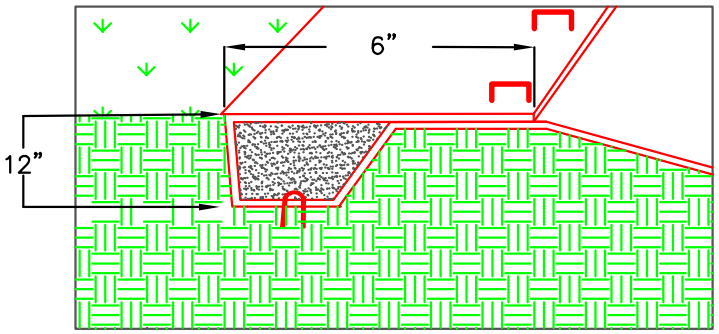
- Plastic transition mat

COMPANION BMPs

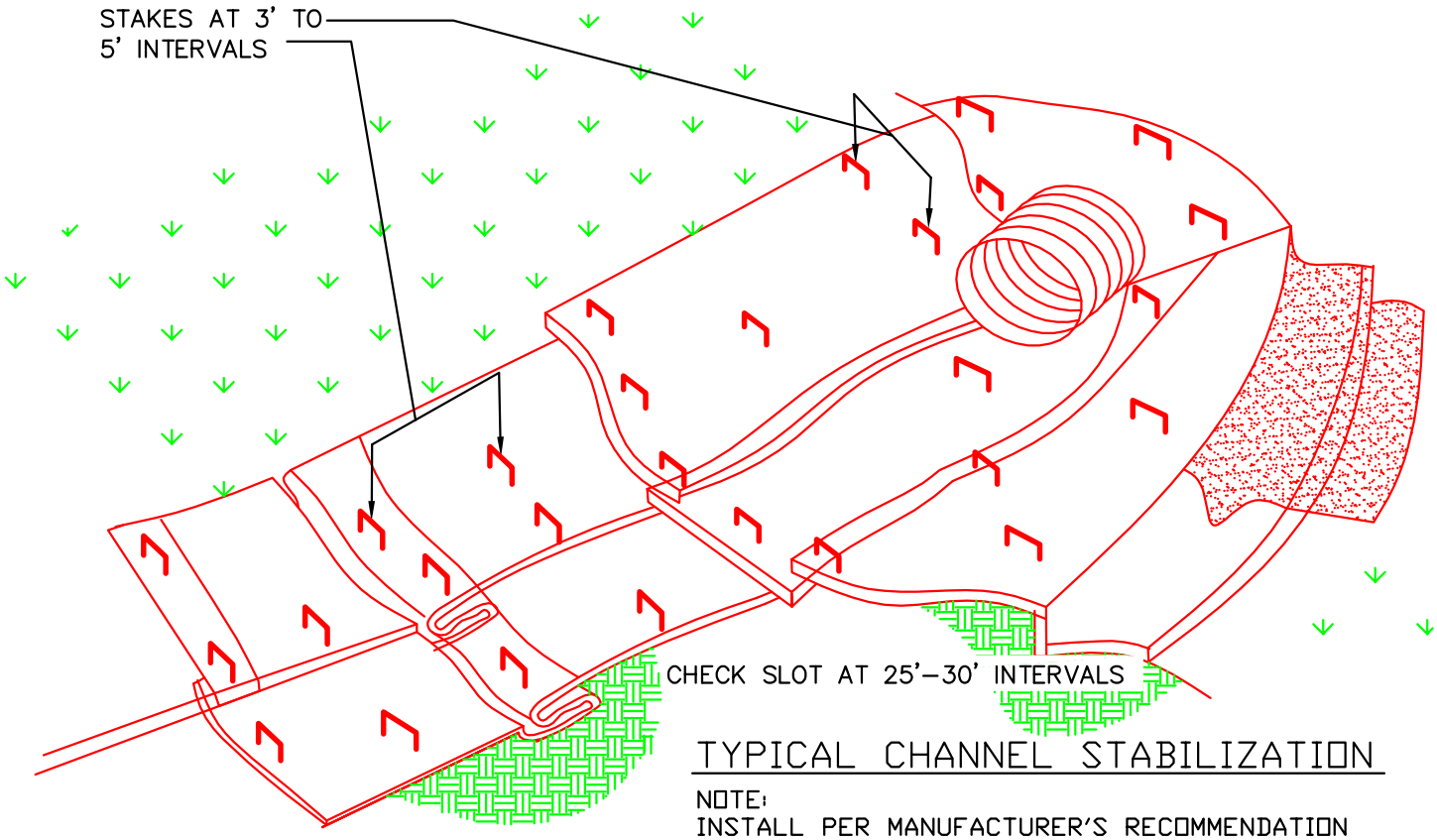
- Ditch Checks in channels and Fiber Rolls on slopes



INITIAL CHANNEL ANCHOR TRENCH

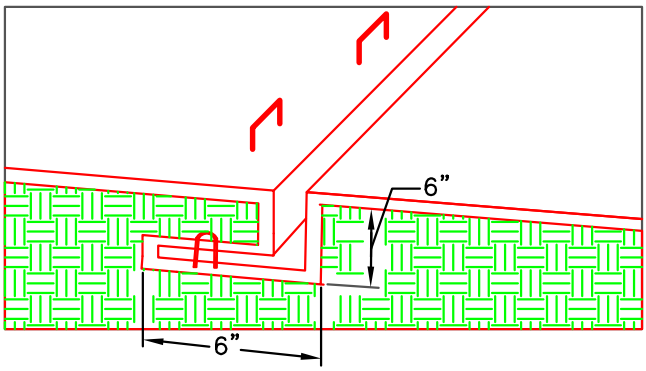


TERMNAL SLOPE AND CHANNEL ANCHOR TRENCH

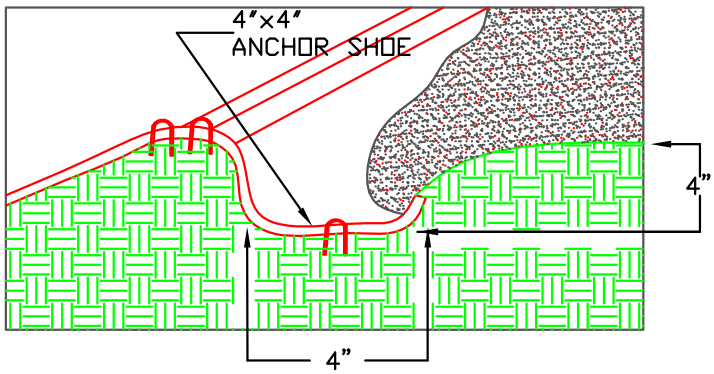


TYPICAL CHANNEL STABILIZATION

NOTE:
INSTALL PER MANUFACTURER'S RECOMMENDATION



INTERMITTENT CHECK SLOT



LONGITUDINAL ANCHOR TRENCH

Modified from California Stormwater BMP Handbook

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City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES

TURF REINFORCEMENT MATS

Issued: 10–01–2008

Revised: 06–01–2014

HYDROSEEDING

DEFINITION & PURPOSE

Hydroseeding is a method of seeding that consists of applying a mixture of water, seed, wood fiber, and soil stabilizer (if used) with hydroseeding equipment.

CONDITIONS FOR EFFECTIVE USE

To select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to: soil conditions, site topography, season and climate, vegetation types, maintenance requirements, sensitive adjacent areas, water availability, and plans for permanent vegetation (if hydroseeding is done for temporary vegetation). Soil should be loose (un-compacted) at time of application. For best results, cover the hydroseed layer with a mulch layer to help protect the seed from wind and erosion, retain soil moisture, and control soil temperature during establishment. Mulching should also be used when there is not sufficient time in the season to ensure adequate vegetation establishment and coverage for erosion control. Conduct a soil test to determine if soil amendments are needed. Fertilizer should only be applied if a soil test indicates it is needed. The hydroseeding mixture should be determined by an industry professional. See MDNR Guide Section 6-87 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Hydroseeding should be done immediately after completion of a phase of grading. Hydroseeding can be accomplished using a multiple-step or one-step process. The multiple-step process ensures maximum direct contact of the seeds to soil. When the one-step process is used to apply the mixture of seed, fiber, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil. Follow-up applications shall be made as needed to cover weak spots. Avoid overspray on existing vegetation, waterways, sidewalks, and roadways. Straw or other mulch should be applied to reduce the erosive capacity of stormwater and keep soil and seed in place.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Hydroseeded areas should be inspected for failures and re-seeded and mulched within the planting season, using not less than half the original application rates.

ROBUST ALTERNATIVES:

- Sod
- Turf reinforcement mat
- Control Blankets

SEEDING

DEFINITION & PURPOSE

Seeding is used to establish temporary or permanent vegetation in order to protect exposed soil from erosion.

CONDITIONS FOR EFFECTIVE USE

The SWPPP should include a site-specific seeding specification for permanent seeding and for temporary seeding if needed. For public improvements, seeding specifications can be found in Chapter 13, City of Springfield General Conditions and Technical Specifications. See MDNR Guide Section 6-71 Temporary Seeding and Section 6-77 Permanent Seeding for other specifications and guidance. Conduct a soil test to determine the need for soil amendments. Specifications for topsoil and soil amendments should be followed to ensure vegetation establishment and growth. Fertilizer should only be applied if a soil test indicates it is needed. Use additional stabilization (erosion control blankets, etc.) on slopes steeper than 3:1 and in areas of concentrated flow.

INSTALLATION/CONSTRUCTION PROCEDURES

Seeding should be done immediately after completion of a phase of grading, or in areas where construction activity has ceased for 14 days. Follow seeding specification for topsoil, soil amendments, seed type, seeding rate, and seeding dates. Apply straw or other mulch (see Mulching). Water immediately, to a depth of 4 inches.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Protect seeded areas from vehicular and foot traffic. Reseed and mulch areas that have not sprouted within 21 days of planting. Repair damaged or eroded areas and reseed/mulch as needed. Do not mow until 4 inches of growth occurs. During the first 4 months, mow no more than 1/3 the grass height. Seeded areas should be repaired and reseeded/mulched for one year following permanent seeding to ensure successful establishment.

ROBUST ALTERNATIVES:

- Sod and Hydroseed

SODDING

DEFINITION & PURPOSE

Sod is a mat of grass with an established root system used to provide immediate vegetation for erosion control.

CONDITIONS FOR EFFECTIVE USE

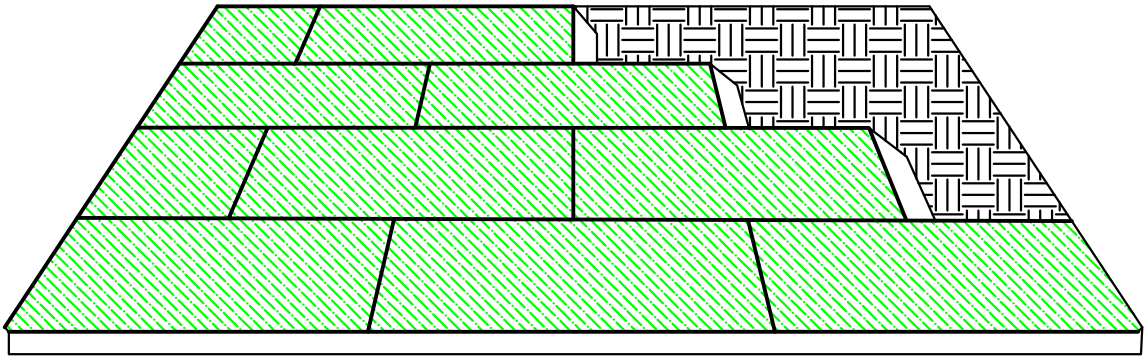
Sod is an effective way to achieve immediate erosion protection in areas of sheet flow and low concentrated flows with velocities less than 5 feet/second. A soil test should be performed to determine if soil amendments are needed. Fertilizer should only be applied if a soil test indicates it is needed.

INSTALLATION/CONSTRUCTION PROCEDURES

Install immediately after finish grading. Remove debris larger than 1 inch in diameter and concentrated areas of smaller debris. Level and roll soil lightly to provide an even grade and firm the surface. Soil should not be excessively wet or dry. Lay first row of sod perpendicular to the slope or direction of flow. Lay subsequent rows tightly against previous rows with joints staggered in a brick-like pattern. Fill minor gaps with good soil and roll entire surface to ensure contact. Stake, staple and/or net corners and centers of sod strips as required, especially in areas of concentrated flow. Water the sod immediately after installation, enough to soak 4 inches into the soil without causing runoff. For additional guidance see MDNR Guide Section 6-107.

OPERATION & MAINTENANCE PROCEDURES

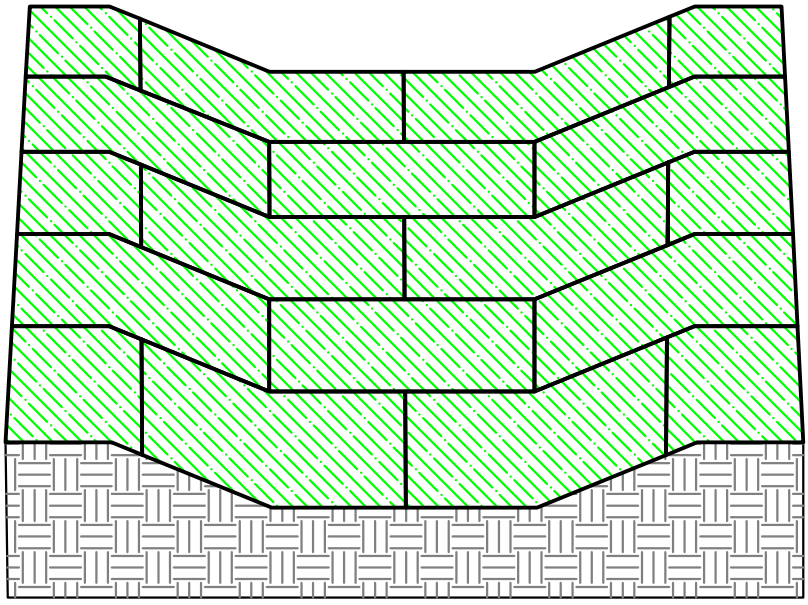
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Water the sod as often as necessary to maintain moist soil to a depth of at least 4 inches. Reposition areas of sod that have moved along the slope. Remove sediment accumulations, and replace sod if necessary. Repair and replace sod in eroded areas as needed. Do not mow sod until 3 inches of new growth occurs. During the first 4 months, mow no more than 1/3 the grass height.



LAY SOD IN A STAGGERED PATTERN WITH STRIPS BUTTED TIGHTLY AGAINST EACH OTHER

ON SLOPE > 3:1 USE PEGS OR STAPLES TO FASTEN SOD FIRMLY AT THE CORNERS AND CENTERS.

INSTALLATION OF GRASS SOD



LAY SOD PERPENDICULAR TO THE DIRECTION OF FLOW. USE PEGS OR STAPLES TO FASTEN SOD FIRMLY AT THE CORNERS AND CENTERS

INSTALLATION OF SOD IN WATERWAYS

Modified from Chesterfield, Missouri Model BMPs for Land Disturbance

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES
SODDING		Issued: 10–01–2008 Revised: 06–01–2014	

MULCHING

DEFINITION & PURPOSE

A layer of organic material designed to protect exposed soil or freshly seeded areas from erosion by eliminating direct impact of precipitation and slowing overland flows. Mulch materials include grass, hay, straw, wood chips, wood fibers, and shredded bark.

CONDITIONS FOR EFFECTIVE USE

Mulching can be used in areas of sheet flow for temporary soil stabilization on disturbed areas and applied to seeded areas to protect the seed and retain moisture for plant establishment. It is essential to seeding success in most conditions. In landscape areas, mulch is installed for permanent use. Where slopes are 3:1 or greater, hydraulic mulch-bonded fiber matrix, erosion control blankets, or turf reinforcement mats should be used. See MDNR Guide Section 6-91 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install immediately after grading landscaped areas or after seeding in other areas. Grade area and remove all debris larger than 1 inch if area is to be vegetated and mowed in the future, larger than 2 inches if area is to be permanently mulched. If area is to be seeded, follow requirements of seeding. Spread mulch evenly and anchor by crimping it into the ground or using netting.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site until adequate vegetation is established. For permanent mulch, inspect annually. Protect from vehicular and foot traffic. Repair damaged or eroded areas, and reseed and replace mulch as needed.

SITE CONDITIONS FOR REMOVAL

Mulching is biodegradable and will remain in place.

SOIL BINDERS

DEFINITION & PURPOSE

Soil binders are materials applied to the soil surface to temporarily prevent water-induced erosion of exposed soils on construction sites. These materials must be made for this purpose and material safety data sheet available upon request. Soil binders also provide temporary dust, wind, and soil stabilization (erosion control) benefits. The useful life of most products is 3 to 6 months.

CONDITIONS FOR EFFECTIVE USE

Soil binders should be used in areas of sheet flow only. Soil binders are typically applied to disturbed areas requiring short-term, temporary protection and in combination with other BMPs, such as perimeter controls, seeding, and mulching. Because soil binders can often be incorporated into the work, they may be a good choice for areas where grading activities will soon resume. Binders can also be applied to stockpiles to prevent water and wind erosion. See MDNR Guide Section 6-103 on Dust Control for more information on soil binders.

INSTALLATION/CONSTRUCTION PROCEDURES

Consider drying time for the selected soil binder, and apply with sufficient time before anticipated rainfall. Soil binders shall not be applied during or immediately before rainfall. Soil binders may not cure if low temperatures occur within 24 hours of application. Follow manufacturer's specifications for application rates, pre-wetting of application area, and cleaning of equipment after use. Use the recommendations to maximize usefulness and avoid formation of pools or impervious areas where stormwater cannot infiltrate.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site, looking for damage from vehicles, runoff, or freeze-thaw conditions. Reapply product or utilize additional BMPs.

SITE CONDITIONS FOR REMOVAL

Soil binders are typically left in place to degrade naturally.

COMPANION BMPs

- Seeding and Hydroseeding

SLOPE DRAINS

DEFINITION & PURPOSE

A slope drain is a pipe or lined channel which extends from the top to the bottom of a cut or fill slope.

CONDITIONS FOR EFFECTIVE USE

These structures are designed to convey concentrated runoff to protect exposed slopes from upstream runoff. They can be used for sheet flow and concentrated flow. Slope drains typically extend beyond the toe of the slope to a stable area or outlet. They should be designed by a registered design professional. See MDNR Guide Section 6-153 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install concurrently with diversion devices, as soon as cut and fill operations have occurred. Install according to plans. Typical installation is as follows. Install slope drain down the slope, perpendicular to slope contours, extending beyond the toe of slope. At top of slope, grade a diversion channel toward the slope drain. Install flared end or t-section at pipe inlet. Section should be well entrenched and stable so water can enter freely. Ensure that all pipe connections are secure and watertight. Securely anchor the exposed section of the drain with stakes. Install flared end section at pipe outlet and discharge into a sediment trap or other stabilized outlet. Protect area around inlet with filter fabric. Protect outlet with rip rap or other energy dissipation device.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on site. Remove sediment and trash accumulation at inlet. Repair settlement, cracking, or piping holes. Repair leaks or inadequate anchoring along pipe. Remove sediment and stabilize eroded areas at outlet. Extend the outlet if necessary.

SITE CONDITIONS FOR REMOVAL

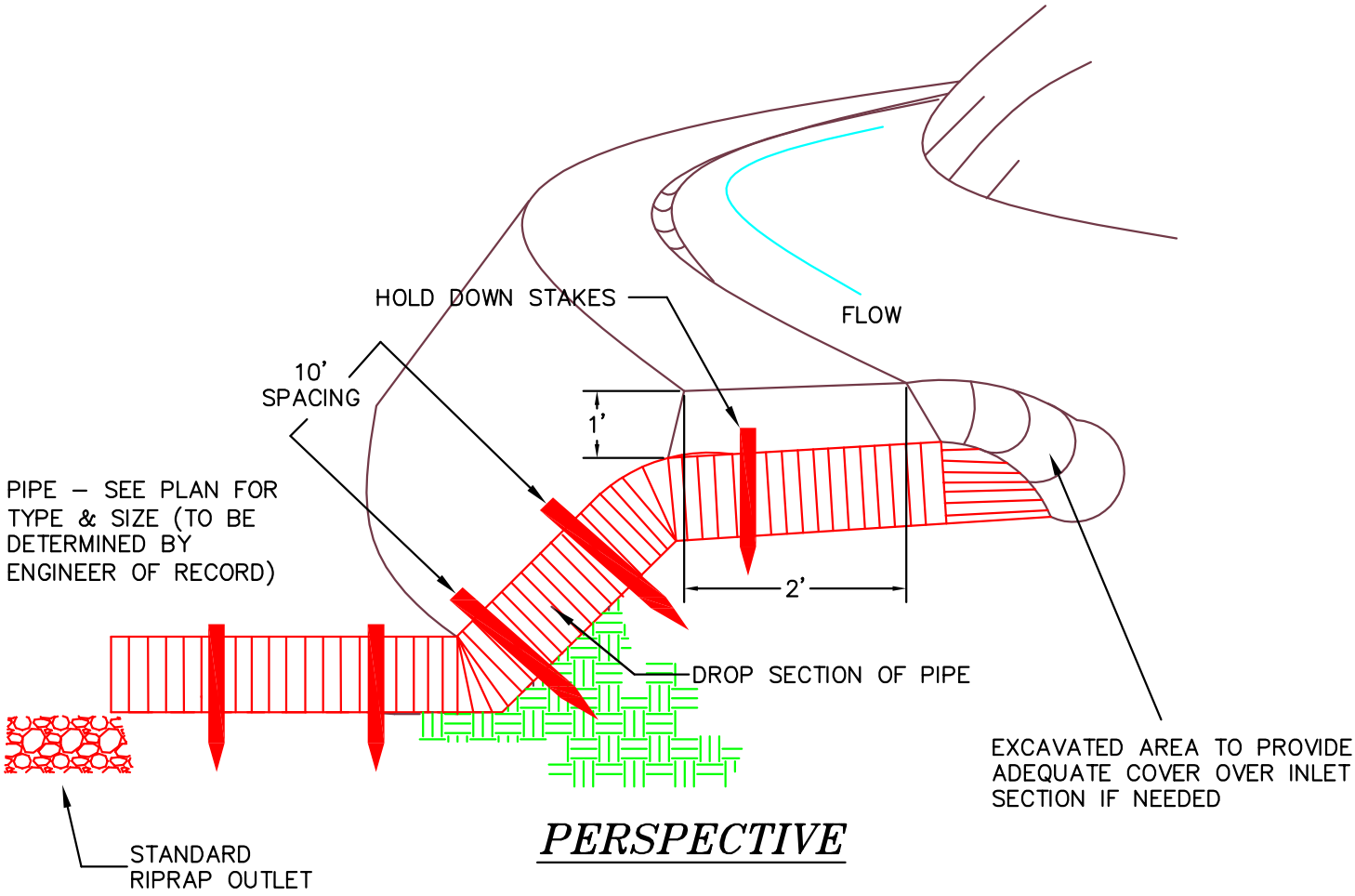
Remove concurrently with upstream diversion device after slope has been stabilized. Stabilize the exposed areas where the slope drain and diversion device were removed.

ROBUST ALTERNATIVES

- Conveyance Channel

COMPANION BMPs

- Plastic transition mat and Rip-Rap



PERSPECTIVE

Modified from Chesterfield, Missouri Model BMPs for Land Disturbance

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	
SLOPE DRAINS		Issued: 04–01–2008 Revised: 06–01–2014

TEMPORARY STREAM CROSSING

DEFINITION & PURPOSE

A temporary stream crossing is a structure placed across a waterway that allows vehicles to cross the waterway during construction to minimize erosion and downstream sedimentation.

CONDITIONS FOR EFFECTIVE USE

Temporary stream crossings are installed at sites where construction equipment or vehicles need to frequently cross a waterway, and when alternate access routes are not feasible. They should be designed by a registered design professional. Appropriate permits (404, 401, etc.) must be obtained. Design considerations include: current and proposed watershed conditions, average and peak discharge (typically, 2-year rainfall intensity event), effect on water surface elevation off-site, velocity, sediment removal, and protection of fish and trees. General guidelines for a low water crossing include: light traffic, bank height less than 5 feet, and perpendicular to flow or with a slight upstream arc. General guidelines for a culvert crossing include: sized for 2-year rainfall intensity event with 1 foot freeboard and no flooding of offsite areas, pipe parallel to flow, embankment perpendicular to channel or with a slight upstream arc, rip rap on exposed faces sized for overtopping during a peak storm period. See MDNR Guide Section 6-29 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install during periods of dry weather. Installation may require dewatering or temporary diversion of the stream. Procedures are specific to the type of crossing used. Generally, provide a stable means to bypass normal channel flow prior to disturbing the channel. Stabilize the channel bottom, install culvert (if used), grade and compact access ramps and soil embankment, install fabric, stone, and rip rap according to design.

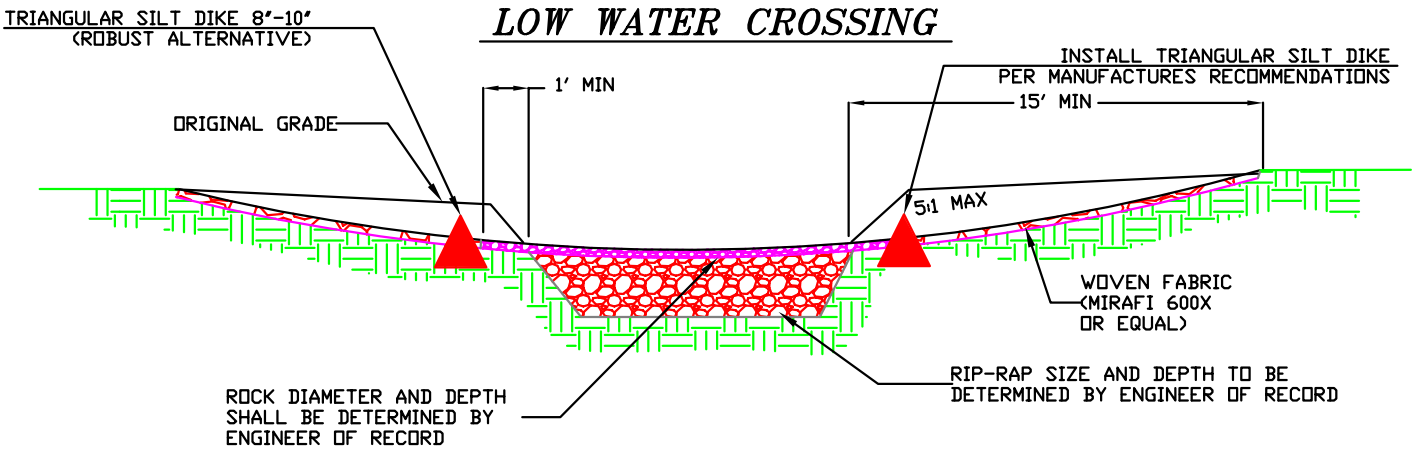
OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site, checking for: blockage in channel, debris buildup, erosion of abutments, channel scour, rip rap displacement, piping of soil, and structural weakening. Remove sediment and trash accumulation. Repair and stabilize eroded areas. Extend rip rap if necessary.

SITE CONDITIONS FOR REMOVAL

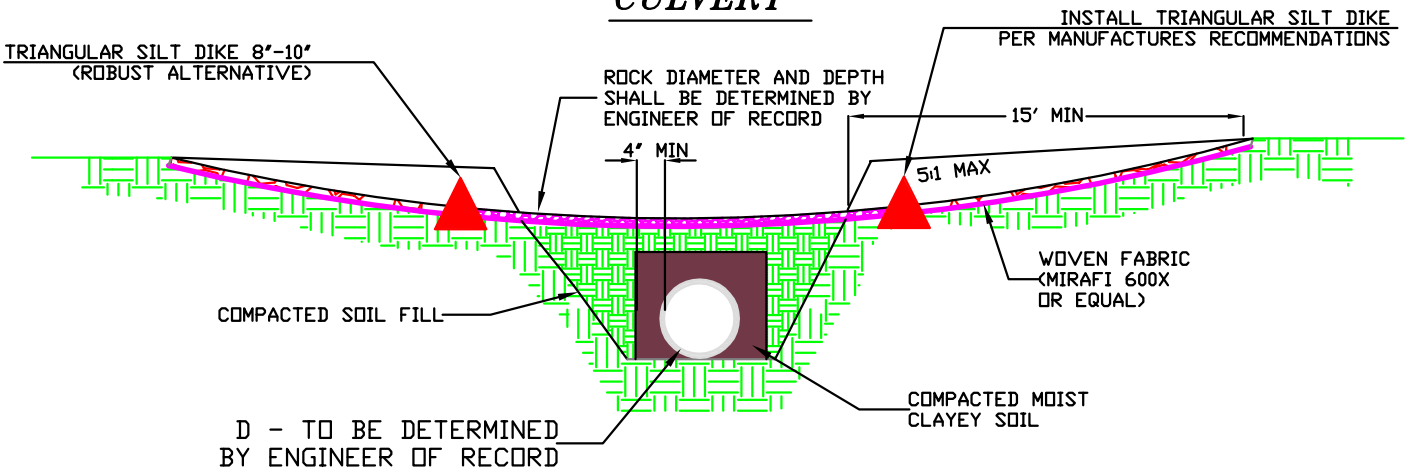
Remove as soon as alternative access is available. All foreign materials should be removed from creek. The streambed/banks should be returned to the original contour and stabilized if necessary.

LOW WATER CROSSING



ELEVATION

CULVERT



ELEVATION

Modified from Chesterfield, Missouri Model BMPs for Land Disturbance

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
TEMPORARY STREAM CROSSING		Issued: 10-01-2008 Revised: 06-01-2014	

WATER DIVERSIONS

DESCRIPTION & PURPOSE

Water diversions consist of practices that intercept and divert water around a construction site.

CONDITIONS FOR EFFECTIVE USE

A water diversion is implemented when work is performed in a body of water or when runoff needs to be diverted around a construction site to keep the runoff clean. Diversion of stream flow should generally be combined with other in-stream BMPs downstream of the diversion such as check dams to act as secondary measures for sediment control. Excavation of a bypass channel or passing the flow through a pipe is appropriate for the diversion of streams generally less than 20 feet wide, with flow rates less than 99 cubic feet/second. Water diversions may be used with other practices, such as pumps. Pumped diversions are suitable for intermittent and low flow streams. Temporary berms, excavated channels, or a combination of both can be used to divert runoff around a construction site. Diversions should be designed by a registered design professional. See MDNR Guide Section 6-143 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install the diversion according to the plans prior to starting construction in the area that water will be diverted around. When working in a body of water, install downstream sediment controls such as check dams before installing the diversion to catch any sediment released during installation.

OPERATION & MAINTENANCE PROCEDURES

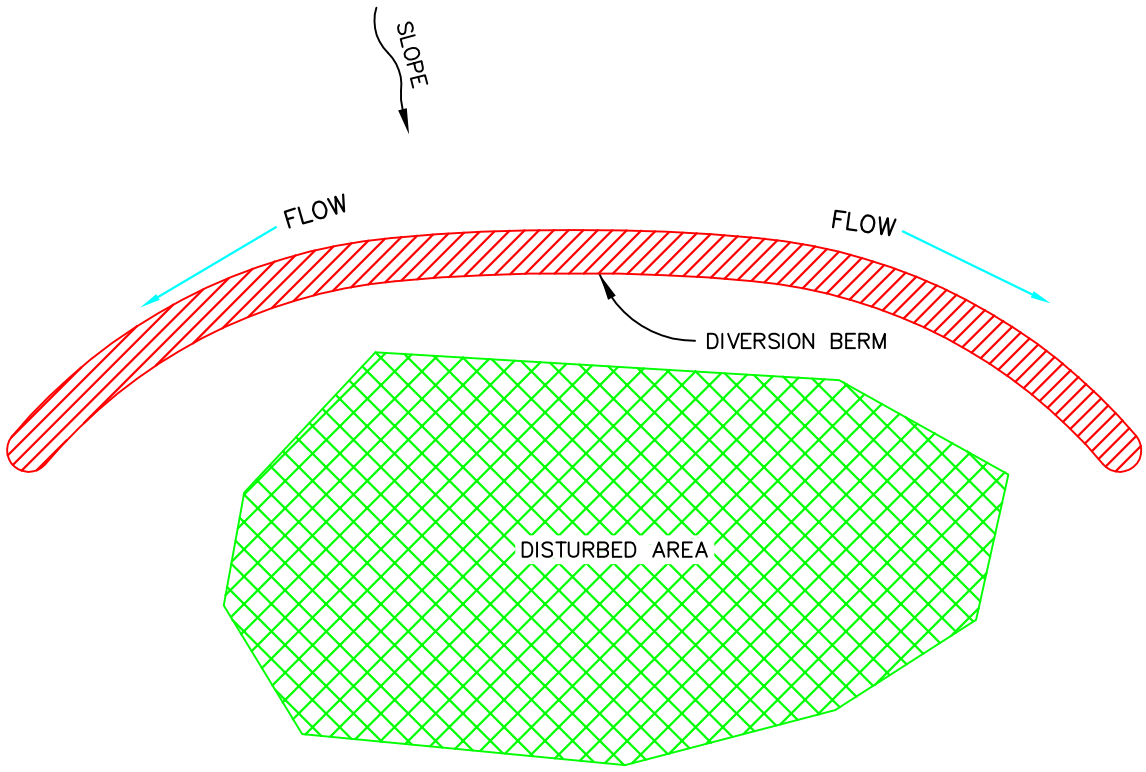
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove debris and sediment from area.

SITE CONDITIONS FOR REMOVAL

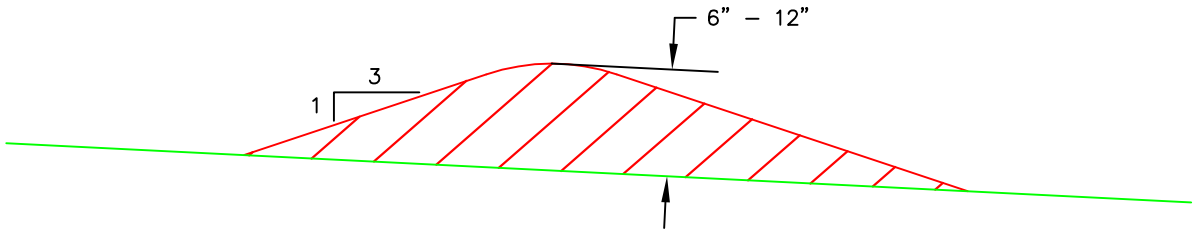
Remove the water diversion when work in the area is completed.

COMPANION BMPs

- Dewatering and Temporary Stream Crossing



PLAN



THE AREA WHERE THE BERM IS CONSTRUCTED SHALL BE STRIPPED OF VEGETATION PRIOR TO PLACING FILL FOR THE BERM. FILL SHALL BE A GOOD QUALITY TOPSOIL REASONABLY FREE OF STONES, ROOTS AND OTHER DEBRIS.

ELEVATION

Modified From Greene County Missouri – Storm Water Design Standards

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES

TYPICAL DIVERSION BERM

Issued: 10–01–2008

Revised: 06–01–2014

DUST CONTROL/ WIND EROSION

DEFINITION & PURPOSE

Practices of controlling wind-borne dust include phasing, preservation of trees and existing vegetation, minimization of soil disturbance, mulching, watering, wind barriers, and soil binders.

CONDITIONS FOR EFFECTIVE USE

Phase work to the extent practical to minimize the amount of area disturbed at one time (see Phasing/Sequencing). Preservation of grass and trees and the use of solid board fences may also serve as wind barriers. For areas not subjected to traffic, vegetation provides the most practical method of dust control and should be established as early as possible. Effectiveness of application of water, adhesives, and chemical treatment depends on soil, temperature, humidity and wind velocity. See MDNR Guide Section 6-103 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Use dust control when clearing and grading activities create blowing dust, especially during periods of dry weather. Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution. Place barriers at right angles to prevailing wind at intervals of about 10 times their height to control soil blowing. Paved areas that have soil on them from construction sites should be cleaned with street sweeper. Mulching offers a fast and effective means of controlling dust when properly applied. Binders and tackifiers should be used on organic mulches. NOTE: If calcium chloride or spray-on adhesives are used for dust control, a permit may be required from MDNR. Follow manufacturer's specifications for binders and tackifiers.

OPERATION & MAINTENANCE PROCEDURES

Check areas where mulch or binders have been applied for dust control and adjust/reapply as needed, according to manufacturer's specifications.

SITE CONDITIONS FOR REMOVAL

Dust control practices can be terminated when stabilization has been achieved.

ROBUST ALTERNATIVES

- Binders and Tackifiers

CONSTRUCTION EXIT

DEFINITION & PURPOSE

A stabilized exit to a construction site is designed to minimize the amount of sediment tracked from the site on vehicles and equipment. Mud and sediment fall off of tires as they bounce along the stabilized entrance.

CONDITIONS FOR EFFECTIVE USE

Limit the number of points of ingress/egress and locate them where it is safe for construction vehicles and equipment to access public road. Avoid placing construction exit in low areas, where stormwater can accumulate and discharge off site. If possible, locate where permanent roads will eventually be constructed. See MDNR Guide Sections 6-7 through 6-15 for construction exit and robust alternatives.

INSTALLATION/CONSTRUCTION PROCEDURES

Install prior to the start of construction. Properly grade and compact each construction entrance/exit to prevent runoff from leaving the site. Install culvert under entrance if needed to maintain positive drainage. Install woven geotextile fabric and cover with 3 to 6" aggregate to a depth of 6". Construction exit should have a length of 50' and a turn radius of 25' or full width of roadway. All contractors, subcontractors, and suppliers should be instructed to utilize construction entrance/exit before entering or exiting unstable areas.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Add a new lift of rock, or turn stones when voids become inundated with sediment and pad becomes smooth. Keep all temporary roadway ditches clear. Immediately remove any mud, rock or debris tracked onto paved surfaces. Use a street sweeper adjacent with the construction exit to reduce track out from site.

SITE CONDITIONS FOR REMOVAL

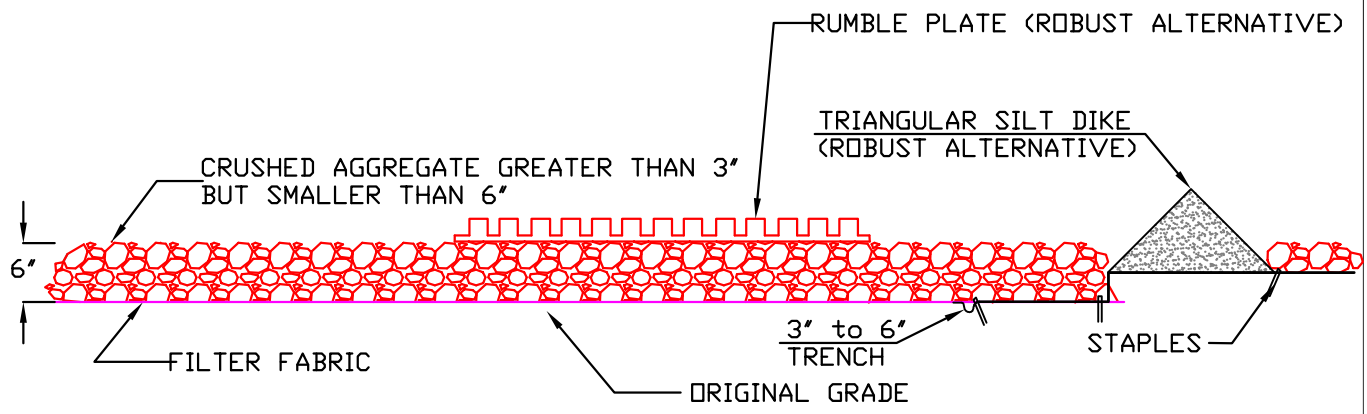
Remove exit when vehicles and equipment will no longer access unpaved areas.

ROBUST ALTERNATIVES

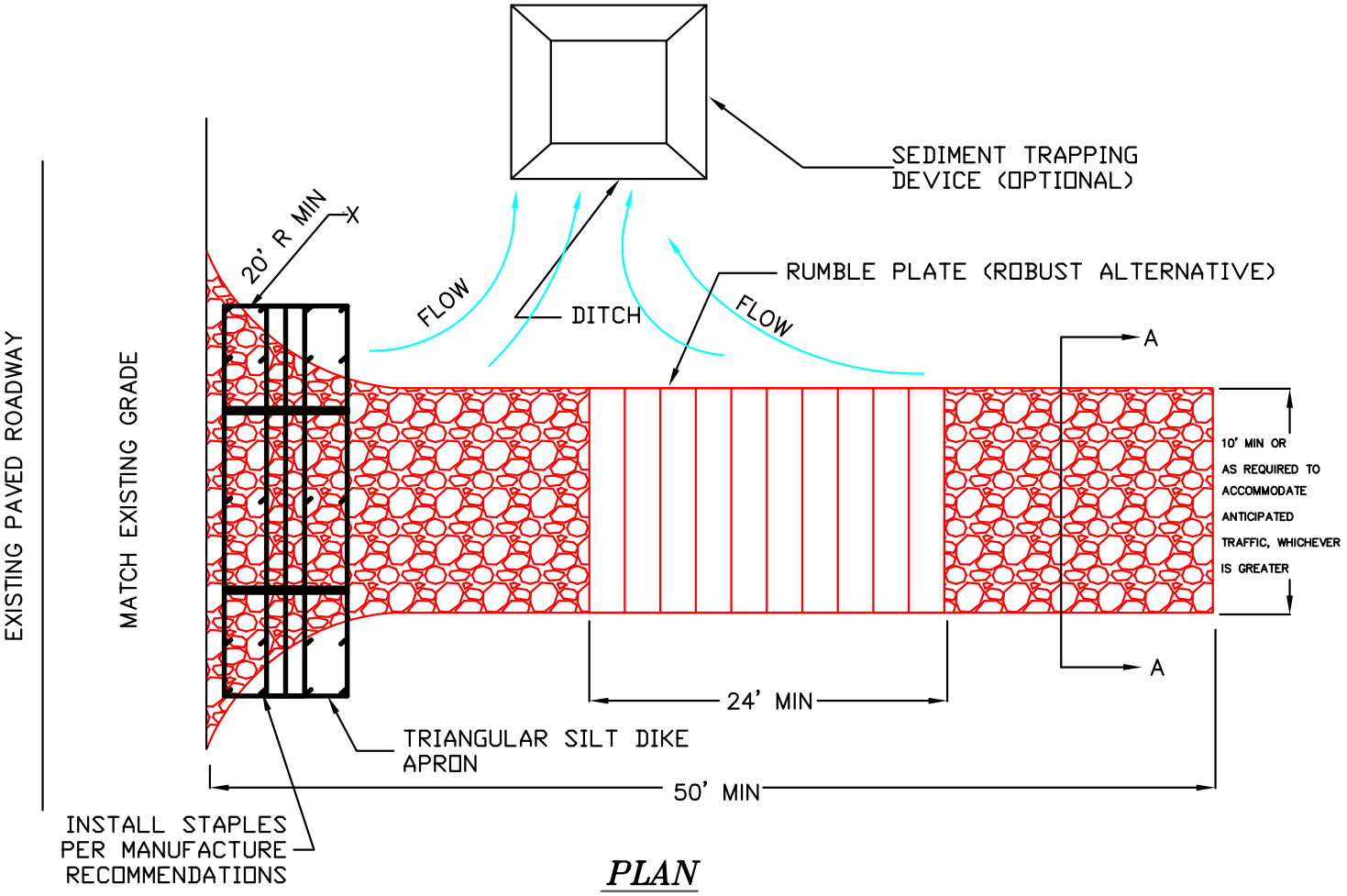
- Rumble Plate, Bamboo Mat, Automated Wheel Wash Systems

COMPANION BMPs

- Triangular Foam Perimeter control
- Street cleaning
- Stabilized gravel access road



SECTION A–A



PLAN

Modified from California Storm Water BMP Handbook

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
CONSTRUCTION ENTRANCE/EXIT		Issued: 10–01–2008 Revised: 06–01–2014	

STREET CLEANING

DEFINITION & PURPOSE

Street cleaning includes shoveling, brooming, sweeping and/or vacuuming to remove track-out of sediment from paved public roads.

CONDITIONS FOR EFFECTIVE USE

Shoveling should be used to remove mud layers and large dirt clods. Sweeping and vacuuming may not be effective when paved roads are wet or muddy.

INSTALLATION/CONSTRUCTION PROCEDURES

If track out is present, street cleaning should be performed as soon as possible, at the end of the work day, and before rain events. If not mixed with debris or trash, consider incorporating the removed sediment back into the project. Otherwise, sweeper waste should be disposed in a solid waste dumpster on or off-site. Do not wash any sediment or debris down the storm drain.

OPERATION & MAINTENANCE PROCEDURES

Inspect ingress/egress access points daily, and clean tracked sediment as needed and/or required.

COMPOST FILTER SOCKS

DEFINITION & PURPOSE

A compost filter sock is a mesh tube filled with composted material used to control sediment through settling and filtration.

CONDITIONS FOR EFFECTIVE USE

Compost filter socks are generally placed along the perimeter of a site, at intervals along a slope, or as ditch checks to slow down runoff and retain sediment, allowing cleaned water to flow through. Compost material shall be screened ≤ 2 inches. Filter socks generally come in 8", 12", and 18" diameters. Compost filter socks can be used for sheet flow and small concentrated flows. Common industry practice is that drainage areas should not exceed 0.25 acres per 100 feet of sock length and flow should not exceed one cubic foot per second. Manufacturer's specifications should be followed for selecting the sock diameter. See MDNR Guide Section 6-167 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install prior to disturbance of the site. Follow manufacturer's specifications. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

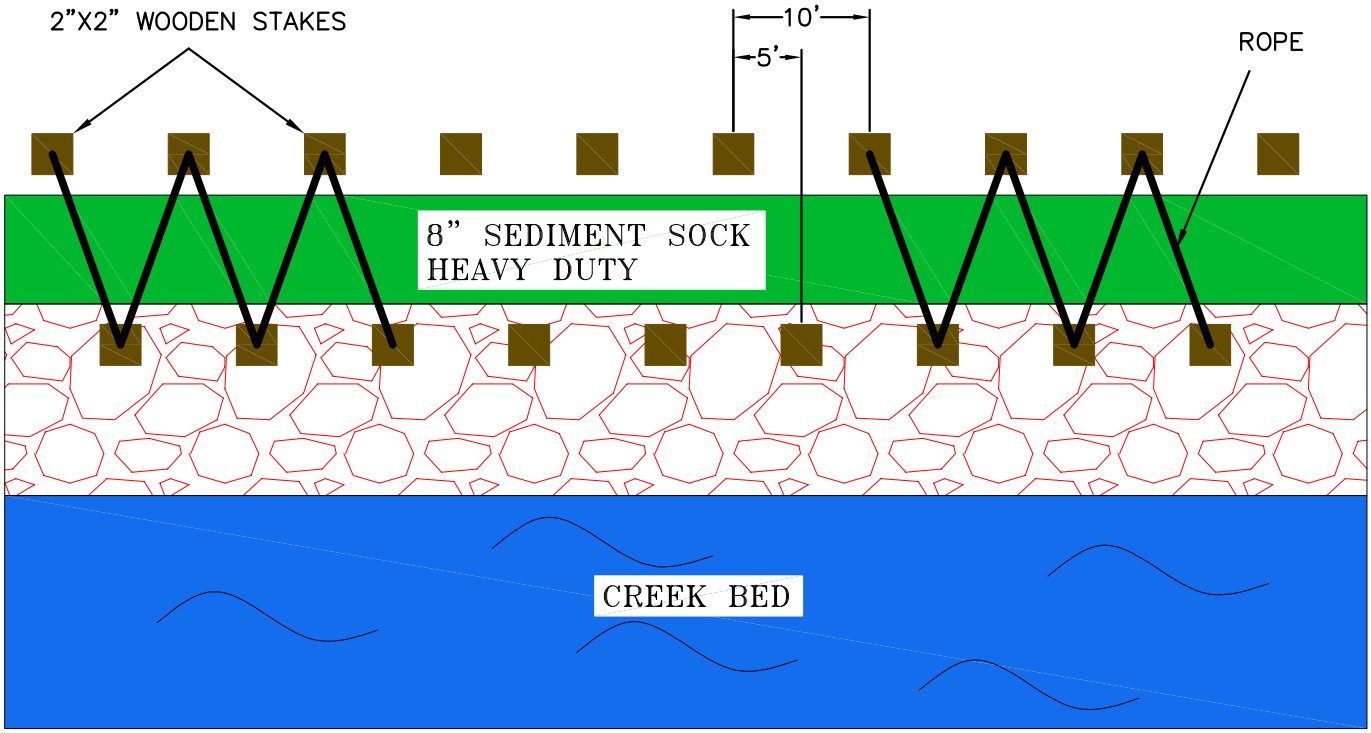
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Prevent vehicles and machinery from damaging sock. Remove accumulated sediment generally when it reaches half the height of the sock, replace broken stakes, and repair or replace sections that are torn.

SITE CONDITIONS FOR REMOVAL

Removal of sock can occur after permanent vegetation is established. The mesh material can be cut open and removed, leaving the compost to degrade naturally.

ROBUST ALTERNATIVES

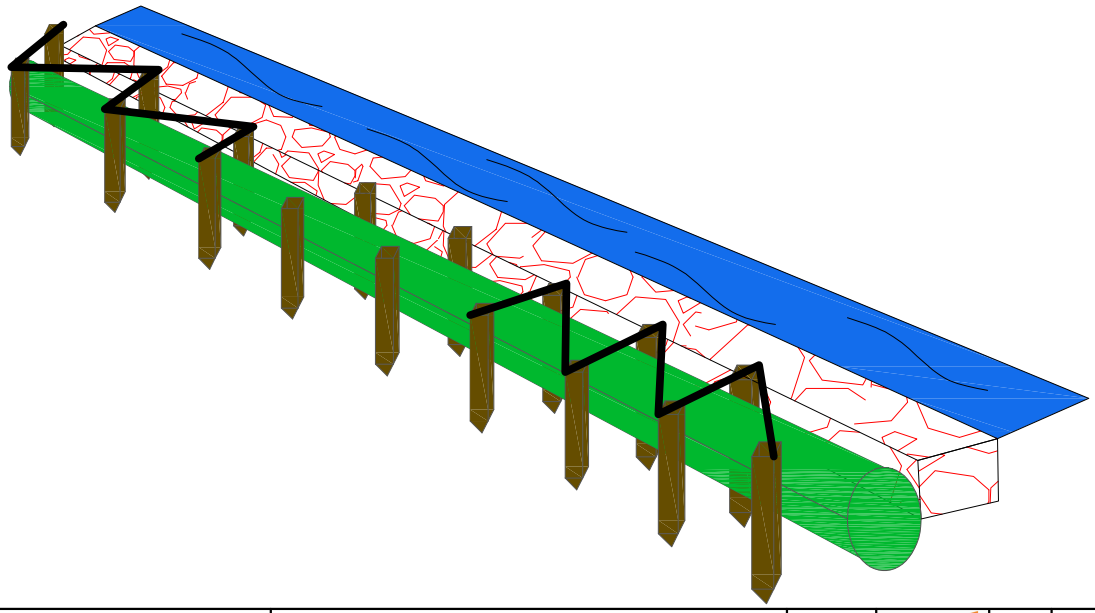
- Tie Down Composted River Sock
- Silt fence



PERIMETER CONTROL

NOTES:

- USE 2"X2"X2.5" WOODEN STAKES SPACED EVERY TEN FEET, OFFSET EVERY 5 FEET ON OPPOSITE SIDE OF SOCK.
- TIE ROPE TO FOUR STAKES ALTERNATING SIDE.
- LEAVE 30 FEET BETWEEN TIED STAKES



NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES
COMPOST FILTER SOCK ROBUST METHOD		Issued: 06–01–2014 Revised:	

SILT FENCE

DEFINITION & PURPOSE

A silt fence consists of a run of filter fabric, stretched, trenched in the ground and attached to anchored posts. Silt fence used as a perimeter control BMP encourages ponding of runoff and settling of sediment from stormwater.

CONDITIONS FOR EFFECTIVE USE

Install silt fence along slopes, at bases of slopes, and around the perimeter of a site as a final barrier to sediment being carried off site. Silt fence should follow level contour lines with ends turned upslope in a J-Hook. Silt fence should never be used in areas of concentrated flow. Common industry practice is that drainage areas should not exceed 0.25 acres per 100 feet of fence length. See MDNR Guide Section 6-137 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install silt fence prior to disturbance and at intervals during construction of fill slopes. Follow Manufacturer's Specifications. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

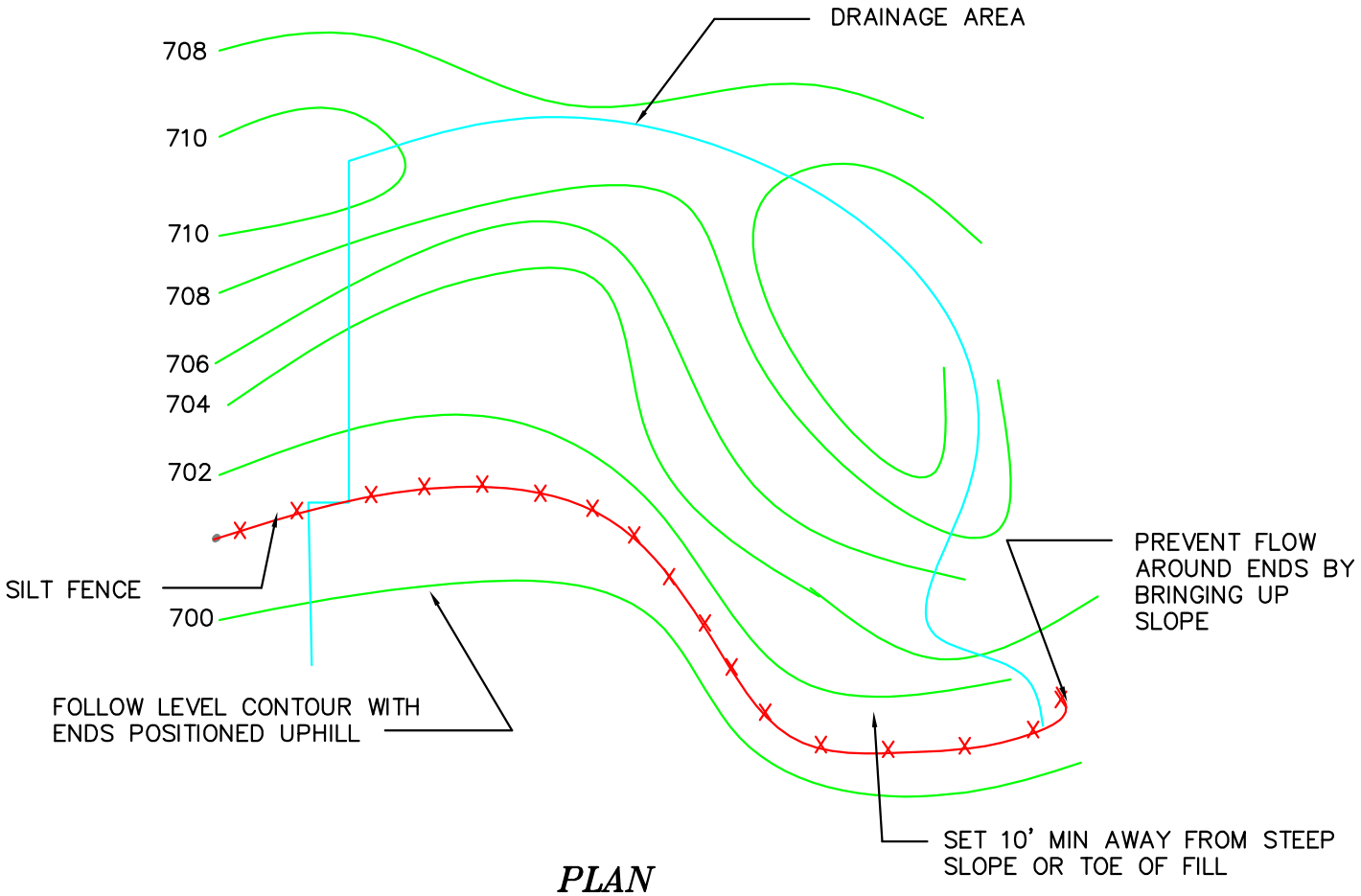
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove sediment buildup once it accumulates to 6 inches. Replace torn/clogged fabric, and repair loose fabric and broken stakes.

SITE CONDITIONS FOR REMOVAL

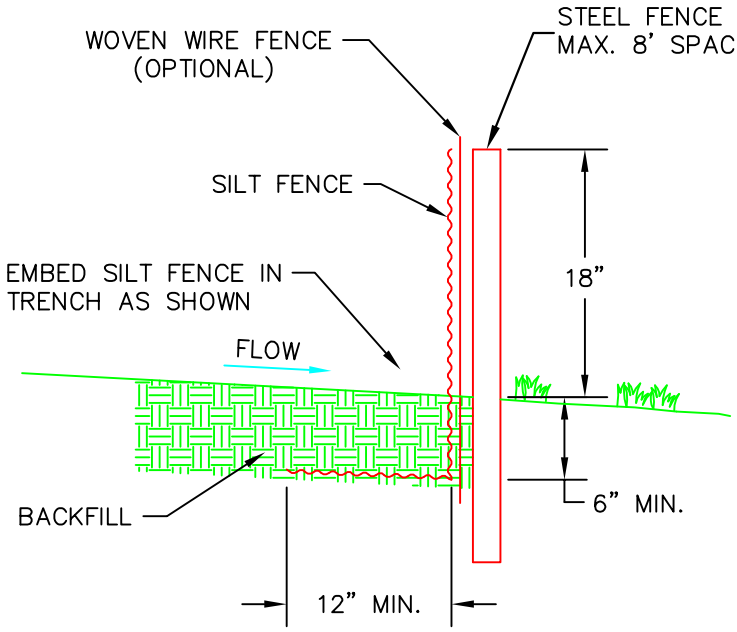
Remove silt fence after permanent vegetation is established. Remove fence, grade trench area and vegetate.

ALTERNATIVES

- Compost Sock



PLAN



NOTES:

1. PLACE SILT FENCE AT DOWNSLOPE LIMIT OF AREA TO BE GRADED.
2. SILT FENCE SHALL BE PLACED ALONG A LEVEL CONTOUR WITH AN ALLOWANCE OF ± 4 INCHES.
3. SEDIMENT TRAPPED BY THIS PRACTICE SHALL BE DISPOSED OF IN AN APPROVED SITE IN A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.
4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH SUPPORT POST OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE STEEL FENCE POSTS.
5. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN IT HAS SERVED ITS USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES
8. AT EACH END OF SILT FENCE, TURN FENCE UPSLOPE AND EXTEND UNTIL GROUND SURFACE RISES 18 INCHES.

Modified from Chesterfield, Missouri Model BMPs for Land Disturbance

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
SILT FENCE		Issued: 10–01–2008 Revised: 06–01–2014	

DITCH CHECKS

DEFINITION & PURPOSE

Ditch checks are used in channels to reduce water velocity, dissipate energy, and contain sediment in ditches. A ditch check is constructed of 12" or greater compost filter sock, rock-lined geotexile or rock bags.

CONDITIONS FOR EFFECTIVE USE

Ditch checks should be placed at specified intervals to slow velocities and provide adequate sediment storage capacity. Ditch checks should be designed by a registered design professional based on the hydraulics/hydrology of the site. See MDNR Guide Section 6-191 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Immediately following excavation of ditch line, install ditch checks according to plan specifications. Ditch checks need to be installed perpendicular to the ditch. It is important to establish elevation of center mass to be lower than the outside edges. Water should never be allowed to flow around ends of a check dam, as this will cause erosion and deteriorate ditch walls.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove accumulation of trash and debris. Remove sediment when depth reaches one-half of the ditch check height. Repair/restore ditch check structure, if necessary, to original configuration.

SITE CONDITION FOR REMOVAL

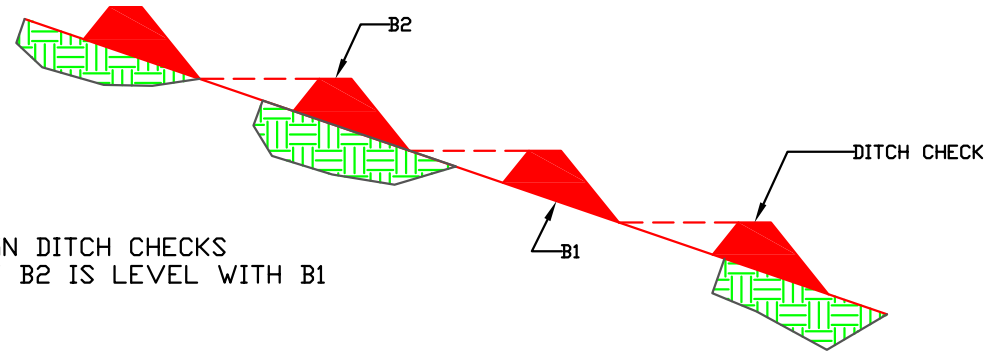
Remove ditch checks after stabilization of ditch line. Clean out sediment. Remove materials that make up ditch checks.

ALTERNATIVES

- Triangular Dikes

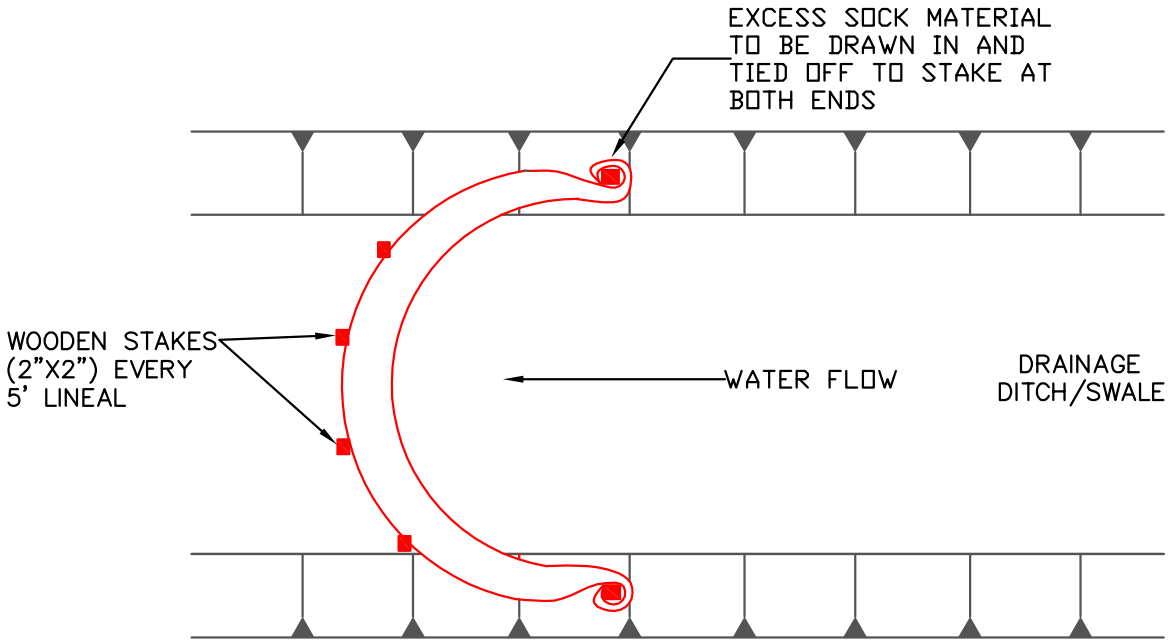
ROBUST ALTERNATIVES

- Check Dam and Pyramid Sock



NOTE: ALIGN DITCH CHECKS
SUCH THAT B2 IS LEVEL WITH B1

STEEP SLOPES



DITCH CHECK

NOTE: FOLLOW MANUFACTURER'S SPECIFICATION

Modified from Filtrexx Standard Specification and Design Manual, Version 5.0, 2006

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
DITCH CHECK		Issued: 10–01–2008 Revised: 06–01–2014	

CHECK DAMS

DEFINITION & PURPOSE

Check dams reduce flow velocity, allowing sediment to settle out. A check dam is a device constructed of rock, rock bags, or proprietary products placed across a natural or man-made channel or swale. They are similar to ditch checks but designed to be more robust. Not to be constructed from silt fence.

CONDITIONS FOR EFFECTIVE USE

Check dams should be designed by a registered design professional and consists of one or more dams placed at intervals in channels and swales to slow velocities, reducing erosion and allowing sediment to settle out. They can also be used as an alternative to a sediment basin for sites with a drainage area of 20 acres or less. They can also be used as a secondary sediment control measure in streams but should be combined with water diversion and other BMPs. See MDNR Guide Section 6-187 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install before disturbing vegetation in contributing drainage area and immediately following excavation of channels or swales. Check dams must be placed perpendicular to flow of water. Install geotexile filter fabric below rock. When using rock bags, no geotextile is needed. Check dam must be long enough to assure that center mass is lower than outside edge so that water will run over the middle and not undermine outside edges.

OPERATION & MAINTENANCE PROCEDURES

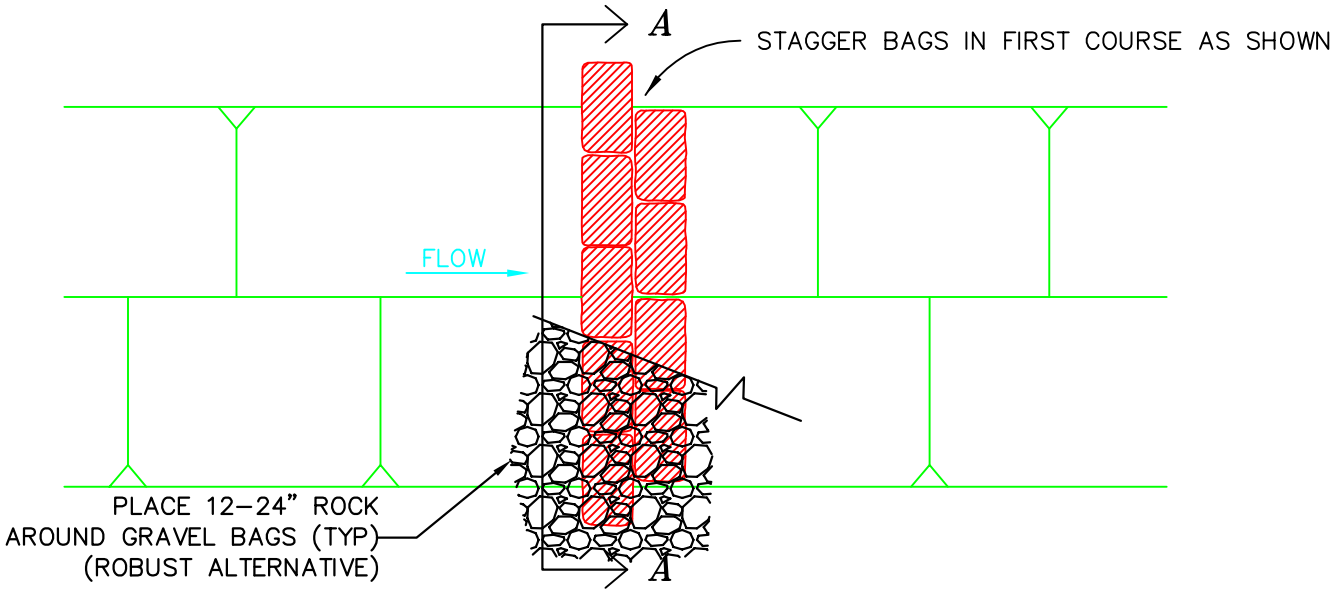
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove accumulation of trash and leaves. Remove sediment when depth reaches one-half of the check dam height. Repair/restore dam structure, if necessary, to original configuration.

SITE CONDITIONS FOR REMOVAL

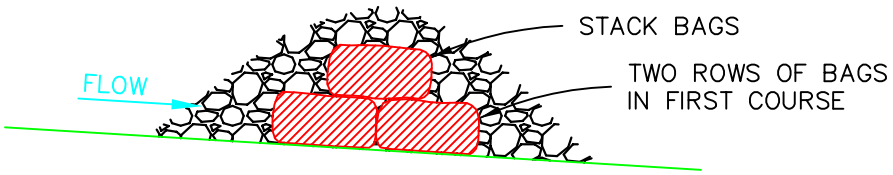
Remove check dam after contributing areas have been stabilized. Clean out sediment. Remove check dam material and return steam or channel back to original condition.

ROBUST ALTERNATIVES

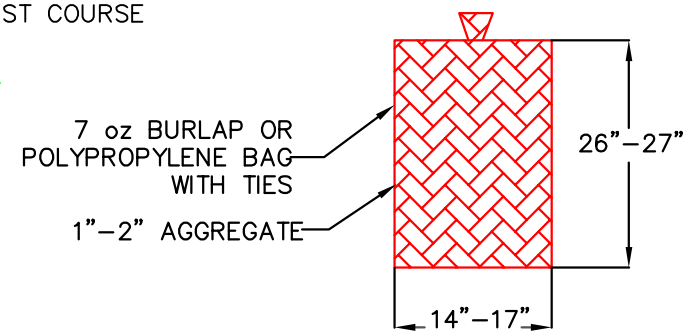
- Constructed Conveyance Channel and Diversion Practices



PLAN



PROFILE

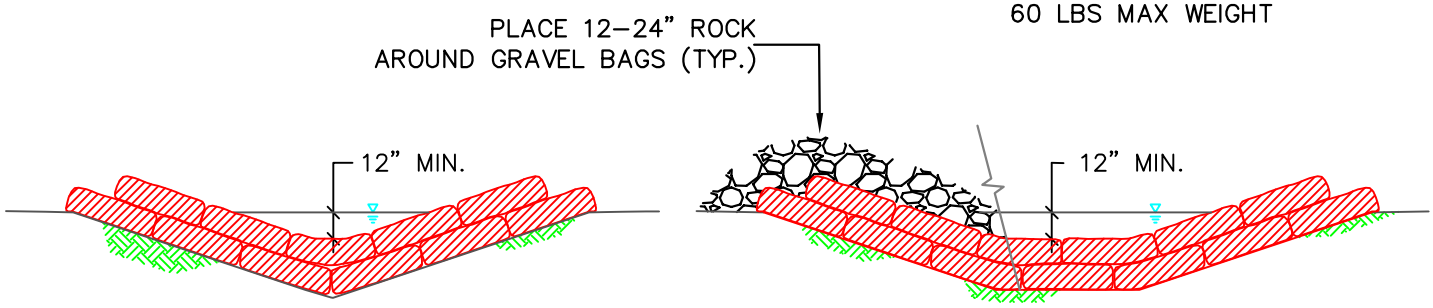


GRAVEL BAG

NOTE: FILL BAGS 2/3 FULL.
60 LBS MAX WEIGHT

NOTES:

FILL BAGS WITH 1" TO 2" CRUSHED LIMESTONE.
BAGS MAY BE BURLAP OR WOVEN PLASTIC.
SPACE CHECK DAMS ACCORDINGLY



A–TYPICAL CROSS–SECTIONS

Modified From Greene County Missouri – Storm Water Design Standards

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
CHECK DAM		Issued: 10–01–2008 Revised: 06–01–2014	

INLET PROTECTION

DEFINITION & PURPOSE

A temporary sediment control barrier placed around an inlet that minimizes sediment from entering the storm drain.

CONDITIONS FOR EFFECTIVE USE

All functional inlets that drain disturbed areas should have inlet protection. The type of inlet protection should be determined based on the type of inlet, drainage area, slope, and whether the inlet is in a high traffic area. Types of inlet protection include gravel bags and proprietary inserts and covers. Compost filter sock or silt fence can be used for protection of area inlets where the sock and fence can be properly staked into the ground. Compost filter sock may also be used on pavement for curb inlet protection but gravel bags may be a better choice in high traffic areas because of their higher flow rate.

INSTALLATION/CONSTRUCTION PROCEDURES

Install before land disturbing activities begin on existing inlets, or immediately after installation of a new inlet. Gravel bags may be placed either as a j-hook on the upstream end of the inlet or as a full barrier, sometimes stacked 2 bags high, across the entire opening of the inlet). Create an overflow bypass in the inlet protection structure so that excessive ponding of water around the inlet will not become a safety issue.

OPERATION & MAINTENANCE PROCEDURES

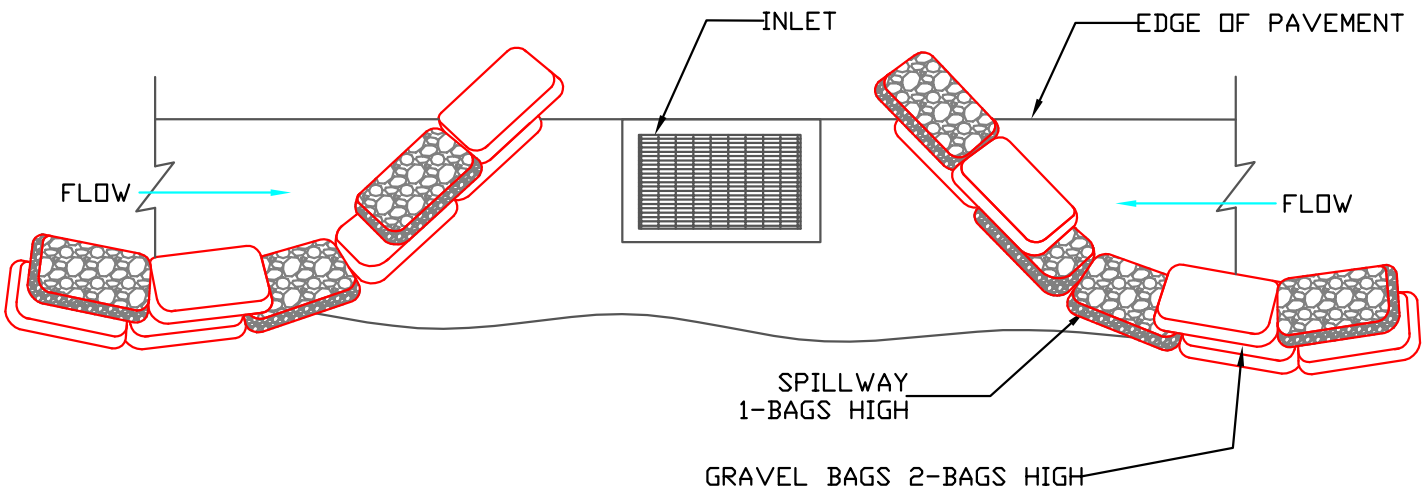
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Inspect inlet protection to ensure integrity and effectiveness every week or 48 hour after every rain event that causes stormwater runoff to occur on-site. Remove sediment and construction debris that impedes flow to the inlet, and replace or repair nonfunctional inlet protection.

SITE CONDITIONS FOR REMOVAL

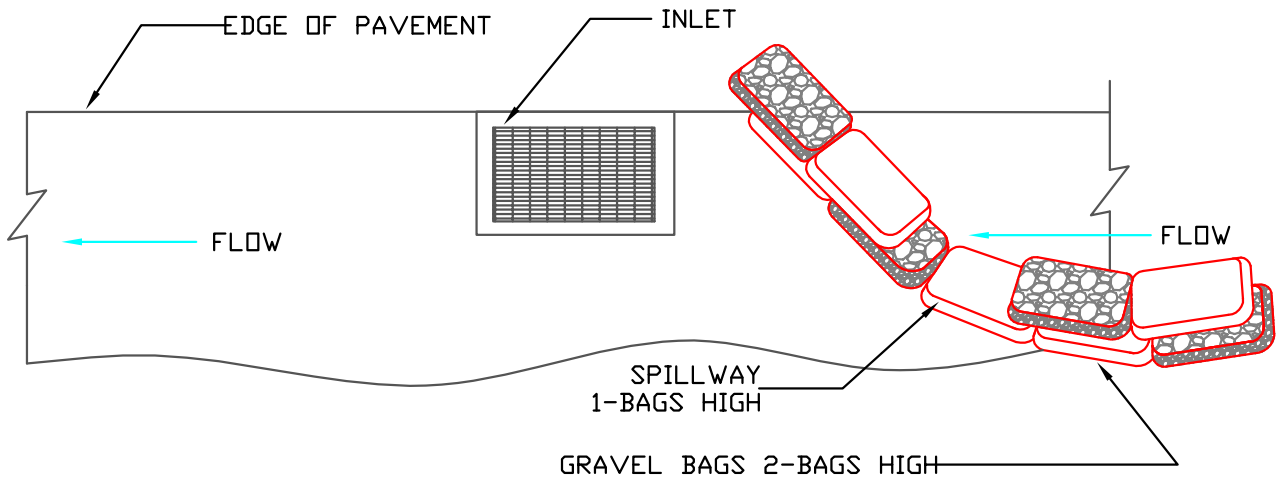
Remove after contributing drainage areas have been adequately stabilized.

ROBUST ALTERNATIVES

- Inlet Filter Inserts



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

Modified from California Stormwater BMP Handbook

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES
CURBED GUTTER INLET PROTECTION GRAVEL BAGS		Issued: 10–01–2008 Revised: 06–01–2014	

GRAVEL BAGS

DEFINITION & PURPOSE

Open mesh nylon or burlap bags of gravel designed to pond water and cause sediment to settle out.

APPROPRIATE APPLICATIONS

Gravel bags may be implemented on a project-by-project basis with other BMPs.

CONDITIONS FOR EFFECTIVE USE

Type of Flow: Sheet flow and concentrated flow. Gravel bags can be used alone or with other BMPs. They can be used as inlet protection, check dams in streams and channels, outfall protection, for water diversions, to create temporary sediment basins, and as barriers.

INSTALLATION/CONSTRUCTION PROCEDURES

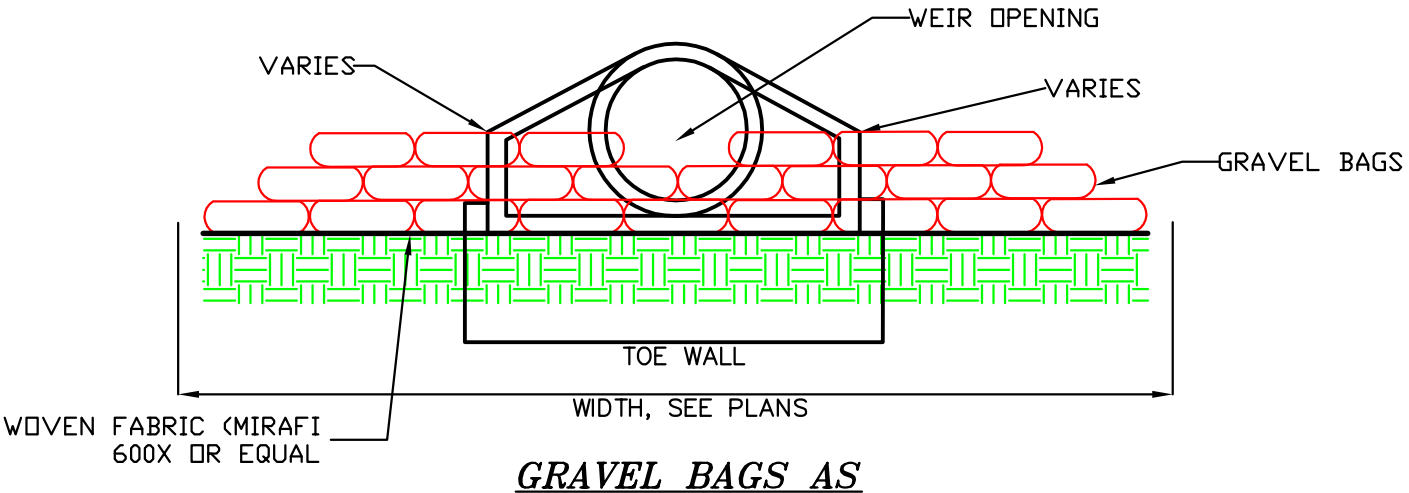
Time of installation is dependent upon the function gravel bags are intended to perform. When used as a linear control for sediment removal, install along a level contour and turn ends of gravel bag row up slope (j-hook style) to prevent flow around the ends. When used for concentrated flows, stack gravel bags to required height using a pyramid approach. The upper rows of gravel bags should overlap joints in lower rows.

OPERATION & MAINTENANCE PROCEDURES

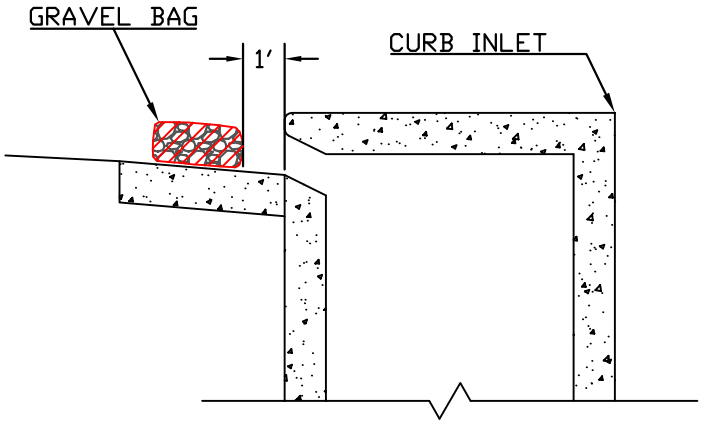
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Replace or stabilize any damaged bags or bags that have moved out of place. Repair wash-outs or other damages as needed. Inspect gravel bags for sediment accumulations, and remove sediment when accumulation reaches ½ the height of the structure.

SITE CONDITIONS FOR REMOVAL

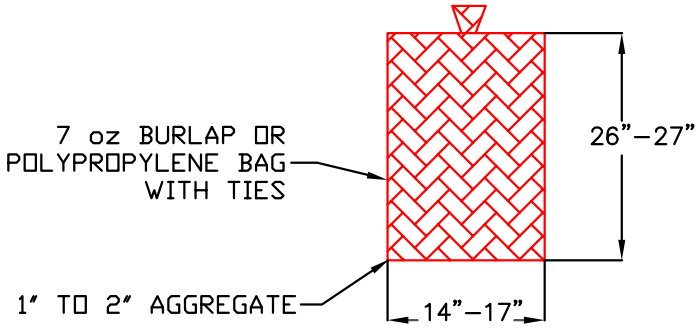
Remove upon completion of upstream/upslope work and vegetation/stabilization of contributing runoff areas.



GRAVEL BAGS AS ROCK OUTLET PROTECTION

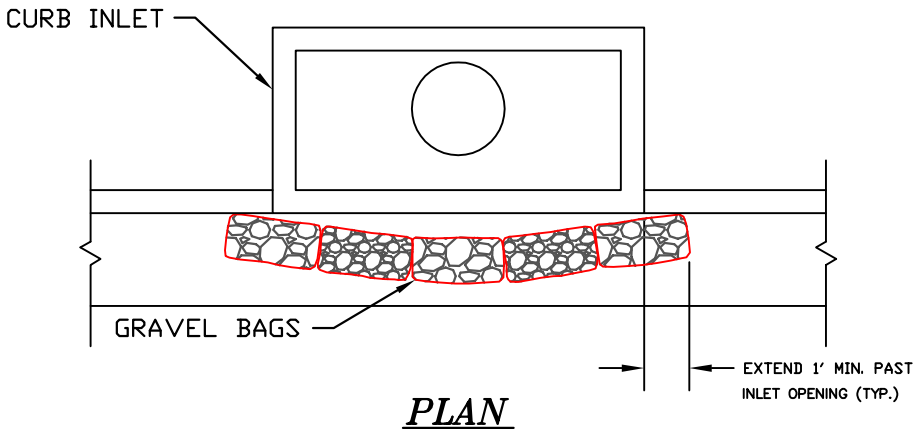


CROSS-SECTION



GRAVEL BAG

NOTE: FILL BAGS 2/3 FULL. 60 LBS MAX WEIGHT



PLAN

NOTE:
1. FILL BAGS WITH CRUSHED 1" TO 2" LIMESTONE
2. BAGS SHALL BE BURLAP OR WOVEN PLASTIC
3. BAGS SHALL BE INSPECTED AND REPLACES AS NEEDED

GRAVEL BAGS AS INLET PROTECTION

NOTE:
COMPOST FILTER SOCK MAY BE USED AS INLET PROTECTION BUT MUST BE STAKED AT EDGES AND IN THE CENTER. USE 8" OR 12" SOCK SIZE DEPENDING ON ROADWAY CLASSIFICATION.

Modified from Chesterfield, Missouri Model BMPs for Land Disturbance

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES
GRAVEL BAGS		Issued: 04-01-2008 Revised: 06-01-2014	

FIBER ROLLS/WATTLES

DEFINITION & PURPOSE

Fiber rolls or straw wattles are a rolled erosion control product filled with straw, flax, rice, coconut fiber material, or composted material. Each roll is wrapped with UV-degradable polypropylene netting or with biodegradable materials like burlap, jute, or coir. These devices are slope dissipaters that reduce velocity of runoff as sheet flow and catch sediment on steep slopes.

CONDITIONS FOR EFFECTIVE USE

Fiber rolls can be used in areas of low shear stress including: along the toe, top, face, and at grade breaks on exposed and erodible slopes to shorten slope length and spread runoff as sheet flow, at the end of a downward slope where it transitions to a steeper slope, along the perimeter of a project (less than 1/3 acre) or down-slope of a stockpile, and down-slope of other exposed soil areas. See MDNR Guide Section 6-195 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install fiber roll immediately after rough grading and prior to seeding or mulching. On slopes, install fiber rolls along the contour with a slight downward angle at the end of each row to prevent ponding at the midsection. Turn the ends of each fiber roll upslope (like a j-hook) to prevent runoff from flowing around the roll. Determine using manufacturer's specification the vertical spacing for slope installations. Straw wattles can float or move if not properly staked and trenched in.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on site. Remove sediment accumulation when it reaches ½ the height of the roll/wattle. Repair or replace split, torn, unraveled, or slumping fiber rolls.

SITE CONDITIONS FOR REMOVAL

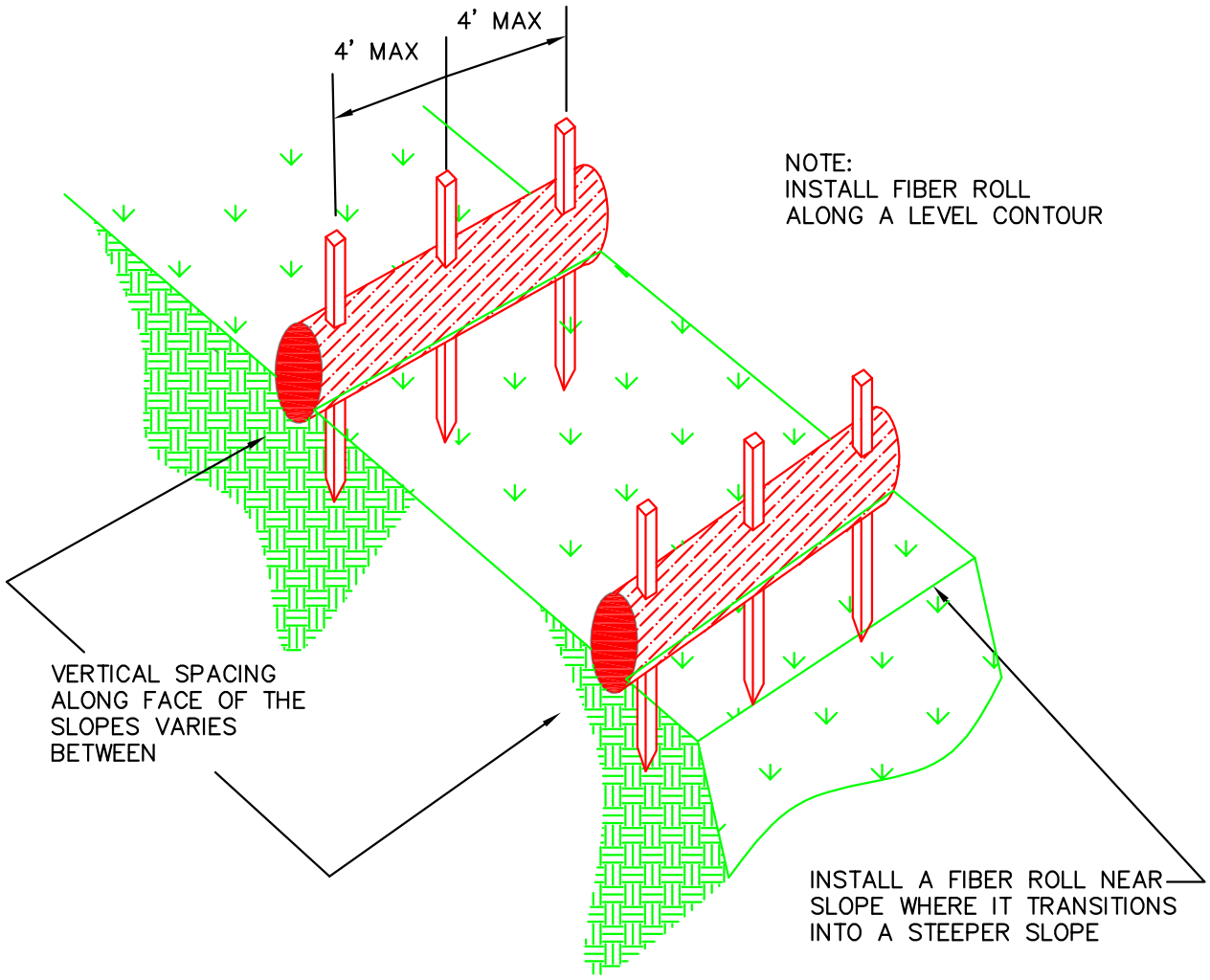
Fiber rolls are typically left in place on slopes. If they are removed after stabilization has been achieved, collect and dispose of the accumulated sediment.

ROBUST ALTERNATIVES

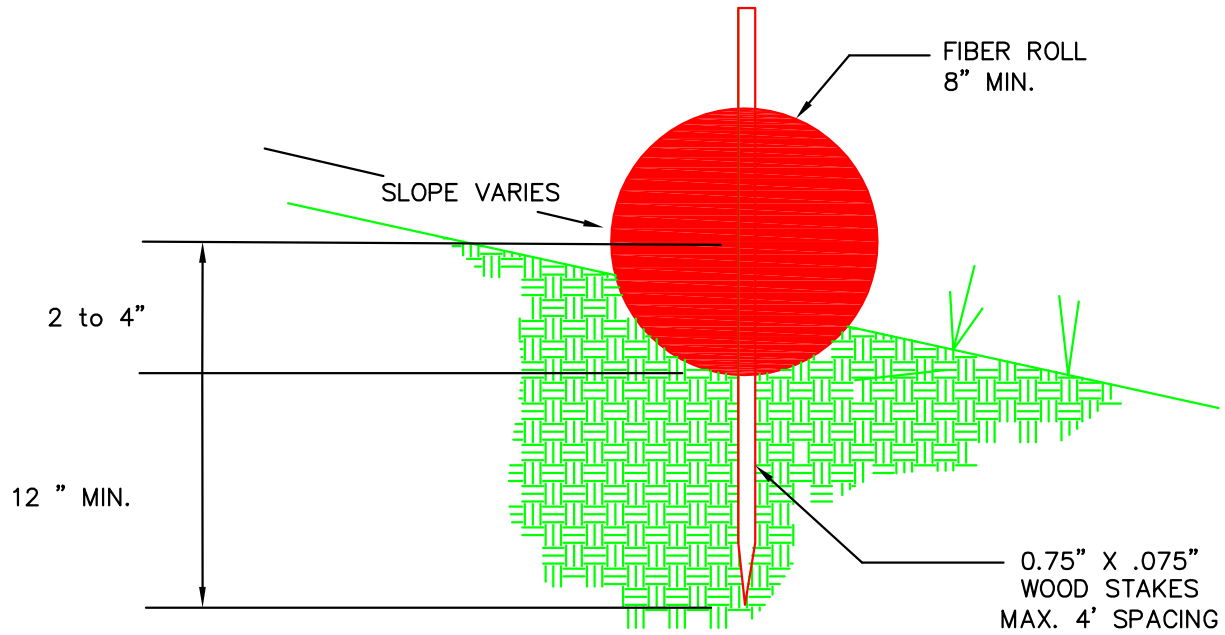
- Compost Sock

COMPANION BMPs

- Erosion Control Blanket



TYPICAL FIBER ROLL INSTALLATION



ENTRENCHING DETAILS

Modified from California Stormwater BMP Handbook

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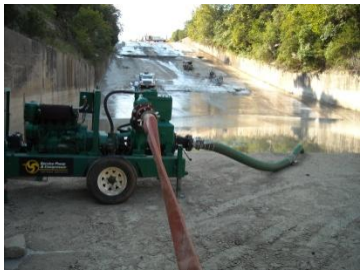
City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES
FIBER ROLLS AND WATTLES		Issued: 10–01–2008 Revised: 06–01–2014	



DEWATERING OPERATIONS

DEFINITION & PURPOSE

Dewatering operations are practices using dewatering bags, filter socks, rock bags or a suction pump with skimmer to manage the discharge of pollutants when stormwater and non-stormwater must be removed from a construction site. Water cannot be directly pumped into storm sewer system, streams, or lakes without first going through a sediment control BMP.

CONDITIONS FOR EFFECTIVE USE

These practices are implemented for removing standing stormwater and allowable non-stormwater discharges from construction sites. Non-stormwater removal includes groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area and are authorized discharges in the state land disturbance permit. Site conditions will dictate the design. A dewatering plan should be submitted as part of the SWPPP detailing the location of dewatering activities, equipment, BMPs and discharge point. Additional permits or special permission from other agencies may be required for some dewatering operations. It is best if stormwater is allowed to settle in the trap or basin for a minimum of 24 hours after the storm event. The intake hose of the dewatering pump should be elevated off the bottom. Dewatering discharges must not cause erosion at the discharge point. See MDNR Guide Section 6-207 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

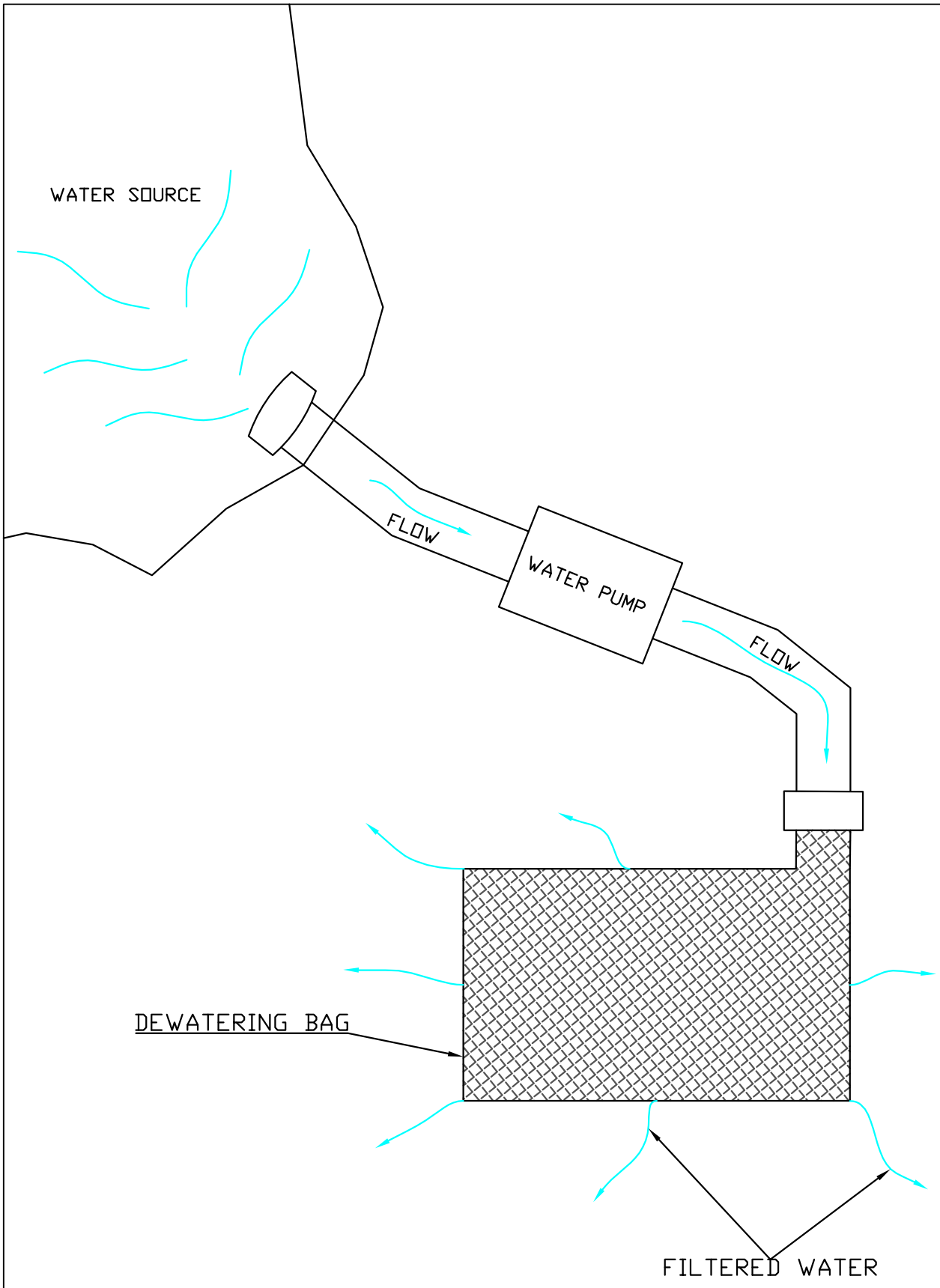
Implement the dewatering plan detailed in the SWPPP as needed to dewater work areas.

OPERATION & MAINTENANCE PROCEDURES

Dewatering operations should be closely attended when in use to ensure BMPs are functioning properly. Accumulated sediment removed during the maintenance of a dewatering device can be incorporated into the site.

SITE CONDITIONS FOR REMOVAL

Remove the dewatering operation when dewatering the site is no longer necessary.



Modified from California Stormwater BMP Handbook

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division	CITY OF Springfield PUBLIC WORKS	CITY OF Springfield ENVIRONMENTAL SERVICES

DEWATERING BAG

Issued: 10–01–2008

Revised: 06–01–2014

SEDIMENT BASIN

DEFINITION & PURPOSE

A sediment basin is a temporary settling pond designed to slowly release runoff, detaining it long enough to allow sediment to settle out. Sediment basins may also be retrofitted to permanent stormwater detention or retention basins after construction has ended.

CONDITIONS FOR EFFECTIVE USE

The basin should be designed by a registered design professional. Sediment basins are required by the state land disturbance permit for each drainage area with 10 or more acres disturbed at one time and shall be sized to contain a volume of at least 3,600 cubic feet per each disturbed acre draining thereto. Other similarly effective BMPs can be specified if a sediment basin is impractical. Sediment basins must have a stabilized spillway and utilize outlet structures that withdraw water from the surface unless infeasible. Basins should be located as close to the sediment source as possible. A sediment basin should not be used in areas of continuously running water (live streams) or in areas where failure of the embankment will result in loss of life, damage to homes or structures, or prevent the use of roadways or utilities. See MDNR Guide Section 6-209 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Sediment basins should be constructed according to the design plans prior to disturbance of the drainage area.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove trash accumulation at outlet. Remove sediment accumulations at a minimum when the basin is 50% full. Any sediment accumulation must be removed prior to converting the sediment basin into a permanent stormwater basin. If not removed, the accumulated sediment reduces the basin's capacity and makes it difficult to achieve adequate vegetation. Repair and reseed any erosion damage on spillway. Repair settlement, cracking, piping holes, or seepage at embankment. Replace gravel around riser if basin does not drain properly.

SITE CONDITIONS FOR REMOVAL

If the basin is to be converted to a permanent stormwater basin, it will remain in place. For temporary sediment basins, remove after upstream areas are stabilized. Grade surface as appropriate and vegetate immediately.

ALTERNATIVES

- Sediment Traps and Check Dams

COMPANION BMPs

- Gravel Bags

SEDIMENT TRAP

DEFINITION & PURPOSE:

A sediment trap is a temporary pond where sediment-laden stormwater is detained, allowing sediment to settle out before runoff is discharged through a stabilized spillway/dewatering pipe.

CONDITIONS FOR EFFECTIVE USE

Sediment traps should be designed by a registered design professional. Sediment traps can be used where runoff can be directed into them at low velocities, typically at the outlets of stormwater diversion structures, channels, slope drains, construction site entrances, vehicle wash areas, or other runoff conveyances. The maximum drainage area is 5 acres. They should be located where sufficient access for sediment removal is available. See MDNR Guide Section 6-177 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install sediment trap prior to disturbance of all other natural vegetation. When excavating an area for a sediment trap, make sure the side slopes are no steeper than 2:1 and the embankment height is no more than 5 feet from the original ground surface. Install an outlet pipe and riser if necessary. Place and compact fill to construct embankments and the spillway. To reduce velocity of runoff from the trap, line the outlet with rip rap and gravel over the riser pipe.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after rain events that cause stormwater runoff to occur on site. Remove trash accumulation. Remove sediment accumulations once sediment reaches ½ the design depth.

SITE CONDITIONS FOR REMOVAL

Remove after upstream areas are stabilized. Grade surface as appropriate and vegetate.

ROBUST ALTERNATIVES

- Sediment Basin

COMPANION BMPs

- Gravel Bags and Compost Sock
- Composted Filter Sock and Triangular Foam Log

STOCKPILE PROTECTION

DEFINITION & PURPOSE

Geotextiles or plastic covers may be placed over stockpiles or disturbed soil areas to protect against wind and/or water erosion. Compost filter sock or sediment fence may also be used when necessary to retain stockpiled sediment.

CONDITIONS FOR EFFECTIVE USE

Applications include small graded areas and stockpiles. The use of plastics and impermeable geotextiles may result in 100% runoff, which may cause erosion problems in the areas receiving the increased velocities and flow. Additional BMPs may need to be installed. Covers can be secured in place with wire staples or sandbags. Avoid stockpiling on impervious surfaces, near storm drains, and on steep slopes. Stockpile side slopes should not exceed 2:1. When installing on slopes, key into the top of the slope and along edges to prevent infiltration of surface water under the geotextile. Seams are typically taped or weighted down their entire length. Off-site borrow/fill areas should also be protected by adequate sediment and erosion control BMPs, and if part of a job ≥1 acre, their location should be noted within the SWPPP.

INSTALLATION/CONSTRUCTION PROCEDURES

Installation should occur when stockpile is generated, dependent upon intended use.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site, checking for erosion, undermining, and anchorage failure. Any failures shall be repaired immediately. If wash-out or breakages occur, the material shall be re-installed after repairing the damage to the slope.

SITE CONDITIONS FOR REMOVAL

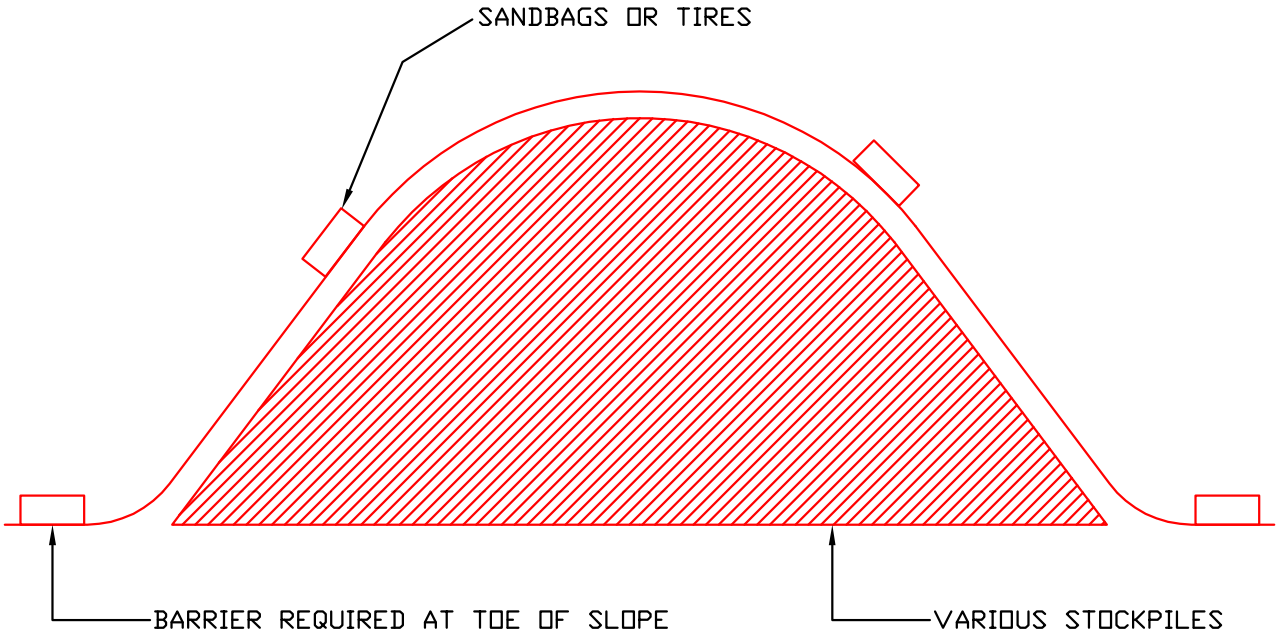
Remove upon establishment of other temporary stabilization BMPs, or after permanent stabilization has occurred.

ROBUST ALTERNATIVES

- Stabilizing stockpile with vegetation.

COMPANION BMPs

- Perimeter control BMP



NOTES:

1. MINIMUM 12" OVERLAP OF ALL SEAMS REQUIRED.
2. BARRIER REQUIRED AT TOE OF SLOPE
3. COVERING MAINTAINED TIGHTLY IN PLACE BY USING SANDBAGS OR TIRES ON ROPE WITH A MAXIMUM 10' SPACING IN ALL DIRECTION

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
PLASTIC SHEETING		Issued: 10–01–2008 Revised: 06–01–2014	

PROTECTION OF PERMANENT INFILTRATION PRACTICES DURING CONSTRUCTION

DEFINITION & PURPOSE

Permanent infiltration practices are post-construction BMPs which are designed to improve the quality and manage the volume of stormwater runoff by encouraging natural infiltration on-site. These practices, which include, but are not limited to, grass swales, infiltration basins and trenches, and pervious pavement and pavers, must be protected during construction in order to prevent them from becoming clogged with sediment and/or compacted by equipment.

CONDITIONS FOR EFFECTIVE USE

In areas where infiltration practices will be installed, soil compaction should be minimized by limiting equipment/vehicle traffic. The first step in protecting permanent infiltration practices during construction is to utilize phasing to minimize the exposure of these structures to sediment. Install pervious pavement, infiltration basins and trenches after all upstream areas have been stabilized. If this is not possible, protect pervious paving with a perimeter control BMP, or leave plastic used for curing in place until all upstream areas have been stabilized. Protect infiltration trenches and basins by placing inlet protection in curb cuts and perimeter control where necessary.

INSTALLATION/CONSTRUCTION PROCEDURES

Before construction, utilize phasing to schedule installation of permanent infiltration practices after stabilization of upstream areas. Use the site map to locate the staging area and stockpiled material away from areas where infiltration practices will be installed. Install structural BMPs immediately following construction of the infiltration practice. See standards and specifications for the BMPs which will be utilized. BMPs may include Phasing, Compost Filter Sock, Gravel Bags, and Inlet Protection.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after rain events that cause stormwater to occur on site. Make sure that areas that will be used for permanent infiltration practices are not becoming compacted by equipment/vehicle traffic, material storage, or other construction activities. Loosen and prepare compacted soil as needed. Remove accumulated sediment from behind structural BMPs. Excavate sediment accumulation in infiltration basins, swales and trenches. If basins and/or trenches will be used as sediment traps during construction to manage stormwater volume, they must be completely excavated prior to adding subbase, base and surface materials for conversion into permanent infiltration practices. Sediment accumulation in pervious paving requires cleaning by sweeper/vacuum truck. Never use a broom to sweep dirt off pervious pavement.

SITE CONDITIONS FOR REMOVAL

Remove after upstream areas are stabilized.

COMPANION BMPs

- phasing/sequencing

HOUSEKEEPING

DEFINITION & PURPOSE

Housekeeping refers to construction site management measures that are designed and implemented to minimize discharge of pollutants from the site. Chemicals, hazardous materials, solid waste, human waste and construction debris are some materials stored on site that can be sources of stormwater pollution without proper BMPs and good housekeeping. Follow manufacturer's specifications and refer to material safety data sheets for proper use and disposal of chemicals.

CONDITIONS FOR EFFECTIVE USE

An effective management system requires training and signage to promote proper storage, handling and disposal of materials. Storage areas should be regularly inspected for compliance. Plans should contain notes clearly stating requirements for addressing potential pollutants. Provide sufficient temporary toilet facilities to serve the number of workers on the site. Temporary sanitary facilities should not be placed on top of storm inlets or near waterways. Secondary containment can be added at the base of porta-potties to address leaks/spills. The porta-pottie can be tied down using t-posts to prevent tipping over. Collection of trash and construction debris should be in covered dumpsters. Products should be stored in original containers and tightly sealed. Fueling should be done in areas that do not receive a substantial amount of runoff and do not drain directly to lakes, creeks, streams, rivers, sewers, groundwater, wetlands, or road ditches. Place waste receptacles near area of work and empty them on a regular basis. All fueling activities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers. Hazardous wastes shall be managed according to Missouri Hazardous Waste Laws and Regulations. Install appropriate signage. Post guidelines for proper handling, storage and disposal of materials, and emergency spill clean-up on site. See MDNR Guide Section 2 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Good housekeeping starts concurrently with work at the site.

OPERATION & MAINTENANCE PROCEDURES

Inspect for good housekeeping in storage areas and throughout the site weekly and within 48 hours of every rain event which causes stormwater runoff to occur on site. Maintenance of temporary toilet facilities should be frequent and thorough. Make necessary corrections and repairs.

SITE CONDITIONS FOR REMOVAL

Housekeeping measures can be removed at the completion of the project.

POLLUTION PREVENTION PROCEDURES
(GENERAL POLLUTION NOTES)

CITY OF Springfield ENVIRONMENTAL SERVICES

SPILL PREVENTION CONTROLS

Keep a spill kit on-site with equipment necessary for spill clean-up. Equipment and materials include, but are not limited to: brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sawdust, oil-absorbent booms, and trash containers.

FUELING, MAINTENANCE OF EQUIPMENT & VEHICLES

No fueling, servicing, maintenance or repair of equipment or machinery should be done within 100 feet of a stream, or within 150 feet of a classified stream, losing stream, or sinkhole. Tarps or drop cloths and drip pads should be used when servicing, repairing, or performing maintenance on construction equipment in the field. When work is complete, the contaminated materials should be disposed of appropriately.

WASHING OF EQUIPMENT & VEHICLES

No wash water is allowed to discharge into storm drains or drainage way without proper treatment.

PESTICIDES, HERBICIDES, INSECTICIDES, FERTILIZERS & LANDSCAPE MATERIALS

Exposure of these chemicals to precipitation and stormwater on-site should be minimized.

DIESEL FUEL, OIL, HYDRAULIC FLUIDS, OTHER PETROLEUM PRODUCTS & CHEMICALS

All fueling facilities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers. All fuel, oil, and other fluids exposed to precipitation shall be stored in watertight, structurally sound, closed containers. Minimize the discharge of fluids from spills and leaks by implementing chemical spill and leak prevention and response procedures, including, but not limited to, installation of containment berms and use of drip pans. Machinery should be kept out of the waterway as much as possible.

HAZARDOUS OR TOXIC WASTE

Hazardous wastes shall be Missouri Hazardous Waste Laws and Regulations. Post guidelines for proper handling, storage and disposal of materials, and emergency spill cleanup on site. An accurate, up-to-date inventory of materials delivered and stored on-site should be kept. Retain original labels and material safety data sheets. All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored using best management practices. Materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers with proper labels. Store bagged and boxed materials on pallets. Cover bagged and boxed materials during non-working days and prior to rain events. Incompatible materials, such as ammonia and chlorine, must not be stored in the same temporary containment facility. Containers for proper disposal of waste paints, solvents, and cleaning compounds shall be provided. All hazardous wastes that are transported, stored, or used for maintenance, cleaning, or repair shall be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations. For guidance, contact 1-800-361-4827.

CONCRETE WASH-OUT PIT

DEFINITION & PURPOSE

Concrete wash-out pits are used to contain concrete wash-out when truck chutes, drums and/or hoses are rinsed out after delivery to construction site. Disposal can occur when concrete wash-out becomes a solid. Concrete wash-out water is a pollutant because of the high pH level and chemical additives in the wash-out. Concrete wash-out management prevents the contamination of stormwater with high Ph and additives that may cause adverse impact to water quality.

CONDITIONS FOR EFFECTIVE USE

Concrete wash-out pits must be implemented on construction projects where concrete slurries are generated. Wash-out should be located a minimum of 50 feet from storm drains, ditches, and 100 feet from classified streams, losing streams or sinkholes. Design concrete wash-out pits to sufficiently hold all liquid and concrete waste. Plastic liner should be a minimum of 10 mil. polyethylene sheeting. See MDNR Guide Section 6-63 for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install concrete wash-out pits prior to concrete pouring activities. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

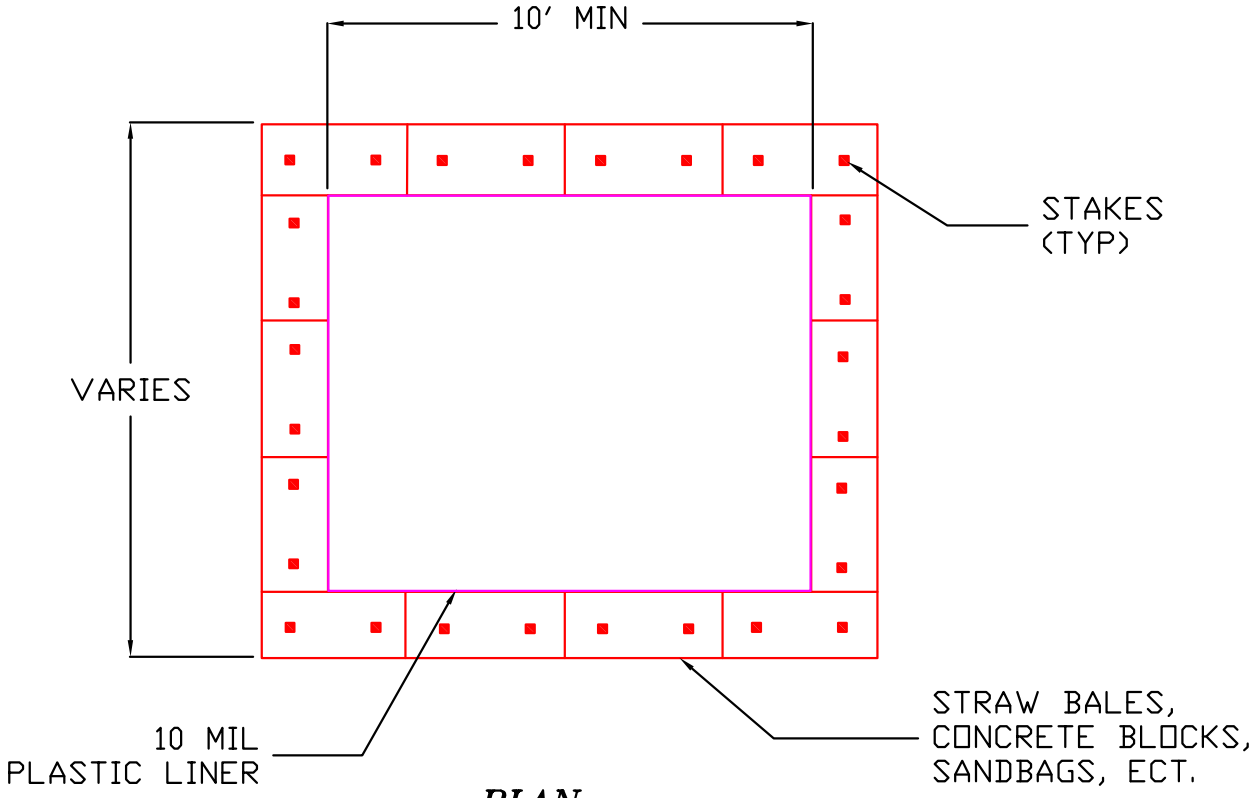
Inspect every week and within 48 hours after a rain event that causes stormwater runoff to occur on-site. Remove and dispose of solid concrete material. Wash-out facilities must be cleaned when volume reaches 75% of capacity. Cover the concrete wash-out pit before predicted rain events to prevent overflow.

SITE CONDITIONS FOR REMOVAL

Remove concrete wash-out pit when concrete wash-out activity ceases.

ALTERNATIVES

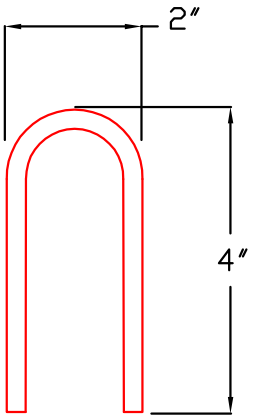
- Return unwanted concrete back to concrete batch plant to wash-out, proprietary disposal boxes, roll-off dumpster

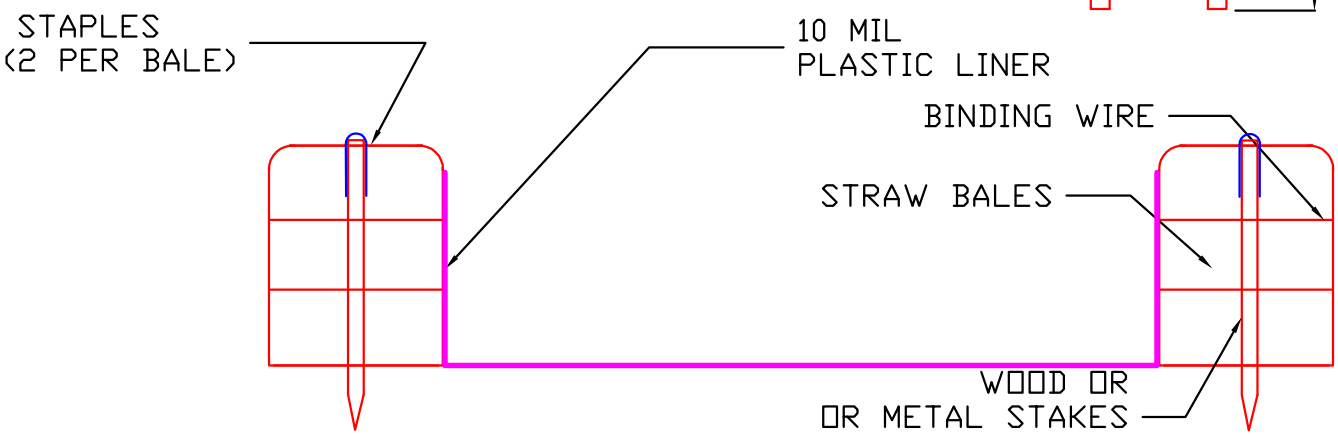


PLAN

NOTES:

1. ACTUAL LAYOUT DETERMINED IN FIELD
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY





SECTION

NTS

City of Springfield, Missouri	Department of Public Works Storm Water Services Division		
CONCRETE WASHOUT–ABOVE GRADE		Issued: 10–01–2008 Revised: 06–01–2014	