5.15 OUTLET PROTECTION
(ES BMP 1.36)

Definition

Structurally lined aprons or other acceptable energy dissipating devices placed at the outlets of pipes (See Plate 5.15a) or paved channel sections (see Plate 5.15c). The most common types are riprap aprons or concrete aprons with energy dissipator blocks or walls.

Purpose

To prevent scour at stormwater outlets and to minimize the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions Where Practice Applies

Applicable to the outlets of all pipes and paved channel sections where the velocity of flow at design capacity of the outlet will exceed the permissible velocity of the receiving channel or area.

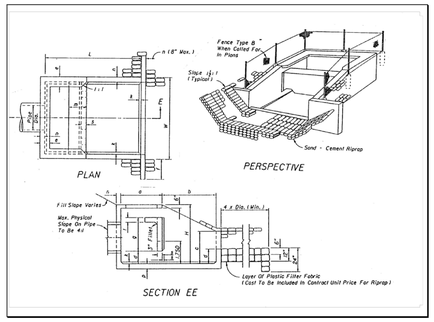

Plate 5.15a Energy Dissipator
Source: FDOT

Construction Specifications

Subgrade preparation for all types of outlet protection shall follow guidelines presented in EARTHWORK SPECIFICATIONS - Section 5.00. Riprap outlet protection aprons shall be installed in accordance with RIPRAP - Section 5.16. Reno mattresses can also be used as per GABIONS AND RENO MATTRESSES - Section 5.19. Underlying geotextiles shall be anchor trenched in at least 6" -9" (15 - 25 cm) and backfilled (see Plate 5.15b).

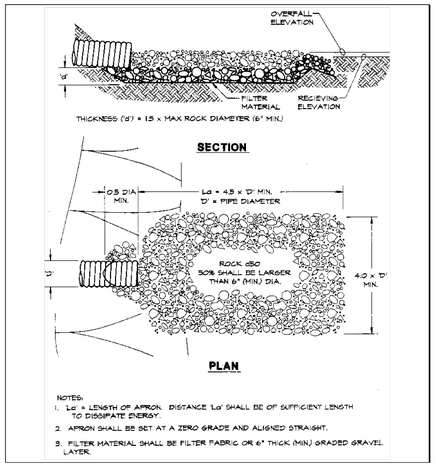

Plate 5.15b Energy Dissipator
Source: Erosion Draw

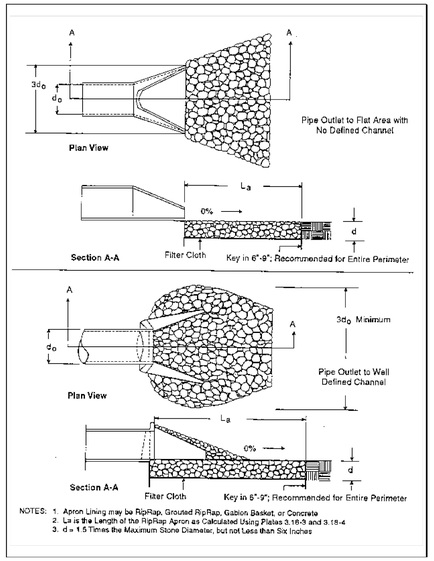

Plate 5.15c Pipe Outlet Conditions
Source: Virginia DSWC

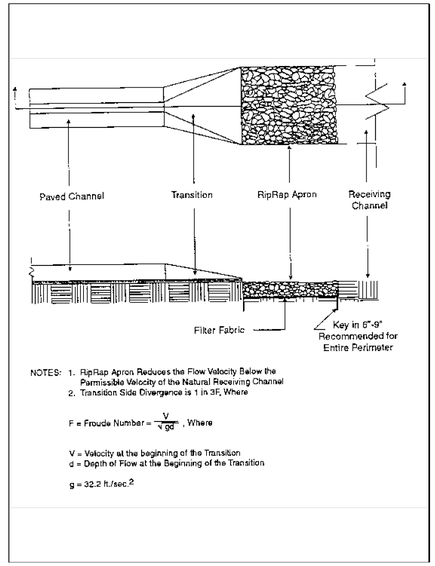

Plate 5.15d Paved Channel Outlet
Source: Virginia DSWC

OP **OUTLET PROTECTION** NTS

6.67 SODDING
(ES BMP 1.67)

Definition

Stabilizing fine-graded disturbed areas by establishing permanent grass stands with sod.

Purposes

1. To establish permanent turf immediately.
2. To prevent erosion and damage from sediment and runoff by stabilizing the soil surface.
3. To reduce the production of dust and mud associated with bare soil surfaces.
4. To stabilize drainageways where concentrated overland flow will occur.

Conditions Where Practice Applies

1. Disturbed areas which require immediate vegetative covers, or where sodding is preferred to other means of grass establishment.
2. Locations particularly suited to stabilization with sod are:
   a. slopes and buffer strips.
   b. waterways and swales, especially around drop inlets.
   c. residential or commercial lawns where quick use or aesthetics are factors.

Specifications

Soil Preparation

1. Prior to soil preparation, areas to be sodded shall be brought to final grade in accordance with the approval plan. These operations should leave as much topsoil as possible or replace the topsoil to a depth of four inches (10 cm).
2. Soil tests should be made to determine the exact requirements for lime and fertilizer. Soil tests may be conducted by the State Laboratory at the University of Florida or a reputable commercial laboratory. Information on state soil tests is available from county agricultural extension agents.

   When a soil test is not made the following soil amendments should be made:

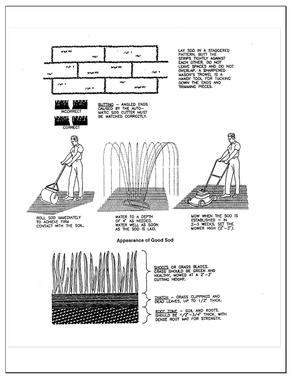

Plate 6.67a Sodding
Source: Virginia DSWC

Pulverized agricultural limestone at 100 lbs./1000 ft^2 (2 tons/acre)(4.48 t/ha)

Fertilizer at 25 lbs./1000 ft^2 (1000 lbs./acre)(1.12 t/ha) of 10-10-10 in fall or 25lbs./1000 ft^2 of 5-10-10 in spring. NOTE: Equivalent nutrients may be applied with other fertilizer formulations.

These amendments shall be spread evenly over the area to be sodded, and incorporated into the top 3 - 6 inches (8 - 15 cm) of the soil by discing, harrowing or other acceptable means.

3. Prior to laying sod, the soil surface shall be clear of trash, debris, roots, branches, stones and clods in excess of 2 inches (5 cm) in length or diameter. Sod shall not be applied to gravel or other non-soil surfaces.
4. Any irregularities in the soil surface resulting from topsoil or other operations shall be filled or leveled in order to prevent the formation of depressions or water pockets.
5. Areas to be topsoiled and topsoil used shall fulfill the requirements of TOPSOILING - Section 6.61 (ES BMP 1.61). No sod shall be spread on soil which has been treated with soil sterilants until enough time has elapsed to permit dissipation of toxic materials.

Sod Quality

1. Sod should be free of weeds and undesirable coarse weedy grasses. If possible, Certified or Approved turfgrass sod should be used.
2. Sod shall be machine cut at a uniform soil thickness of 3/4 inch (20 mm), plus or minus 1/4 inch (6 mm), at the time of cutting. This thickness shall exclude shoot growth and thatch.
3. Pieces of sod shall be cut to the supplier's standard width and length, with a maximum allowable deviation in any dimension of 5%. Torn or uneven pads will not be acceptable.
4. Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended from a firm grasp on one end of the section.
5. Sod shall be not cut or laid in excessively wet or dry weather.
6. Sod shall be harvested, delivered, and installed within a period of 36 hours

Sod Installation

A. Solid Sodding (Plate 6.67a)

1. Irrigate areas to be sodded with a minimum of 1/2-inch (13 mm) of water unless

recent rains have provided equivalent moisture.

2. The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and butting tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which would cause drying of the roots.

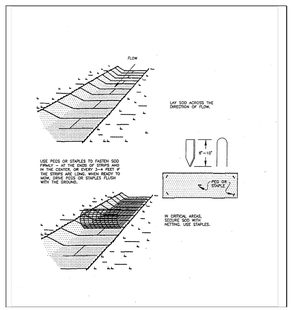

Plate 6.67b Sodding Swales and Waterways
Source: Virginia DSWC

3. On slopes 3:1 or greater, or wherever erosion may be a problem, sod shall be laid with staggered joints and secured by pegging or other approved methods. Sod shall be installed with the length perpendicular to the slope (on the contour). Begin laying sod at the bottom of the slope and work uphill. On very steep slopes, the use of ladders will facilitate the work and prevent damage to the sod.
4. Surface water cannot always be diverted from flowing over the face of the slope, but a capping strip of heavy jute or erosion netting, properly secured, along the crown of the slope will provide extra protection against lifting and undercutting of sod. This same technique can be used to fortify sod in water-carrying channels and other critical areas. Use wire staples to anchor heavy jute or erosion netting in channels.
5. As sodding of clearly defined areas is completed, sod shall be rolled or tamped to provide firm contact between roots and soil.
6. After rolling, sod shall be irrigated to a depth sufficient that the underside of the sod pad and the soil 4 inches (10 cm) below the sod is thoroughly wet.
7. During the first week, in the absence of adequate rainfall, watering shall be performed as often as necessary to maintain moist soil to a depth of at least 4 inches (10 cm).
8. The first mowing shall not be attempted until the sod is firmly rooted, usually after 2 - 3 weeks. Not more than 1/3 of the grass leaf should be removed at any one cutting.

B. Spot Sodding

1. Spot sodding is the planting of plugs or blocks, a minimum of 4 inches (10 cm) in diameter or square, of sod at measured intervals. The plugs or blocks should be placed one foot (30 cm) apart.
2. Sod spots within a row should be placed alternately and not directly opposite sod spots in adjacent rows.
3. Fit the plugs or blocks tightly into prepared holes and tamp them firmly into place.
4. Irrigate to a depth sufficient that the underside of the sod spot and the soil 4 inches (10 cm) below the sod is thoroughly wet.

C. Strip Sodding

1. Areas to be strip sodded should be fertilized, limed, prepared and smoothed as in solid sodding.
2. Lay the strips end to end in rows that are from 1 to 1-1/2 feet (30 to 45 cm) apart with the strips a minimum of 2 to 4 inches (5 to 10 cm) wide.

3. Roll or tamp the strips thoroughly to provide firm contact between roots and soil.
4. Irrigate to a depth sufficient that the underside of the strips and the soil 4 inches (10 cm) below the strips are wet.

D. Sodded Swales and Waterways (Plate 6.67b)

1. Care should be taken to prepare the soil adequately in accordance with this specification. The sod type shall consist of plant materials able to withstand the designed velocity. (See STORMWATER CONVEYANCE CHANNELS - Section 6.35 (ES BMP 1.35).
2. Sod strips in swales and waterways shall be laid perpendicular to the direction of flow. Care should be taken to butt ends of strips tightly.
3. After rolling or tamping, sod shall be pegged or stapled to resist washout during the establishment period. Chicken wire, jute or other netting may be pegged over the sod for extra protection in critical areas.
4. All other specifications for this practice shall be adhered to when sodding a swale or waterway.

Maintenance of Established Sod

1. After the first week, sod shall be watered as necessary to maintain adequate moisture in the root zone and prevent dormancy.
2. Apply lime and fertilizer under a regular program based on soil tests and on the use and general appearance of the vegetative cover. In the absence of a soil test apply 1 - 2 tons/acre (45 - 90 lbs./1000 ft^2)(2.24 to 4.48 t/ha) of finely ground agricultural limestone every three years. Apply 400 - 500 lbs./acre (9 - 18 lbs./1000 ft^2)(450 - 560 kg/ha) of 10-10-10 fertilizer. To obtain better vegetative cover, topdress with 150 - 300 lbs./acre (6 - 12 lbs./1000 ft^2)(170 - 340 kg/ha) of 16-4-4 fertilizer during the growing season, but at least six weeks before the end of the growing season. If Centipede or St. Augustine grass is used, do not apply more than 1 pound of actual nitrogen per 1000 ft^2 (20 - 40 lbs./acre)(22 - 44 kg/ha).
3. Mow to control weeds, improve the appearance of the vegetative cover, and to reduce fire hazard, as necessary. In general, the coarser the leaf texture of the grass, the higher it should be cut. Continuous close mowing will result in loss of vigor and reduced stand. No more than 1/3 of the grass leaf should be removed in any mowing.

SO **SODDING** NTS

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REVISIONS:

C1	1ST COUNTY COMMENTS	04/05/2021
C2	2ND COUNTY COMMENTS	06/04/2021

ISSUE DATE:

	ALT. STANDARDS	12/17/2020
	PRELIMINARY SITE PLAN	01/12/2021
	COUNTY COMMENTS	04/05/2021
	ISSUE FOR BID	06/04/2021

DRAWN BY: INGENIUM

PANDA PROJECT #: D8135
PANDA STORE #:
ARCH PROJECT #:

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