



Module 3.

Erosion and Sediment Control Practices



Module 3

Introduction

MODULE 3 | ESC MEASURES



Technical Assistance

•Section 62.1-44.15:52. B. of the VESCL requires the Department to provide technical assistance and advice to, and conduct and supervise educational programs for VESCP authorities.

•One way the Department accomplishes this is with the Virginia Erosion and Sediment Control Handbook



MODULE 3 | ESC MEASURES



Virginia Erosion and Sediment Control Handbook (Table 3-1)

Chapter 1	Introduction
Chapter 2	Erosion and Sediment Control Principles, Practices and Cost
Appendix	Wall Chart (Unified Coding System)
Chapter 3	State Minimum Standards and Specifications
Chapter 4	Stormwater Runoff
Chapter 5	Engineering Calculations
Chapter 6	Preparing an Erosion and Sediment Control Plan
Appendices	6-A: Soils Information 6-B: Soil Survey Information 6-C: List of Soil Types
Chapter 7	Administrative Guidelines
Appendices	7-A: Sample Administrative Forms 7-B: Enforcement Flow Chart 7-C: Directory
Chapter 8	Virginia Erosion and Sediment Control Law and Regulations
Appendix	Glossary

Technical Assistance

- Safety (3.01)
- Road Stabilization (3.02, 3.03)
- Sediment Barriers (3.04, 3.05, 3.06, 3.07, 3.08)
- Dikes and Diversions (3.09, 3.10, 3.11, 3.12)
- Sediment Traps and Basins (3.13, 3.14)
- Flumes (3.15, 3.16)
- Waterway and Outlet Protection (3.17, 3.18, 3.19, 3.20, 3.21)
- Stream Protection (3.22, 3.23, 3.24, 3.25, 3.26, 3.27)
- Subsurface Drainage (3.28)
- Site Preparation for Vegetative Establishment (3.29, 3.30)
- Grass Establishment (3.31, 3.32, 3.33, 3.34)
- Mulches (3.35, 3.36)
- Other Vegetative Controls (3.37, 3.38)
- Dust Controls (3.39)

MODULE 3 | ESC MEASURES



Organization of ESCH Specifications

- Definition
- Purpose
- Condition Where Practice Applies
- Planning Considerations
- Design Criteria
- Construction Specifications
- Maintenance

MODULE 3 | ESC MEASURES



Module 3

The Erosion and Sediment Control Specifications (for inspectors)

Turn to Chapter 3 in your handbook

MODULE 3 | ESC SPECIFICATIONS



3.01 (SAF) – Safety Fence (p. III-1)

Safety fence is not a ESC Practice; but
is a protective barrier used for:

- Delineation of project or property boundary
- Limiting access/Public safety/Traps, Basins
- Delineation of areas not to be disturbed or protected (i.e., for tree protection or areas used in the future for stormwater infiltration practices)

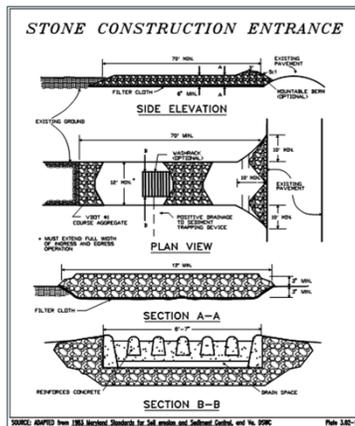


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3.02 (CE) – Construction Entrance (p. III-6)

- Prevents tracking of mud
- MS 4 & 17 (Minimize tracking of mud/dirt into paved public roads)



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Design/Construction Specifications (p. III-7)

- 6" thick - 12' wide & 70' long
- Excavated 3"
- VDOT #1 aggregate (2-3" stone)
- Filter cloth under
- Wash water must be carried to an approved settling area (wash rack)



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Maintenance per MS17

- Mud shall be removed from paved areas at the end of the day.
- Cleaning of pavement shall be done by shoveling and sweeping
- Wash pavement ONLY after shoveling and sweeping



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Construction entrance problems



3.03 (CRS) – Construction Road Stabilization (p. III-11)

Design/Construction Specifications (p. III-12); **MS 1**

Installed per approved plan (14' = 1 way; 20' = 2 way)

- Correct stone size (VDOT #1)
- Inspect for sediment accumulation on stone



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3.04 (STB)– Straw Bale Barrier (p. III-14)

Design/Construction Specifications (p.III-15)

- MS-4
- Life span = less than 3 months
- Can only be used for sheet flow conditions (total drainage area $\frac{1}{4}$ acre per 100 feet)
- Installed on contour (no end runs)
- 2 Stakes per bale
- Entrenched and backfilled
- Cleanout sediment ($\frac{1}{2}$ the barrier height) p.17



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Straw Bale Problems



3.05 (SF) – Silt Fence (p. III-19)

Design/Construction Specifications
(p. III-20-21)

- MS 4
- Should only be used for sheet flow conditions (total drainage area $\frac{1}{4}$ acre per 100 feet)
- However, if constructed across a ditch concentrated flow should be <1 cfs
- Should be installed on contour (no end runs)



3.05 (SF) – Silt Fence (p. III-19)

Design/Construction Specifications (p. III-20-21)

- To be placed 5-7 feet beyond the base of a slope > 7%
- Height above ground

Min=16"

Max= 34"

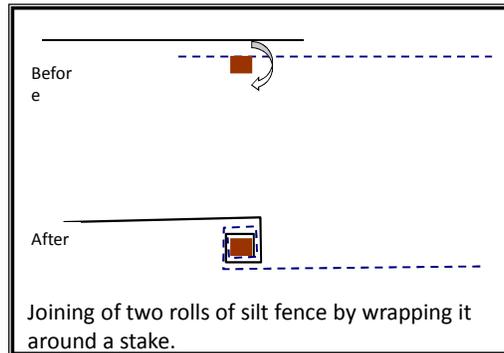


3.05 (SF) – Silt Fence (p. III-19)



In joints that overlap, min. of 6" of fabric around the stake (p. III-23)

Joining two sections of silt fence



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3.05 (SF) – Silt Fence (p. III-26)

Maintenance

- Inspect after rainfall events
- Repair areas of end runs or undercutting
- Life span ~ 6 months
- Cleanout ($\frac{1}{2}$ barrier height)
- Remove when no longer needed (MS18)

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3.07 (IP) – Storm Drain Inlet Protection (P. III-31)

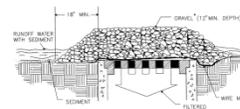
MS-10

Types of drop inlet structures:

1. Silt fence
2. Gravel and wire
3. Block and gravel
4. Others*



GRAVEL AND WIRE MESH
DROP INLET SEDIMENT
FILTER



Storm Drain Inlet Protection MS-10

Design/Construction Specifications (p. III-33)

- Max. Drainage Area = 1 Acre
- Shall not create excessive ponding
- Filter fabric can be added



Storm Drain Inlet Protection MS-10

Design/Construction Specifications (p. III-33-34)

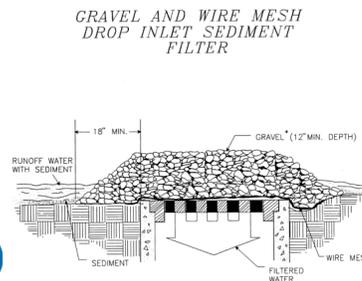
- Silt Fence Drop inlet IP
- Use 2 X 4 stakes for vertical and horizontal
- Space 2 X 4's 3 feet apart
- Entrench fabric 12 inches around inlet (see detail p. III-35)



Storm Drain Inlet Protection MS-10

Design/Construction Specifications (p. III-34)

- Gravel & Wire Mesh Drop inlet IP
- Use ½" wire mesh over inlet
- Place stone over the wire
- Depth of stone shall be at least 12 inches
- Can also be used for curb inlets (p. 37)



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Storm Drain Inlet Protection MS-10

Design/Construction Specifications (p. III-34)

- Block & Gravel Drop inlet IP
- Use 4", 8" or 12" concrete block
- Shall be at least 12" high
- Use ½" wire mesh



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3.07 (IP) – Storm Drain Inlet Protection (P. III-42) MS-10

Wooden weir & Block and gravel curb inlet protection



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Inlet Protection Problems



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More Inlet Protection Problems



Maintenance



Other Inlet Protection Devices



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3.08 (CIP) – Culvert Inlet Protection (p. III-46) MS-10

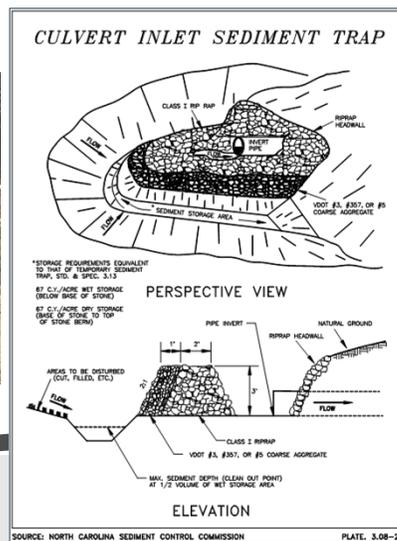
Silt fence culvert inlet protection

- Must be constructed in a manner to facilitated clean out
- Provides protection from disturbed area above the culvert
- Types include:
 - Silt Fence
 - Sediment Trap



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3.08 (CIP) – Culvert Inlet Protection (p. III-48) MS-10

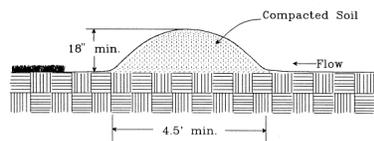


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3.09 (DD) – Temporary Diversion Dike (p. III-52)

- Temporary measure, usually to be installed as a first step measure (MS-4) and to be stabilized immediately (MS-5)
- Must have a positive grade, stable outfall or outlet

TEMPORARY DIVERSION DIKE



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Problem temporary diversion dikes

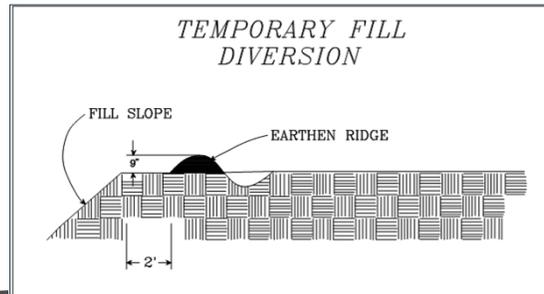
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Problem temporary diversion dikes

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3.10 (FD) – Temporary Fill Diversion (p. III-56) MS-7 & 8

- Temporary structural measure, usually installed at the end of a working day on an active fill slope
- Needs positive grade to stable outfall
- Does **NOT** require stabilization = Maximum life 1 week
- Min. height = 9 inches



SOURCE: VA. DSWC

PLATE 3.10-1



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Incorrect construction of a Temporary Fill Diversion



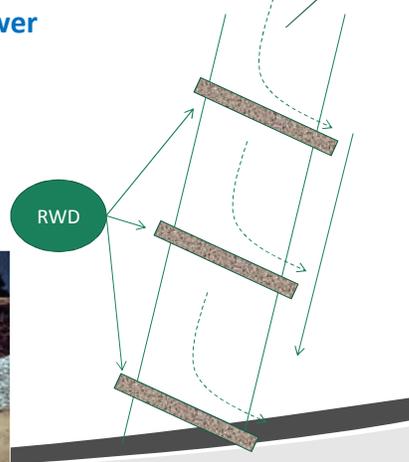
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3.11 (RWD) – Temporary Right-of-Way Diversion (p. III-60) MS-7 & 8

Unpaved road/right-of-way

- Used to shorten slope length and lower velocity of runoff
- Min. height 18 inches
- Needs proper spacing (p.63)
- Needs to outfall to stabilized area
- Mountable by vehicles

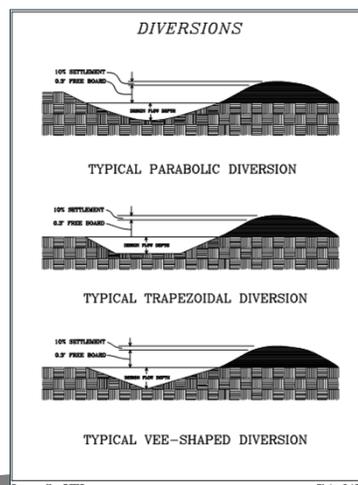


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3.12 (DV) – Diversions (p. III-65) MS-7 & 8

- Diversions are permanent and installed for a very specific reason
- Associated with a channel on the upslope side
- Need to be stabilized immediately after construction before making active (MS-5)
- Requires outlet protection



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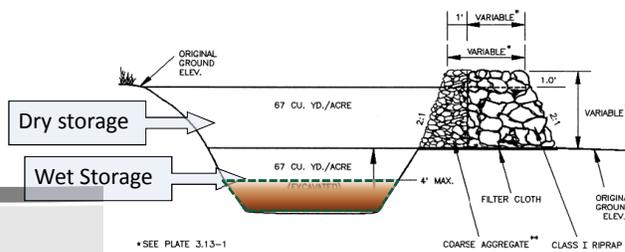


3.13 (ST) – Temporary Sediment Trap (p. III-70)

MS-6 (a)

- Must have a storage capacity of 134 cubic yards per acre of drainage area
- Storage volume = 50% dry; 50% wet
- Drainage areas less than 3 acres

TEMPORARY SEDIMENT TRAP



Sediment Trap Inspection Considerations

- **Maintenance (p. III-75)**
 - **Must be cleaned out when sediment reaches half of the wet storage volume**
 - **Inspect at least once every two weeks and repair any damage immediately; and**
 - **Make sure outlet rock is not clogged**

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Sediment Trap Examples



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Sediment Trap Inspection Problems



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Sediment Trap Inspection Problems



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3.14 (SB) - Temporary Sediment Basin (p. III-77)

MS-6 (b)

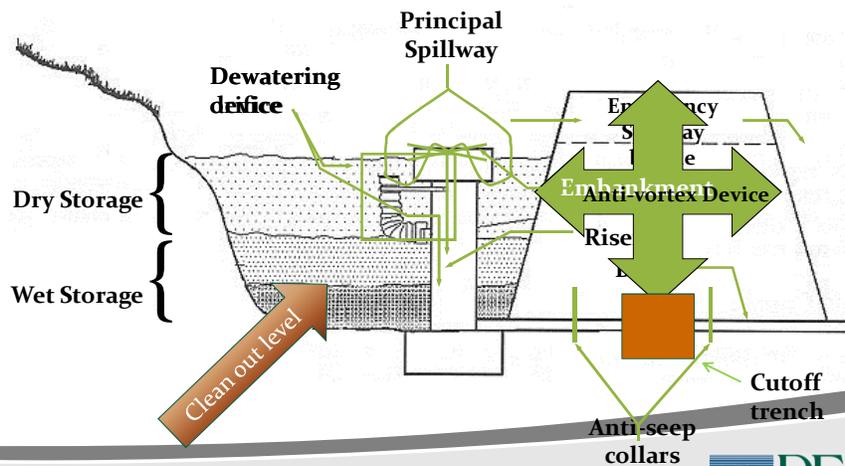
- Required for drainage areas ≥ 3 acres
- Shall have a capacity of 134 cubic yards per acre of drainage



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3.14 (SB) - Temporary Sediment Basin



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Sediment Basin Construction Specifications (p. III-88-89)

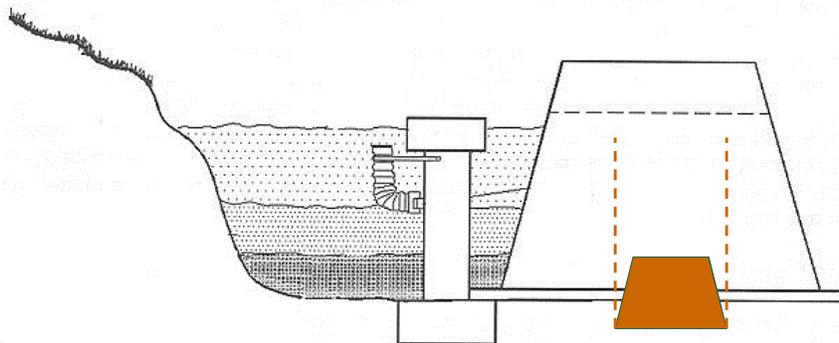
- Embankment
 - Cross sections (width height, slope) must be in accordance with the approved plan
 - Fill material shall be approved and shall achieve a compaction of 95%
 - Must be placed and compacted in 6 inch layers or lifts

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Sediment Basin Construction Specifications (p. III-88)

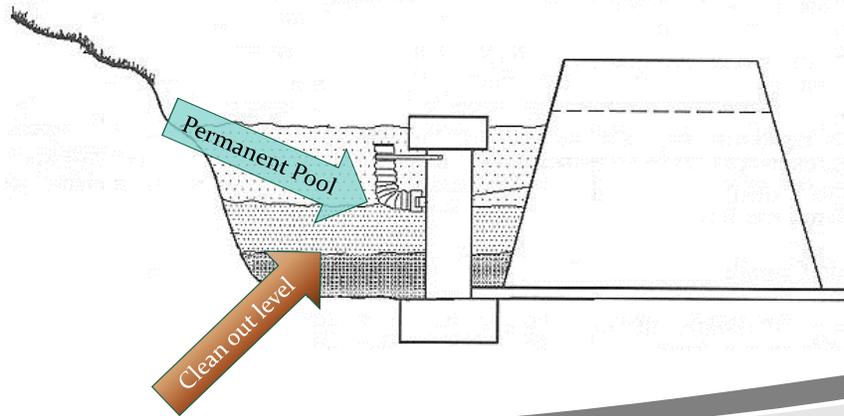
- The cutoff trench must be installed properly



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Sediment Basin Maintenance (p. III-90)



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Sediment Basin Examples



Sediment Basin Problem



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Sediment Basin Problem



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3.15 (TSD) – Temporary Slope Drain (p. III-116)

- Used in conjunction with a diversion dike
- MS-8



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Temporary Slope Drain Design/ Construction Specifications (p. III-117- 118)

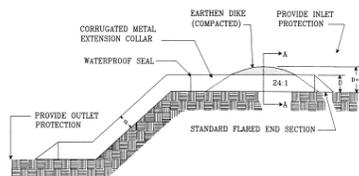
- Entrance of the drain is located at a low point
- The dike at the inlet of the drain must be properly compacted



Temporary Slope Drain Design/ Construction Specifications (p. III-118-119)

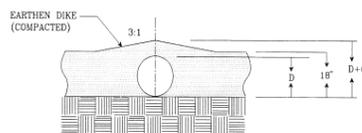
- Entrance of the drain has a slope of ½ inch per foot
- Make sure slope drain has been properly anchored down the slope with water tight fittings
- Make sure proper outlet protection is installed

TEMPORARY SLOPE DRAIN



SECTION VIEW

NOTE: SEDIMENT MAY BE CONTROLLED AT OUTLET IF UPLAND PONDING WILL CREATE PROBLEMS



SECTION A - A

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Incorrect Temporary Slope Drain examples

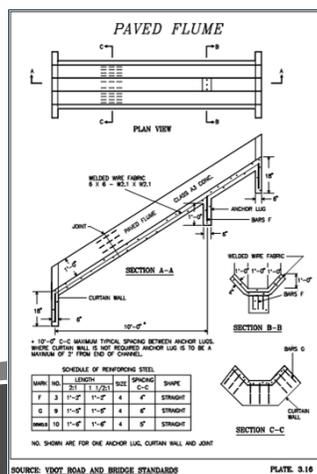


3.16 (PF) – Paved Flume (p. III-123)

Is a permanent paved/concrete channel constructed on a slope MS-8, 10 or 11



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3.17 (SCC) – Stormwater Conveyance Channels (p. III-130) MS-5, 19

Three different types:
Grass, Rip-Rap, Concrete
 Three different shapes:
V-Shape, Parabolic and Trapezoidal



Stormwater Conveyance Channel

Inspection Items

- In rip rap or concrete lined channels, the finished cross-section and elevation of the stone or concrete is \leq elevation of the diversion or tributary @ the point of intersection.

Stormwater Conveyance Channel

Inspection Items

- For rip rap channels, was filter cloth installed underneath?
- For concrete channels were expansion joints installed every 100 feet?

Stormwater Conveyance Channel

Inspection Items

- **Grass lined channels must be stabilized before made operational**
- **All channels need: outlet protection and to discharge into an adequate channel**

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Stormwater Conveyance Channel

Inspection Items

- **Erosion in a grass lined channel may occur because of excessive velocity**
- **Channels should be inspected frequently for erosion & under scour**
- **See table on page III-135**

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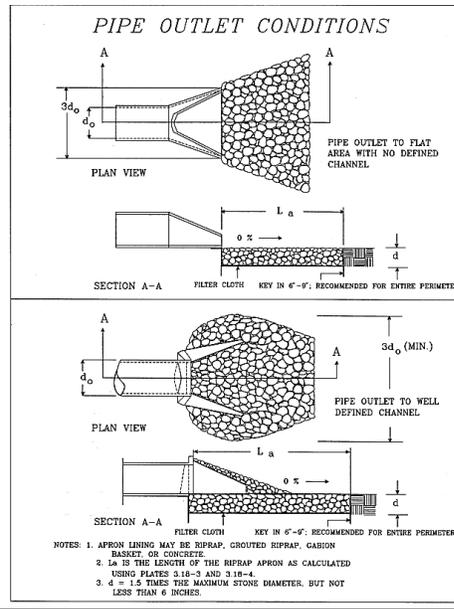


Examples of Stormwater Conveyance Channels



3.18 (OP) – Outlet Protection (p. III-154)

Used to dissipate energy of runoff discharged from channels, pipes, conveyances (MS-11) and prevent erosion in the receiving channel.



3.18 (OP) – Outlet Protection (p. III-155)

- Installed at 0% grade
- First excavate to depth shown on the approved plan or details
- Install filter fabric
- Place rock to correct depth, length and width
- Smooth transition with natural channel
- If in a well defined channel, side slope no greater than 2:1

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3.18 (OP) – Outlet Protection (p. III-155)



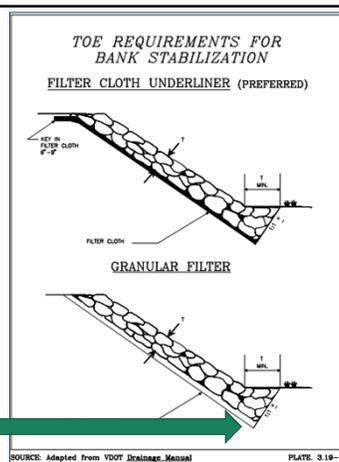
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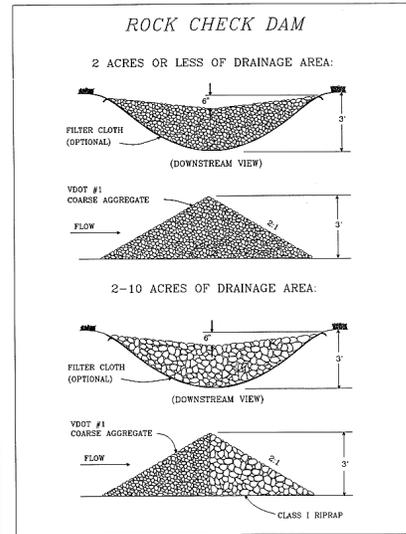
3.19 (RR) – Riprap (p. III-166) MS-7, 11 & 19

- Make sure there is a filter fabric underlayment
- Check the stone size to make sure it is correct
- Should be laid to full thickness in one operation
- Make sure the toe was installed



3.20 (CD) – Rock Check Dams (p. III-185)

- Verify correct stone size was used
- Two stone sizes depending on drainage area
- Verify stone was laid correctly and center of the dam is 6 inches lower than edges



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3.20 (CD) – Rock Check Dams (p. III-185) Design/Construction Specifications (p. III-186-188)

- Used to reduce velocity in a ditch or swale
- Max. height is 3 feet.
- Remove accumulated sediment when it exceeds half the height of the dam



3.20 (CD) – Rock Check Dams (p. III-185)



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3.20 (CD) – Rock Check Dams (p. III-185)



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3.23 (SSS) – Structural Streambank Stabilization (p. III-210) MS-15

- Often part of a stream restoration project or erosion abatement
- Can be done with rip rap, gabions or other non-erodible materials
- Limit the disturbed area while stabilization excavation is being performed
- What other MS would apply?



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3.24 (SC) – Temporary Vehicular Stream Crossing (p. III-218-219) MS-13

- Temporary crossings should be constructed of non-erodible materials
- The type will depend on drainage area
- Bridges must be anchored



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3.24 (SC) – Temporary Vehicular Stream Crossing (p. III-219) MS-13

- Make sure sediment trapping measures have been installed along the access road leading to the stream crossing (div. dikes, silt fence, const road stabilization)



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3.24 (SC) – Temporary Vehicular Stream Crossing (p. III-219) MS-13

- Culvert crossing p.221
- Filter cloth placed on bed & back before pipe placement
- Proper stone size and stabilization over the pipes are critical



3.25 (USC) – Utility Stream Crossing (p. III-227-237) MS-12, 13, 14

- Type A, B, or C (velocity dependent)
- Must be operational and stable before construction activity begins
- Inspect at the end of each day for construction material stability



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3.26 (DS) – Dewatering Structure (p. III-238) MS-16 (C)

- The type used must be sized correctly and not overfilled
- Storage capacity (ft.³) should = 16 x pump discharge capacity (GPM)



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3.26 (DS) – Dewatering Structure (p. III-238) MS-16 (C)



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3.26 (DS) – Dewatering Structure (p. III-238) MS-16 (C)

- Ensure proper settlement of the structure is adhered to before cleaning out the sediment (p. 243)
- Clean-out at 1/3 the capacity



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3.27 (TC) – Turbidity Curtain (p. III-246)

MS-12, 14

- Used to provide sediment protection when working along the edge in water
- See page 254 for installation methods



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3.28 (SD) – Subsurface Drain (p. III-256),

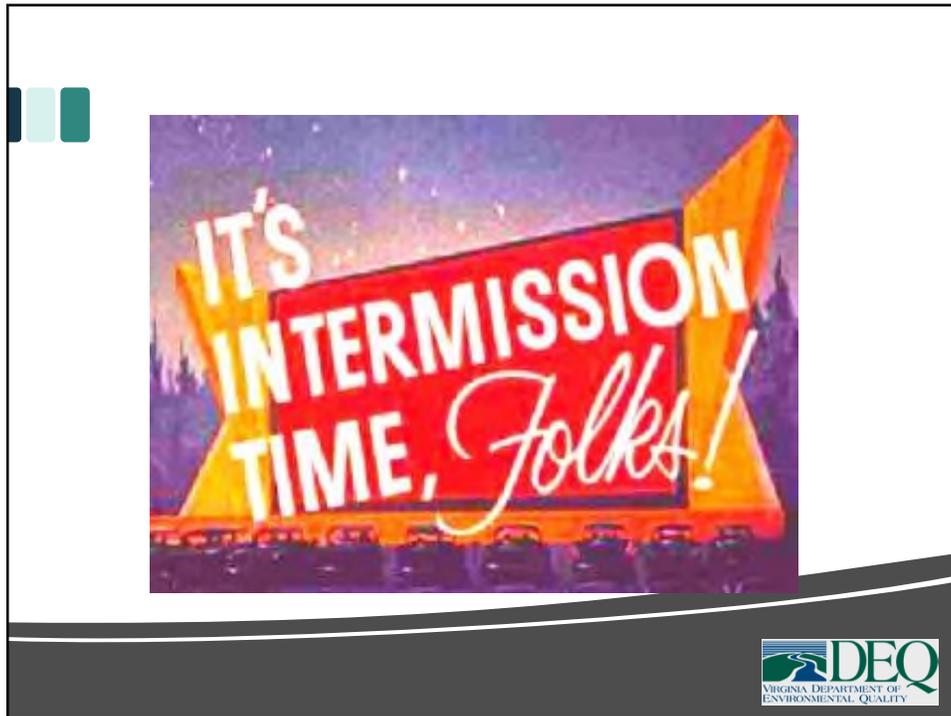
MS 9

- Used in areas of high water tables and on water seeps on a slope face
- There are several ways and materials choices to use



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3.29 (SR) – Surface Roughening (p. III-273); MS 1

Purpose: To slow down water and increase infiltration down; thus, reducing erosion

- **Make sure groves, cleat tracks or other roughening are oriented horizontally (not vertically)**



Slope roughening examples



Area should be seeded & mulched per MS?



Vegetative Erosion Controls



3.30 (TS) – Topsoiling (p. III-279)

Topsoiling consists of 3 processes:

1. Stripping
2. Stockpiling
3. Spreading




MS 2 – Stockpiling
MS 3 – Permanent seeding
MS 1 – Stabilizing

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Topsoil



- Original soil
- Soil (micro)organisms
- Good growing medium
- Nutrients
- High water holding capacity
- Low bulk density
- Organic matter

Topsoil



- Stock piling (takes up space)
- Requires more time to strip, stock pile and reapply
- Increased exposure time of denuded areas
- Weed seeds

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Topsoil Stripping and Stockpiling Specifications (p. III-281-282)

- Make sure perimeter controls are in place prior to stripping
- Avoiding stripping of soil when it is frozen or wet
- Limit areas to be stripped to those designated for construction
- Stockpiles must be stabilized in accordance with MS2/MS1
- Stockpiles off-site must be inspected as well

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Topsoil Stockpiles



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Topsoil Spreading (p. 282)

- Ensure subsoil is loosened to provide a good bond between the subsoil and the topsoil
- Make sure the perimeter controls are maintained during the spreading and revegetation effort



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3.(31) TS – Temporary Seeding (p. III-284)



Used for:

- Compliance with MS-1
- Compliance with MS-5
- As a nurse crop to bridge to an optimal time for permanent seeding

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Temporary Seeding

- **Required** when denuded areas will remain dormant for longer than 14 days (MS-1)
- Make sure the area is mulched after seeding
- Make sure the appropriate species is used for the time of year



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Permanent Seeding (3.32)

Used for:

- Compliance with MS-1 and MS-3

Need:

- Good growing medium/soil
- Good plant material



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Soil and Plant Material Requirements

- Verify the soil is at least 12 inches deep (to bedrock or impermeable layer)
- Check the approved plan for appropriate type of plants for your area
- Check to see if the soil has been tested by a soils laboratory and recommendations for the soil pH and nutrient content have been made
- Make sure the soil does not contain large amounts of rocks, woody materials, or construction debris

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Final inspection for Permanent Seeding

Is the area mulched after seeding? (3.35)



Is permanent stabilization achieved? (MS-3)



3.33 (SO) – Sodding (p. III-332)

Positive

- Immediate results/erosion, dust, mud control
- Can be established almost year-round
- No weeds
- Area can be used quickly after sodding
- Less prone to failure

Negative

- Limited species selection and diversity
- Expensive
- Difficult to sod inaccessible places
- Warm soil in summer may reduce establishment of cool season grasses
- Watering requirements for establishment

Inspecting Sodding Operations

- Site Preparation
- Installation
- Maintenance



Sod Installation Considerations

- Soil was slightly irrigated if sodding occurs during very dry weather
- Sod is installed within 36 hours of harvesting
- Sod is unrolled to provide soil contact



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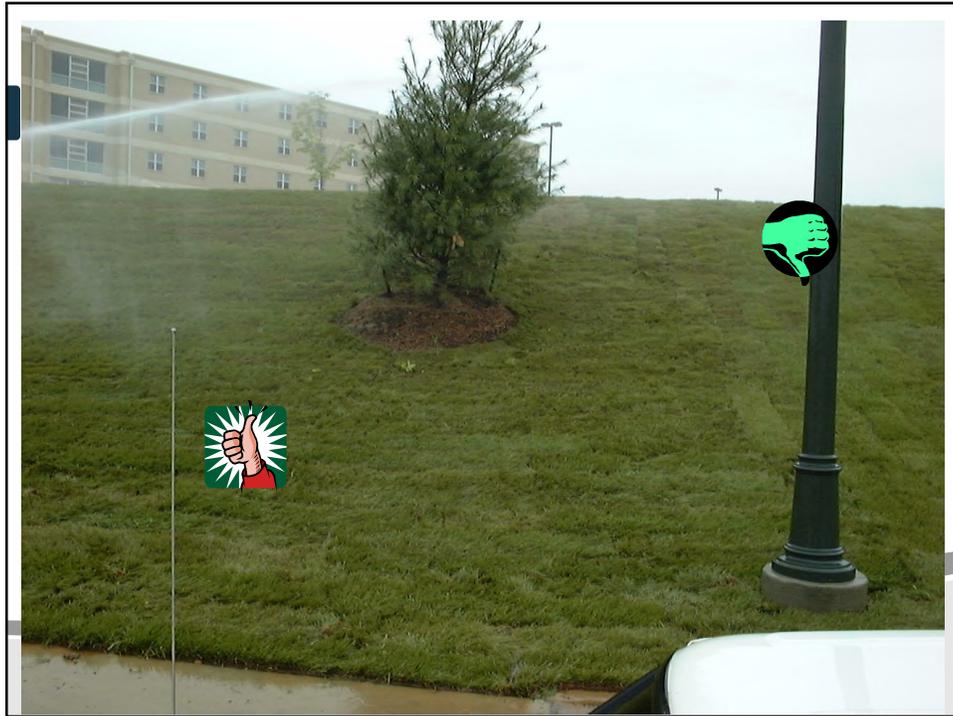
Installation of Sod (p.336)

- Sod is laid in staggered rows
- Sod is tightly butted against each other
- Sod installed on steep slopes is anchored



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Installation in Waterways (p. 340)

- Sod strips in waterways should be laid perpendicular to the flow
- Butt ends tightly
- Peg or staple after rolling



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3.34 (BE)/(ZE) – Bermuda and Zoysia grass (p. III-343) MS-3

- Plant specimens should be planted between May 1 and July 15 (full coverage in 8 to 12 weeks)
- Suited for sunny locations (both grass species are intolerant to shade)



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3.35 (MU) – Mulching (p. III-349)

Why do we mulch?

- Protect the soil from raindrop impacts, thus reducing erosion
- Provide a favorable microclimate for seed germination and plant establishment

#1 choice of mulch is straw –
applied at 2 tons/acre
Fiber mulch – applied at 500-750
lbs/acre over straw mulch



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3.36 (B/M) – Blankets & Matting (p. III-356)

- Treatment 1 (VDOT EC-2) is a (bio) degradable blanket
- Treatment 2 mats (VDOT EC-3) are non-degradable plastic structures



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Installation



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Stabilization Blanket/Matting Inspections

- Need to be installed according to the approved plan, specifications in the VESCH and/or manufacturer recommendations
- Installation on a relatively smooth soil with no clods, rock, or rills
- Ensure there is proper contact between the mat and the soil by laying them loosely on the soil (note: stretching the blankets and mats will lift the materials and reduce soil contact)
- Inspect for undermining and undercutting until permanently vegetated and stabilized

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3.37 (VEG) – Trees, Shrubs, Vines & Ground Covers (p. III-369)

Inspection items for establishing tree or woody vegetation include:

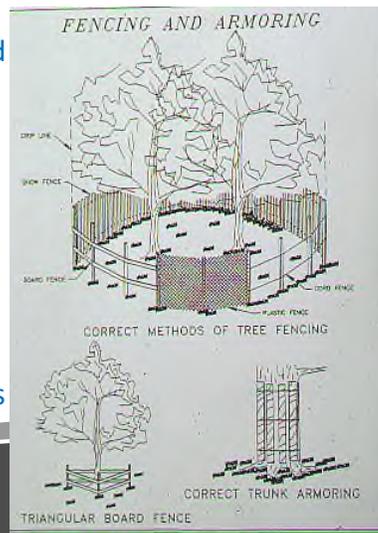
- Ensure that good, vigorous plant material is being used
- Ensure the plants are properly planted, watered, and mulched



3.38 (TP) – Tree Preservation & Protection (p. III-393)

Inspection items for tree preservation and protection include:

- Make sure protection is installed at the drip line to minimize root damage from equipment
- Check the tree protection area for potential infringements (such as vehicle parking, storage and other damage)
- Make sure the fencing and armoring is not damaged





Tree Protection and Preservation

3.39 (DC) – Dust Control (p. III-414)

Dust Control Measures:

- *Vegetative cover* - areas of no construction traffic
- *Mulch* - Fast & effective; not in traffic areas - use binders to tack
- *Tillage* - Emergency measure to bring clods to surface
- *Irrigation* - Keep surface wet
- *Spray on adhesives* - Organics - derivatives of pine tar and vegetable gum



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End of Module 3

