PART 1: GENERAL

1.01 Scope of Standard

A. This standard provides general guidance concerning the specific preferences of The University of Texas at Austin for site storm water management.

B. UT recognizes that project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification, it is expected that theses guidelines will govern the design and specifications for UT projects.

1.02 Reference Standards

In order to minimize the discharge of pollutants to storm water, permanent and temporary structural controls located at The University of Texas at Austin construction sites shall be implemented in accordance with the City of Austin's Drainage Criteria Manual and the Environmental Criteria Manual, Section 1, entitled Water Quality Management or with a design that provides equivalent pollutant removal if approved by UT.

In order to minimize the discharge of pollutants to storm water, pollution control measures in addition to the permanent and temporary controls at The University of Texas at Austin construction sites shall be implemented in accordance with The University of Texas at Austin's Storm Water Management Program.

In order to provide a brief reference for construction contractors working on University projects, the contractors are referred to The University of Texas at Austin's Construction Site Procedures For Contractors policy document that outlines procedural Best Management Practices ("BMPs") that contractors are required to follow.

1.03 General Requirements

A.

Projects disturbing more than 5 acres of soil or projects that are part of a larger plan of development involving more than 5 acres of cumulative soil disturbance are required to file a Notice of Intent (NOI) and have an on-site Storm Water Pollution Prevention Plan (SWPPP). All SWPPPs must meet the requirements of the EPA's National Pollutant Discharge Elimination System (NPDES) and the requirements listed in B.1 – B.12 below. Field revisions to the SWPPP may be required by UT System's Office of Facilities Planning and Construction

(OFPC) or The University of Texas at Austin during the course of construction to correct control inadequacies.

B. All projects which by themselves or as a part of a larger plan of development involving less than 5 acres of soil disturbance shall have a written, site specific Erosion and Sedimentation Control Plan included in the project documentation. Field revisions to the erosion and sedimentation control plan may be required by OFPC or The University of Texas at Austin during the course of construction to correct control inadequacies. This plan will, at a minimum, meet the following criteria:

1. The plan must be prepared under the supervision of a professional engineer licensed in the State of Texas. This will be witnessed by the engineer affixing his seal and signature to each plan sheet and any reports or calculations submitted to support the plans.

2.

The plan must include a sequence of development detailing which phases of construction will be done at which time and what specific controls are required during each phase of the development. Specifications will call for the Contractor to install erosion and sedimentation controls prior to any site preparation work (clearing, grubbing, or excavation).

Sequence of construction (typical):

a. Install traffic control devices and signs.
b. Install temporary erosion and sedimentation controls and tree protection as required.
c. Install stabilized construction entrance/exit.
d. Construct all utilities and fire protection services and connect to the storm sewer system, wastewater systems and university utilities for services.
e. Install gas service tap line and meter.
f. Begin construction of building.
g. Begin construction of pavement, drives etc.
h. Finish rough grading.
i. Construct landscaping and irrigation.
j. Re-establish all disturbed areas in accordance with notes and establish permanent erosion controls.

3. The plan must call for the contractor to inspect the controls at least every 7 days and after every significant (0.5 inches or greater) rainfall event to insure they have not been substantially disturbed and that they are functioning properly.

4. The plan must require that any sediment buildup occurring after a significant rain shall be removed and placed in the designated spoil disposal site.

5. The plan needs to include a schematic representation of each control measure to be implemented on the project, with adequate specifications for the measure, such as dimensions and length or size. Structural practices should be used to divert flows from exposed soils, store flow or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Such practices may include silt fences, storm drain inlet protection, entrance site stabilization, gabions or others.

6. The plan must indicate approved areas for material and equipment storage and staging, construction traffic, vehicle parking, vehicle maintenance, concrete truck and equipment washing, and if appropriate, vehicle washing.

7. the plan must indicate the location of temporary spoils areas, including size, time of use, and ultimate revegetation schedules. Where construction is to occur in a channel which drains greater than five acres, a note shall be included on the plan specifying that "the contractor shall remove all spoil material from the channel of any creek or drainage way at the end of each work day".

8. The plan must indicate the location of on-site permanent spoils disposal areas must be indicated, including size, depth of fill and revegetation procedures.

9. The plan must include a map of suitable scale that will indicate all contributing subareas both on and off-site so that controls can be properly evaluated.

10. The plan must include revegetation strategies for all disturbed areas on the site with a clear definition of criteria to be utilized in determining when acceptable revegetation has taken place. Minimum requirements for revegetation are 95 percent coverage with no bare areas exceeding 16 square feet with a 1-1/2 inch stand of grass. The University has a policy of expeditious revegetation of disturbed areas. Sod is to be specified instead of seeding for grassy areas to the maximum extent practicable.

11. the plan must indicate the specific locationof a slope requiring special stabilization techniques and all detention, sedimentation, or sedimentation/filtration ponds.

12. The plan must include the identity and phone number of the designated representative(s) of the contractor who will be responsible for the maintenance of erosion and sedimentation control being used on the project and who can authorize appropriate changes to the plan, if it is discovered to be inadequate.

PART 2: PRODUCTS2.01 General:

New types of erosion and sediment control products are continuously being developed. The Texas Department of Transportation (TxDOT) has defined the critical performance factors for certain types of products, such as blankets and matting materials, and has established minimum performance standards which must be met for any product seeking to be approved for use within any of TxDOT's construction or maintenance activities. These products are also appropriate for general construction site stabilization. TxDOT maintains a web site at:

http://www.dot.state.tx.us/insdtdot/orgchart/cmd/erosion/contents.htm

This site is continually updated as new products are evaluated. While UT does require products to be selected from this list, this list does identify products that have been tested for minimum performance standards.

2.02. Temporary Erosion Control:

In all cases, the development of SWPPPs or Erosion and Sediment Control Plans will give first consideration to erosion controls, as it is more effective to maintain soil cover than it is to trap sediment in storm water runoff. Erosion controls disturb the smallest area of land possible for the shortest period of time and stabilize disturbed soils to prevent erosion from occurring. All projects should divert storm water runoff away from unstable areas or provide a stable surface that will resist the effects of rain and runoff by utilizing one or more of the following preferred controls. Make sure to evaluate the consequences of a measure failing when considering which control measure to use, since failure of a practice may be hazardous to people, the environment and UT property.

Non-structural Controls

1. Development Sitting
2. Project Scheduling
3. Material Management
4. Conservative Clearing

Structural Controls

1. Dust/Wind Erosion Control*

2. Mulch
3. Sod
4. Blankets/Matting
5. Temporary Vegetation
6. Tree Protection*
7. Diversion Dike
8. Subsurface Drain
9. Level Spreader
10. Outlet Stabilization
11. Pipe Slope Drain
12. Interceptor Swale
13. Retaining Wall

*These controls must always be used on University construction projects while others will be selected based on site conditions.

Guidelines for Selection of Temporary Erosion Controls

Practice	Area	Application	Notes
Interceptor Swale	<5 ac	Used as a perimeter control or to shorten slope	Maximum flow velocity 6 ft/s unless stabilized
Diversion Dike	<10 ac	Used to route runoff away from disturbed areas	
Pipe Slope Drain	<5 ac	Transport runoff down steep, erodible slopes	
Outlet Stabilization	NA	Prevent erosion at outlet of channel or conduit	
Level Spreader	Based on flow	Outlet device for dikes and diversions	Slope <10% and stable, flowrate <20 cfs
Subsurface Drain	NA	Prevent soils from becoming saturated and prevent seeps	
Tree Protection	NA	Erosion control and aesthetic benefits	
Blankets/Matting	NA	Used in channels and on steep slopes	Slope <15%
Temporary Vegetation	NA	Temporary stabilization of disturbed areas	One of the most effective measures, highly recommended.
Mulch	NA	Stabilization of newly seeded areas	Slope <15%
Sod	NA	Immediate stabilization in channels, around inlets, or for aesthetics	
Dust Control	NA	In areas subject to surface and air movement of dust where on- or off-site damage may occur	

B. Temporary Sediment Control:

Typical construction activities such as grading, clearing, and staging will disturb soil on the site at some point. Erosion occurs in these disturbed areas and therefore erosion controls are the first line of defense in controlling runoff. But when denuded ground is a must to perform construction, sediment controls must be in place to prevent sediment-laden runoff from exiting the site and entering the unprotected storm sewer system. The goal is to reduce the runoff velocity with these controls so that sediment in the runoff can settle out. All projects should maintain surface roughness and infiltration rate or reduce flow velocities by utilizing one or more of the following preferred controls. Make sure to evaluate the consequences of a measure failing when considering which control

measure to use, since failure of a practice may be hazardous to people, the environment and UT property.

Non-structural Controls

1. Conservative Clearing
2. Plan location of sediment deposition
3. Protect low points with barriers

Structural Controls

1. Stabilized Construction exit/entrance (with wheel washing)
2. Silt Fencing
3. Triangular filter dike
4. Rock berm
5. High service rock berm
6. Sand bag berm
7. Inlet protection
8. Sediment trap
9. Sediment basin
10. Mulch
11. Temporary Vegetation

Guidelines for Selection of Temporary Sediment Control

Control Type	Applications	Drainage Area	Slope
Construction Exit (with wheel washing)	Should be used at all designated access points. Wheel washing may be necessary.	NA	NA
Silt Fence (interior)	Areas of minor sheet flow.	<1/4 acre/100 ft of fence	<20%
Silt Fence (exterior)	Down slope borders of site; up slope border is necessary to divert offsite drainage. For larger areas use diversion swale or berm.	<1/4 acre/100 ft of fence	<20%
Triangular Filter Dike	Areas within site requiring frequent access.	< 1 acre	<10%
Rock Berm	Drainage swales and ditches with and below site.	<5 acres	<30%
High Service Rock Berm	Around sensitive features, high flow areas within and below site.	<5 acres	<30%
Sand Bag Berm	For construction activities in streambeds.	5-10 acres	<15%
Inlet Protection	Prevent sediment from entering storm drain system.	<1 acre	NA

Sediment Trap	Used where flows concentrated in a swale or channel.	1-5 acres	NA
Sediment Basin	Appropriate for large disturbed areas.	5-100 acres	NA

C. Temporary Pollution Control

Typical construction activities require the use and cleaning of equipment as well as the use and storage of chemicals and materials. These activities and materials can pollute the water system and therefore pollution control measures are the tertiary line of defense in preventing contaminated discharges from any construction site. All projects must prevent polluted discharges by utilizing all of the following preferred controls, unless otherwise not applicable. Make sure to maintain these practices to their fullest intent, since failure of a practice may be hazardous to people, the environment and UT property.

1. Dumpsters to be covered
2. Street sweeping, as appropriate
3. Litter pick up weekly or before rain event
4. Storm drains protected from solids and liquids
5. Concrete wash out pit
6. Equipment cleaning practices
7. Waste disposal
8. Pressure washing rules
9. Chemical/material storage
10. Irrigation control

PART 3: EXECUTION

Preferred construction details of selected best management practices follow:

Erosion Controls

Interceptor Swale

Interceptor swales are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or
disturbed area. They may have a v-shape or be trapezoidal with a flat bottom and side slopes of 3:1 or flatter. The outflow from a swale should be directed to a stabilized outlet or sediment-trapping device. The swales should remain in place until the

disturbed area is permanently stabilized. A schematic of an interceptor swale is shown below.

Materials:

(1) Stone stabilization should be used when grades exceed 2% or velocities exceed 6 feet per second and should consist of a layer of crushed stone three inches thick, riprap or high velocity erosion control mats.

(2) Stabilization should extend across the bottom of the swale and up both sides of the channel to minimum height of three inches above the design water surface elevation based on a 2-year, 24-hour storm.

Installation:

(1) An interceptor swale should be installed across exposed slopes during construction and should intercept no more than 5 acres of runoff.

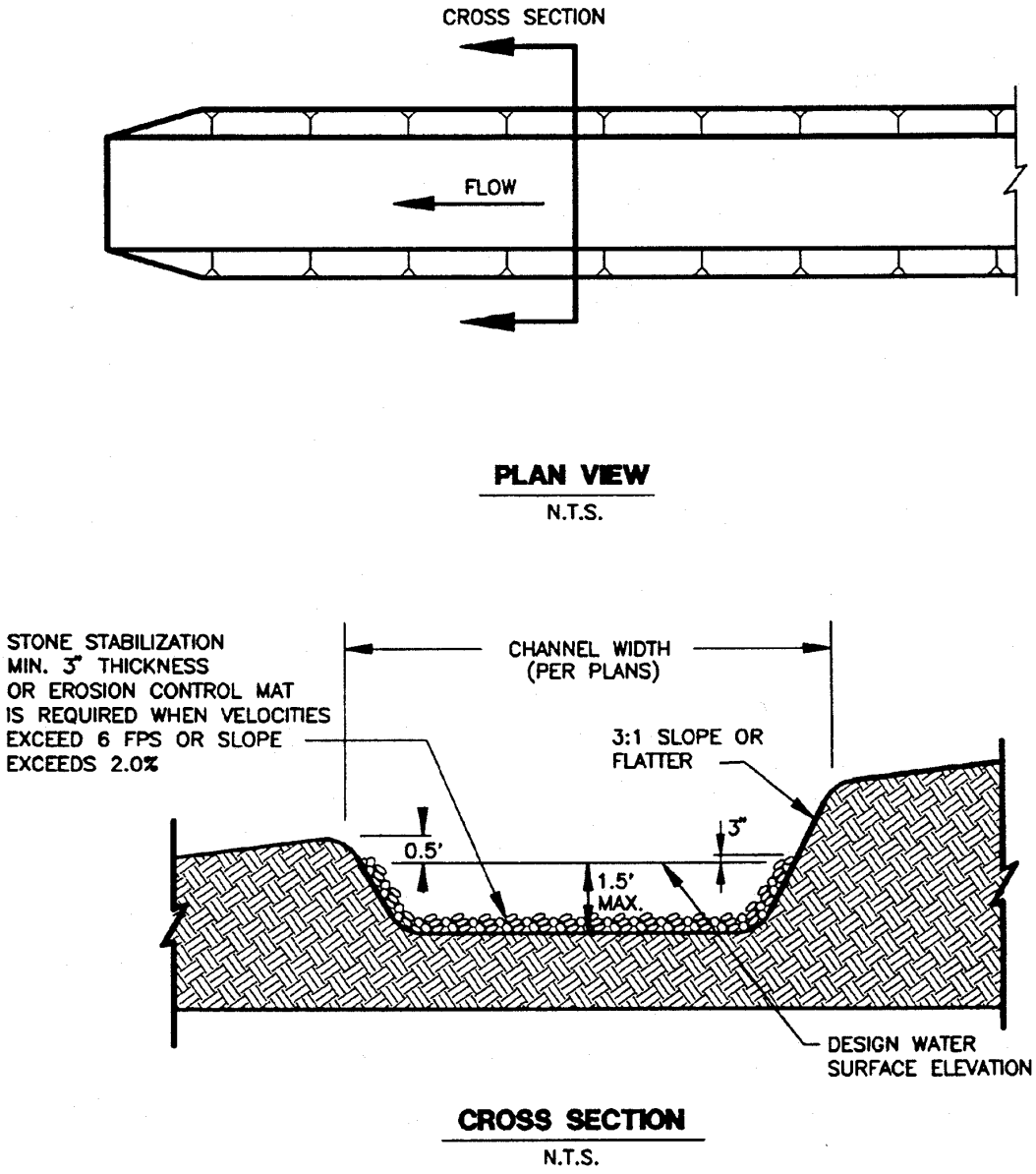
(2) All earth removed and not needed in construction should be disposed of in an approved spoils site so that it will not interfere with the functioning of the swale or contribute to siltation in other areas of the site.

(3) Trees, brush, stumps, obstructions and other material should be removed and disposed of to avoid interference with proper functioning of the swale.

(4) Should have a maximum depth of 1.5 feet with side slopes of 3:1 or flatter. Swale should have positive drainage for its entire length to an outlet.

(5) When the slope exceeds 2 percent, or velocities exceed 6 feet per second (regardless of slope), stabilization is required. Stabilization should be crushed stone placed in a layer of at least 3 inches thick or may be high velocity erosion control matting. Check dams are also recommended to reduce velocities in the swales possibly reducing the amount of stabilization necessary.

(6) Minimum compaction for the swale should be 90% standard proctor density.



Schematic Diagram of an Interceptor Swale

Inspection and Maintenance Guidelines:

(1) Swales should be inspected weekly and after each rain event to locate and repair any damage to the channel or clear debris or other obstructions so as not to diminish flow capacity.

(2) Damage from storms or normal construction activities such as tire ruts or disturbance of swale stabilization should be repaired as soon as practical.

Diversion Dikes

A temporary diversion dike is a barrier created by the placement of an earthen embankment to reroute the flow of runoff to an erosion control device or away from an open, easily erodible area. A diversion dike intercepts runoff from small upland areas and diverts it away from exposed slopes to a stabilized outlet, such as a rock berm, sandbag berm, or stone outlet structure. These controls can be used on the perimeter of the site to prevent runoff from entering the construction area. Dikes are generally used for the duration of construction to intercept and reroute runoff from disturbed areas to prevent excessive erosion until permanent drainage features are installed and/or slopes are stabilized. A schematic of a diversion dike is shown below.

Materials:

(1) Stone stabilization (required for velocities in excess of 6 fps) should consist of riprap placed in a layer at least 3 inches thick and should extend a minimum height of 3 inches above the design water surface up the existing slope and the upstream face of the dike.

(2) Geotextile fabric should be a non-woven polypropylene fabric designed specifically for use as a soil filtration media with an approximate weight of 6 oz./yd ^{2}, a Mullen burst rating of 140 psi, and having an equivalent opening size (EOS) greater than a #50 sieve.

Installation:

(1) Diversion dikes should be installed prior to and maintained for the duration of construction and should intercept no more than 10 acres of runoff.

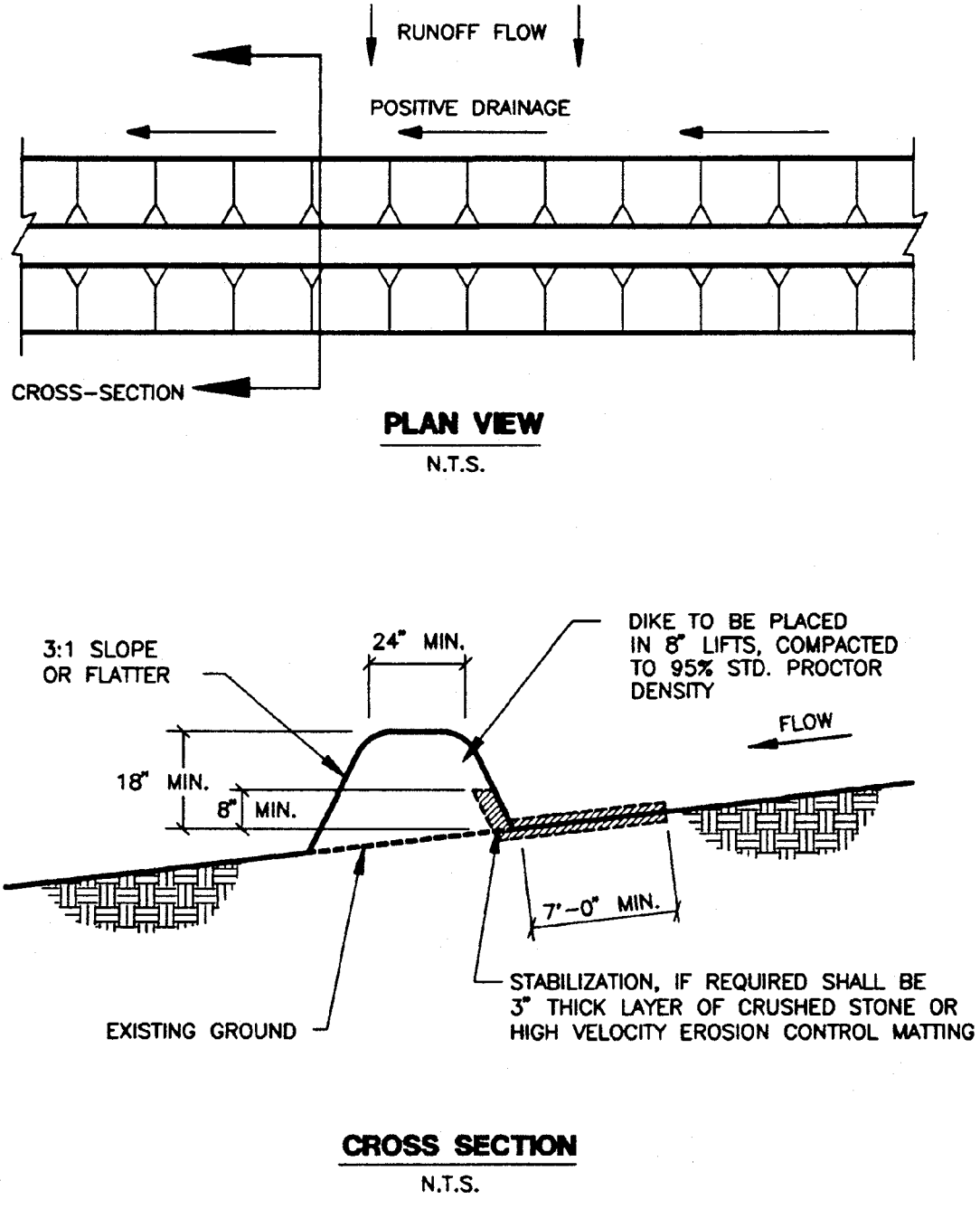
(2) Dikes should have a minimum top width of 2 feet and a minimum height of compacted fill of 18 inches measured form the top of the existing ground at the upslope toe to top of the dike and having side slopes of 3:1 or flatter.

(3) The soil for the dike should be placed in lifts of 8 inches or less and be compacted to 95 % standard proctor density.

(4) The channel, which is formed by the dike, must have positive drainage for its entire length to an outlet.

(5) When the slope exceeds 2 percent, or velocities exceed 6 feet per second (regardless of slope), stabilization is required. Situations in which

velocities do not exceed 6 feet per second, vegetation may be used to control erosion.



Schematic of a Diversion Dike (NCTCOG, 1993b)

Inspection and Maintenance Guidelines:

(1) Swales should be inspected weekly and after each rain event to determine if silt is building up behind the dike or if erosion is occurring on the face of the dike. Locate and repair any damage to the channel or clear debris or other obstructions so as not to diminish flow capacity.

(2) Silt should be removed in a timely manner.

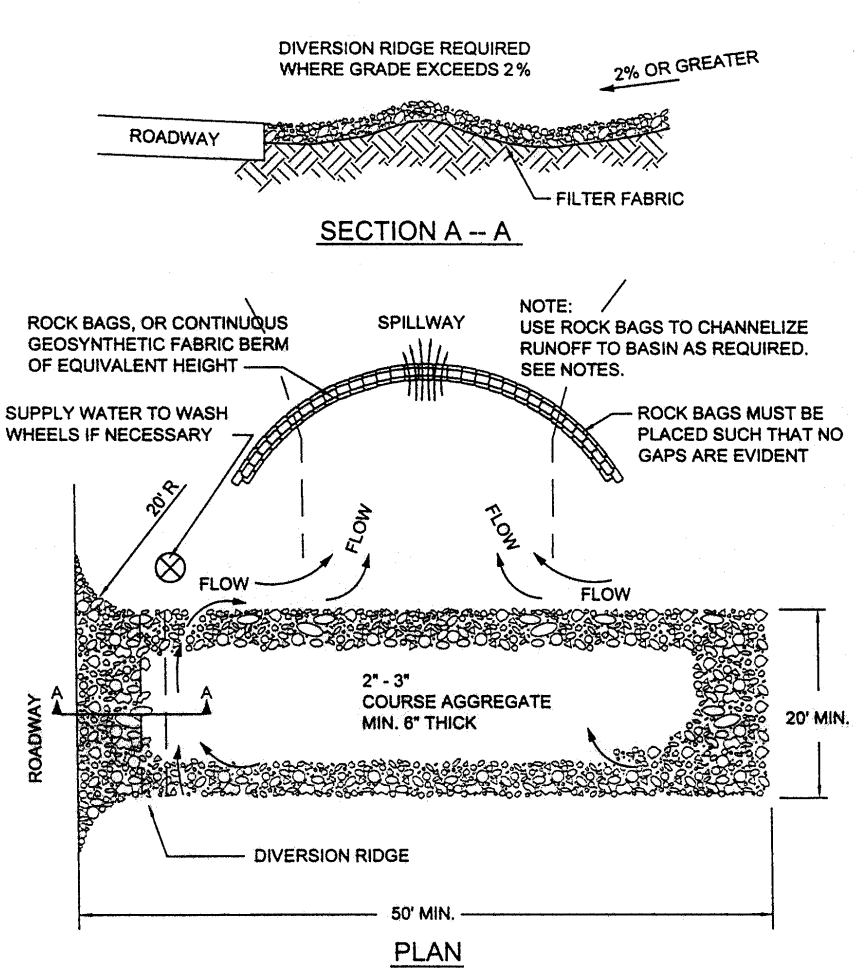
(3) If erosion is occurring on the face of the dike, the slopes of the face should either be stabilized through mulch or seeding or the slopes of the face should be reduced.

(4) Damage from storms or normal construction activities such as tire ruts or disturbance of swale stabilization should be repaired as soon as practical.

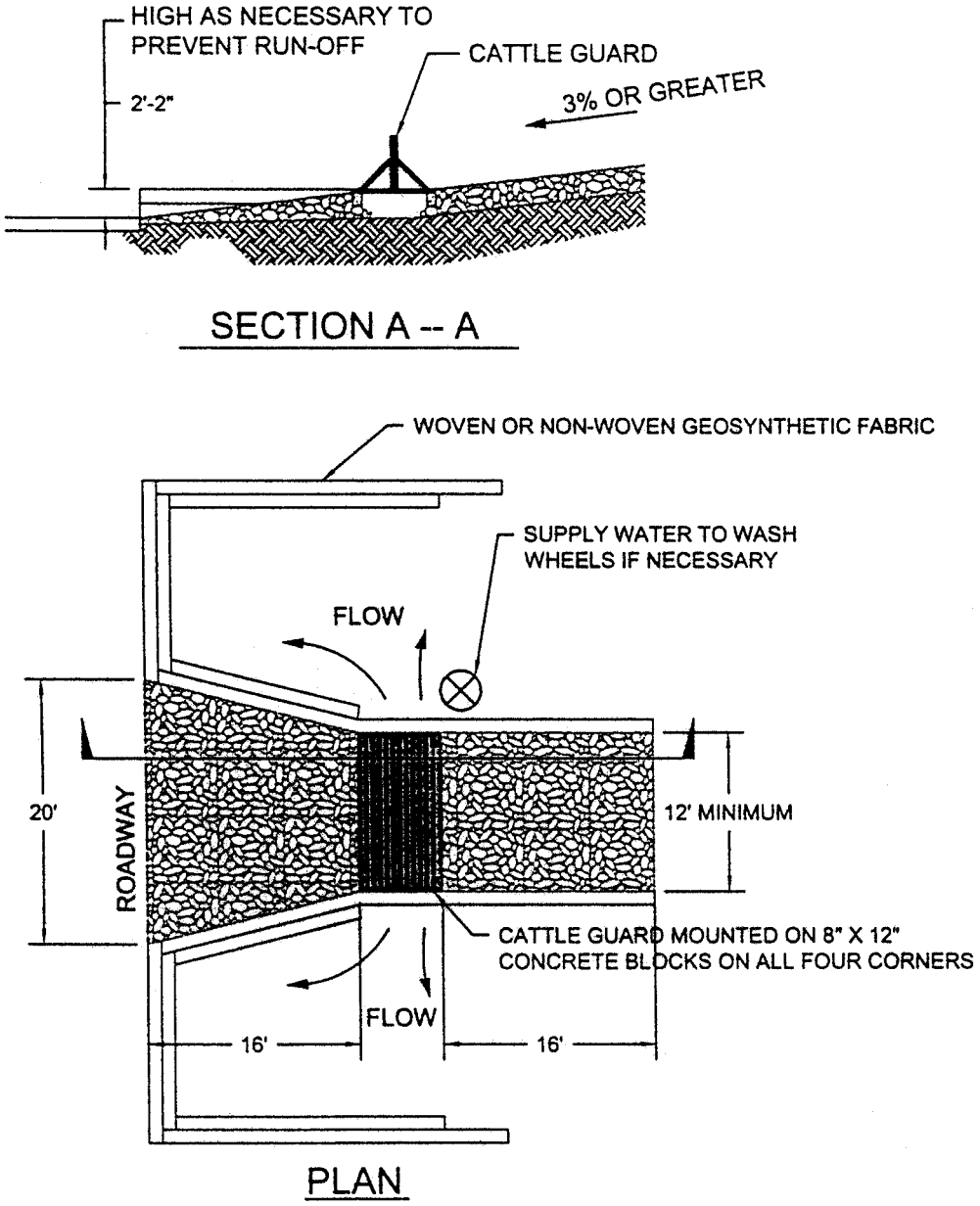
Sedimentation Controls

Temporary Construction Entrance/Exit

The purpose of a temporary construction entrance is to provide a stable entrance/exit condition from the construction site and keep mud and sediment off public roads. A stabilized construction entrance is a stabilized pad of crushed stone located at any point traffic will be entering or leaving the construction site from a public right-of-way, street, alley, sidewalk or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking or flowing of sediment onto public rights-of-way. This practice should be used at all points of construction ingress and egress. Excessive amounts of mud can also present a safety hazard to roadway users. To minimize the amount of sediment loss to nearby roads, access to the construction site should be limited to as few points as possible and vegetation around the perimeter should be protected were access is not necessary. A rock stabilized construction entrance should be used at all designated access points.



Schematic of Temporary Construction Entrance/Exit



Construction Entrance/Exit for Steep Slopes

Materials:

(1) The aggregate should consist of 4 to 8 inch washed stone over a stable

foundation as specified in the plan.

(2) The aggregate should be placed with a minimum thickness of 8 inches.

(3) The geotextile fabric should be designed specifically for use as a soil filtration media with an approximate weight of 6 oz/yd ^{2}, a mullen burst rating of 140 lb/in ^{2}, and an equivalent opening size greater than a number 50 sieve.

(4) If a washing facility is required, a level area with a minimum of 4 inch washed stone or commercial rack should be included in the plans. Divert wastewater to a sediment trap or basin.

Installation:

(1) Avoid curves on public roads and steep slopes. Remove vegetation and other objectionable material from the foundation area. Grade crown foundation for positive drainage.

(2) The minimum width of the entrance/exit should be 12 feet or the full width of exit roadway, whichever is greater.

(3) The construction entrance should be at least 50 feet long.

(4) If the slope toward the road exceeds 2%, construct a ridge, 6 to 8 inches high with 3:1 (H:V) side slopes, across the foundation approximately 15 feet from the entrance to divert runoff away from the public road.

(5) Place geotextile fabric and grade foundation to improve stability, especially where wet conditions are anticipated.

(6) Place stone to dimensions and grade shown on plans. Leave surface smooth and slope for drainage.

(7) Divert all surface runoff and drainage from the stone pad to a sediment trap or basin.

(8) Install pipe under pad as needed to maintain proper public road drainage.

Common trouble points:

(1) Inadequate runoff control – sediment washes onto public road.

(2) Stone to small or geotextile fabric absent, results in muddy condition as stone is pressed into soil.

(3) Pad too short for heavy construction traffic – extend pad beyond the minimum 50 foot length as necessary.

(4) Pad not flared sufficiently at road surface, results in mud being tracked on to road and possible damage to road edge.

(5) Unstable foundation – use geotextile fabric under pad and/or improve foundation drainage.

Inspection and Maintenance Guidelines:

(1) The entrance should be maintained in a condition, which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment.

(2) All sediment spilled, dropped, washed or tracked on to public rights-of-way should be removed immediately by contractor.

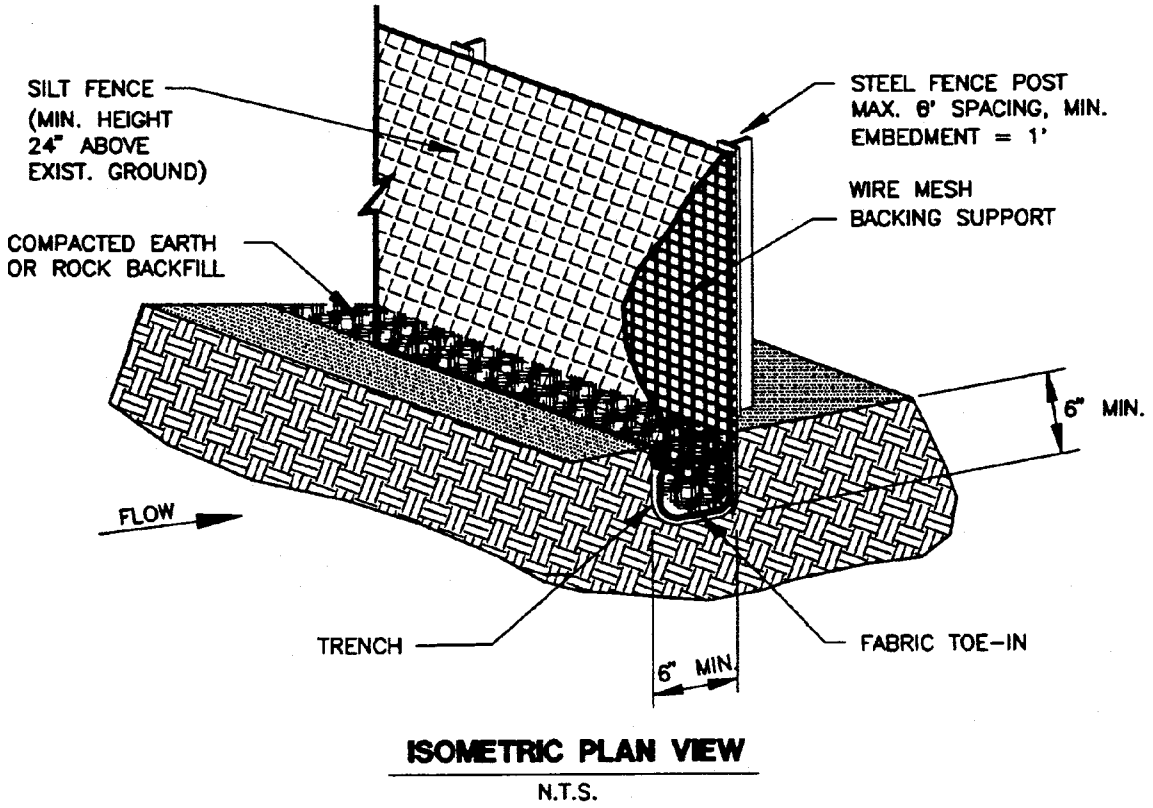
(3) When necessary, wheels should be cleaned to remove sediment prior to entrance onto public right-of-way.

(4) When washing is required, it should be done on an area stabilized with crushed stone that drains into an approved sediment trap or sediment basin.

(5) All sediment should be prevented from entering any storm drain, ditch or water course by using approved methods.

Silt Fence

A silt fence is a barrier consisting of geotextile fabric supported by metal posts to prevent soil and sediment loss from a site. When properly used, silt fences can be highly effective at controlling sediment from disturbed areas. They cause runoff to pond, allowing heavier solids to settle out. If not properly installed, silt fences are not likely to be effective. A schematic illustration of a silt fence is shown below.



Schematic of a Silt Fence Installation (NCTCOG, 1993b)

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas of a limited extent. Silt fence is used during the period of construction
near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence should remain in place until the disturbed area is permanently stabilized. Silt fence should not be used where there is a concentration of water in a channel or drainage way. If concentrated flow occurs after installation, corrective action must be taken such as placing a rock berm in the areas of concentrated
flow.

Silt fencing within the site may be temporarily moved during the day to allow construction activity provided it is replaced and properly anchored to the ground at the
end of the day. Silt fences on the perimeter of the site or around drainage ways should not be moved at any time.

Materials:

(1) Silt fence material should be polypropylene, polyethylene or polyamide woven or nonwoven fabric. The fabric width should be 36 inches, with a minimum unit weight of 4.5 oz/yd, mullen burst strength exceeding 190 lb/in 2 , ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30.

(2) Fence posts should be made of hot rolled steel, at least 4 feet long with Tee or Y-bar cross section, surface painted or galvanized, minimum nominal weight 1.25 lb/ft 2 , and Brindell hardness exceeding 140.

(3) Woven wire backing to support the fabric should be galvanized 2" x 4" welded wire, 12 gauge minimum.

Installation:

(1) Steel posts, which support the silt fence, should be installed on a slight angle toward the anticipated runoff source. Post must be embedded a minimum of 1 foot deep and spaced not more than 8 feet on center. Where water concentrates, the maximum spacing should be 6 feet.

(2) Lay out fencing down-slope of disturbed area, following the contour as closely as possible. The fence should be sited so that the maximum drainage area is ¼ acre/100 feet of fence.

(3) The toe of the silt fence should be trenched in with a spade or mechanical trencher, so that the down-slope face of the trench is flat and perpendicular to the line of flow. Where fence cannot be trenched in (e.g., pavement or rock outcrop), weight fabric flap with 3 inches of pea gravel on uphill side to prevent flow from seeping under fence.

(4) The trench must be a minimum of 6 inches deep and 6 inches wide to allow for the silt fence fabric to be laid in the ground and backfilled with compacted material.

(5) Silt fence should be securely fastened to each steel support post or to woven wire, which is in turn attached to the steel fence post. There should be a 3-foot overlap, securely fastened where ends of fabric meet.

(6) Silt fence should be removed when the site is completely stabilized so as not to block or impede storm flow or drainage.

Common Trouble Points:

(1) Fence not installed along the contour causing water to concentrate and

flow over the fence.

(2) Fabric not seated securely to ground (runoff passing under fence)

(3) Fence not installed perpendicular to flow line (runoff escaping around sides)

(4) Fence treating too large an area, or excessive channel flow (runoff overtops or collapses fence)

Inspection and Maintenance Guidelines:

(1) Inspect all fencing weekly, and after any rainfall.

(2) Remove sediment when buildup reaches 6 inches, or install a second line of fencing parallel to the old fence.

(3) Replace any torn fabric or install a second line of fencing parallel to the torn section.

(4) Replace or repair any sections crushed or collapsed in the course of construction activity. If a section of fence is obstructing vehicular access, consider relocating it to a spot where it will provide equal protection, but will not obstruct vehicles. A triangular filter dike may be preferable to a silt fence at common vehicle access points.

Triangular Sediment Filter Dikes

The purpose of a triangular sediment filter dike (Figure 1.27) is to intercept and detain
water-borne sediment from unprotected areas of limited extent. The triangular sediment
filter dike is used where there is no concentration of water in a channel or other drainage way above the barrier and the contributing drainage area is less than one acre. If the uphill slope above the dike exceeds 10%, the length of the slope above the dike should be less than 50 feet. If concentrated flow occurs after installation, corrective action should be taken such as placing rock berm in the areas of concentrated flow.
This measure is effective on paved areas where installation of silt fence is not possible or where vehicle access must be maintained. The advantage of these controls is the ease with which they can be moved to allow vehicle traffic, then reinstalled to maintain
sediment control.

Materials:

(1) Silt fence material should be polypropylene, polyethylene or polyamide woven or nonwoven fabric. The fabric width should be 36 inches, with a minimum unit weight of 4.5 oz/yd, mullen burst strength exceeding 190 lb/in 2 , ultraviolet stability exceeding 70%, and minimum apparent opening size of U.S. Sieve No. 30.

(2) The dike structure should be 6 gauge 6" x 6" wire mesh folded into triangular form being eighteen (18) inches on each side.

Installation:

(1) As shown in the diagram (Figure 1.27), the frame should be constructed of 6" x 6", 6 gauge welded wire mesh, 18 inches per side, and wrapped with geotextile fabric the same composition as that used for silt fences.

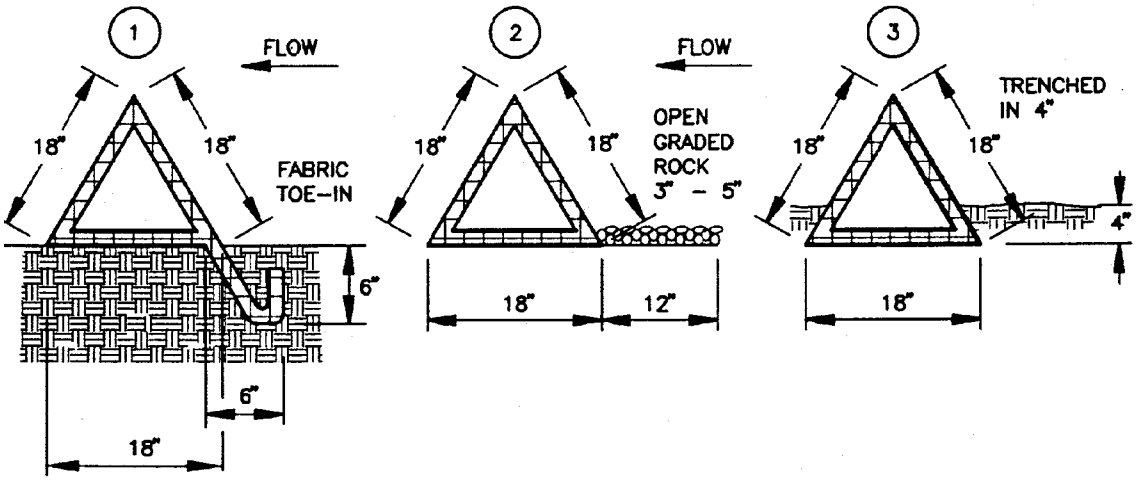
(2) Filter material should lap over ends six (6) inches to cover dike to dike junction; each junction should be secured by shoat rings.

(3) Position dike parallel to the contours, with the end of each section closely abutting the adjacent sections.

(4) There are several options for fastening the filter dike to the ground as shown in Figure 1.27. The fabric skirt may be toed-in with 6 inches of compacted material, or 12 inches of the fabric skirt should extend uphill and be secured with a minimum of 3 inches of open graded rock, or with staples or nails. If these two options are not feasible the dike structure may be trenched in 4 inches.

(5) Triangular sediment filter dikes should be installed across exposed slopes during construction with ends of the dike tied into existing grades to prevent failure and should intercept no more than one acre of runoff.

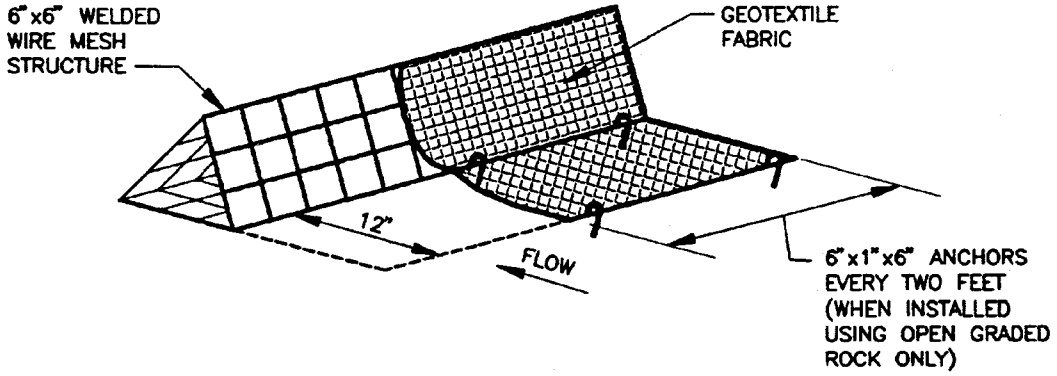
(6) When moved to allow vehicular access, the dikes should be reinstalled as soon as possible, but always at the end of the workday.



CROSS SECTION OF INSTALLATION OPTIONS

N.T.S.

1. TOE-IN 6" MIN
2. WEIGHTED W/ 3" - 5" OPEN GRADED ROCK
3. TRENCHED IN 4"



ISOMETRIC PLAN VIEW

N.T.S.

Schematic of a Triangular Filter Dike (NCTCOG, 1993)

Common Trouble Points:

(1) Fabric skirt missing, too short, or not securely anchored (flows passing under dike).

(2) Gap between adjacent dikes (runoff passing between dikes).

(3) Dike not placed parallel to contour (runoff flowing around dike).

Inspection and Maintenance Guidelines:

(1) Inspection should be made weekly or after each rainfall event and repair or replacement should be made promptly as needed by the contractor.

(2) Inspect and realign berms as needed to prevent gaps between sections.

(3) Accumulated silt should be removed after each rainfall, and disposed of in a manner which will not cause additional siltation.

(4) After the site is completely stabilized, the dikes and any remaining silt should be removed. Silt should be disposed of in a manner that will not contribute to additional siltation.

Rock Berm

1. Use only open graded rock 4-8 inch diameter for streamflow conditions; Use open graded rock 3-5 inches diameter for other conditions.

2. The rock berm shall be secured with a woven wire sheathing having maximum 1 inch opening and minimum wire diameter of 20 gauge.

3. The rock berm shall be inspected weekly of after each rain, and the stone and/or fabric core-woven wire sheathing shall be replaced when the structure ceases to function as intended, due to silt accumulation among the rocks, washout, or construction traffic damage.

4. When silt reaches a depth equal to one-third the height of the berm or one foot, whichever is less, the silt shall-be removed and disposed of in an approved site and in a manner as to not create a siltation problem.

5. Daily inspection shall be made on sever service rock berms; Silt shall be removed

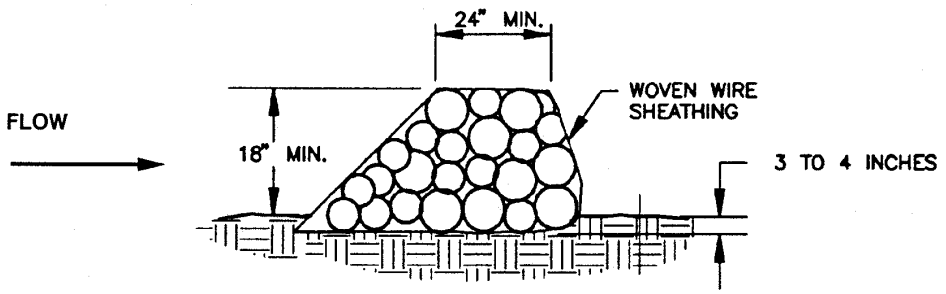
6. When the site is completely stabilized, the berm and accumulated silt shall be removed and disposed of in an approved manner.

Conditions Where Practice Applies:

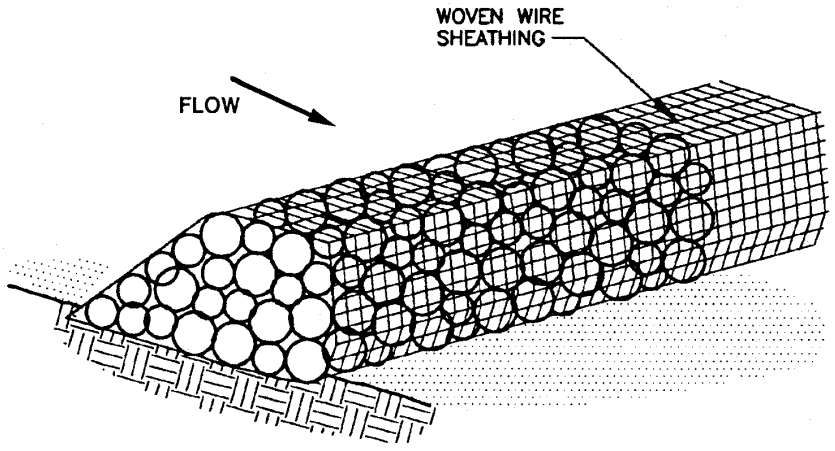
1. There is sheet flow or concentration of water in a channel or other drainageway above the berm.

2. The contributing drainage area is generally less than five (5) acres.

3. Severe Service - For construction activities in stream beds where the contributing drainage area above the construction disturbance exceeds five (5) acres. In this case the rock berm is not to be used as a substitute for other measures further up in the watershed. It is to be used only where disturbance is occurring in the channel or where upslope measures are not feasible.



CROSS SECTION
N.T.S.



ISOMETRIC PLAN VIEW
N.T.S.

Schematic of a Rock Berm (NCTCOG, 1993)

Drop Inlet Protection For Use In Paved Areas

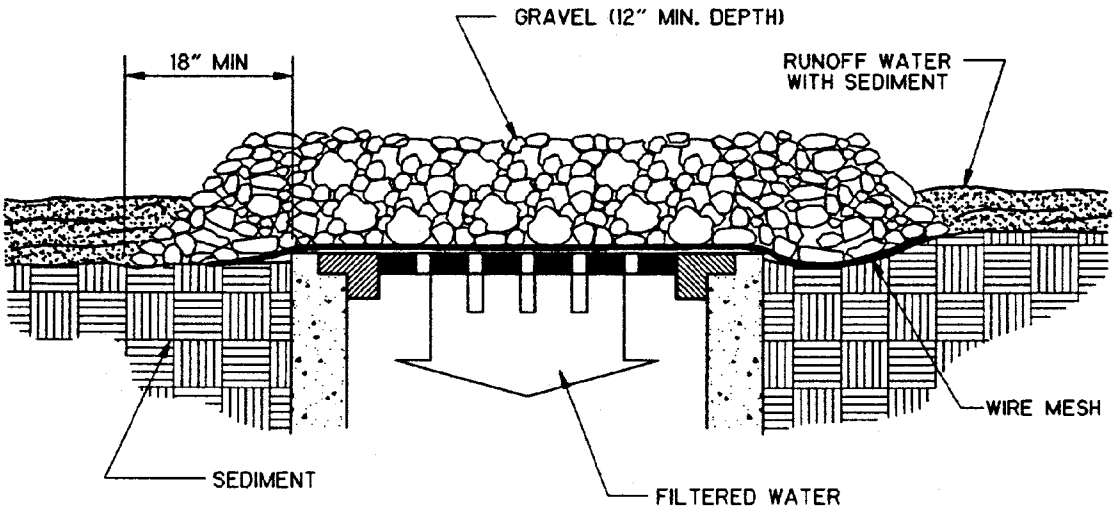
Alternate #1 - Gravel and Wire Mesh Drop Inlet Sediment Filter

(1) Wire mesh should be laid over the drop inlet so that the wire extends a minimum of 1 foot beyond each side of the inlet structure. Wire mesh with 1/2-inch openings should be used. If more than one strip of mesh is necessary, the strips should be overlapped.

(2) Coarse aggregate should be placed over the wire mesh as indicated in Figure 1.35. The depth of stone should be at least 12 inches over the entire inlet opening. The stone should extend beyond the inlet opening at least 18 inches on all sides.

(3) If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stones must be pulled away from the inlet, cleaned and/or replaced.

Note: This filtering device has no overflow mechanism; therefore, ponding is likely especially if sediment is not removed regularly. This type of device should never be used where overflow may endanger an exposed fill slope. Consideration should also be given to the possible effects of ponding on traffic movement, nearby structures, working areas, adjacent property, etc.



CROSS SECTION
N.T.S.

Wire Mesh and Gravel Inlet Protection (NCTCOG, 1993)

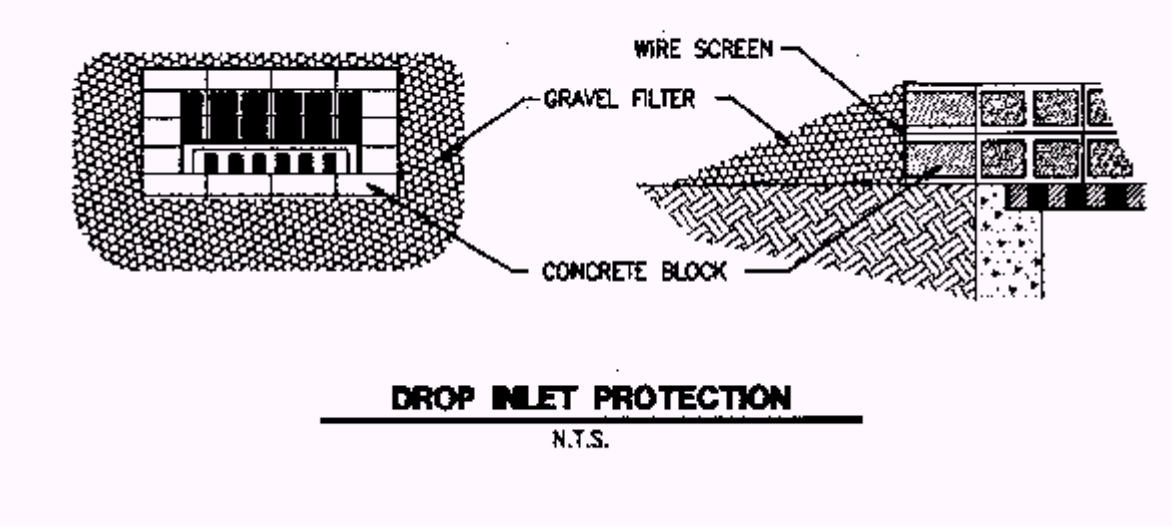
Alternate #2 - Block and Gravel Drop Inlet Sediment Filter

(1) Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, with the ends of adjacent blocks abutting. The height of the barrier can be varied, depending on design needs, by stacking combinations of 4-inch, 8-inch and 12-inch wide blocks. The barrier of blocks should be at least 12-inches high and no greater than 24-inches high.

(2) Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Wire mesh with 1/2-inch openings should be used.

(3) Stone should be piled against the wire to the top of the block barrier, as shown in Figure.

(4) If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned and replaced.



Alternate #3 - Bagged Gravel Inlet Filter

Sandbags filled with pea gravel can also be used to construct a sediment barrier around curb and drain inlets. The sandbags should be filled with washed pea gravel and stacked to form a continuous barrier about 1 foot high around the inlets. The bags should be tightly abutted against each other to prevent runoff from flowing between the bags. This measure should be installed as shown in .

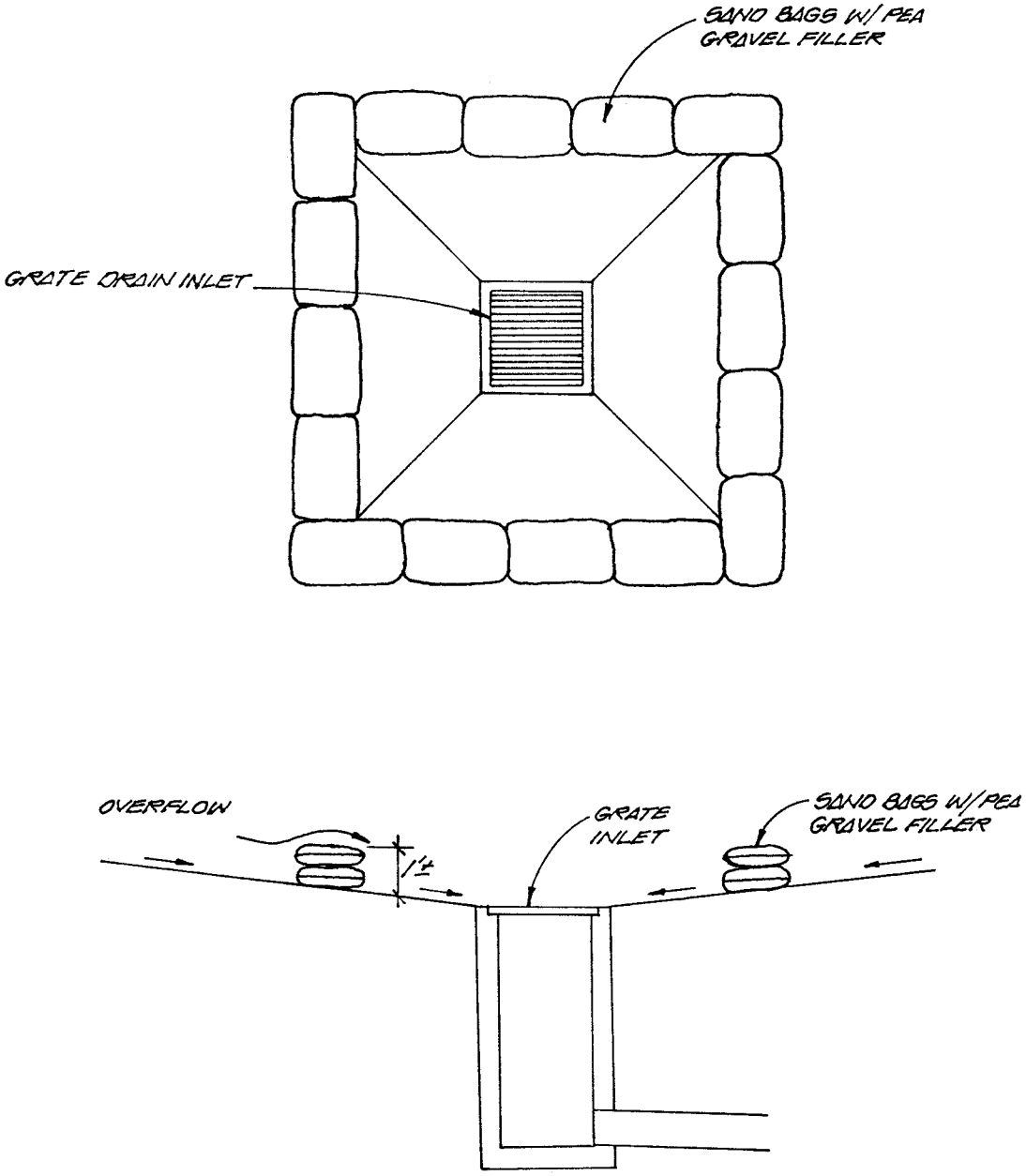


Diagram of Bagged Gravel Grate Inlet Protection (Pape-Dawson)

Inspection and Maintenance Guidelines:

(1) Inspection should be made weekly and after each rainfall. Repair or replacement should be made promptly as needed by the contractor.

(2) Remove sediment when buildup reaches a depth of 3 inches. Removed sediment should be deposited in a suitable area and in such a manner that it will not erode.

(3) Structures should be removed and the area stabilized only after the remaining drainage area has been properly stabilized.

Curb Inlet Protection For Use In Paved Areas

Alternate #1 - Block and Gravel Curb Inlet Sediment Filter

(1) Two concrete blocks should be placed on their sides abutting the curb at either side of the inlet opening.

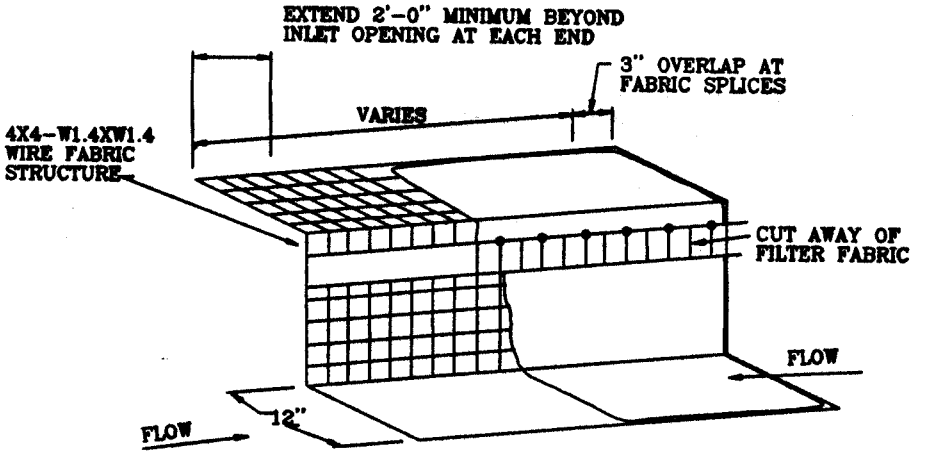
(2) A 2-inch x 4-inch stud should be cut and placed through the outer holes of each spacer block to help keep the front blocks in place.

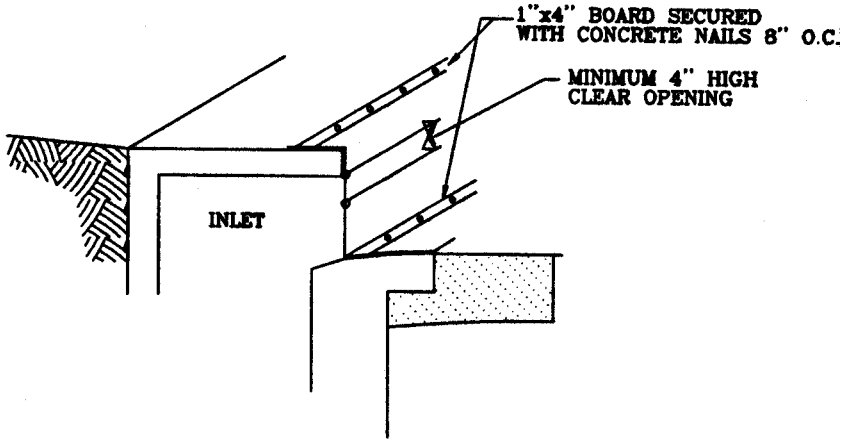
(3) Concrete blocks should be placed on their sides across the front of the inlet and abutting the spacer blocks as depicted.

(4) Wire mesh should be placed over the outside vertical face (webbing) of the concrete blocks to prevent stone from being washed through the holes in the blocks. Wire mesh with 1/2-inch openings should be used.

(5) Coarse aggregate should be piled against the wire to the top of the barrier as shown.

(6) If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned and/or replaced.



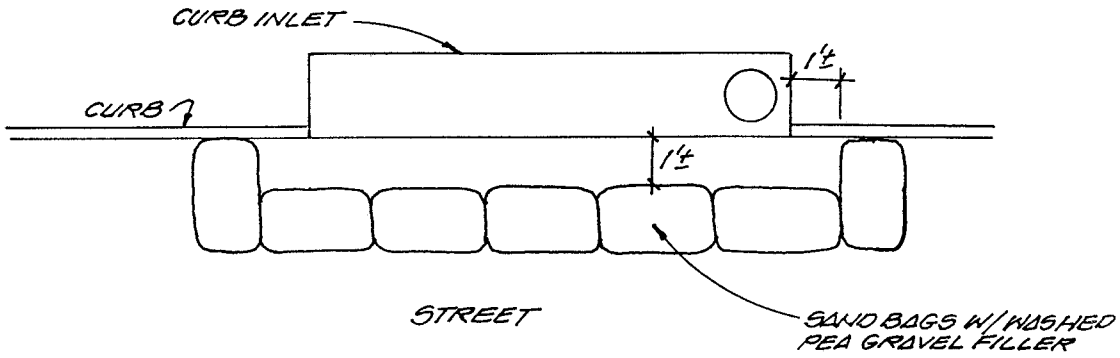


NOTES:

1. Contractor to secure filter with 1"x4" board set with concrete nails 8 inches off-center.
2. Remove section of filter fabric if concentrated flow occurs at this location or as directed by the Environmental Inspector. Fabric must be secured to wire backing with clips or hog rings at this location.

Alternate #2 - Bagged Gravel Inlet Filter

Sandbags filled with pea gravel can also be used to construct a sediment barrier around curb and drain inlets. The sandbags should be filled with washed pea gravel and stacked to form a continuous barrier about 1 foot high around the inlets. The bags should be tightly abutted against each other to prevent runoff from flowing between the bags. This measure should be installed as shown in .



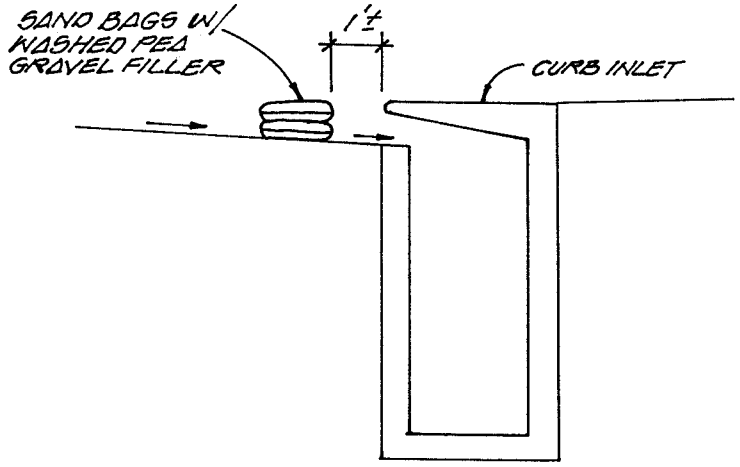


Diagram of Bagged Gravel Curb Inlet Protection (Pape-Dawson).

Inspection and Maintenance Guidelines:

(1) Inspection should be made weekly and after each rainfall. Repair or replacement should be made promptly as needed by the contractor.

(2) Remove sediment when buildup reaches a depth of 3 inches. Removed sediment should be deposited in a suitable area and in such a manner that it will not erode.

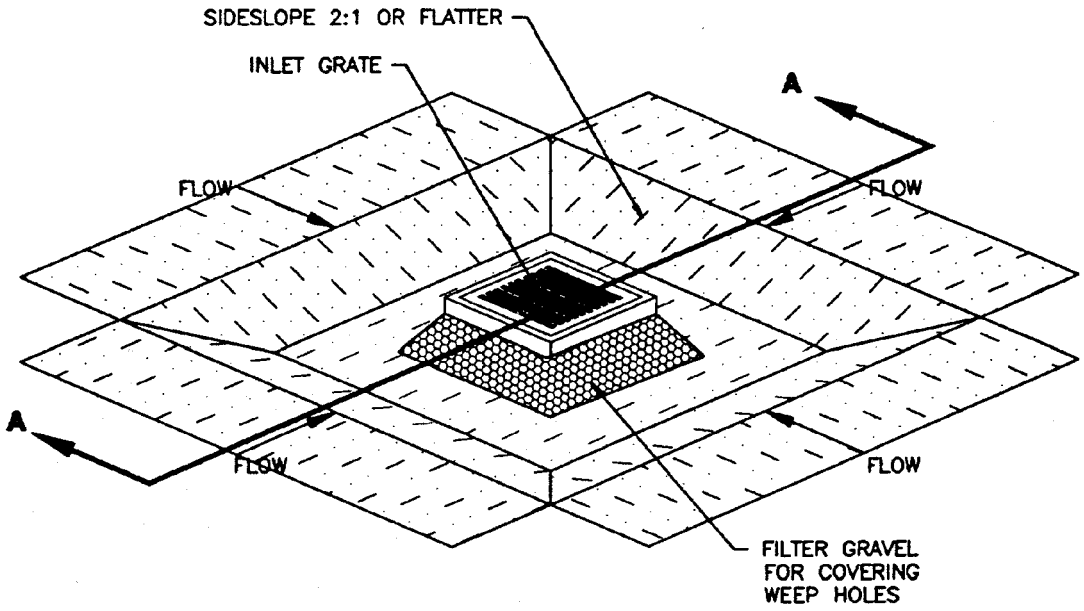
(3) Check placement of device to prevent gaps between device and curb.

(4) Structures should be removed and the area stabilized only after the remaining drainage area has been properly stabilized

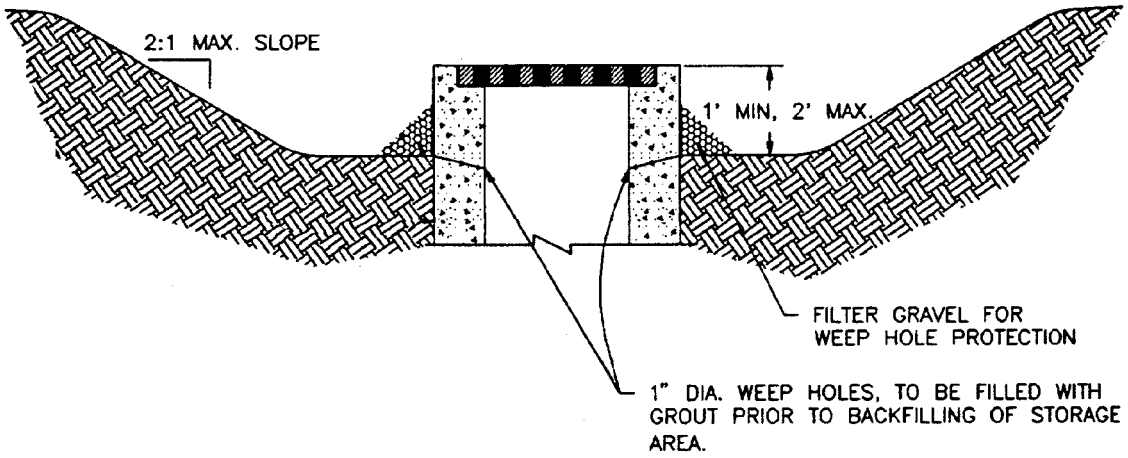
<u>Drop Inlet Protection For Use In Unpaved Areas</u>

Excavated Drop Inlet Sediment Trap

(1) The excavated trap should be sized to provide a minimum storage capacity calculated at 3,600 cubic feet per acre of drainage area. A trap should be no less than 1-foot nor more than 2-feet deep measured from the top of the inlet structure. Side slopes should not be steeper than 2:1.



ISOMETRIC PLAN VIEW
N.T.S.



SECTION A-A
N.T.S.

Excavated Inlet Protection (NCTCOG, 1993)

(2) The slope of the basin may vary to fit the drainage area and terrain. Observations must be made to check trap efficiency and modifications should be made as necessary to ensure satisfactory trapping of sediment. Where an inlet is located so as to receive concentrated flows, such as in a highway median, it is recommended that the basin have a rectangular shape in a 2:1 (length/width) ratio, with the length oriented in the direction of the flow.

(3) Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Removed sediment should be deposited in a suitable area and in a manner such that it will not erode.

Silt Fence Drop Inlet Protection

(1) Silt fence should conform to the specifications listed above and should be cut from a continuous roll to avoid joints.

(2) For stakes, use 2 x 4-inch wood or equivalent metal with a minimum length of 3 feet.

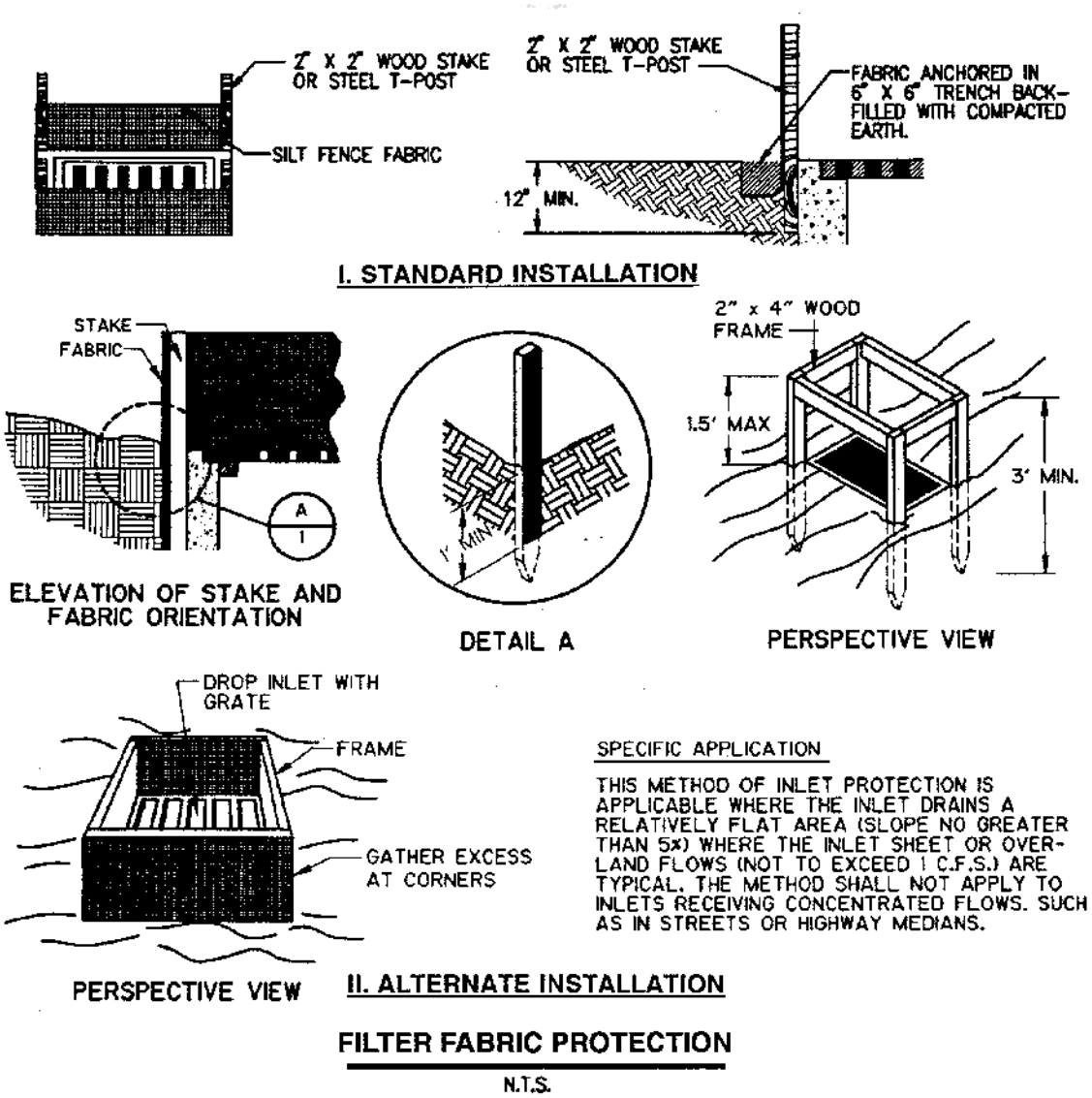
(3) Space stakes evenly around the perimeter of the inlet a maximum of 3-feet apart, and securely drive them into the ground, approximately 18-inchesdeep.

(4) To provide needed stability to the installation, a frame with 2 x 4-inch wood strips around the crest of the overflow area at a maximum of 1½ feet above the drop inlet crest should be provided.

(5) Place the bottom 12 inches of the fabric in a trench and backfill the trench with 12 inches of compacted soil.

(6) Fasten fabric securely by staples or wire to the stakes and frame. Joints must be overlapped to the next stake.

(7) It may be necessary to build a temporary dike on the down slope side of the structure to prevent bypass flow. If the drop inlet is above the finished grade, the grate may be completely covered with filter fabric. The fabric should be securely attached to the entire perimeter of the inlet using 1”x 2” wood strips and appropriate fasteners.



Filter Fabric Inlet Protection (NCTCOG, 1993)

Site Dewatering

Sediment Tank

Sediment tanks are generally used for the period of deep excavation where space is limited.

- Traps and retains sediment from water being pumped from excavated areas.
- Sediment Tank shall be located convenient for clean out and disposal of the trapped sediment and shall minimize the interference with construction activities. The size of the tank can be estimated from the following formula:

- Storage (cubic foot) =16 x pump discharge (gallons per minute).
- Discharged water shall be conveyed to a sediment trapping device.
- Inspection shall be made by the contractor after each pumping, and when one third of the sediment tank is filled with silt, the contractor shall clean out the tank.
- Sediment collected in the tank shall be disposed of at an approved site in a manner that will not contribute to additional siltation.
- The sediment tank shall be removed when the construction is completed.

Sump Pit

Sump pits are constructed for collecting water during construction; particularly useful during excavation for building foundations.

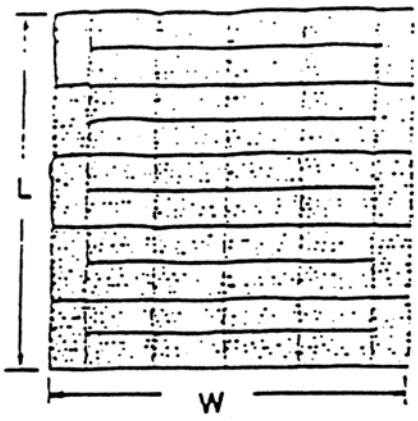
- Collects water retained in excavated areas and removes sediment before the water is pumped from the site.
- The number of sump pits and their locations shall be determined by an engineer.
- Discharged water shall be conveyed to a sediment trapping device.
- The site of sump pits shall be restored to stabilized condition when the construction is completed.

Straw Bale Dewatering Structure

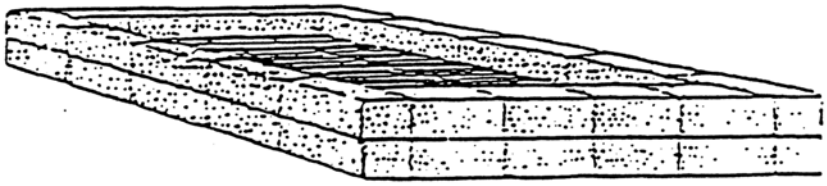
Straw bale dewatering structures are generally used for the period of deep excavation where space is limited.

- Traps and retains sediment from water being pumped from excavated areas.
- Dewatering Structure shall be located convenient for clean out and disposal of the trapped sediment and shall minimize the interference with construction activities.
- Inspection shall be made by the contractor after each pumping, and when one-third of the structure is filled with silt, the contractor shall clean out the structure.
- Sediment collected in the structure shall be disposed of at an approved site in a manner that will not contribute to additional siltation.
- The structure shall be removed when the construction is completed.

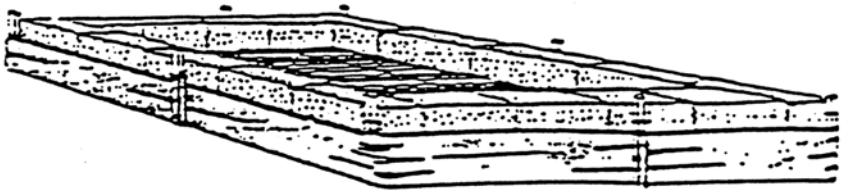
DEWATERING STRUCTURE



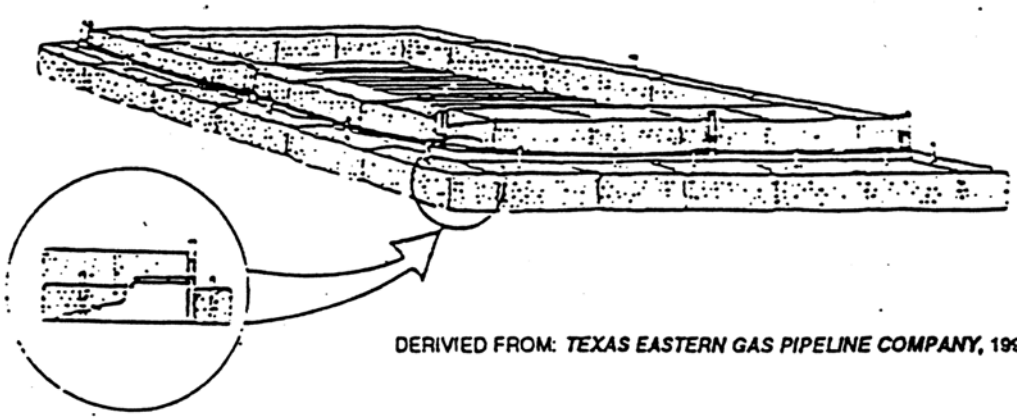
Step 1: Arrange straw bales on level ground tightly packed as shown.



Step 2: Install another layer of straw bales on the outer edge as shown



Step 3: Install another layer of straw bales on the outside by driving stakes through each of the outer bales.



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