Field Guide for Erosion and Sediment Control

This field guide is intended to serve as a supplemental document to the 1994 Maryland Standards and Specifications for Soil Erosion Sediment Control and Maryland SHA Standard Specifications for Construction and Materials to be used by MD SHA Staff, Inspection Personnel, and Contractors.

State Highway Administration
Driven to Excel
Maryland Department of Transportation

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Quality Assurance Ratings

308.01.02

All Administration projects requiring Erosion and Sediment Control measures will be inspected by an Independent Quality Assurance Inspector to ensure compliance with the approved Erosion and Sediment Control Plan. The Contractor shall obtain all appropriate permits and approvals; demarcate Limits of Disturbances, wetland and wetland buffers, floodplains and tree protection areas as specified in Section 107; and shall proceed according to the approved Erosion and Sediment Control Plan and schedules. Projects will be inspected every 2 weeks at a minimum and be given one of the following ratings:

A RATING: The project will receive an 'A' rating from the Quality Assurance Inspector if the score is equal to or greater than 90 on form number OOC61, Erosion and Sediment Control Field Investigation Report.

B RATING: The project will receive a 'B' rating from the Quality Assurance Inspector if the score is 80 to 89.9 on form number OOC61, Erosion and Sediment Control Field Investigation Report

C RATING: The project will receive a 'C' rating from the Quality Assurance Inspector if the score is 70 to 79.9 on form number OOC61, Erosion and Sediment Control Field Investigation Report. A 'C' Rating indicates that the project is in compliance however, deficiencies are noted and shall be corrected. Conditions for a shut down could arise quickly. Projects that receive a 'C' rating will be re-inspected within 72 hours.

D RATING: The project will receive a 'D' rating from the Quality Assurance Inspector if the score is 60 to 69.9 on form number OOC61, Erosion and Sediment Control Field Investigation Report. A 'D' Rating indicates that the project is in noncompliance. All earthwork operations will be shut down by the Administration. All work efforts shall focus on correcting erosion and sediment control deficiencies. The project will be reinspected within 72 hours. All required corrective actions shall be completed within the 72 hour period for the project to be upgraded to a 'B' rating. Failure to upgrade the project to a 'B' rating will result in the project being rated an 'F'. Liquidated damages will be imposed for each day the project has a 'D' rating.

F RATING: The project will receive an 'F' rating from the Quality Assurance Inspector

if the score is less than 60 on form number OOC61, Erosion and Sediment Control Field Investigation Report; or if the Contractor has not obtained all appropriate permits and approvals; demarcated limits of disturbances, wetland and wetland buffers, floodplains, and tree protection areas as specified in Section 107; or is not proceeding according to the approved Erosion and Sediment Control Plan and schedules. An 'F' rating indicates that the project is in noncompliance. The entire project will be shut down by the Administration until the project receives a 'B' rating. All work efforts shall focus on correcting erosion and sediment control deficiencies. Liquidated damages will be imposed for each day the project has a 'F' rating.

Shutdowns. When a 'C' rating is given to a project, the Contractor shall have all deficiencies corrected within 72 hours. The project will be reinspected at the end of this period. If it is found that the deficiencies have not been satisfactorily corrected, a 'D' rating will be given and all earthwork operations will be shut down until the project receives a 'B' rating.

When a consecutive 'C' rating is given for other deficiencies and the original

deficiencies were corrected, the Contractor will be alerted that their overall effort is marginal and a shut down of all earthwork operations is imminent if erosion and sediment control efforts do not substantially improve within 72 hours. The project will be reinspected at the end of this period. If it is found that the deficiencies have not been satisfactorily corrected or other deficiencies are identified by the Independent Quality Assurance Inspector that results in a score of less than 80 on form number OOC61 a 'D' rating will be given and all earthwork operations will be shut down until the project receives a 'B' rating.

When a disregard for correcting these deficiencies is evident, an 'F' rating will be given and the entire project will be shut down until the project receives a 'B' rating.

When degradation to a resource could occur, or if the Contractor is unresponsive to direction to take corrective action, the Administration may elect to have these corrective actions taken by another contractor or by Administration maintenance staff. All costs associated with this work will be billed to the original Contractor in addition to liquidated damages.

Incentive Payment / Liquidated Damages. The Administration has included an incentive payment to the Contractor. When an average score equal to or greater than 85 for the entire rating quarter is given to the project by the Independent Quality Assurance Inspector the quarterly incentive payment will be made to the Contractor within sixty days after the end of the rating quarter. No incentive will be paid for partial quarters or for quarters with less than four inspections. No incentives will be paid for any quarter that liquidated damages are imposed. A rating quarter consists of three months. The first quarter begins with the month the Notice to Proceed is issued for the project. When a project does not receive a 'D' or 'F' rating and the overall average score given to the project by the Independent Quality Assurance Inspector is equal to or greater than 85 the final incentive payment will be made to the Contractor at final project close-out. If a time extension is granted to the contract, additional quarterly incentive payments will be drawn from the final incentive payment.

When a 'D' or 'F' rating is given to the project by the Independent Quality Assurance Inspector for any inspections; the Administration will impose liquidated damages on the Contractor. Payment of the liquidated

damages shall be made within thirty days from imposition of the liquidated damages and shall not be allowed to accrue for consideration at final project close-out.

When the project receives two 'F' ratings the erosion and sediment control certification issued by the Administration shall be revoked from the project superintendent and the Erosion and Sediment Control Manager for a period of not less than six months and until successful completion of the Administration's Erosion and Sediment Control Certification Program. Neither the project superintendent nor the Erosion and Sediment Control Manager shall be allowed to oversee the installation and maintenance of erosion and sediment controls during the period the certification is revoked on any project of the Administration. The Contractor shall provide certified personnel to replace the project superintendent and the Erosion and Sediment Control Manager.

Stream Restriction Periods

Stream closure dates for fish spawning or migration within waterways are as follows:

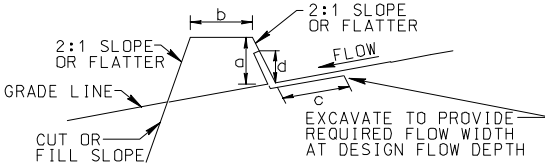
Use I and IP	March 1 – June 15
Use II	June 1 – September 30 & December 16 – March 14
Use III and IIIP	October 1 – April 30
Use IV	March 1 – May 31
SAV	April 15 – October 15

All instream work is prohibited during these periods.

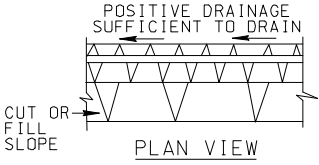
Earth Dike

MDE Detail A-1-6

A-2 / B-3



CROSS SECTION



PLAN VIEW

	DIKE A	DIKE B
a-DIKE HEIGHT	18″	30″
b-DIKE WIDTH	24″	36″
c-FLOW WIDTH	4′	6′
d-FLOW DEPTH	12″	24″

FLOW CHANNEL STABILIZATION

GRADE 0.5% MIN. 10% MAX.

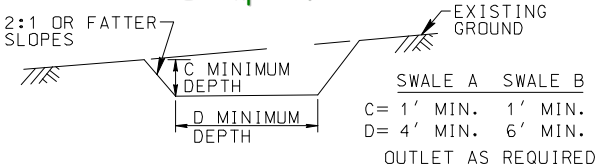
1. Seed and cover with straw mulch.
2. Seed and cover with Soil Stabilization Matting or line with sod.
3. 4″ – 7″ stone or recycled concrete equivalent pressed into the soil 7″ minimum.

Temporary Swales

MDE Detail A-2-4

A-2 / B-3

Example of A-2



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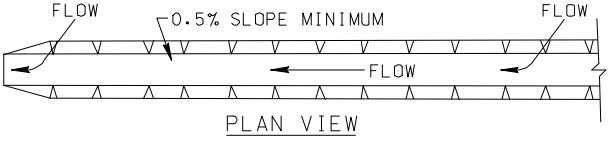


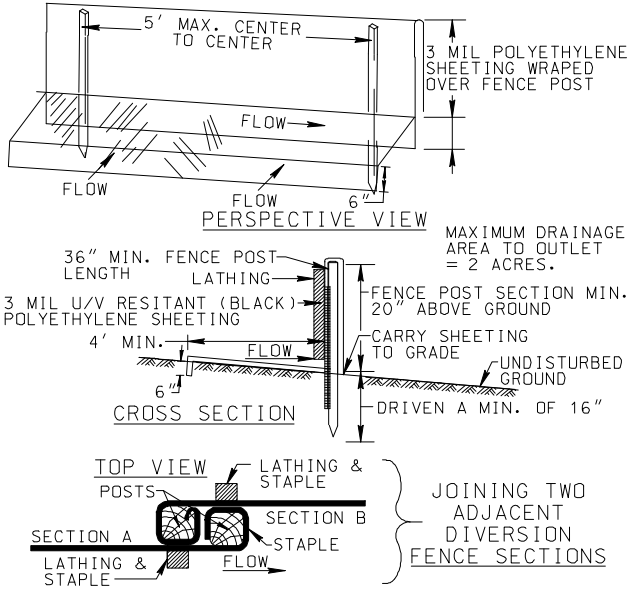
PLAN VIEW

FLOW CHANNEL STABILIZATION
GRADE 0.5% MIN. 10% MAX.

1. Seed and cover with straw mulch.
2. Seed and cover with Erosion Control Matting or line with sod.
3. 4"-7" stone or recycled concrete equivalent pressed into soil in a minimum 7" layer.

Diversion Fence

MDE Detail A-3-5

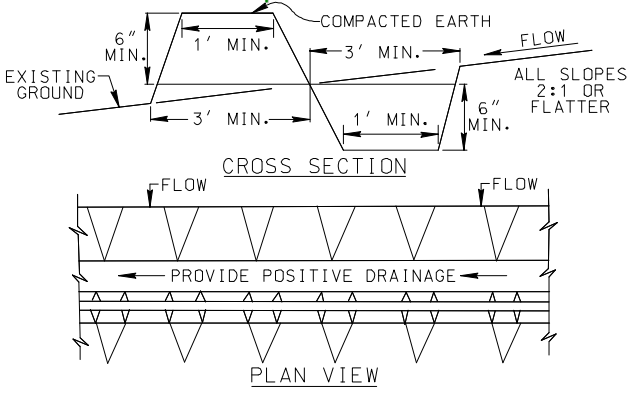


Perimeter Dike/Swale

MDE Detail A-3-3

PD/S-1

Example of PD/S-2



STABILIZATION

PD/S-1 -SEED AND MULCH (DRAINING 1 ACRE)
PD/S-2 -SEED AND COVER WITH SOIL STABILIZATION MATTING OR LINE WITH SOD (DRAINING BETWEEN 1 AND 2 ACRES)

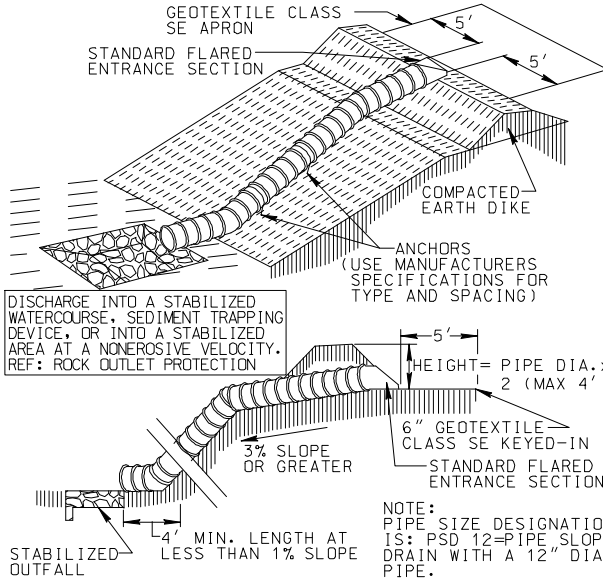
CONSTRUCTION SPECIFICATIONS

1. All perimeter dike/swales shall have an uninterrupted positive grade to an outlet. Spot elevations may be necessary for grades less than 1%.
2. The maximum drainage area for this practice is 2 acres.

Pipe Slope Drain

MDE Detail B-5-4

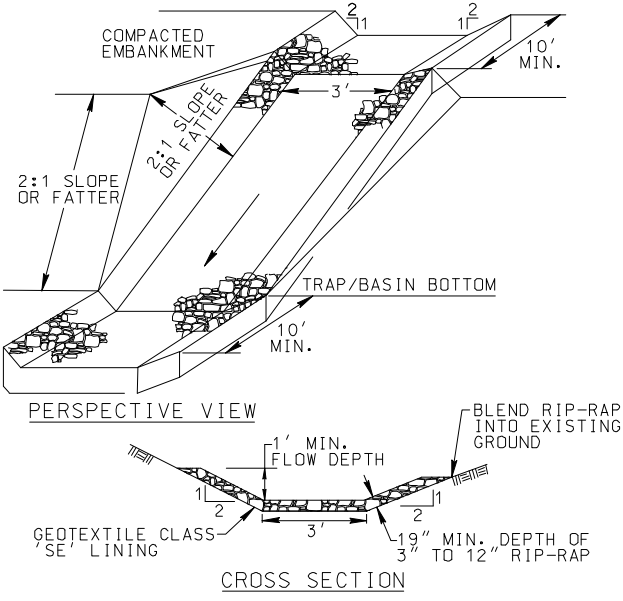
PSD-12



Riprap Inflow Protection

MDE Detail B-6-2

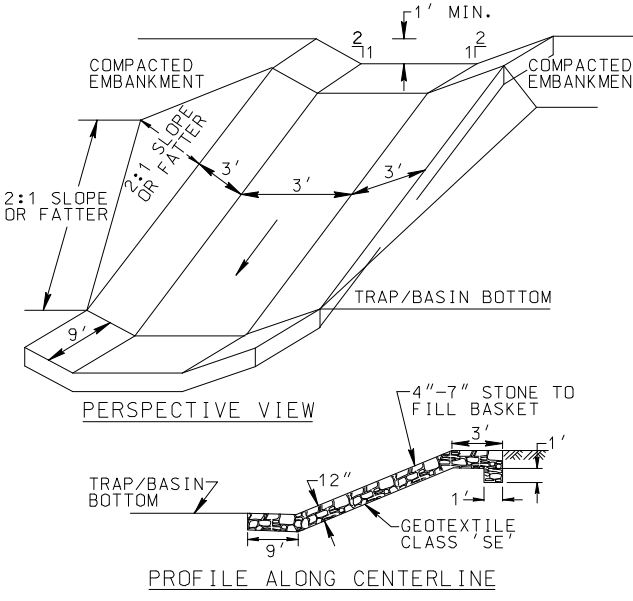
RRP



Gabion Inflow Protection

MDE Detail B-7-2

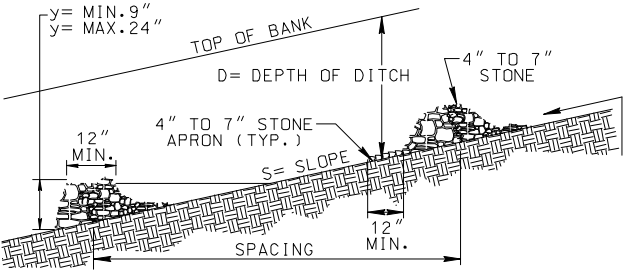
GP



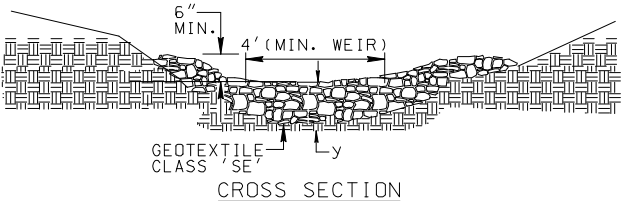
Stone Check Dams

MDE Detail B-8-3

CD



DITCH PROFILE



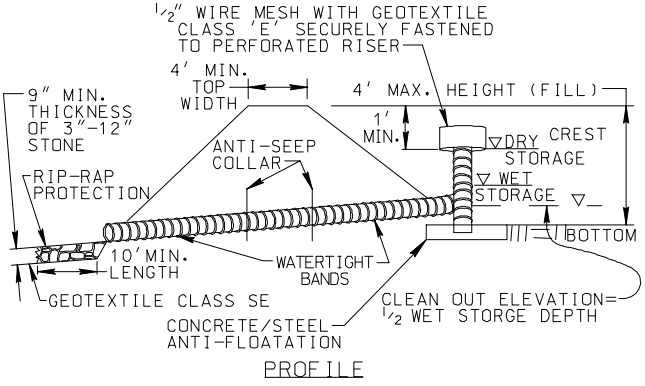
CROSS SECTION

CLEAN OUT ELEVATION $^1/_2$ OF
THE HEIGHT OF THE WEIR CREST.

Sediment Traps

Pipe Outlet Sediment Trap – ST I

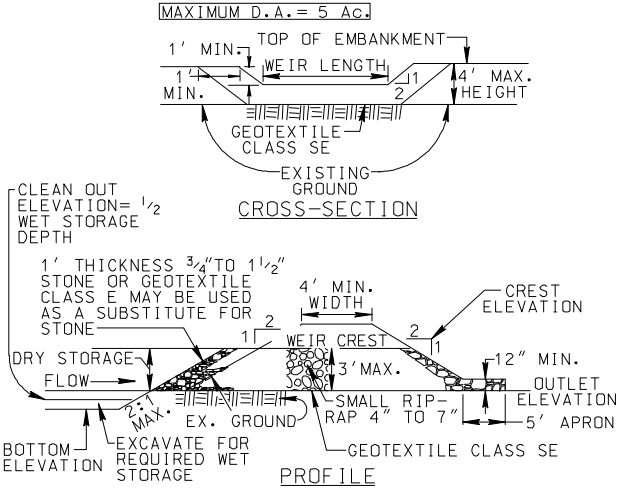
MDE Detail C-9-7



Sediment Traps

Stone Outlet Sediment Trap – ST II

MDE Detail C-9-10



Sediment Traps

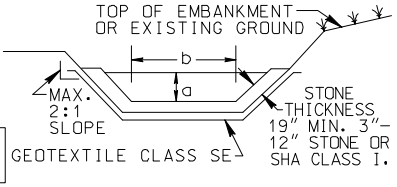
Riprap Outlet Sediment Trap – ST III

MDE Detail C-9-13

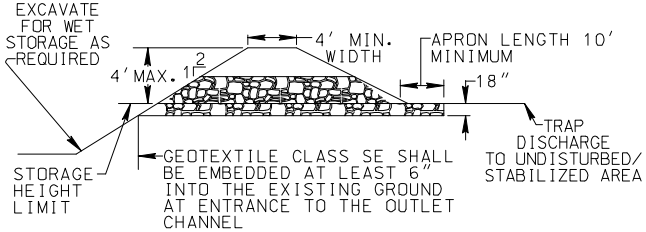
MAXIMUM D.A.= 10 Ac.

TOP OF COMPACTED EMBANKMENT MIN. 1' ABOVE TOP OF STONE LINING, MAX. 4' ABOVE EXISTING GROUND

BOTTOM WIDTH OF WEIR (b): MINIMUM DEPTH OF CHANNEL (a)



CROSS SECTION

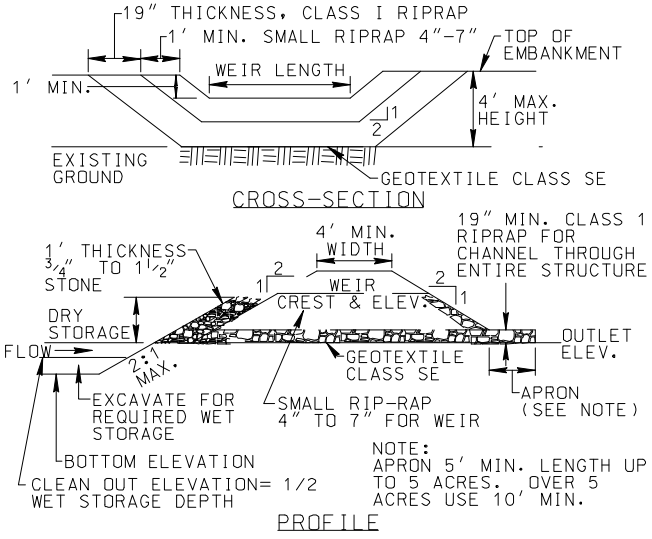


PROFILE

Sediment Traps

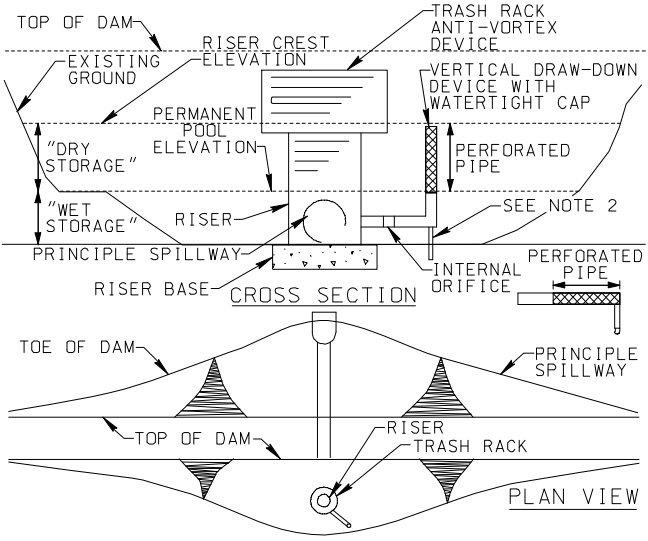
Stone/Riprap Outlet Sediment Trap – ST IV

MDE Detail C-9-13



Sediment Basins

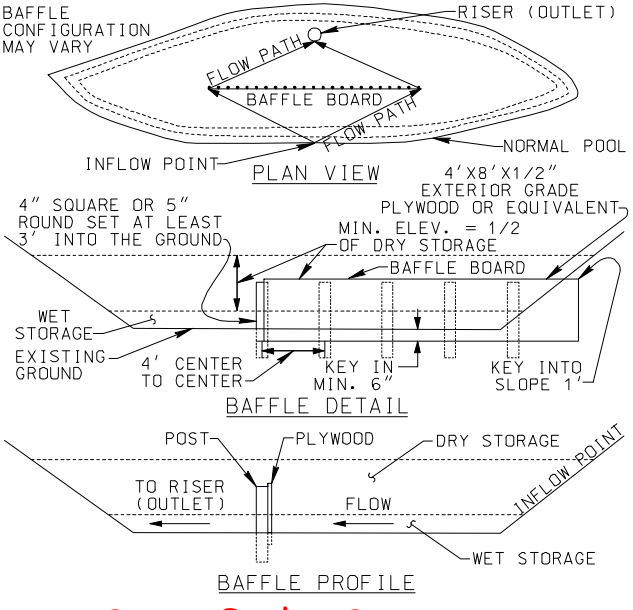
MDE Detail C-10-30



1. THE PERFORATED DRAW-DOWN DEVICE SHALL BE WRAPPED WITH ½" WIRE MESH AND CLASS E GEOTEXTILE FABRIC.
2. PROVIDE SUPPORT TO PREVENT SAGGING & FLOATATION.

Sediment Basin/Trap Baffles

MDE Detail C-10-28



Stone Outlet Structures

MDE Detail E-16-10

TSOS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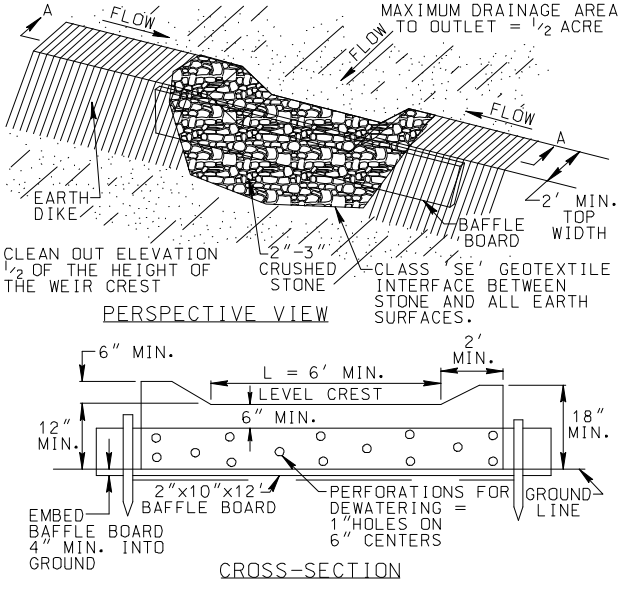
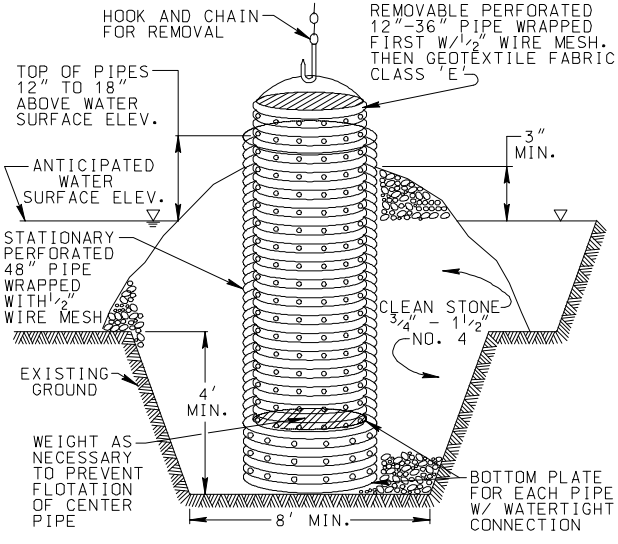

A
FLOW
MAXIMUM DRAINAGE AREA
TO OUTLET = 1/2 ACRE
FLOW
FLOW
A
EARTH
DIKE
2' MIN.
TOP
WIDTH
BAFFLE
BOARD
CLEAN OUT ELEVATION
1/2 OF THE HEIGHT OF
THE WEIR CREST
2"-3"
CRUSHED
STONE
CLASS 'SE' GEOTEXTILE
INTERFACE BETWEEN
STONE AND ALL EARTH
SURFACES.
PERSPECTIVE VIEW
6" MIN.
2'
MIN.
L = 6' MIN.
LEVEL CREST
6" MIN.
12"
MIN.
18"
MIN.
2"x10"x12'
BAFFLE BOARD
PERFORATIONS FOR
DEWATERING =
1"HOLES ON
6" CENTERS
GROUND
LINE
EMBED
BAFFLE BOARD
4" MIN. INTO
GROUND
CROSS-SECTION

Removable Pumping Station

MDE Detail D-12-5

RPS

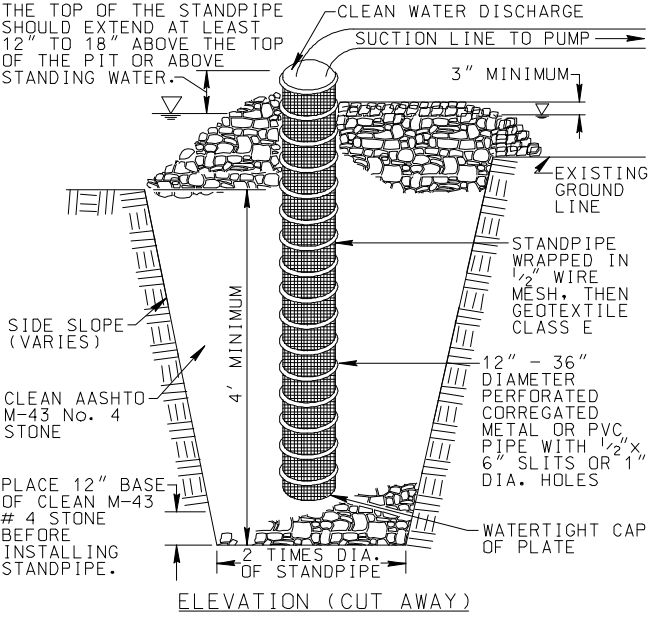


ELEVATION (CUT AWAY)

Sump Pit

MDE Detail D-13-2

SP

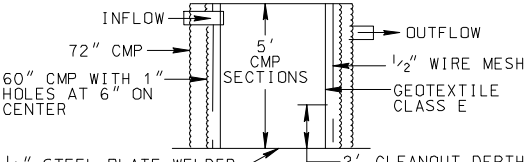


ELEVATION (CUT AWAY)

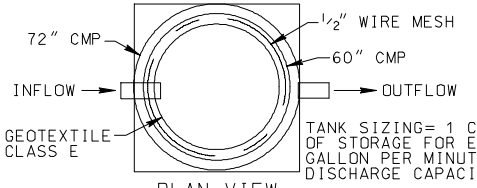
Portable Sediment Tank

MDE Detail D-14-2

☒ PST



ELEVATION



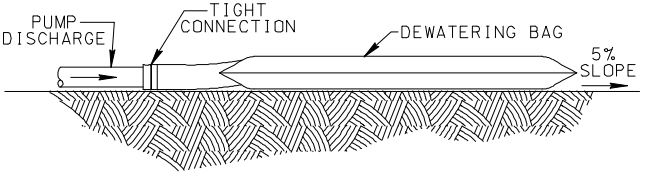
PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. TANKS MAY BE CONNECTED IN SERIES.
2. TANK SHALL BE PLACED IN AN UNDISTURBED LOCATION, SO TREATED DISCHARGE FROM TANK DOES NOT BECOME SEDIMENT LADEN. IN ADDITION, LOCATION OF TANK SHOULD ALLOW TREATED WATER TO BE CONVEYED SAFELY TO RECEIVING CHANNEL OR WATERWAY AND AWAY FROM WORK AREA.

Dewatering Sediment Bag

MDE Detail D-15-2



CONSTRUCTION SPECIFICATIONS

1. FILTER BAG SHALL BE PLACED IN AN UNDISTURBED LOCATION, SO TREATED DISCHARGE FROM THE BAG DOES NOT BECOME SEDIMENT LADEN. IN ADDITION, LOCATION OF FILTER BAG SHOULD ALLOW TREATED WATER TO BE CONVEYED SAFELY TO RECEIVING CHANNEL OR WATERWAY AND AWAY FROM WORK AREA.
2. NOZZLE SHOULD BE SEALED TIGHTLY AROUND THE PUMP DISHARGE HOSE WITH A STRAP OR SIMILAR DEVICE TO PREVENT UNFILTERED WATER FROM ESCAPING.

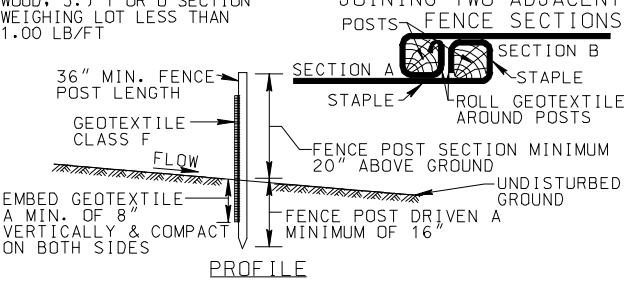
Silt Fence

MDE Detail E-15-3 or Revised SHA SPI 308.03.28

PERSPECTIVE VIEW

POST SHALL CONSIST OF THE FOLLOWING: 1.) 2"x2" SQUARE CUT WOOD, 2.) 1¾" ROUND WOOD, 3.) T OR U SECTION WEIGHING LOT LESS THAN 1.00 LB/FT

MAINTENANCE SHALL BE PERFORMED WHEN BULGES OCCUR OR WHEN SEDIMENT ACCUMULATION REACHES 50% OF THE FABRIC HEIGHT

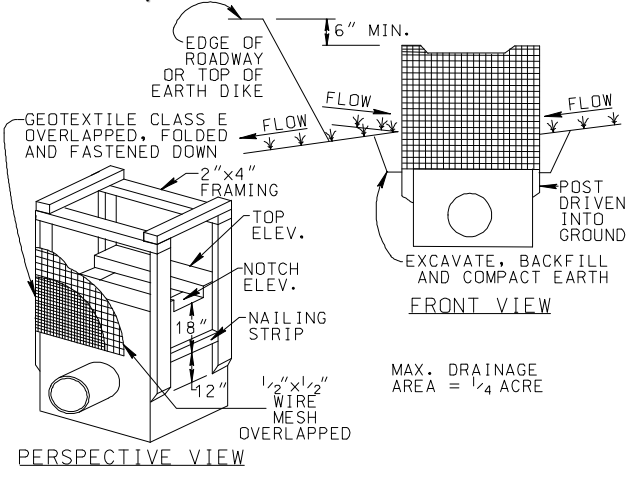


Storm Drain Inlet Protection

MDE Detail E-16-5

SIP

Example of Standard Inlet Protection



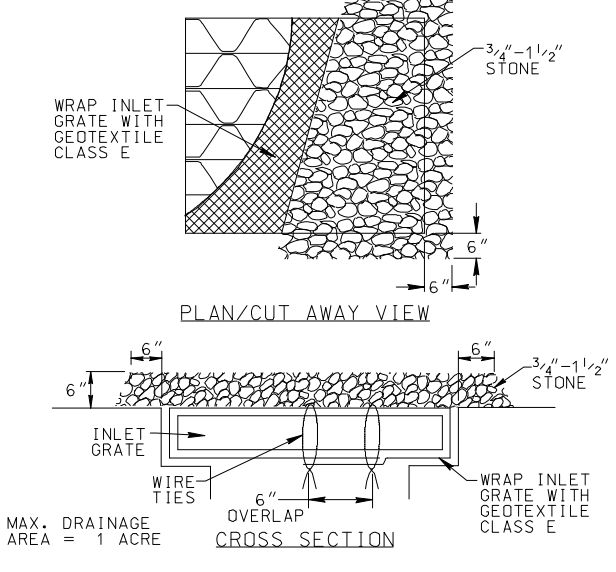
CONSTRUCTION SPECIFICATIONS

1. IF THE INLET IS NOT IN A SUMP, CONSTRUCT A COMPACTED EARTH DIKE ACROSS THE DITCH LINE DIRECTLY BELOW IT. THE TOP OF THE EARTH DIKE SHOULD BE AT LEAST 6" HIGHER THAN THE TOP OF FRAME.
2. REPLACE THE GEOTEXTILE WHEN IT BECOMES CLOGGED.

Storm Drain Inlet Protection

MDE Detail E-16-6

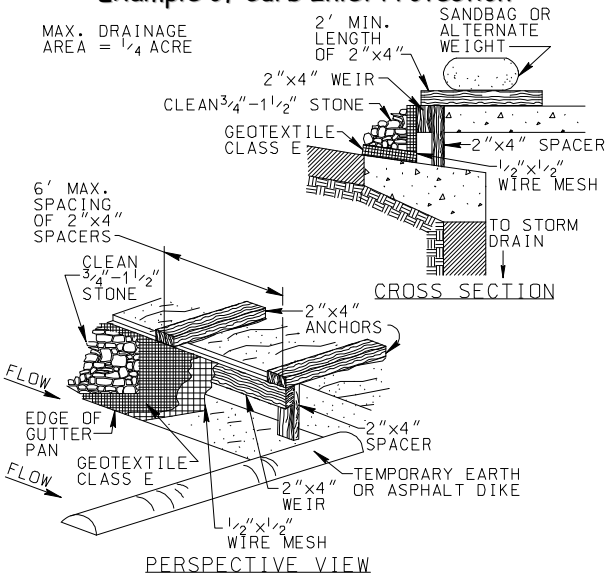
Example of At Grade Inlet Protection



Storm Drain Inlet Protection

MDE Detail E-16-7

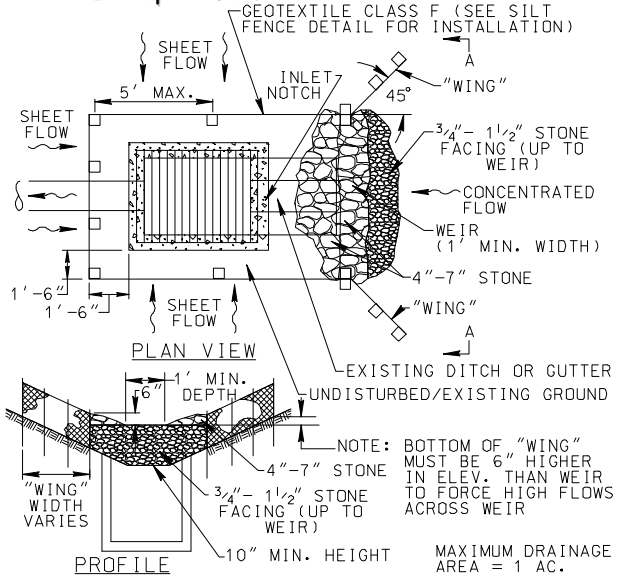
Example of Curb Inlet Protection



Storm Drain Inlet Protection

MDE Detail E-16-8

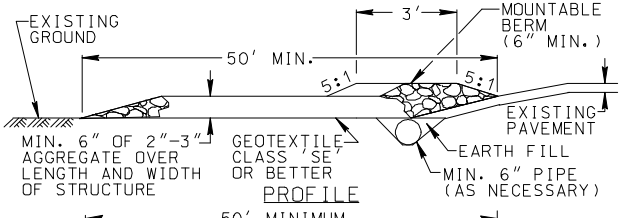
Example of Median Inlet Protection

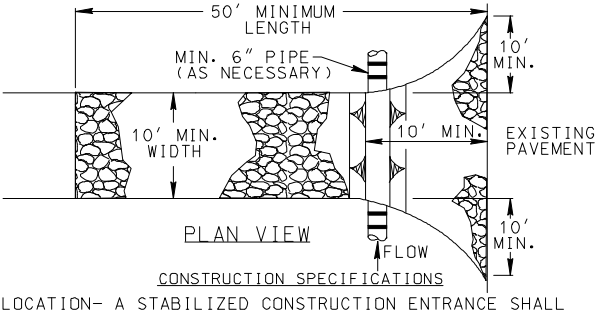


Stabilized Construction Entrance

MDE Detail F-17-3

SCE





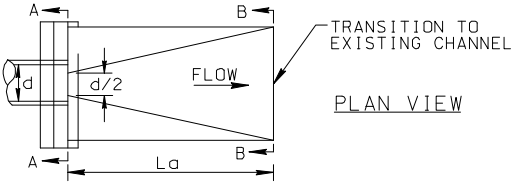
CONSTRUCTION SPECIFICATIONS

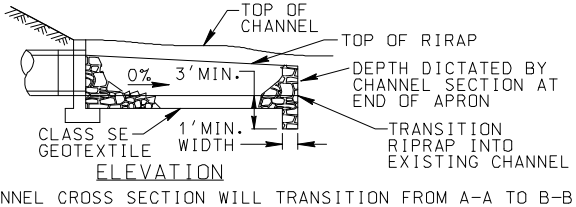
LOCATION- A STABILIZED CONSTRUCTION ENTRANCE SHALL BE LOCATED AT EVERY POINT WHERE CONSTRUCTION TRAFFIC ENTERS OR LEAVES A CONSTRUCTION SITE. VEHICLES LEAVING THE SITE MUST TRAVEL OVER THE ENTIRE LENGTH OF THE STABILIZED CONSTRUCTION ENTRANCE.

Rock Outlet Protection

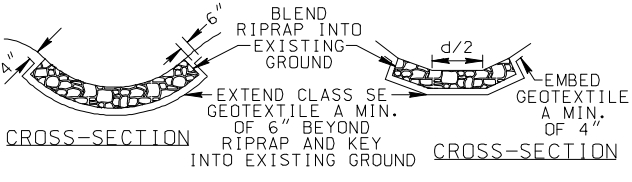
MDE Detail F-18-8

Rock Outlet Protection I





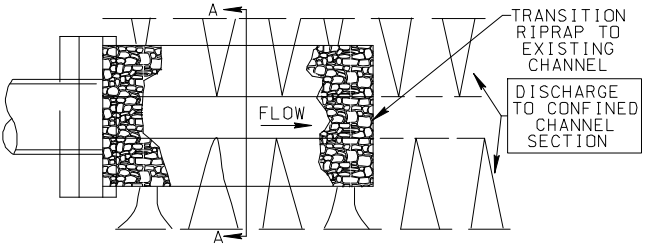
CHANNEL CROSS SECTION WILL TRANSITION FROM A–A TO B–B



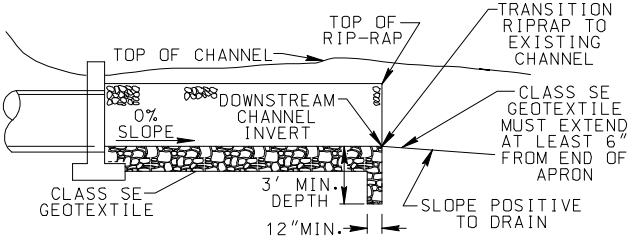
Rock Outlet Protection

Rock Outlet Protection II

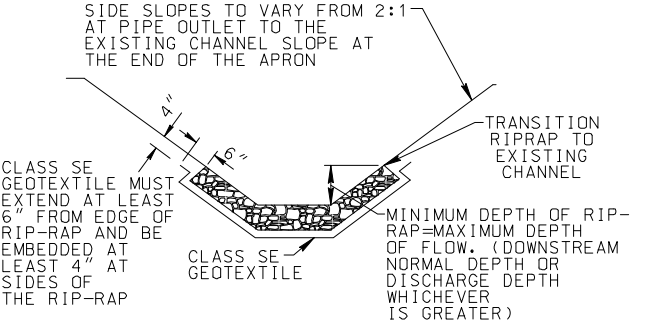
MDE Detail F-18-9



PLAN VIEW



ELEVATION

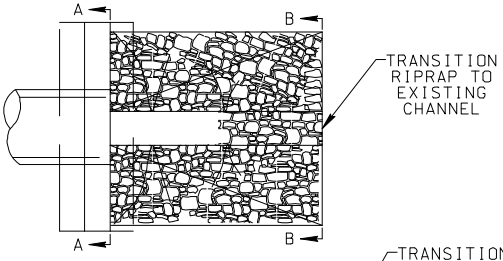


CROSS-SECTION

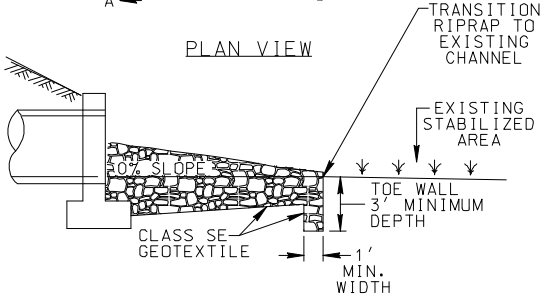
Rock Outlet Protection

Rock Outlet Protection III

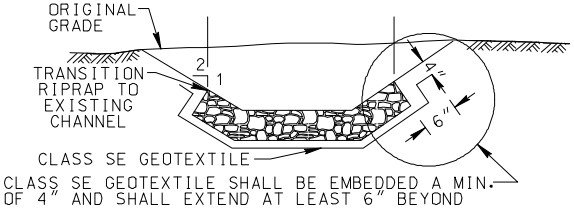
MDE Detail F-18-10



PLAN VIEW

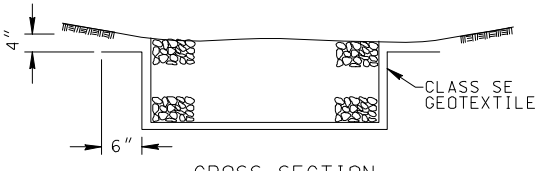


PROFILE



CLASS SE GEOTEXTILE SHALL BE EMBEDDED A MIN. OF 4" AND SHALL EXTEND AT LEAST 6" BEYOND THE EDGE OF THE RIP-RAP

CROSS-SECTION



CROSS-SECTION

Vegetative Stabilization

MDE Detail G-20-1

Purpose: Vegetative stabilization specifications are used to promote the establishment of vegetation on exposed soil. When soil is stabilized with vegetation, the soil is less likely to erode and more likely to allow infiltration of rainfall, thereby reducing sediment loads and runoff to downstream areas, and improving wildlife habitat and visual resources.

Topsoil and Subsoil

Placing and Spreading Topsoil: Topsoil shall be placed, spread, and maintained over the areas designated to the depth, that after settlement, the completed work shall be in conformance with the thickness, lines, grades, and elevations specified in the Contract Documents. Stones and other foreign material larger than 3 in. shall be removed. Slopes 4:1 to 2:1 shall be tracked operating perpendicular to the slope.

Placing and Spreading, and Compacting Subsoil: Subsoil shall be placed, spread, and compacted in maximum layer of 8 in. to produce a uniform firm layer of subsoil. The

completed work shall be in conformance with the thickness, lines, grades, and elevations specified in the Contract Documents. Stones and other foreign material larger than 4 in. shall be removed. Slopes 4:1 to 2:1 shall be tracked operating perpendicular to the slope.

Temporary Seeding

Temporary seeding shall consist of preparing soil, seeding, fertilizing, mulching and applying wood cellulose fiber binder. Temporary seeding shall be done to areas that will remain undisturbed for 1 month or more. Temporary seeding and temporary wood cellulose mulching shall be done any time of the year.

Soil Preparation: Soil shall be loosened from the grading operation. Compacted soil surfaces shall be loosened before seed is applied.

Application Rates:

TEMPORARY SEEDING		
MATERIAL	**LBS PER 1000 FT^2**	**LBS PER ACRE**
Temporary Seed Mix	2.9	125
Fertilizer (15-30-15)	10.3	450
Mulch (Straw or Hay)	91.8	4000
Wood Cellulose Fiber (Mulch Binder)	17.2	750

Turf Establishment / Permanent Seeding

Permanent seeding shall consist of soil preparation, seeding, fertilizing, liming as required, mulching, overseeding, and refertilizing.

a. Minimum soil conditions required for permanent vegetative establishment:

1. Soil pH shall be between 6.0 and 7.0.
2. Soluble salts shall be less than 500 ppm.
3. The soil shall contain less than 40% clay but enough fine grained mater (> 30% silt plus clay) to provide the capacity to hold a moderate amount of moisture. An exception is if lovegrass or serecia lespedeza is to be planted, then a sandy soil (< 30% silt plus clay) would be acceptable.
4. Soil shall contain 1.5 % minimum organic matter by weight.
5. Soil must contain sufficient pore space to permit adequate root penetration.
6. If these conditions cannot be met by soils on site, adding topsoil is required in accordance with Section 21

Standard and Specification for Topsoil.

b. Areas previously graded in conformance with the drawings shall be maintained in true and even grade, then scarified or otherwise loosened to a depth of 3-5" to permit bonding of the topsoil to the surface area. By tracking the slope, this prevents topsoil from sliding down the slope.

c. Apply soil amendments as per soil test, as included on the plans, or in accordance with the Nutrient Management Plan.

d. Mix soil amendment into the top 3-5" of topsoil by disking or other suitable means.

Regional Areas

Maryland is divided into regions by counties as follows:

Region 1 — Garrett, Allegany and Washington (West of Clear Spring, MD).

Region 2 — Washington (East of Clear Spring, MD), Frederick, Carroll, Baltimore, Harford, Cecil, Howard, Montgomery, and Baltimore City.

Region 3 — Anne Arundel, Prince Georges, Calvert, Charles, St. Marys, Kent, Queen Anne's, Talbot, Caroline, Dorchester, Wicomico, Worcester and Somerset.

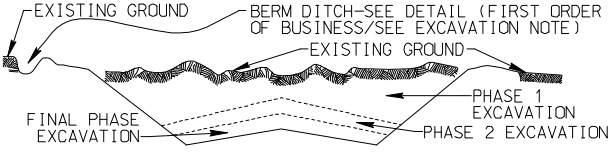
SEEDING SEASONS AND SEED MIXES	
REGIONS	**SPRING AND FALL MONTH/DAY**
1	4/1 to 6/15 and 8/1 to 10/1
2	3/1 to 5/15 and 8/1 to 10/20
3	3/3 to 5/1 and 8/1 to 10/31
1, 2 and 3	No Additives
REGIONS	**SUMMER MONTH/DAY**
1	6/16 to 7/31
2	5/16 to 7/31
3	5/2 to 7/31
1, 2 and 3	Plus Additive A
REGIONS	**LATE FALL MONTH/DAY**
1	10/2 to 11/1
2	10/21 to 11/20
3	11/1 to 11/30
1, 2 and 3	Plus Additive B
REGIONS	**ALL SEASONS**
1, 2 and 3	Plus Additive C for seeding: a. Areas 30' and greater from the edge of the pavement b. Slopes 4:1 and steeper When seeding areas within 4 miles of a State Airport: a. Flatter than 4:1 – No additives b. 4:1 and steeper – Special Purpose Seed Mix in lieu of Permanent Seed Mix

Seed Mix contents refer to 920.04.02

ADDITIVES: A = Lovegrass or Foxtail Millet
B = Temporary Seed Mix
C = Sercia Lespedeza

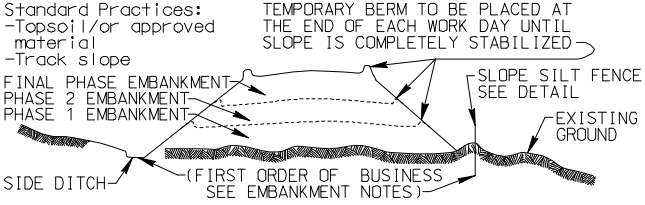
Incremental Stabilization

MDE Detail G-20-6 & G-20-7



1. Excavation is not to exceed 15′ without stabilization.
2. Excavation should be continuous through the completion of permanent seed and mulch. Any interruptions will necessitate the application of temporary stabilization.

INCREMENTAL STABILIZATION – CUT

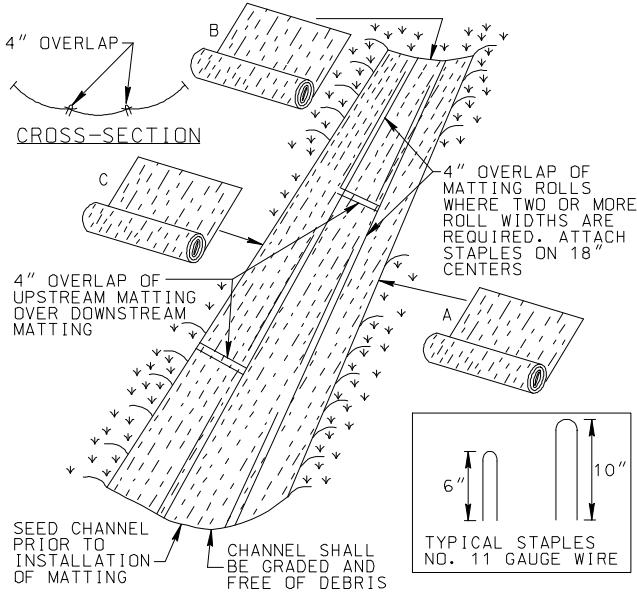


1. Embankment construction is not to exceed 15′ without stabilization.
2. Placement of fill should be continuous through the completion of permanent seed and mulch. Any interruptions will necessitate the application of temporary stabilization.

INCREMENTAL STABILIZATION – FILL

Erosion Control Matting

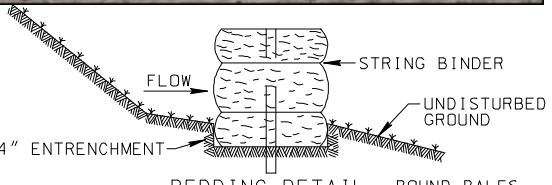
MDE Detail G-22-2



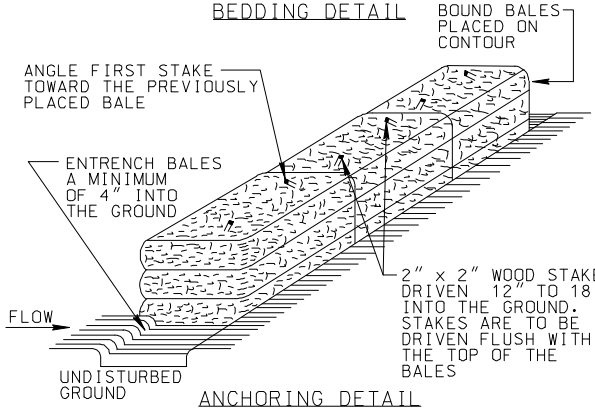
Straw Bale Dike

MDE Detail E-16-12

SBD



BEDDING DETAIL



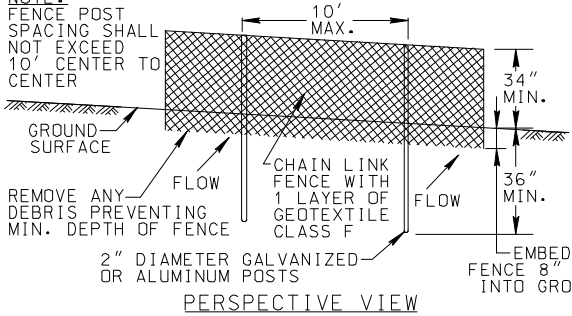
ANCHORING DETAIL

Super Silt Fence

MDE Detail E-15-7

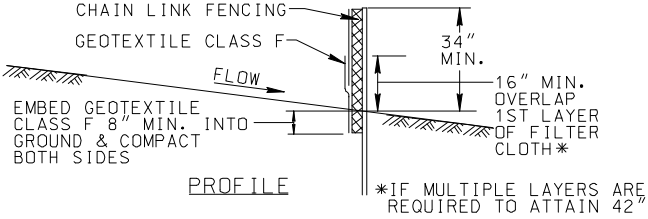
SSF

NOTE:
FENCE POST SPACING SHALL NOT EXCEED 10' CENTER TO CENTER



PERSPECTIVE VIEW

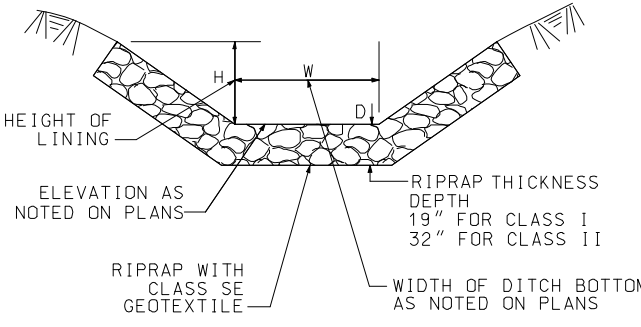
MAINTENANCE SHALL BE PERFORMED WHEN "BULGES" DEVELOP IN THE SILT FENCE, OR WHEN SILT REACHES 50% OF THE FENCE HEIGHT.



PROFILE

*IF MULTIPLE LAYERS ARE REQUIRED TO ATTAIN 42"

Lined Waterway or Outlet

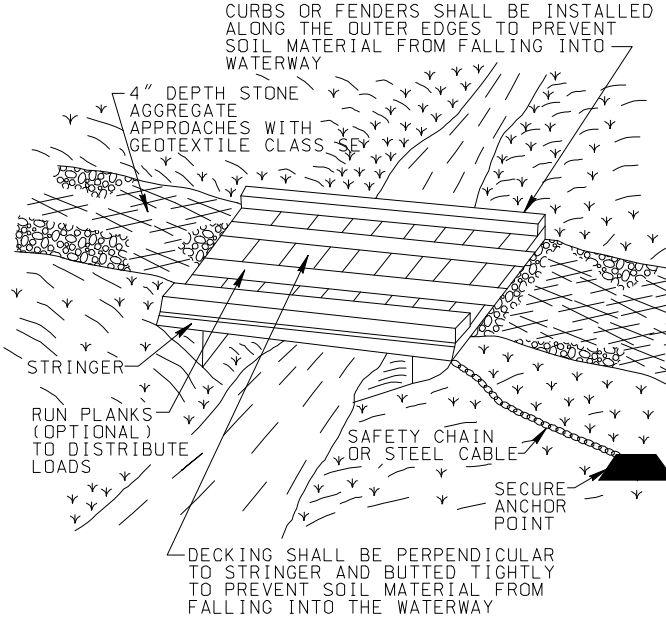


RIPRAP DITCH DETAIL

NOT TO SCALE

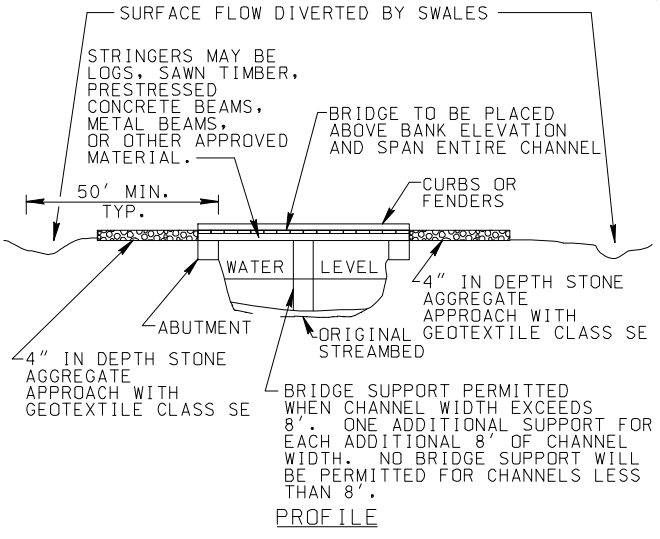
Temporary Access Bridge

MDE Detail H-27-9



Temporary Access Bridge

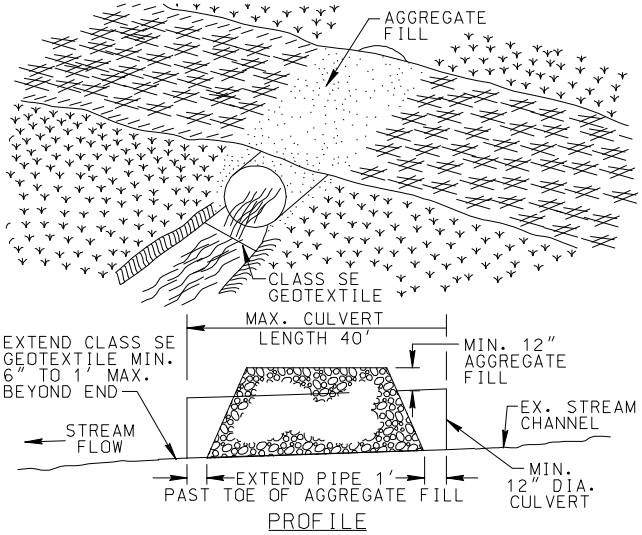
-Continued-



Temporary Access Culvert

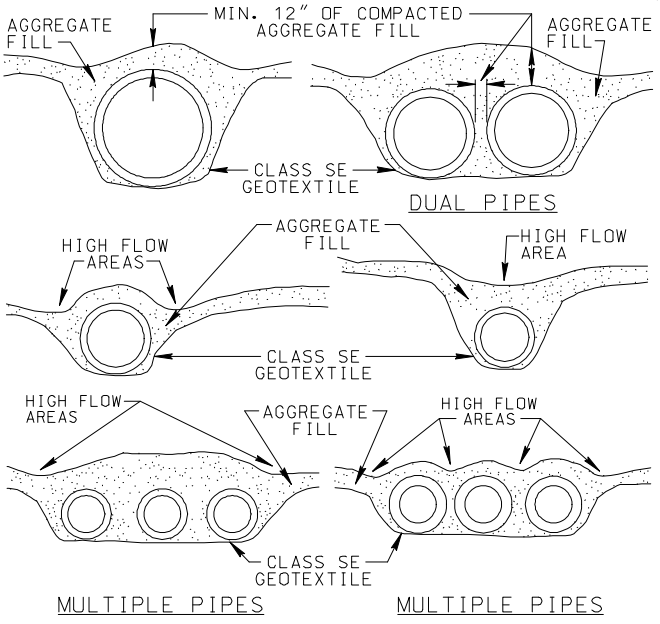
MDE Detail H-27-12

NOTE: ALL AGGREGATE FILL USED SHALL BE A MIN. 4"-7" STONE. SMALLER STONE MAY BE USED TO FILL THE VOIDS ON THE SURFACE FOR A DRIVING SURFACE



Temporary Access Culvert

-Continued-



CONSTRUCTION SPECIFICATIONS

1. CULVERT SIZE- THE SIZE OF THE CULVERT PIPE SHALL BE THE LARGEST PIPE DIAMETER THAT WILL FIT INTO THE EXISTING CHANNEL WITHOUT MAJOR EXCAVATION OF THE WATERWAY CHANNEL OR WITHOUT MAJOR APPROACH FILLS. IF A CHANNEL WIDTH EXCEEDS 3 FEET, ADDITIONAL PIPES MAY BE USED UNTIL THE CROSS SECTIONAL AREA OF THE PIPES IS GREATER THAN 60 PERCENT OF THE CROSS SECTIONAL AREA OF THE EXISTING CHANNEL. THE MINIMUM SIZE CULVERT THAT MAY BE USED IS A 12" DIA. PIPE. IN ALL CASES, THE PIPE(S) SHALL BE LARGE ENOUGH TO CONVEY NORMAL STREAM FLOWS.
2. STABILIZATION- ALL AREAS DISTURBED DURING CULVERT INSTALLATION AND REMOVAL SHALL BE STABILIZED WITHIN 24 HOURS OF THE DISTURBANCE.
3. AFTER EACH RAIN EVENT CULVERT SHOULD BE INSPECTED FOR BLOCKAGES OR AGGREGATE FILL WASHOUTS.

Routine / Maintenance Inspection – Troubleshooting

Control Measure	Problems	Possible Remedies
Vegetation	Erosion along slopes	Check top-of-slope diversion for positive drainage, install diversion if needed
	Bare soil patches	Fill erosion, regrade eroded slopes, & restabilize
	Sediment at toe-of-slope	Remove sediment, & restabilize
Dikes	Erosion on backside of dike	Verify positive drainage; repair eroded area, compact, & restabilize
	Loose soil	Compact dike
	Erosion on front face of dike	Verify channel lining, repair erosion, & restabilize

Control Measure	Problems	Possible Remedies
Swales	Erosion on slope below swale	Verify positive drainage; repair eroded area, compact, & restabilize
	Water ponding in swale	Verify positive drainage, & regrade swale
	Sediment or debris in channel	Remove material accumulation
	Erosion within swale	Verify channel lining, repair erosion, restabilize & install lining as appropriate; check dams may be necessary
Pipe Slope Drain	Blocked inlet or outlet	Remove sediment and debris
	Runoff is eroding slope along pipe	Construct a berm at the inflow point
	Runoff is bypassing inlet	Construct an interceptor berm to direct flow

Control Measure	Problems	Possible Remedies
Pipe Slope Drain (Continued)	Erosion at the outlet	Increase size of riprap apron, use larger riprap; or convey runoff to a more stable outlet
Grass Waterways	Bare areas	Reseed, add lime & fertilizer; install soil stabilization matting
	Channel capacity reduced	Remove sediment/debris accumulations; or mow high growth
Riprap Lined Waterways	Scour underneath riprap	Verify proper channel dimensions; regrade, install & key-in geotextile, & place riprap
	Scour along the side of the waterway	Verify proper channel dimensions; and reconstruct waterway

Control Measure	Problems	Possible Remedies
Riprap Lined Waterways (Continued)	Riprap dislodged	Replace with larger sized riprap
Outlet Protection	Scour at outlet	Verify depth, dimensions, & configuration of riprap outlet; reconstruct & enlarge riprap apron & increase size of riprap; outlet should be at 0% slope; extend riprap beyond apron to transition to stream channel.
	Erosion below outlet	Enlarge riprap apron; increase size of riprap; inspect structural integrity of pipe & outlet structure
	Riprap dislodged	Replace with larger sized riprap

Control Measure	Problems	Possible Remedies
Sediment Traps & Basins	Sediment accumulation is half the height of the wet storage elevation	Dewater facility using approved pumping methods & restore facility to elevations and grades shown on the plans, allow material to dry in an approved location.
	Stone outlet structure is full of sediment	Remove clogged stone & replace with new stone
	Basin not dewatering as designed	Inspect riser structure; remove any blockages from orifices; remove clogged stone & replace with new stone
	Embankment misaligned, sliding, or sloughing is occurring	Reconstruct embankment immediately and restabilize. Facility subject to failure

Control Measure	Problems	Possible Remedies
Sediment Traps & Basins (Continued)	Stone outlet structure erosion	Verify plans for spillway elevations, rock size, & dimensions. Verify design drainage area is not exceeded. Install baffle boards.
	Outlet erosion	Verify depth, dimensions, & configuration of riprap outlet; reconstruct & enlarge riprap apron & increase size of riprap; outlet should be at 0% slope; extend riprap beyond apron to transition to stream channel.
	Riser floating or leaning	Construct riser in concrete footing. Remove and reconstruct riser subgrade and verify joints.

Control Measure	Problems	Possible Remedies
Sediment Traps & Basins (Continued)	Excessive discharge to and from facility.	Verify plans for facility dimensions. Verify design drainage area is not exceeded. Enlarge the sediment facility. Temporarily divert a small portion of drainage to another facility that is capable of handling the additional drainage area.
	Wet storage requires regular maintenance	Verify plans for facility dimensions. Stabilize as much of the drainage area as possible. Install interim E&S Controls prior to discharging to the sediment facilities.

Control Measure	Problems	Possible Remedies
Straw Bale Dike	Bale displacement	Anchor bales with proper stakes. Verify drainage area, slope length, and gradient behind each barrier.
	Undercutting of bales	Entrench bales to proper depth, backfill, and compact the soil.
	Gaps between bales	Restake bales. Drive first stake in each bale at an angel to force it snug against the adjacent bale.

Control Measure	Problems	Possible Remedies
Straw Bale Dike (Continued)	Baling string broken	Retie bale or replace with new bale.
	Bale disintegrating	Replace with new bale.
	Sediment level near top of bales	Remove sediment when sediment is half the height of the barrier height.
Silt Fence	Flow undermining Fence	Entrench geotextile 8", backfill, and compact.
	Sediment exceeds half the height of the fence	Remove sediment when sediment is half the height of the fence.
	Fence leaning or collapsing	Verify post size and geotextile. Verify drainage area, slope length, and gradient behind fence. Correct any substandard condition.

Control Measure	Problems	Possible Remedies
Silt Fence (Continued)	Torn fabric	Replace geotextile from post to post and install properly.
	Runoff escaping around end	Extend fence and turn end upslope.
Stone Outlet Structure	Sediment exceeds half the height of the structure	Remove sediment when sediment is half the height of the structure.
	Stone voids filled with sediment	Remove sediment filled stone and replace with new stone.
	Displaced stone	Verify drainage area, place additional larger stone, and reconstruct structure.
	Flow escaping around the sides of the structure	Extend stone on each side and provide a low area in the center for spillway.

Control Measure	Problems	Possible Remedies
Inlet Protection	Inlet protection not dewatering and geotextile or stone voids filled with sediment	Replace geotextile or stone.
	Runoff undermining the inlet protection	Key-in geotextile, backfill, and compact.
	Sediment exceeds half the height of the structure	Remove sediment when sediment is half the height of the structure.
	Inlet protection leaning or collapsing	Verify construction of inlet protection. Verify drainage area. Reconstruct inlet protection.

Control Measure	Problems	Possible Remedies
Sump Pit	Discharge from hose is sediment laden	Reconstruct and replace geotextile and stone or install new sump pit.
	Water not entering pipe for pumping	Reconstruct and replace geotextile and stone or install new sump pit.
Portable Dewatering Tank	Discharge from outlet is sediment laden	Cease pumping and remove sediment from tank, and replace geotextile. If discharge continues, slow pumping rate of flow or use sump pit in conjunction.
	Discharge from outlet is becoming sediment laden once it discharges back onto the ground.	Relocate tank to a stabilized area or place polyethylene sheeting to convey discharge to stabilized area.

Control Measure	Problems	Possible Remedies
Dewatering Sediment Bag	Sediment laden discharge is escaping around the hose insert.	Cease pumping and insert discharge hose further into bag. Retie bag around the discharge hose to create a tight seal. Periodically check this connection.
	Bag is not dewatering efficiently.	Remove and replace bag and dispose of bag in proper location.
	Discharge from outlet is becoming sediment laden once it discharges on the ground.	Relocate tank to a stabilized area or place polyethylene sheeting to convey discharge to stabilized area.