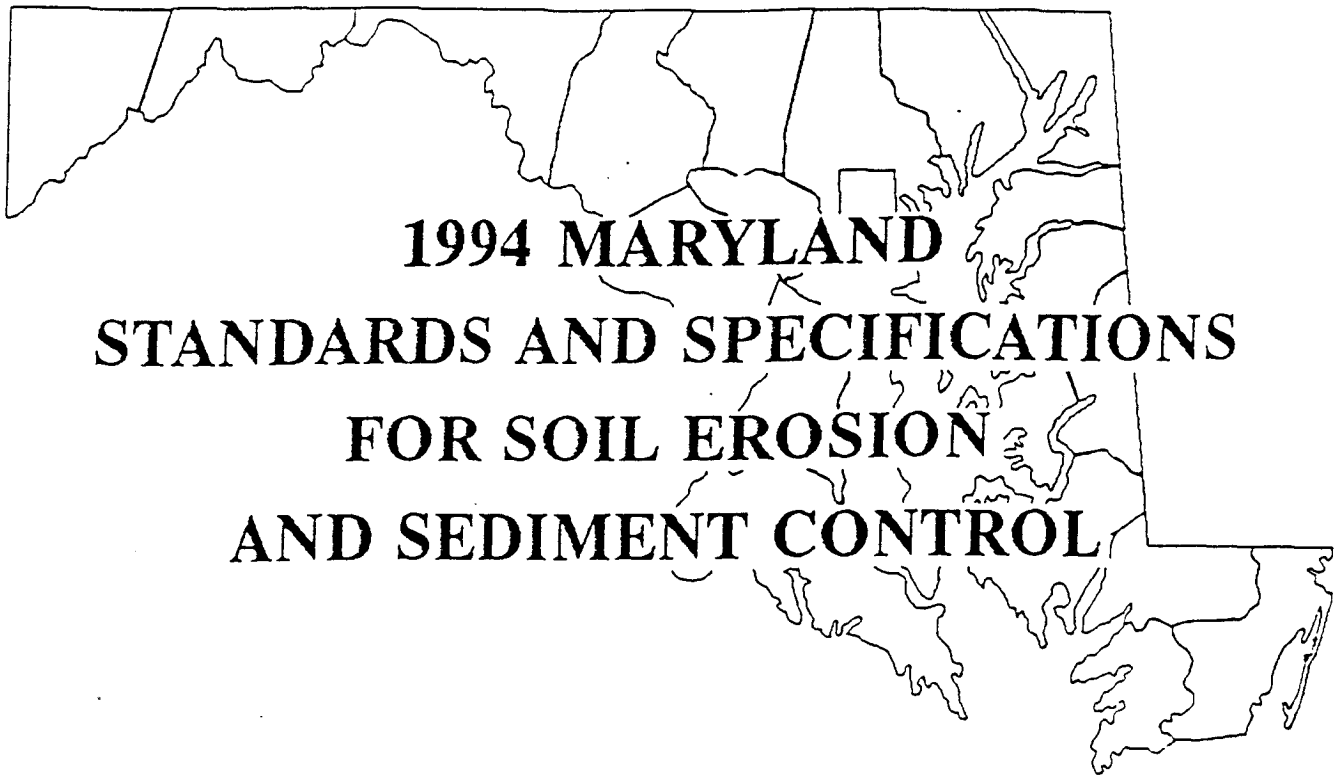

1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT

Water Management Administration

in association with

SOIL CONSERVATION SERVICE

and

STATE SOIL CONSERVATION COMMITTEE

**NOTE: This document consists only of those detail drawings and specification sections that are highlighted in the table of contents. For additional information please refer to the 1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

FOREWORD

At the outset, it is necessary to establish the fact that soil erosion and sediment control are only part of the overall management of stormwater during and after site development. As the original ground cover of a site is disturbed and removed, the runoff characteristics are modified. Velocities of flow are increased and the total runoff volume is also increased. Limited management of runoff during the construction phase is provided by sediment control practices. Runoff control after site development is accomplished by means of permanent stormwater management practices such as infiltration trenches or ponds. The practices contained in these standards and specifications are designed to provide a protective transition from initial site disturbance until implementation of permanent stabilization and stormwater management facilities. The practices described herein are minimum requirements. Local concerns may require practices that are more restrictive than these minimum standards.

SENSITIVE AREAS

Sensitive areas are defined in State law, regulation and/or County law and/or regulation and/or Municipality law and/or regulation. Sensitive watersheds are those streams, tributaries, riparian areas, and estuary areas that are part of the critical area, Class III and Class IV streams and tidal and non-tidal wetland areas and the adjacent steep slopes to any of these areas.

Designers and reviewers should be cognizant of the sensitive nature of these areas within the State of Maryland. Additional soil erosion and sediment control provisions and measures may be required to protect these areas to the greatest extent possible.

The level of additional soil erosion and sediment controls needed in these areas will be determined during the review for the project by the Planning Agencies, Soil Conservation Districts, Resource Agencies and Environmental Commissions and Boards. The final approval of these additional measures and practices will be the responsibility of the review and approval agency. Conflicts between recommendations made by Resource Agencies, Planning Agencies, Review Boards and approval agencies and Commissions will be resolved in writing.

The standards and specifications of this manual are the minimum requirements for soil erosion and sediment control. The provision of additional soil erosion and sediment control measures and practices needed in sensitive areas may be recommended by Planning Agencies, Resource Agencies, Review Committees and Commissions.

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1.0 STANDARDS AND SPECIFICATIONS

FOR

EARTH DIKES

Definition

A temporary berm or ridge of soil, compacted, stabilized and located in such a manner as to direct water to a desired location.

Purpose

The purpose of the earth dike is to direct runoff to a sediment trapping device which reduces the potential for erosion and sedimentation. Earth dikes can also be used for diverting clean water away from disturbed areas.

Conditions Where Practice Applies

Earth dikes are often constructed across disturbed areas and around construction sites such as parking lots and subdivisions. The dikes shall remain in place until the disturbed areas are permanently stabilized.

Earth Dikes are constructed:

1. To divert sediment laden runoff from a disturbed area to a sediment trapping device.

2. Across disturbed areas to shorten overland flow distances.

3. To direct sediment laden water along the base of slopes to a trapping device.

4. To divert clear water from an undisturbed area to a stabilized outlet. Runoff shall be discharged at non-erosive rates.

Table 1 Design Criteria

	Dike A	Dike B
Drainage Area	(See Table 2)	(See Table 2)
Slope (of dike)	(See Table 2)	(See Table 2)
Dike Height (a)	18 in.	30 in.
Dike Width (b)	24 in.	36 in.
Flow Width (c)	4 ft.	6 ft.
Flow Depth in Channel (d)	12 in.	24 in.
Side Slopes	2 : 1 or flatter	2 : 1 or flatter

Note: **1. For slopes or drainage areas other than specified on Table 2, an engineering design is required. If the slope of the earth dike or the drainage area contributing to the dike falls between values on Table 2, round up to the next higher slope or drainage area.**

2. Stabilization of the earth dike shall be completed within seven days of installation.

Construction Specifications

1. All temporary earth dikes shall have uninterrupted positive grade to an outlet. Earth dikes having longitudinal slopes flatter than 1% should have spot elevations along the flow line.

2. Diverted runoff from disturbed areas shall be directed to a sediment trapping devices.

3. Diverted runoff from undisturbed areas shall outlet directly onto an undisturbed, stabilized area at a non-erosive velocity ($\leq$ 4 fps for grass).

4. All trees, brush, stumps, and obstructions shall be removed and disposed of so as not to interfere with the proper functioning of the earth dike berm and flow channel.

5. The dike shall be excavated or shaped to line, grade and cross section as required to meet the criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.

6. Fill shall be compacted by earth moving equipment.

7. All earth removed and not needed for construction shall be placed so that it will not interfere with the functioning of the earth dike berm and flow channel.

8. Inspection and maintenance must be provided periodically and after each rain event.

Stabilization

Stabilization of the earth dike shall be completed within 7 days of installation in accordance with the standards and specifications for Vegetative Practices (Section G). The earth dike flow channel shall be stabilized in accordance with Table 2, and the following criteria:

Flow Channel Stabilization

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 the soil in a minimum 7" layer.

The earth dike type (A or B) and lining (1, 2, or 3) shall be shown on the plans using the standard symbol and A-1, or B-3, etc. Earth dike type and lining may vary along its length.

In highly erodible soils, as defined by the local approval agency, refer to the next higher slope grade for the type of stabilization needed.

Engineering Design Criteria

Engineering design may preempt the use of Table 2. The basis for the engineering design shall be the 2-year frequency storm using SCS criteria, assuming the worst soil cover conditions to prevail in the contributing drainage area over the life of the earth dike. Manning's Equation shall be used to determine earth dike flow channel velocities associated with the developed discharges. The Manning's Roughness coefficients to be used in the equation are 0.025 for seed and mulch, 0.03 for soil stabilization matting or sod, and for 4"- 7" stone use 0.045 for flow depths up to 1 foot (Dike A) and 0.038 for flow depths between 1 and 2 feet (Dike B). The allowable flow channel velocities shall be $<$ 4 fps for Seed and Mulch, $<$ 6 fps for Stabilization Matting or sod, and $<$ 8 fps for 4"- 7" stone.

Outlet

1. Earth dikes must have an outlet that functions without causing erosion.

2. Runoff from disturbed areas shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin until the drainage area above the earth dike is adequately stabilized.

3. The on-site location may need to be adjusted to meet field conditions.

4. Clear water diversions around disturbed areas shall be discharged into an undisturbed, stabilized area or watercourse at a non erosive velocity.

Removal

Following completion of all construction and stabilization at a site with established vegetation, all temporary earth dikes shall be removed and the areas occupied by the dikes shall be graded and stabilized with vegetation.

Directions for Using Table 2

1. Determine the location on the Erosion and Sediment Control plan where using the earth dike to divert runoff is feasible. Determine the longitudinal slopes of the proposed temporary earth dike location.

2. Determine the maximum drainage area to various design points along the proposed earth dike alignment.

3. Enter Table 2 with the slope and drainage corresponding to the previously determined design points along the earth dike. Using Table 2 choose an earth dike type (A or B) and lining (1, 2, or 3) for the earth dike alignment between the design points.

4. Review the slopes along the earth dike alignment between the design points to insure that the slope/drainage area relationship does not exceed the chosen lining.

Table 2: Earth Dike Selection

	Drainage Area (acres)									
Slope % **	1	2	3	4	5	6	7	8	9	10
1	SEED	AND	4							
2	MULCH	4		SEED	AND	SOIL	STABILIZATION			
3				MATTING				6	6	6
4	4*						6			
5					6	6				
6				6		4" – 7"		STONE	PRESSED	
7			6			7" (Min)		INTO	GROUND	
8										
9										
10		6								

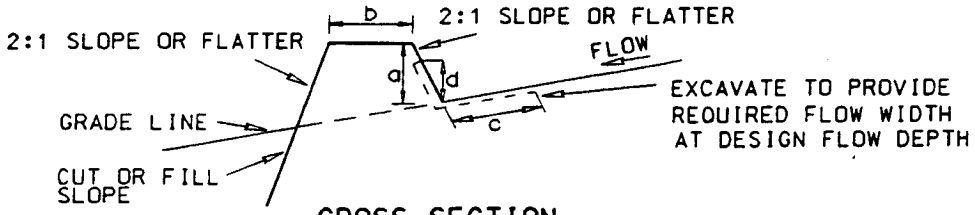
"A" Dike

"B" Dike

*Velocity of discharge in feet/second

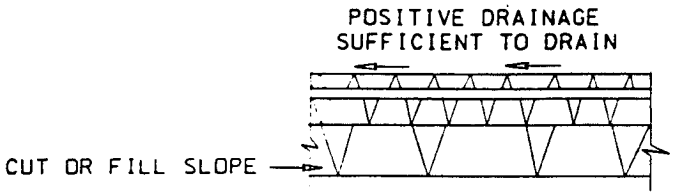
** For slopes steeper than 10% refer to Section B - Grade Stabilization Structures

DETAIL 1 - EARTH DIKE



CROSS SECTION

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



PLAN VIEW

STANDARD SYMBOL
A-2 B-3

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 the soil 7" minimum

Construction Specifications

1. All temporary earth dikes shall have uninterrupted positive grade to an outlet. Spot elevations may be necessary for grades less than 1%.

2. Runoff diverted from a disturbed area shall be conveyed to a sediment trapping device.

3. Runoff diverted from an undisturbed area shall outlet directly into an undisturbed, stabilized area at a non-erosive velocity.

4. All trees, brush, stumps, obstructions, and other objectional material shall be removed and disposed of so as not to interfere with the proper functioning of the dike.

5. The dike shall be excavated or shaped to line, grade and cross section as required to meet the criteria specified herein and be free of bank projections or other irregularities which will impede normal flow.

6. Fill shall be compacted by earth moving equipment.

7. All earth removed and not needed for construction shall be placed so that it will not interfere with the functioning of the dike.

8. Inspection and maintenance must be provided periodically and after each rain event.

DEWATERING STRATEGY

Dewatering refers to the act of removing and discharging water from excavated areas on construction sites or from sediment traps or basins on construction sites. Standards and specifications for dewatering practices follow.

These standards apply to removal and discharge of water from any excavated area or sediment trap or basin at any construction site. Given the unique conditions at any particular construction site, any or all of the practices may apply. Regardless of the applicability of the practices listed herein, operators are required to use acceptable procedures for maintenance and dewatering. In all cases, every effort shall be made to eliminate sediment pollution associated with dewatering.

Designers shall specify the preferred procedures for dewatering on plans. In particular, designers should identify procedures for dewatering sediment traps and basins prior to elimination of the last sediment control facility on the site or prior to conversion of sediment control facilities to stormwater management facilities. Recommended procedures shall be consistent with these standards. Atypical site conditions may require innovative dewatering designs. Dewatering measures not referenced in this standard may be used with the consent of the approval authority.

Dewatering of Excavated Areas

A. Designers shall specify on plans, and in sequences of construction included on plans, practices for dewatering of excavated areas. Plan reviewers shall check to see that procedures for dewatering are included on plans.

B. In all cases, water removed from excavated areas shall be discharged such that it shall pass through a sediment control device prior to entering receiving waters. Sediment control devices include sediment traps and basins, in addition to the practices in this section.

Approved Practices for Dewatering of Excavated Areas

1. Pumping of water to an existing sediment basin or trap in which the entire volume of water from the area to be dewatered can be contained without discharge to receiving waters.

2. Pumping of water to an existing sediment basin or trap such that the entire volume of water from the area to be dewatered can be managed without exceeding the design outflow from the sediment control structure.

3. Removable Pumping Station - Standards and specifications for Removable Pumping Station are on Detail 20A.

4. Use of a Sump Pit - Standards and specifications for a sump pit are on Detail 20B.

5. Sediment Tank - Standards and specifications for a sump pit are on Detail 21.

Dewatering of Sediment Traps and Basins

Designers shall specify on plans, and in sequences of construction included on plans, the practices for dewatering of traps and basins. Plan reviewers shall check to see that procedures for dewatering to be used are included on plans. In all cases, water removed from traps and basins shall be discharged so that it passes through a sediment control device prior to entering receiving waters.

Approved Practices for Dewatering of Traps and Basins

1. Removable pumping station

2. Use of a Sump Pit.

3. Use of a floating suction hose to pump the cleaner water from the top of the pond. As the cleaner water is pumped the suction hose will lower and eventually encounter sediment laden water. When this happens the pumping operation will cease. Provisions shall be made to filter water prior to discharge to receiving waters. When floating suction hoses are used, personnel shall be assigned to monitor pumping operations to ensure that sediment pollution is abated. **Pumping sediment laden water into the waters of the State without filtration is strictly forbidden.**

4. Vegetative buffers - The maintenance of areas of existing vegetation adjacent to wetlands, streams, and other areas of significant natural resource value in connection with sediment control practices noted in this manual can ensure that such areas are not adversely affected by grading and construction or by stormwater runoff once construction is completed. The maintenance of such areas adjacent to streams is particularly important because they lessen the impact of sedimentation on fish and spawning to keep streams at water temperatures favorable to fish and other aquatic species, and provide food such as leaves and twigs for aquatic organisms, particularly in headwater streams.

The width needed for such areas in order to provide adequate protection is dependent on the type of area to be protected, the type of vegetation in the buffer, the slope present, the ability of the soils in the buffer to absorb water, the size distribution of the incoming sediment, and the rate of runoff. However, research studies have shown that the maintenance of a buffer of 100 feet in width in areas with low to moderate slopes should generally provide adequate protection.

12.0 DEWATERING SPECIFICATIONS

FOR

REMOVABLE PUMPING STATION

Definition

A temporary structure which is used to remove water from excavated areas, sediment traps and basins.

Purpose

The Removable Pumping Station is an easily maintained device that filters sediment laden water at a pump intake, prior to discharging to a suitable area.

Conditions Where Practice Applies

Removable Pumping Stations are constructed when water collects and must be pumped away during excavation, cofferdam dewatering, maintenance or removal of sediment traps and basins or for other uses as applicable. These are preferred over Sump Pits on projects where a long duration of pumping is expected.

Design Criteria

The number of Removable Pumping Stations and their locations shall be determined by the designer and included on the plans. Contractors may relocate sump pits to optimize use but discharge location changes must be coordinated with inspectors. A design is not required but construction must conform to the general criteria outlined on Detail 20A.

A perforated, vertical standpipe wrapped with wire mesh and geotextile is placed inside a larger pipe. The outside pipe is then enveloped by a cone of washed stone. Water is then pumped from the center of the inside pipe to a suitable discharge area.

Water pumped from the standpipe should discharge into a sediment trap, sediment basin or stabilized area.

Construction Specifications

1. The inner pipe shall be constructed by perforating a 12" to 36" diameter pipe with a watertight cap on the bottom end and wrapping it with 1/2" hardware cloth and Geotextile Class E[19]. The perforations shall be 1/2" X 6" slits or 1" diameter holes 6" on center.

2. The outer pipe shall be at least 4" larger in diameter than the inside pipe. Both the inner and outer pipes should extend 12" to 18" above the riser crest elevation, or anticipated high water elevation.

[19] Refer to Table 27

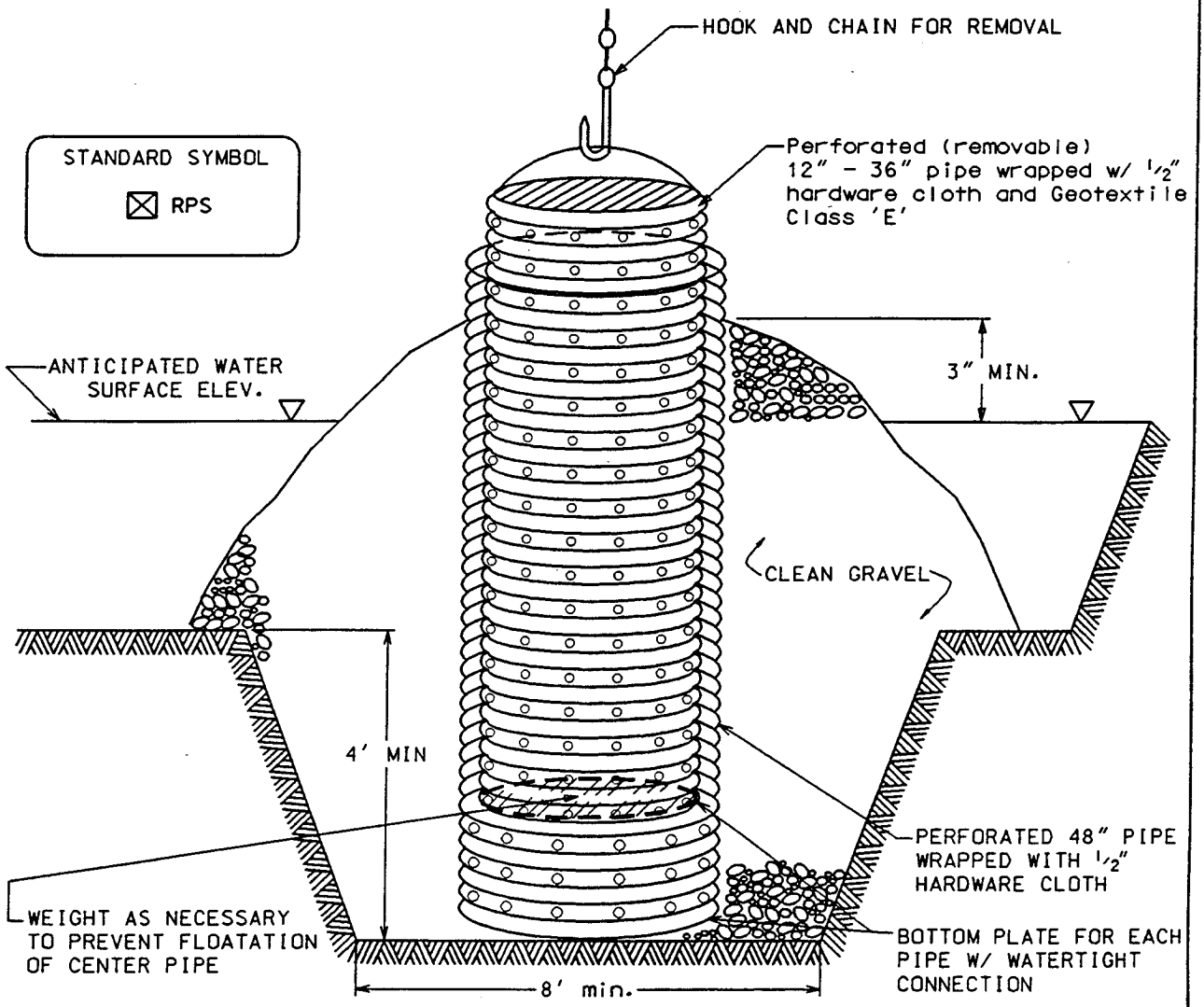
3. Filter material ranging from clean gravel (minimal fines) to #57 stone[20] (1 1/2" maximum diameter) should be backfilled around the outer pipe.

4. The suction hose from the pump shall be placed inside the inner pipe to begin dewatering. The discharge hose shall be placed in a stabilized area downslope of unstabilized areas to prevent erosion. Meadow or wooded areas are preferred discharge locations but storm drains and paved areas are acceptable.

5. Maintenance - The inner pipe can easily be removed to facilitate changing the geotextile when it clogs. Maintenance must be performed when the pump runs dry and backed up water remains.

[20] Refer to Table 28

DETAIL 20A - REMOVABLE PUMPING STATION



ELEVATION (CUT AWAY)

Construction Specifications

1. The outer pipe should be 48" dia. or shall, in any case, be at least 4" greater in diameter than the center pipe. The outer pipe shall be wrapped with 1/2" hardware cloth to prevent backfill material from entering the perforations.

2. After installing the outer pipe, backfill around outer pipe with 2" aggregate or clean gravel.

3. The inside stand pipe (center pipe) should be constructed by perforating a corrugated or PVC pipe between 12" and 36" in diameter. The perforations shall be 1/2" X 6" slits or 1" diameter holes 6" on center. The center pipe shall be wrapped with 1/2" hardware cloth first, then wrapped again with Geotextile Class E.

4. The center pipe should extend 12" to 18" above the anticipated water surface elevation or riser crest elevation when dewatering a basin.

13.0 STANDARDS AND SPECIFICATIONS

FOR

SUMP PIT

Description of Practice

A temporary pit from which pumping is conducted to remove excess water while minimizing sedimentation.

Purpose

The sump pit filters water being pumped to reduce sedimentation to receiving streams.

Conditions Where Practice Applies

Sump Pits are constructed when water collects and must be pumped away during excavating, cofferdam dewatering, maintenance or removal of sediment traps and basins or other uses as applicable.

Design Criteria

The number of sump pits and their locations shall be determined by the designer and included on the plans. Contractors may relocate sump pits to optimize use but discharge location changes must be coordinated with inspectors. A design is not required but construction must conform to the general criteria outlined on Detail 20B.

A perforated vertical standpipe is wrapped with 1/2" hardware cloth and Geotextile Class E[21], then placed in the center of an excavated pit which is then backfilled with filter material consisting of anything from clean gravel (minimal fines) to #57 stone (1 1/2" maximum diameter). Water is then pumped from the center of the standpipe to a suitable discharge area such as into a sediment trap, sediment basin or stabilized area.

Construction Specifications

1. Pit dimensions are variable, with the minimum diameter being twice the diameter of the standpipe.

2. The standpipe should be constructed by perforating a 12" to 36" diameter pipe then wrapping it with 1/2" hardware cloth and Geotextile Class E. The perforations shall be 1/2" X 6" slits or 1" diameter holes 6" on center.

3. A base of filter material consisting of anything from clean gravel (minimal fines) to #57 stone (1 1/2" maximum diameter) should be placed in the pit to a depth of 12". After installing the standpipe, the pit surrounding the standpipe should then be backfilled with the same filter material.

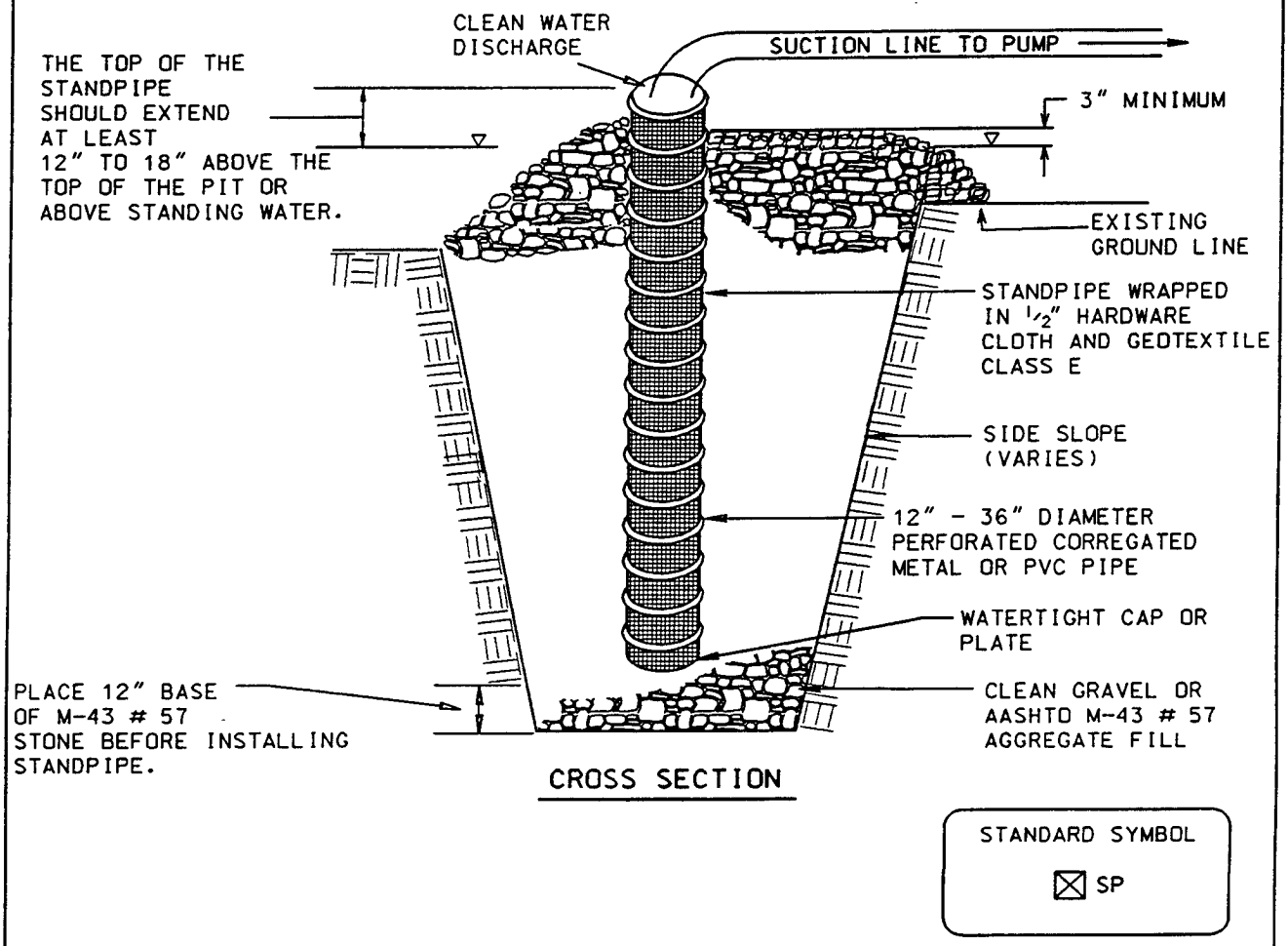
4. The standpipe shall extend 12" to 18" above the lip of the pit or riser crest elevation (basin dewatering) and filter material should extend 3" minimum above the anticipated standing water level.

Maintenance

To maintain, sump pits must be removed and reconstructed when pump runs dry.

[21] Refer to Table 27

DETAIL 20B - SUMP PIT



CROSS SECTION

STANDARD SYMBOL

⊠ SP

Construction Specifications

1. Pit dimensions are variable, with the minimum diameter being 2 times the standpipe diameter.

2. The standpipe should be constructed by perforating a 12" to 24" diameter corrugated or PVC pipe. Then wrapping with ½" hardware cloth and Geotextile Class E. The perforations shall be ½" x 6" slits or 1" diameter holes.

3. A base of filter material consisting of clean gravel or #57 stone should be placed in the pit to a depth of 12". After installing the standpipe, the pit surrounding the standpipe should then be backfilled with the same filter material.

4. The standpipe should extend 12" to 18" above the lip of the pit or the riser crest elevation (basin dewatering only) and the filter material should extend 3" minimum above the anticipated standing water elevation.

14.0 STANDARDS AND SPECIFICATIONS

FOR

SEDIMENT TANK

Definition

A sediment tank is a compartmented tank container through which sediment laden water is pumped to trap and retain the sediment.

Purpose

To trap and retain sediment prior to pumping the water to drainageways, adjoining properties, and rights-of-way below the sediment tank site.

Conditions Where Practice Applies

A sediment tank is to be used on sites where excavations are deep, and space is limited, such as urban construction, where direct discharge of sediment laden water to stream and storm drainage systems is to be avoided.

Design Criteria

1. Location The sediment tank shall be located for ease of clean-out and disposal of the trapped sediment and to minimize interference with construction activities and pedestrian traffic.

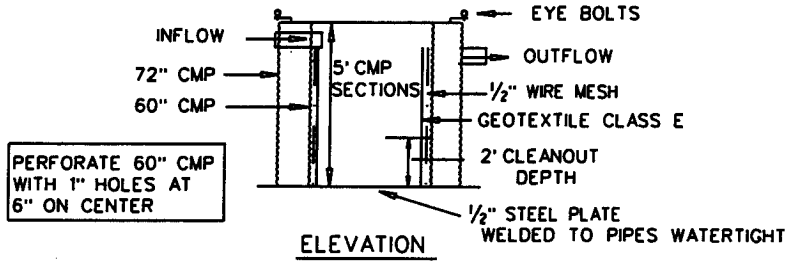
2. Tank Size The following formula should be used in determining the storage volume of the sediment tank: 1 cubic foot of storage for each gallon per minute of pump discharge capacity.

An example of a typical sediment tank is shown below. Other container designs can be used if the storage volume is adequate and approval is obtained from the local approving agency.

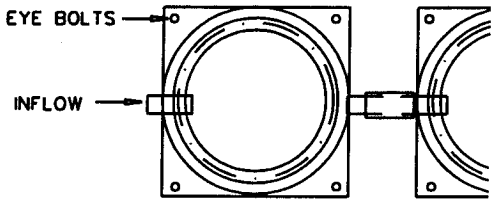
Tanks may be connected in series. Geotextile fabric mesh sizes may vary from tank to tank with the downstream-most layer meeting Geotextile Class C[22] or better.

[22] Refer to Table 27

DETAIL 21 - PORTABLE SEDIMENT TANK



ELEVATION



PLAN VIEW

STANDARD SYMBOL

⊠ PST

Construction Specifications

1. The following formula should be used in determining the storage volume of the sediment tank: 1 cubic foot of storage for each gallon per minute of pump discharge capacity.

2. An example of a typical sediment tank is shown above. Other container designs can be used if the storage volume is adequate and approval is obtained from the local approving agency.

3. Tanks may be connected in series.

15.0 STANDARDS AND SPECIFICATIONS

FOR

SILT FENCE

Definition

Temporary barriers of woven geotextile fabric used to intercept, reduce velocity and filter surface runoff from disturbed areas.

Purpose

Silt fences filter sediment from runoff so that deposition of transported sediment can occur. Silt fences can be used to intercept sheet flow only. They cannot be used as velocity checks in ditches or swales, or placed where they will intercept concentrated flow.

Conditions Where Practice Applies

Silt fence is limited to intercepting sheet flow runoff from limited distances according to slope. Silt fence provides filtering and velocity dissipation to promote gravity settling of sediments.

Design Criteria

1. Silt fence should be used with caution in areas of rocky soils that may prevent trenching.

2. Silt fence should be placed on or parallel to contours.

3. The length of silt fences must conform to the following:

Table 17 Silt Fence Design Constraints

Slope Steepness	(Maximum) Slope Length	(Maximum) Silt Fence Length
Flatter than 50:1 (2%)	unlimited	unlimited
50:1 to 10:1 (2 - 10%)	125 feet	1,000 feet
10:1 to 5:1 (10 - 20%)	100 feet	750 feet
5:1 to 3:1 (20 - 33%)	60 feet	500 feet
3:1 to 2:1 (33 - 50%)	40 feet	250 feet
> 2:1 (> 50%)	20 feet	125 feet

4. In areas of less than 2% slope and sandy soils (USDA general classification system, soil class A) maximum slope length and silt fence length will be unlimited. In these areas a silt fence may be the only perimeter control required.

5. Downslope from the silt fence should be undisturbed ground.

1. Fence posts shall be a minimum of 36 inches long driven 16" minimum into ground. Wood posts shall be 1 1/2" X 1 1/2" (minimum) square cut, or 1 3/4" (minimum) diameter round and shall be of sound quality hardwood. Steel posts will be standard T or U section weighing not less than 1.00 pound per linear foot.

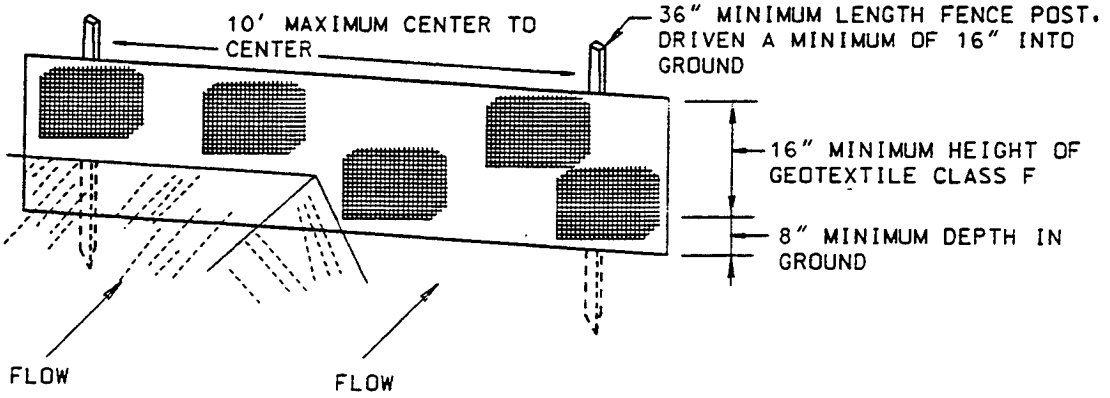
2. Geotextile shall be fastened securely to each fence post with wire ties or staples at top and mid-section and shall meet the following requirements for Geotextile Class F:

Tensile Strength	50 lbs/in (min.)	Test: MSMT 509
Tensile Modulus	20 lbs/in (min.)	Test: MSMT 509
Flow Rate.	3 gal/ft^2/minute (max.)	Test: MSMT 322
Filtering Efficiency	75% (min.)	Test: MSMT 322

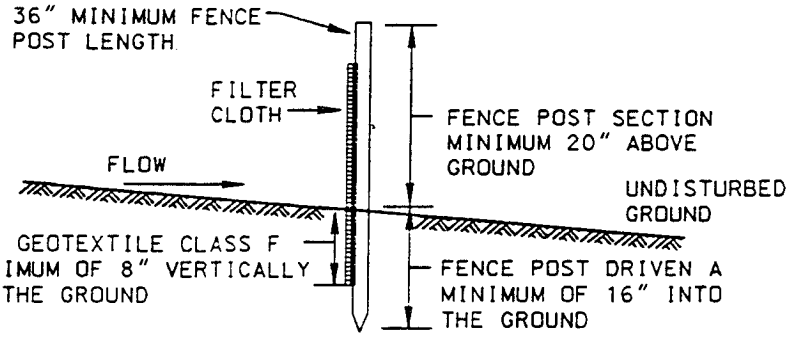
3.Where ends of geotextile fabric come together, they shall be overlapped, folded and stapled to prevent sediment bypass.

4.Silt Fence shall be inspected after each rainfall event and maintained when bulges occur or when sediment accumulation reached 50% of the fabric height.

DETAIL 22 – SILT FENCE

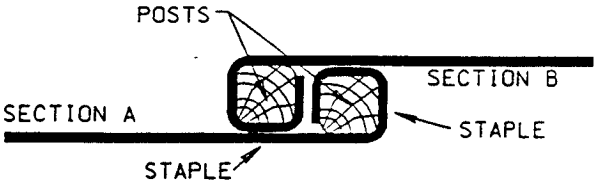


PERSPECTIVE VIEW



CROSS SECTION

TOP VIEW



JOINING TWO ADJACENT SILT FENCE SECTIONS

STANDARD SYMBOL

SF

Construction Specifications

1. Fence posts shall be a minimum of 36" long driven 16" minimum into the ground. Wood posts shall be $1\frac{1}{2}$" x $1\frac{1}{2}$" square (minimum) cut, or $1\frac{3}{4}$" diameter (minimum) round and shall be of sound quality hardwood. Steel posts will be standard T or U section weighting not less than 1.00 pond per linear foot.

2. Geotextile shall be fastened securely to each fence post with wire ties or staples at top and mid-section and shall meet the following requirements for Geotextile Class F:

Tensile Strength	50 lbs/in (min.)	Test: MSMT 509
Tensile Modulus	20 lbs/in (min.)	Test: MSMT 509
Flow Rate	0.3 gal ft²/ minute (max.)	Test: MSMT 322
Filtering Efficiency	75% (min.)	Test: MSMT 322

3. Where ends of geotextile fabric come together, they shall be overlapped, folded and stapled to prevent sediment bypass.

4. Silt Fence shall be inspected after each rainfall event and maintained when bulges occur or when sediment accumulation reached 50% of the fabric height.

SILT FENCE

Silt Fence Design Criteria

Slope Steepness	(Maximum) Slope Length	(Maximum) Silt Fence Length
Flatter than 50:1	unlimited	unlimited
50:1 to 10:1	125 feet	1,000 feet
10:1 to 5:1	100 feet	750 feet
5:1 to 3:1	60 feet	500 feet
3:1 to 2:1	40 feet	250 feet
2:1 and steeper	20 feet	125 feet

Note: In areas of less than 2% slope and sandy soils (USDA general classification system, soil Class A) maximum slope length and silt fence length will be unlimited. In these areas a silt fence may be the only perimeter control required.

16.0 STANDARDS AND SPECIFICATIONS

FOR

STORM DRAIN INLET PROTECTION

Definition

A filter constructed around a storm drain inlet.

Purpose

Storm Drain Inlet Protection is used to filter sediment laden runoff before it enters the storm drain system.

Conditions Where Practices Applies

Storm drain inlet protection is a secondary sediment control device and is not to be used in place of a sediment trapping device unless approved by the appropriate approval authority.

Design Criteria

Storm drain inlet protection shall be used when the drainage area to an inlet is disturbed and the following conditions prevail:

1. It is not possible to temporarily divert the storm drain outfall into a sediment-trapping device;

2. Watertight blocking of inlets is not advisable; and

3. Drainage area is less than 1/4 acre for curb or standard inlet protections and 1 acre for elevated or yard inlets. For yard inlets, the total for inlets in series must be 1 acre or less and the contributing drainage area must have slopes flatter than 5%.

Maintenance

Maintenance requirements for storm drain inlet protection are intense, due to the susceptibility to clogging. When the structure does not drain completely within 48 hours after a storm event, it is clogged. When this occurs, accumulated sediment must be removed and the geotextile fabric and stone must be cleaned or replaced.

Construction Specifications

A. Standard Inlet Protection (Elevated or Yard Inlet)

1. Excavate completely around the inlet to a depth of 18" below the notch elevation.

2. Drive 2" X 4" construction grade lumber posts 1' into the ground at each corner of the inlet. Place nail strips between the posts on the ends of the inlet. Assemble the top portion of the 2" X 4" frame using the overlap joint shown on Detail 23A. The top of the frame (weir) must be 6" below adjacent roadways where flooding and safety issues may arise.

3. Stretch 1/2" X 1/2" wire mesh tightly around the frame and fasten securely. The ends must meet and overlap at a post.

4. Stretch the Geotextile Class E[23] tightly over the wire mesh with the geotextile extending from the top of the frame to 18" below the inlet notch elevation. Fasten the geotextile firmly to the frame. The ends of the geotextile must meet at a post, be overlapped and folded, then fastened down.

5. Backfill around the inlet in compacted 6" layers until the layer of earth is level with the notch elevation on the ends and top elevation on the sides.

6. 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 the frame.

7. The structure must be inspected periodically and after each rain and the geotextile replaced when it becomes clogged.

B. At Grade Inlet

1. Lift grate and wrap with Geotextile Class E to completely cover all openings, then set grate back in place.

2. Place 3/4 to 1 1/2"[24] stone, 4 - 6" thick on the grate to secure the fabric and provide additional filtration.

C. Curb Inlet Protection (COG or COS Inlets)

1. Attach a continuous piece of 1/2" X 1/2" wire mesh (30" minimum width by throat length, plus 4') to the 2" x 4" weir (measuring throat length plus 2') as shown on the standard drawing.

2. Place a continuous piece of approved Geotextile Class E of the same dimensions as the wire mesh over the wire mesh and securely attach it to the 2" x 4" weir.

3. Securely nail the 2" X 4" weir to a 9" long vertical spacer to be located between the weir and the inlet face (max. 4' apart).

4. Place the assembly against the inlet throat and nail (minimum 2' lengths of 2" x 4" to the top of the weir at spacer locations). These 2" x 4" anchors shall extend across the inlet top and be held in place by sandbags or alternate weight.

5. The assembly shall be placed so that the end spacers are 1' beyond both ends of the throat opening.

[23] Refer to Table 27

[24] Refer to Table 28

6. Form the 1/2" x 1/2" wire mesh and the geotextile fabric to the concrete gutter and against the face of the curb on both sides of the inlet. Place clean 3/4" to 1 1/2" stone over the wire mesh and geotextile in such a manner as to prevent water from entering the inlet under or around the geotextile.

7. This type of protection must be inspected frequently and the geotextile fabric and stone replaced when clogged with sediment.

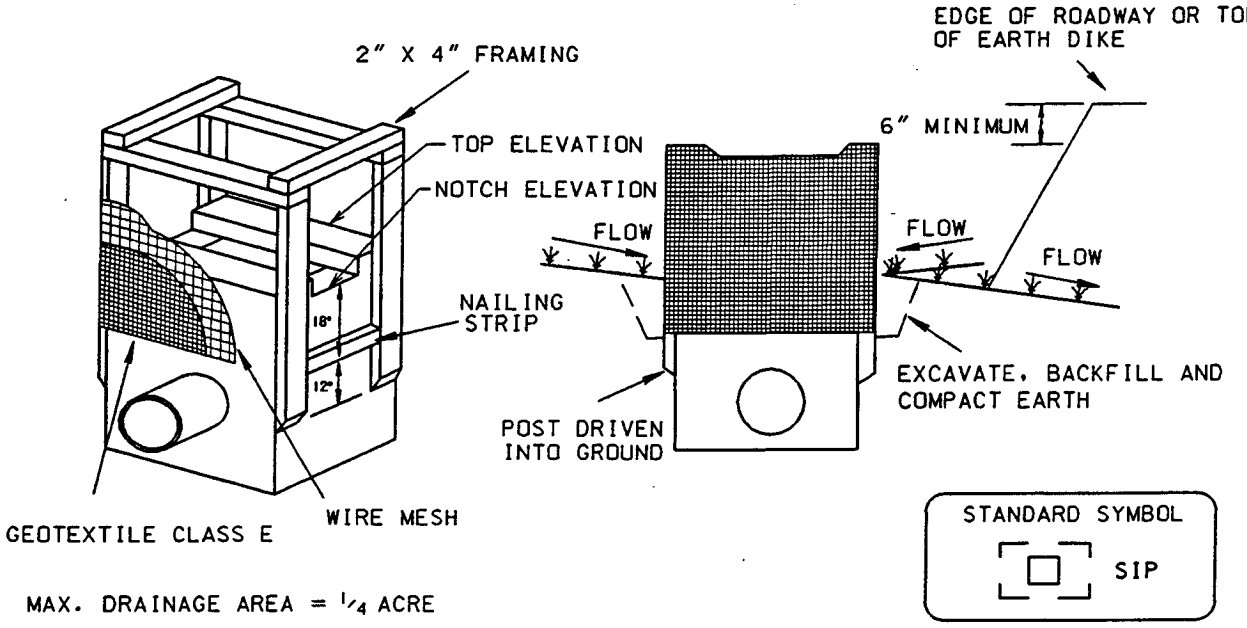
8. Assure that storm flow does not bypass the inlet by installing a temporary earth or asphalt dike to direct the flow to the inlet.

D. Median Inlet Protection (MIP)

1. Construct standard Slope Silt Fence having 5' post spacing 1' - 6" away from the existing inlet only on the sides of the inlet receiving sheet flow and in the location of the "wings".

2. In the location of concentrated flow, construct a stone check dam using 4" - 7" stone for the base faced on the upstream side with 3/4" - 1 ½" aggregate, 1' thick. The the stone check dam shall be 16" high with the weir 10" above the invert of the ditch or valley gutter and shall be the same width as the ditch or gutter bottom or 2' (min.). Where the end of the "wings" meet the ground shall be at or above the weir elevation.

DETAIL 23A - STANDARD INLET PROTECTION



MAX. DRAINAGE AREA = 1/4 ACRE

Construction Specifications

1. Excavate completely around the inlet to a depth of 18" below the notch elevation.

2. Drive the 2" x 4" construction grade lumber posts 1' into the ground at each corner of the inlet. Place nail strips between the posts on the ends of the inlet. Assemble the top portion of the 2" x 4" frame using the overlap joint shown on Detail 23A. The top of the frame (weir) must be 6" below adjacent roadways where flooding and safety issues may arise.

3. Stretch the 1/2" x 1/2" wire mesh tightly around the frame and fasten securely. The ends must meet and overlap at a post.

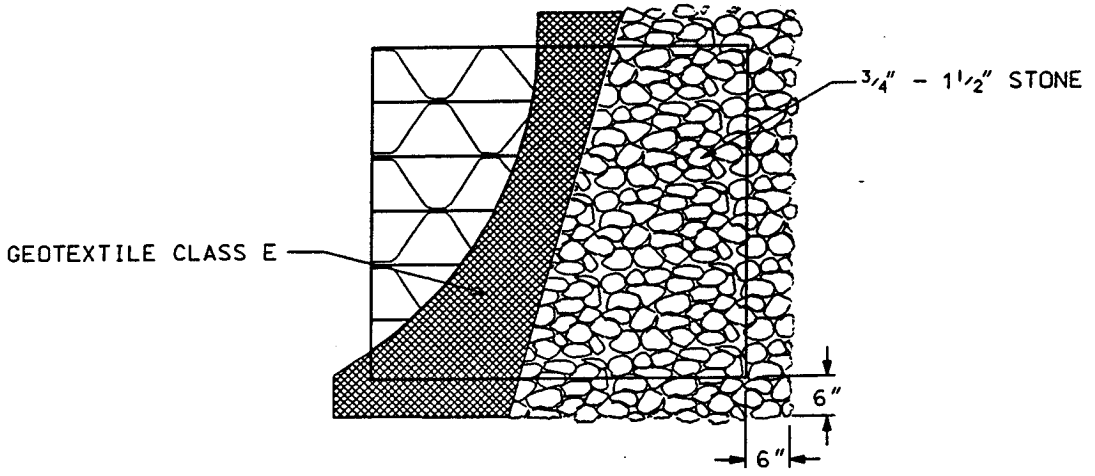
4. Stretch the Geotextile Class E tightly over the wire mesh with the geotixtile extending from the top of the frame to 18" below the inlet notch elevation. Fasten the geotextile firmly to the frame. The ends of the geotextile must meet at a post. be overlapped and folded. then fastened down.

5. Backfill around the inlet in compacted 6" layers until the layer of earth is level with the notch elevation on the ends and top elevation on the sides.

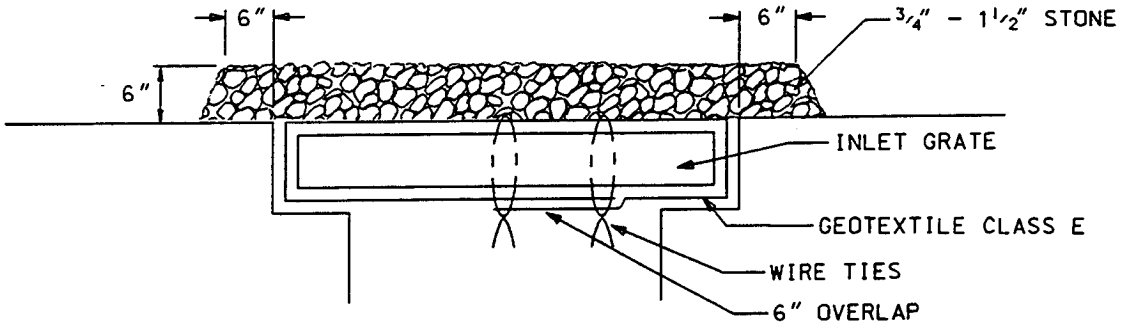
6. If the inlet is not in a sump. construct a compacted earth dike across the ditch line directly below it. The top of the earth dike should be at least 6" higher than the top of the frame.

7. The structure must be inspected periodically and after each rain and the geotextile replaced when it becomes clogged.

DETAIL 23B - AT GRADE INLET PROTECTION



PLAN/CUT AWAY VIEW



CROSS SECTION

STANDARD SYMBOL

AGIP

MAX. DRAINAGE AREA = 1/4 ACRE

Construction Specifications

1. Lift grate and wrap with Geotextile Class E to completely cover all openings. then set grate back in place.

2. Place 3/4" to 1 1/2" stone. 4"-6" thick on the grate to secure the fabric and provide additional filtration.

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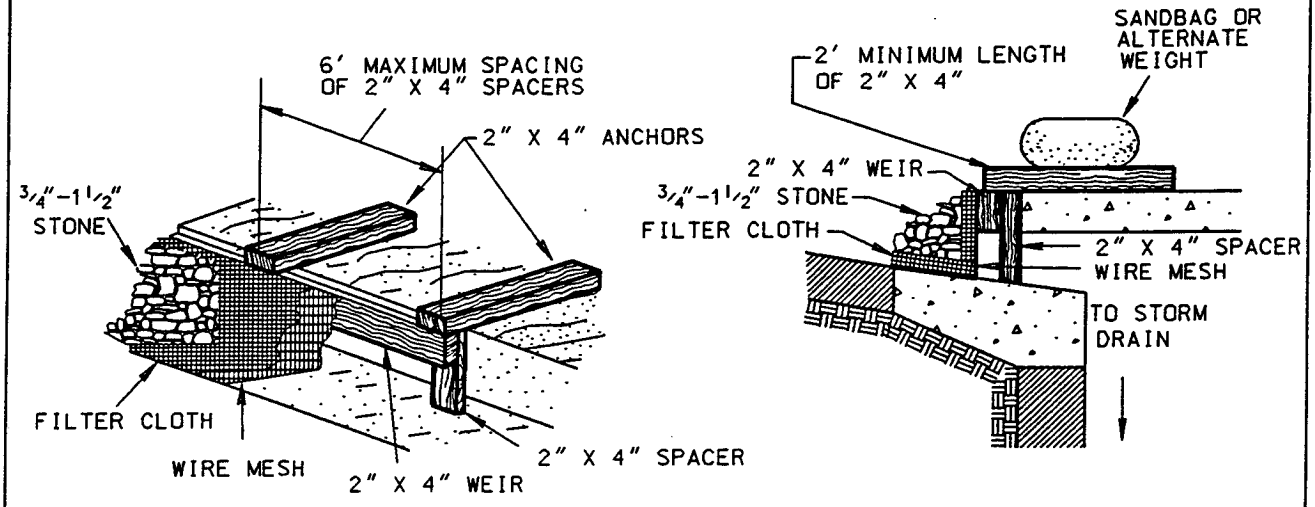
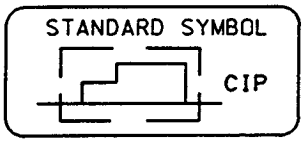
DETAIL 23C – CURB INLET PROTECTION (COG OR COS INLETS)



MAX. DRAINAGE AREA = 1/4 ACRE



Construction Specifications

1. Attach a continuous piece of wire mesh (30" minimum width by throat length plus 4') to the 2" x 4" weir (measuring throat length plus 2') as shown on the standard drawing.

2. Place a continuous piece of Geotextile Class E the same dimensions as the wire mesh over the wire mesh and securely attach it to the 2" x 4" weir.

3. Securely nail the 2" X 4" weir to a 9" long vertical spacer to be located between the weir and the inlet face (max. 4' apart).

4. Place the assembly against the inlet throat and nail (minimum 2' lengths of 2" x 4" to the top of the weir at spacer locations). These 2" x 4" anchors shall extend across the inlet top and be held in place by sandbags or alternate weight.

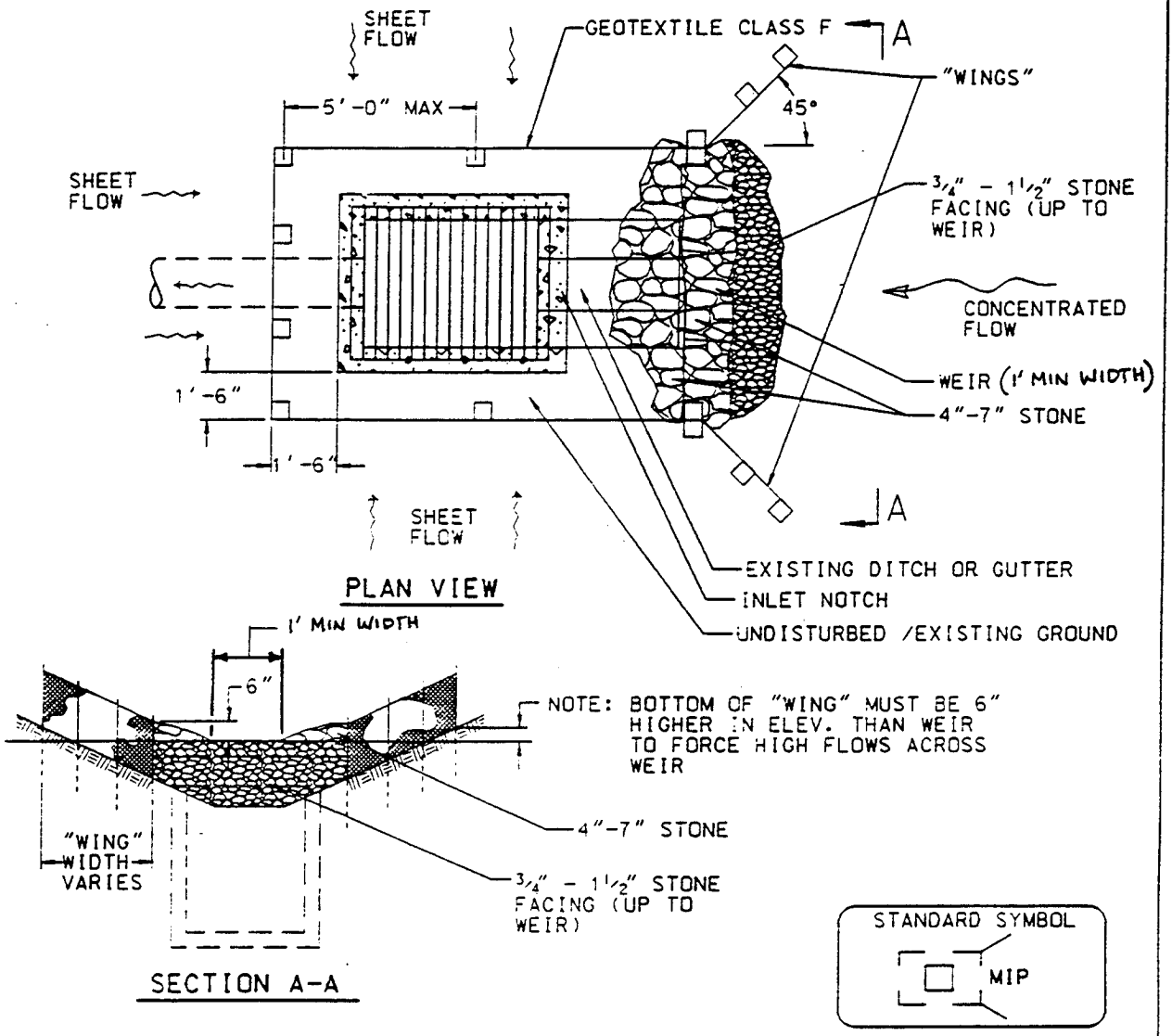
5. The assembly shall be placed so that the end spacers are a minimum 1' beyond both ends of the throat opening.

6. Form the 1/2" x 1/2" wire mesh and the geotextile fabric to the concrete gutter and against the face of the curb on both sides of the inlet. Place clean 3/4" x 1 1/2" stone over the wire mesh and geotextile in such a manner to prevent water from entering the inlet under or around the geotextile.

7. This type of protection must be inspected frequently and the filter cloth and stone replaced when clogged with sediment.

8. Assure that storm flow does not bypass the inlet by installing a temporary earth or asphalt dike to direct the flow to the inlet.

DETAIL 23D - MEDIAN INLET PROTECTION



Construction Specifications

1. Fence posts shall be 36" (min.) long, driven 16" into the ground and spaced 5' (max.) apart. Wood posts shall be 1 1/2" x 1 1/2" (min.) square cut or 1 3/4" (min.) diameter round and shall be of sound quality hardwood. Steel posts shall be standard T or U section weighing not less than 1.0 #/linear foot.

2. Geotextile Class F shall be fastened securely to each post with wire ties or staples at top and mid-section.

3. Where ends of geotextile fabric come together they shall be overlapped, folded and stapled.

4. Median Inlet Protection shall be inspected after each rain and maintained when bulges occur in the fabric or when the stone gets clogged.

5. Stone used to construct the weir shall be 4" - 7" with a 1' thick layer of 3/4" - 1 1/2" stone on the upstream face.

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17.0 STANDARDS AND SPECIFICATIONS

FOR

STABILIZED CONSTRUCTION ENTRANCE

Definition

A stabilized layer of aggregate that is underlain with Geotextile Class C[25]. Stabilized entrances are located at any point where traffic enters or leaves a construction site.

Purpose

Stabilized construction entrances reduce tracking of sediment onto streets or public rights-of-way and provide a stable area for entrance or exit from the construction site.

Conditions Where Practice Applies

1. Stabilized construction entrances shall be located at points of construction ingress and egress.

2. For single family residences, the entrance should be located at the permanent driveway.

3. Stabilized construction entrances should not be used on existing pavement.

Design Criteria

1. Length - minimum of 50' (30' for single residence lot).

2. Width - 10' minimum, should be flared at the existing road to provide a turning radius.

3. Geotextile Class C shall be placed over the existing ground prior to placing stone. The plan approval authority may not require geotextile fabric for single family residences.

4. Stone - crushed aggregate (2" to 3")[26], or recycled concrete equivalent shall be placed at least 6" deep over the length and width of the entrance.

5. Surface Water - all surface water flowing to or diverted toward construction entrances shall be piped under the entrance to maintain positive drainage. Pipe installed under the construction entrance shall be protected with a mountable berm. The pipe shall be sized according to the drainage, with the min. diameter being 6". A pipe will not be necessary when the SCE is located at a high spot.

6. 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.

---

[25] Refer to Table 27.

[26] Refer to Table 28

Maintenance

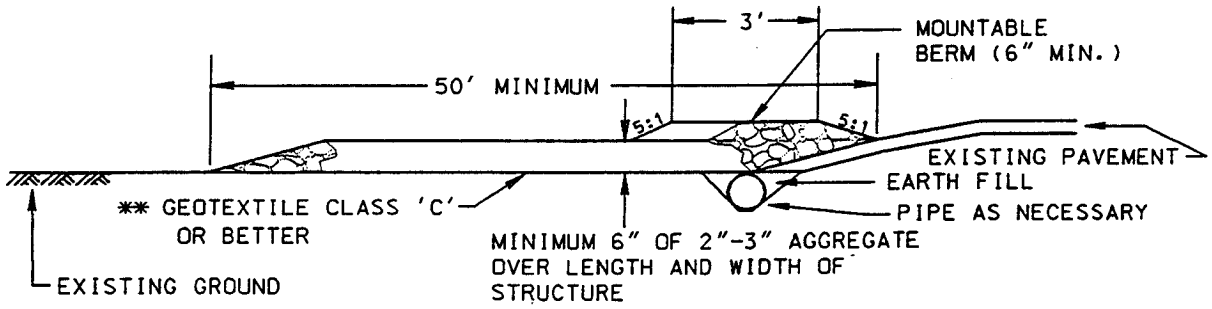
The entrance shall be maintained in a condition which will minimize tracking of sediment onto public rights-of-way. This may require adding stone or other repairs as conditions demand. All sediment spilled, dropped, or tracked onto public rights-of-way must be removed immediately by vacuum sweeping, scraping, or sweeping.

When necessary, wheels shall be cleaned or washed to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device. Daily inspection and maintenance is required.

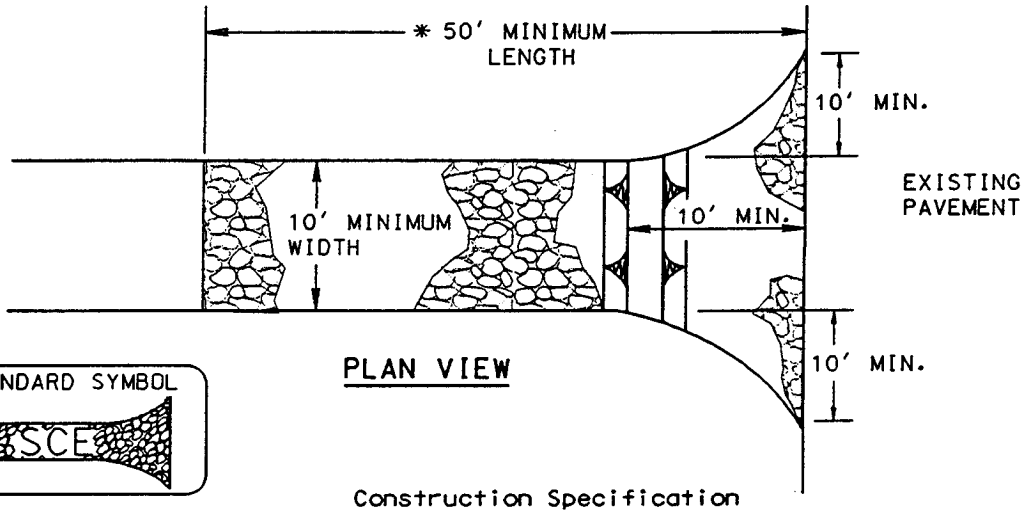
Removal

After construction is complete and the site is stabilized, the stabilized construction entrance will be removed and the area stabilized unless it will be used as an underlayment for a driveway.

DETAIL 24 – STABILIZED CONSTRUCTION ENTRANCE



PROFILE



PLAN VIEW

Construction Specification

1. Length – minimum of 50' (*30' for single residence lot).

2. Width – 10' minimum, should be flared at the existing road to provide a turning radius.

3. Geotextile fabric (filter cloth) shall be placed over the existing ground prior to placing stone. **The plan approval authority may not require single family residences to use geotextile.

4. Stone – crushed aggregate (2" to 3") or reclaimed or recycled concrete equivalent shall be placed at least 6" deep over the length and width of the entrance.

5. Surface Water – all surface water flowing to or diverted toward construction entrances shall be piped through the entrance, maintaining positive drainage. Pipe installed through the stabilized construction entrance shall be protected with a mountable berm with 5:1 slopes and a minimum of 6" of stone over the pipe. Pipe has to be sized according to the drainage. When the SCE is located at a high spot and has no drainage to convey a pipe will not be necessary. Pipe should be sized according to the amount of runoff to be conveyed. A 6" minimum will be required.

6. 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.

22.0 STANDARD AND SPECIFICATIONS

FOR

EROSION CONTROL MATTING

Definition

Erosion control matting is used to temporarily stabilize channels or steep slopes until vegetation is established. There are many types of matting available. The erosion control matting that is used must withstand velocities of 6 feet per second.

Conditions Where Practice Applies

Mattings are used to stabilize the flow channels of dikes and swales where the velocity is under 6 feet per second. They may also be used on tidal or stream banks where moving water is likely to wash out new vegetative plantings.

Installation

Some channels will require multiple widths of matting, with two widths being the most commonly used. Unroll the matting starting at the upper end of the channel, allowing a 4" overlap of mattings along center of channel. The sequence of construction should be as follows:

1. Bury the top ends of the matting in a narrow trench, 6" in depth. Backfill the trench and tamp firmly to conform to the channel cross-section. Secure with a row of staples about 4" down slope from the trench. Spacing between staples is 6".

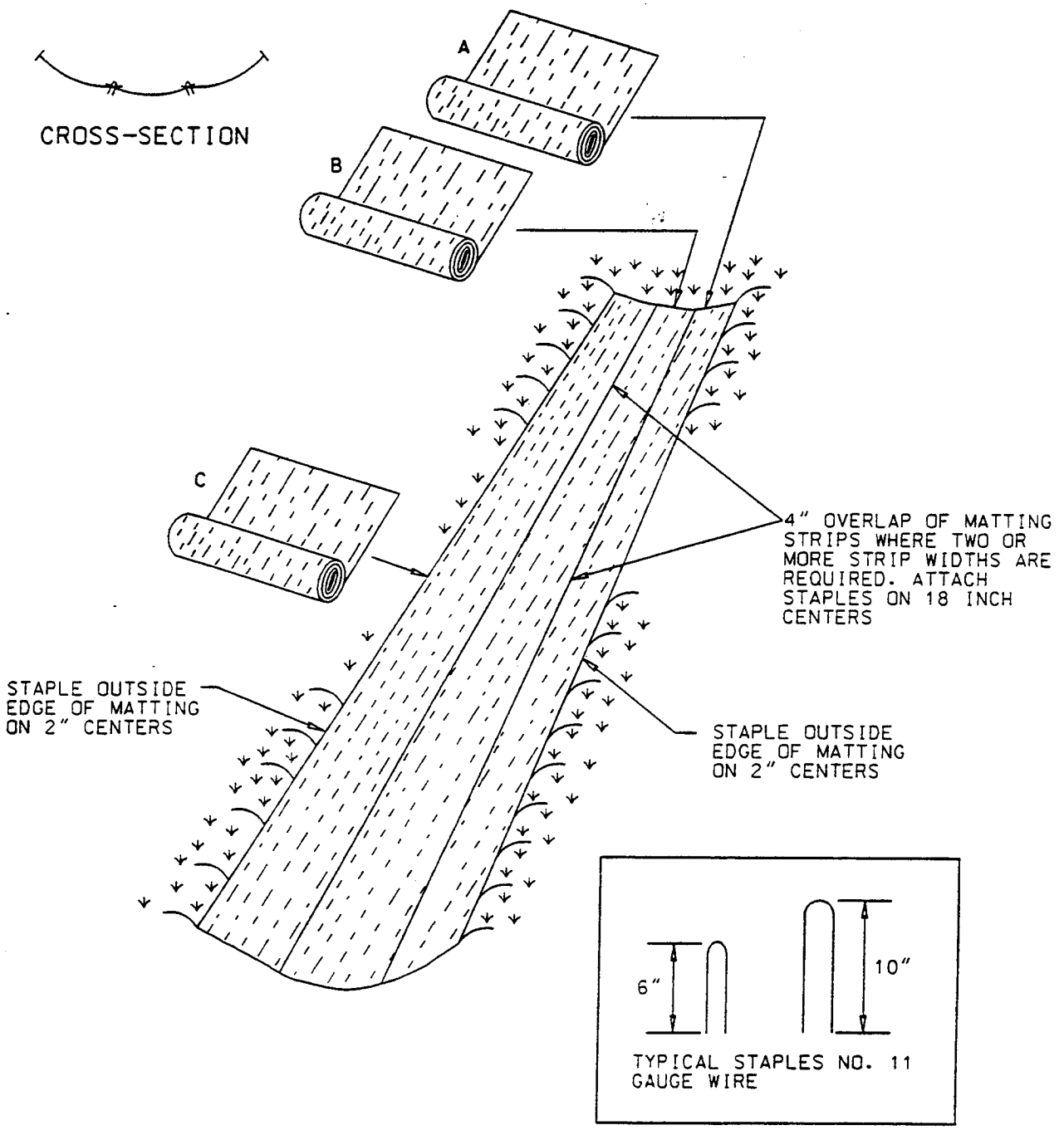
2. Staple the 4" overlap in the channel center spacing the staples 18" apart.

3. Make sure the matting is smooth and in firm contact with the soil, then staple the outer edges of the matting. Staples shall be placed 2' apart with 4 rows for each strip, 2 outer rows, and 2 alternating rows down the center.

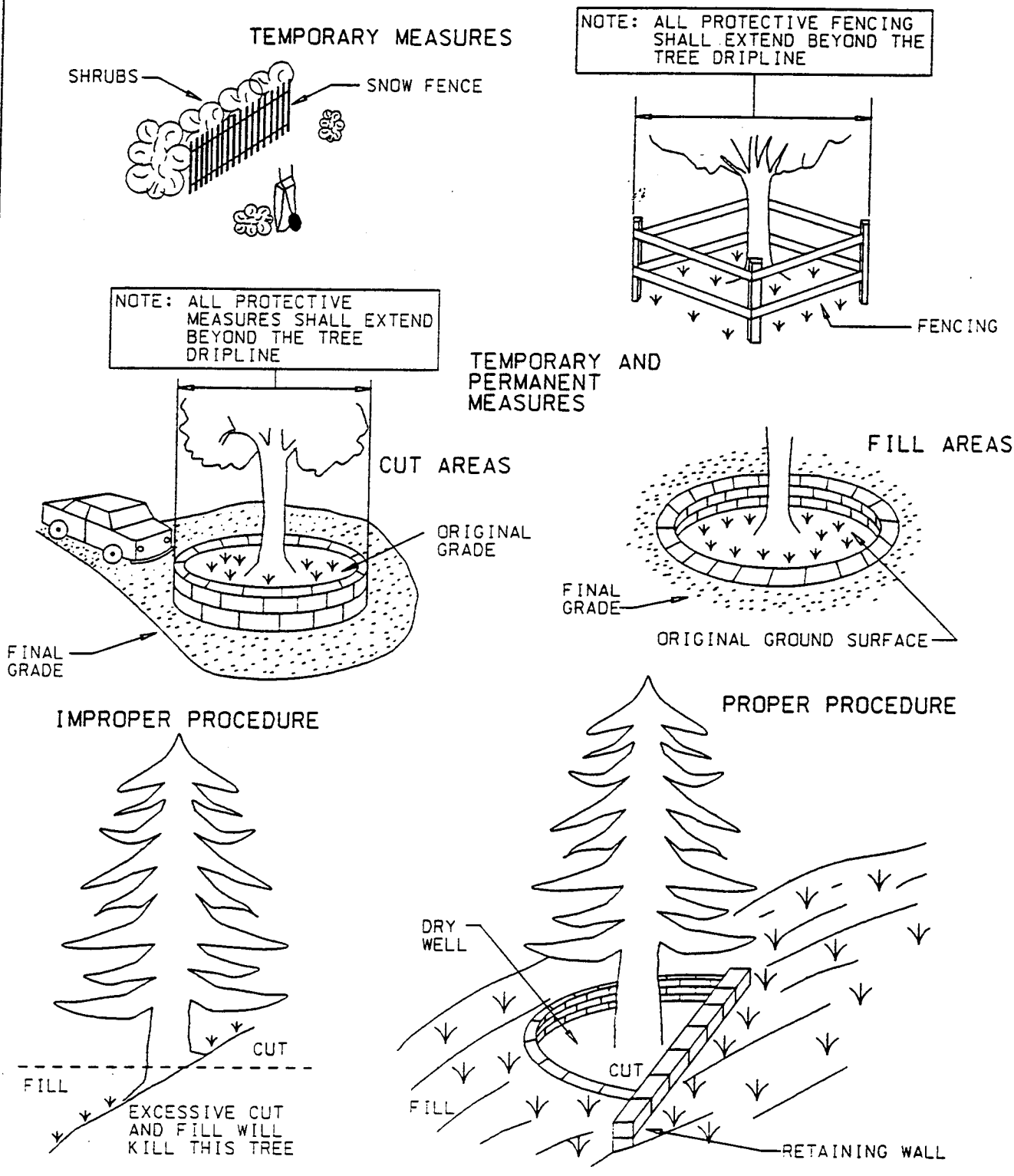
4. Where one roll of matting ends and another begins, the end of the top strip shall overlap the upper end of the lower strip by 4", shiplap fashion. Reinforce the overlap with a double row of staples spaced 6" apart in a staggered pattern on either side. The discharge end of the matting liner should be similarly secured with 2 double rows of staples.

5. The protective matting can be laid over sprigged areas where small grass plants have been planted. Where ground covers are to be planted, lay the protective matting first and then plant through the matting according to the landscape design.

DETAIL 30 EROSION CONTROL MATTING



DETAIL 31 TREE PROTECTION



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26.0 SUPER SILT FENCE

Definition

A temporary barrier of Geotextile Class F over chain link fence used to intercept sediment laden runoff from small drainage areas.

Purpose

To reduce runoff velocity and allow the deposition of transported sediment to occur. Limits imposed by ultraviolet light stability of the fabric will dictate the maximum period that the silt fence may be used.

1. Super silt fence provides a barrier that can collect and hold debris and soil, preventing the material from entering critical areas, streams, streets, etc.

2. Super silt fence can be used where the installation of a dike would destroy sensitive areas, woods, wetlands, etc.

3. Super silt fence should be placed as close to the contour as possible. No section of silt fence should exceed a grade of 5% for a distance of more than 50 feet.

Table 30 Design Criteria

Length of the flow contributing to Super Silt Fence shall conform to the following limitations:

Slope	Slope Steepness	Slope Length (maximum)	Silt Fence Length (maximum)
0 - 10%	0 - 10:1	Unlimited	Unlimited
10 - 20%	10:1 - 5:1	200 feet	1,500 feet
20 - 33%	5:1 - 3:1	100 feet	1,000 feet
33 - 50%	3:1 - 2:1	100 feet	500 feet
50% +	2:1 +	50 feet	250 feet

Where ends of the geotextile fabric come together, the ends shall be overlapped, folded, and stapled to prevent sediment bypass.

Construction Specifications

1. Fencing shall be 42 inches in height and constructed in accordance with the latest Maryland State Highway (SHA) Details for Chain Link Fencing. The SHA specification for a 6 foot fence shall be used, substituting 42 inch fabric and 6 foot length posts.

2. Chain link fence shall be fastened securely to the fence posts with wire ties or staples. The lower tension wire, brace and truss rods, drive anchors and post caps are not required except on the ends of the fence.

3. Filter Cloth shall be fastened securely to the chain link fence with ties spaced every 24" at the top and mid section.

4. Filter colth shall be embedded a minimum of 8" into the ground.

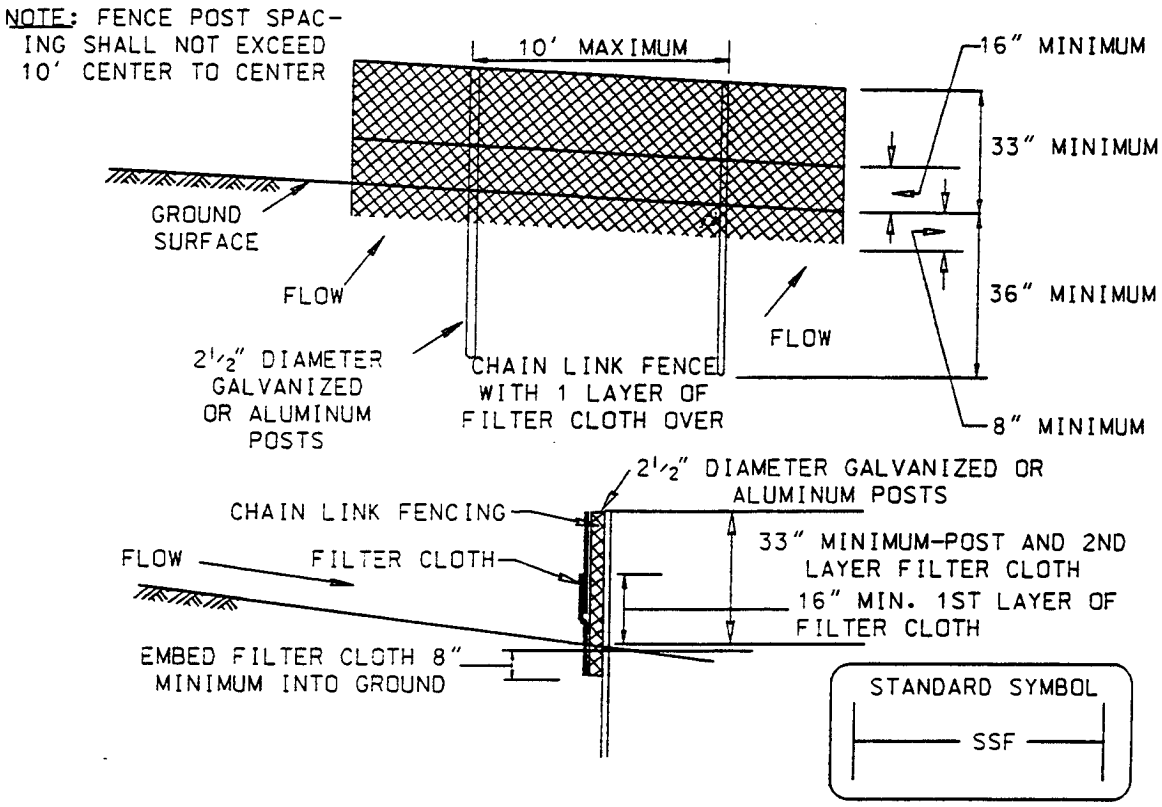
5. When two sections of geotextile fabric adjoin each other, they shall be overlapped by 6" and folded.

6. Maintenance shall be performed as needed and silt buildups removed when "bulges" develop in the silt fence, or when silt reaches 50% of the fence height.

7. Filter cloth shall meet the following requirements for Geotextile Class F:

Tension Strength	50 lb/in (min.)	Test: MSMT 509
Tensile Modulus	20 lb/in (min.)	Test: MSMT 509
Flow Rate	0.3 gal/ft^2/minute (max.)	Test: MSMT 322
Filtering Efficiency	75% (min.)	Test: MSMT 322

DETAIL 33 – SUPER SILT FENCE



Construction Specifications

Fencing shall be 42 inches in height and constructed in accordance with the latest Maryland State Highway Details for Chain Link Fencing. The specification for a 6 foot fence shall be used, substituting 42 inch fabric and 6 foot length posts.

1. The poles do not need to set in concrete.

2. Chain link fence shall be fastened securely to the fence posts with wire ties or staples.

3. Filter cloth shall be fastened securely to the chain link fence with ties spaced every 24" at the top and mid section.

4. Filter cloth shall be embedded a minimum of 8" into the ground.

5. When two sections of filter cloth adjoin each other, they shall be overlapped by 6" and folded.

6. Maintenance shall be performed as needed and silt buildups removed when "bulges" develop in the silt fence.

SUPER SILT FENCE

Design Criteria

Slope	Slope Steepness	Slope Length (maximum)	Silt Fence Length (maximum)
0 - 10%	0 - 10:1	Unlimited	Unlimited
10 - 20%	10:1 - 5:1	200 feet	1,500 feet
20 - 33%	5:1 - 3:1	100 feet	1,000 feet
33 - 50%	3:1 - 2:1	100 feet	500 feet
50% +	2:1 +	50 feet	250 feet

30.0 DUST CONTROL

Definition

Controlling dust blowing and movement on construction sites and roads.

Purpose

To prevent blowing and movement of dust from exposed soil surfaces, reduce on and off-site damage, health hazards, and improve traffic safety.

Conditions Where Practice Applies

This practice is applicable to areas subject to dust blowing and movement where on and off-site damage is likely without treatment.

Specifications

Temporary Methods

1. Mulches - See standards for vegetative stabilization with mulches only. Mulch should be crimped or tacked to prevent blowing.

2. Vegetative Cover - See standards for temporary vegetative cover.

3. Tillage - To roughen surface and bring clods to the surface. This is an emergency measure which should be used before soil blowing starts. Begin plowing on windward side of site. Chisel-type plows spaced about 12" apart, spring-toothed harrows, and similar plows are examples of equipment which may produce the desired effect.

4. Irrigation - This is generally done as an emergency treatment. Site is sprinkled with water until the surface is moist. Repeat as needed. At no time should the site be irrigated to the point that runoff begins to flow.

5. Barriers - Solid board fences, silt fences, snow fences, burlap fences, straw bales, and similar material can be used to control air currents and soil blowing. Barriers placed at right angles to prevailing currents at intervals of about 10 times their height are effective in controlling soil blowing.

6. Calcium Chloride - Apply at rates that will keep surface moist. May need retreatment.

Permanent Methods

1. Permanent Vegetation - See standards for permanent vegetative cover, and permanent stabilization with sod. Existing trees or large shrubs may afford valuable protection if left in place.

2. Topsoiling - Covering with less erosive soil materials. See standards for topsoiling.

3. Stone - Cover surface with crushed stone or coarse gravel.

References

1. Agriculture Handbook 346. Wind Erosion Forces in the United States and Their Use in Predicting Soil Loss.

2. Agriculture Information Bulletin 354. How to Control Wind Erosion, USDA-ARS.