

Erosion & Sediment Control Guidebook

In order to address sediment and pollutants in stormwater runoff, a system of federal, state, and local regulations exists, which requires that programs be developed to manage sources of stormwater pollution that have the potential to discharge to municipal storm drainage systems and streams. Specific requirements for construction site management are currently in effect through state and local regulations.

Local Government Requirements

The Watershed Approach to Stream Health (WASH) Partners, consisting of Boulder County; the cities of Boulder, Longmont, Louisville; and towns of Erie and Superior, are required by federal and state regulations to develop local programs which meet the requirements of a state stormwater discharge permit. These WASH entities have adopted, from *Urban Drainage and Flood Control District (UDFCD) Drainage Criteria Manual Vol. 3*, common standards for construction sites, which will be incorporated into individual community ordinances in late 2004.

Practices designed to prevent sediment and construction materials pollutants from leaving the construction site are available. When these practices, known as **Best Management Practices (BMPs)**, are properly installed and maintained, sediment and pollutants generated by construction sites are greatly reduced.

Guidebook

This guidebook is intended to aid inspectors and construction and maintenance personnel in implementing and maintaining water quality BMPs. The collection of figures contained in this guidebook is extracted from *Urban Drainage and Flood Control District (UDFCD) Drainage Criteria Manual Vol. 3*. Refer to the *Drainage Criteria Manual* for more information on the application, use limitations, design, construction, and maintenance of BMPs for erosion and sediment control and stormwater quality management. The guidebook illustrates good and bad examples of BMPs.

BMPs in this guidebook are provided for general guidance. Additional BMPs can be used as appropriate. Be sure to consult local requirements. Specific installations and requirements may apply. **The guiding reference document for site-specific BMP installations will be the project's Stormwater Management Plan (SWMP), developed for the Colorado Department of Public Health and Environment (CDPHE) – Water Quality Control Division permit, *Stormwater Discharges Associated with Construction Activity* and any erosion control plan developed for local compliance.**

Checklist

The state requires the permit holder to:

- ✓ Develop a Stormwater Management Plan (SWMP).
- ✓ File a permit application at least 10 days prior to the start of construction activities.
- ✓ Update SWMP to reflect current conditions and keep it on-site.
- ✓ Install Best Management Practices (BMPs) prior to initial land disturbance and according to specifications outlined in the SWMP.
- ✓ Perform inspections of stormwater and erosion controls following each significant storm event and maintain records.
- ✓ Perform inspections of BMPs every 14 days and following each significant storm event.
- ✓ Maintain inspection records.
- ✓ Provide SWMP and records to inspector upon request.
- ✓ Maintain and modify BMPs to reflect current conditions of job site.
- ✓ Achieve stabilization. (All disturbed areas have been either built on, paved, or a uniform vegetative cover has been established with a density of at least 70 percent of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed. Re-seeding alone does not qualify.)
- ✓ Remove all temporary BMPs.
- ✓ Inactivate permit.
- ✓ Prevent contamination, pollution, or degradation of State waters.

References

WASH Erosion Control Training

303-441-1439

www.BASIN.org/WASH - ordinances, erosion control training schedule, and training manual

Colorado Water Quality Control Division (WQCD)

303-692-3500

Colorado Stormwater General Permits

[www.cdphe.state.co.us/wq/Permits Unit/wqcdpmt.html](http://www.cdphe.state.co.us/wq/Permits%20Unit/wqcdpmt.html)

State Inspector - Matt Czahor, 303-692-3575

Construction Dewatering - John Nieland, 303-692-3553

Minimal Industrial Discharge (example: hydrostatic testing) - John Nieland, 303-692-3553

Sand and Gravel with Process Water – Chris Gates, 303-692-3539

Permits not from WQCD

Corps of Engineers 404 Wetland Permit – 303-979-4120

General Air Pollution Emission Notice: Construction Permit – 303-692-3100

Urban Drainage and Flood Control District

Criteria Manual order form: www.udfcd.org/usdcm_orders.htm

Environmental Protection Agency

www.epa.gov/npdes/stormwater

Sample SWMP - www.epa.gov/npdes/pubs/sample_swppp.pdf

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EROSION CONTROL PLAN SYMBOLS			EROSION CONTROL PLAN SYMBOLS		
TITLE	KEY	SYMBOL	TITLE	KEY	SYMBOL
CHECK DAM	CD		SEDIMENT BASIN	SB	
CONSTRUCTION ROAD STABILIZATION	CRS		TEMPORARY STREAM CROSSING	SC	
CURB SOCK INLET PROTECTION	CS		SILT FENCE	SF	
TEMPORARY DIVERSION DIKE	DD		SURFACE ROUGHENING	SR	
TEMPORARY CHANNEL DIVERSION	DV		SEDIMENT TRAP	ST	
STORM DRAIN INLET PROTECTION	IP		STRAW BALE BARRIER	STB	
MULCHING	MU		TEMPORARY SEEDING	TS	
OUTLET PROTECTION	OP		TEMPORARY SLOPE DRAIN	TSD	
PAVED FLUME	PF		VEHICLE TRACKING CONTROL	VTC	
PERMANENT SEEDING	PS		VEHICLE TRACKING CONTROL WITH WASH RACK	WR	
ROUGH CUT STREET CONTROL	RCS				

Figure 1 – Map Symbols

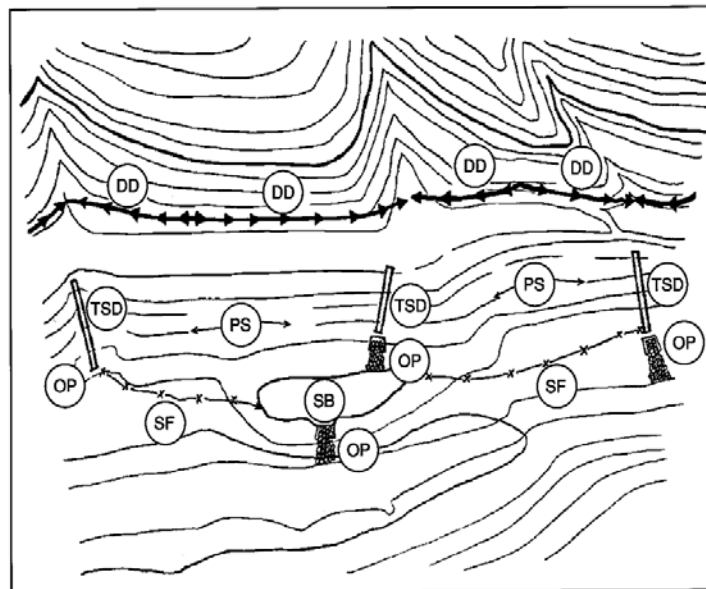
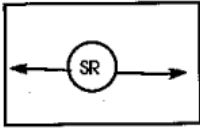


Figure 2 – Example Site Plan Map



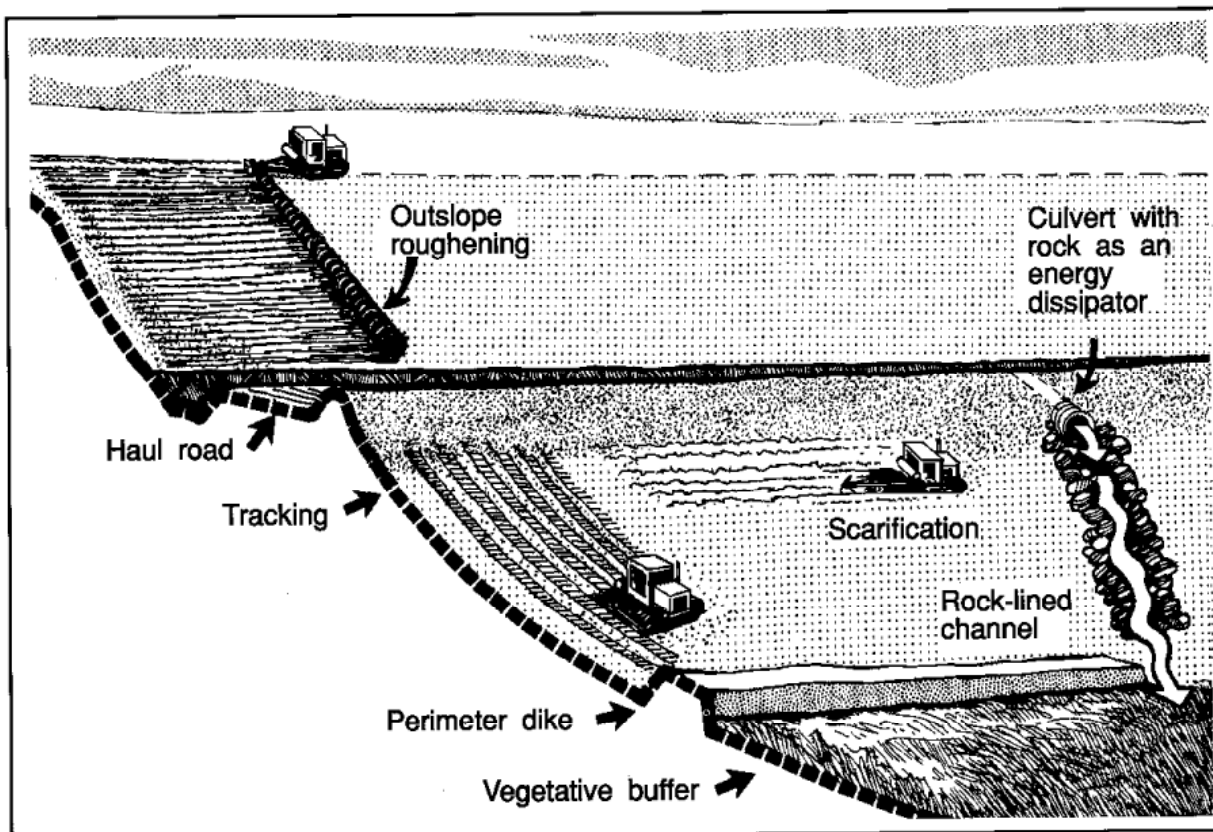
SURFACE ROUGHENING

Definition

Provide a rough soil surface with horizontal depressions created by operating a tillage or other suitable implement on the contour, or by leaving slopes in a roughened condition by no fine-grading them.

Purposes

1. To aid in seed bed preparation and establishment of vegetative cover.
2. To reduce runoff velocity and increase infiltration.
3. To reduce runoff and wind erosion and provide for sediment trapping.



From: Environmental Protection Agency, 1976

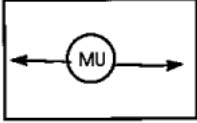
FIGURE 3 Surface Roughening

Figure 3-A



Figure 3-B





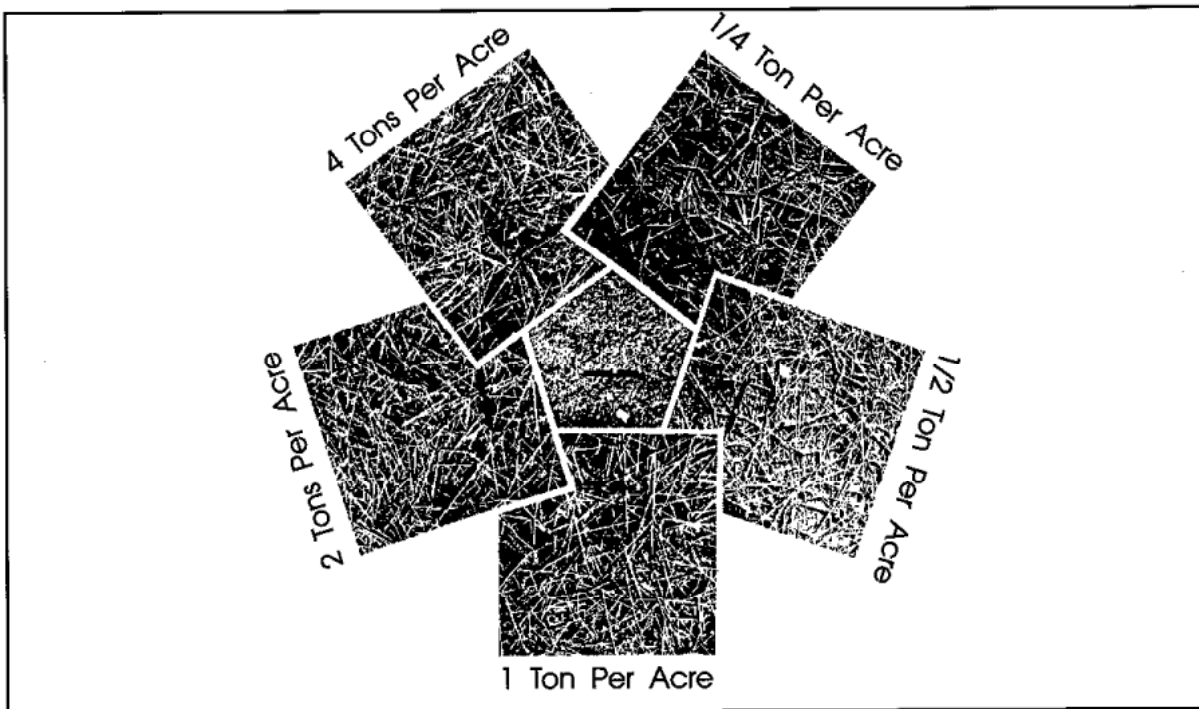
MULCHING

Definition

Application of plant residues or other suitable materials to the soil surface.

Purposes

1. To prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.
2. To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.



From: Environmental Protection Agency, 1976

FIGURE 4 Mulching

Figure 4-A



Figure 4-B

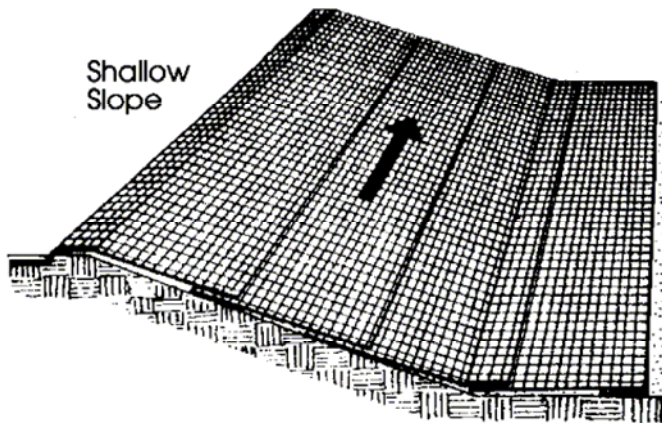


4-C



Figure 4-D

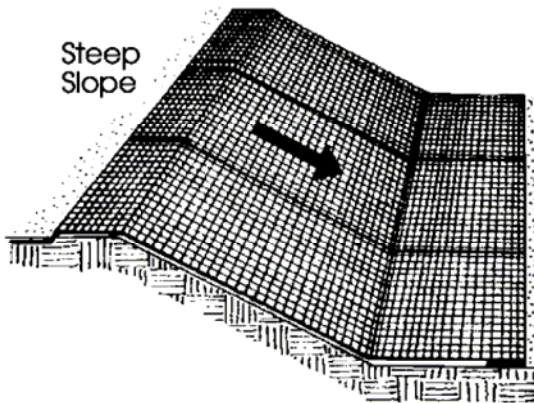




Shallow Slope

On shallow slopes, strips of netting may be applied across the slope.

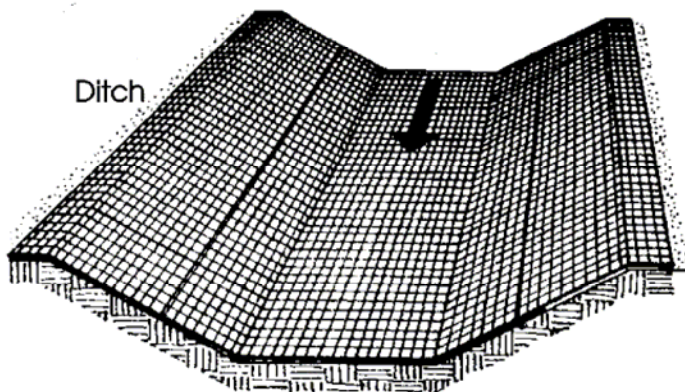
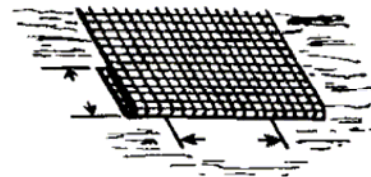
Where there is a berm at the top of the slope, bring the netting over the berm and anchor it behind the berm.



Steep Slope

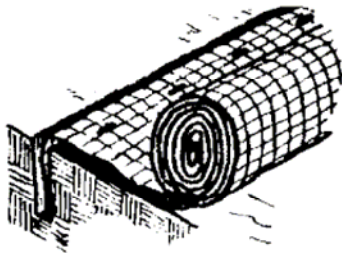
On steep slopes, apply strips of netting parallel to the direction of flow and anchor securely.

Bring netting down to a level area before terminating the installation. Turn the end under 6" and staple at 12" intervals.

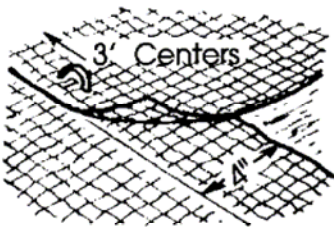


Ditch

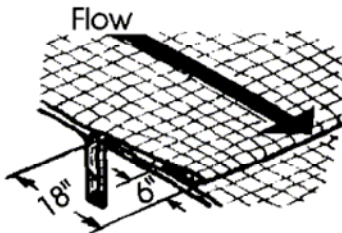
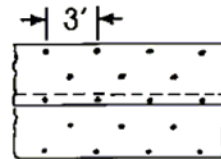
In ditches, apply netting parallel to the direction of flow. Use check slots every 15 feet. Do not join strips in the center of the ditch.



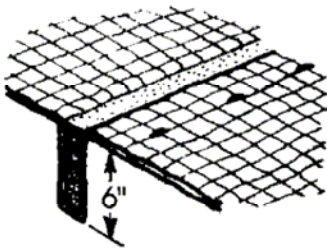
Anchor Slot: Bury the up-channel end of the net in a 6" deep trench. Tamp the soil firmly. Staple at 12" intervals across the net.



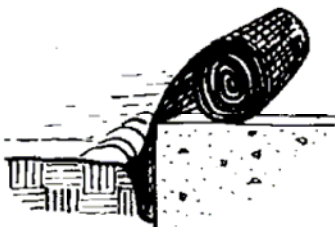
Overlap: Overlap edges of the strips at least 4". Staple every 3 feet down the center of the strip.



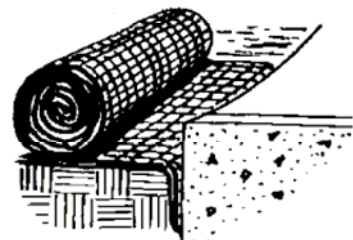
Joining Strips: Insert the new roll of net in a trench, as with the Anchor Slot. Overlap the up-channel end of the previous roll 18" and turn the end under 6". Staple the end of the previous roll just below the anchor slot and at the end at 12" intervals.



Check Slots: On erodible soils or steep slopes, check slots should be made every 15 feet. Insert a fold of the net into a 6" trench and tamp firmly. Staple at 12" intervals across the net. Lay the net smoothly on the surface of the soil - do not stretch the net, and do not allow wrinkles.



Anchoring Ends At Structures: Place the end of the net in a 6" slot on the up-channel side of the structure. Fill the trench and tamp firmly. Roll the net up the channel. Place staples at 12" intervals along the anchor end of the net.



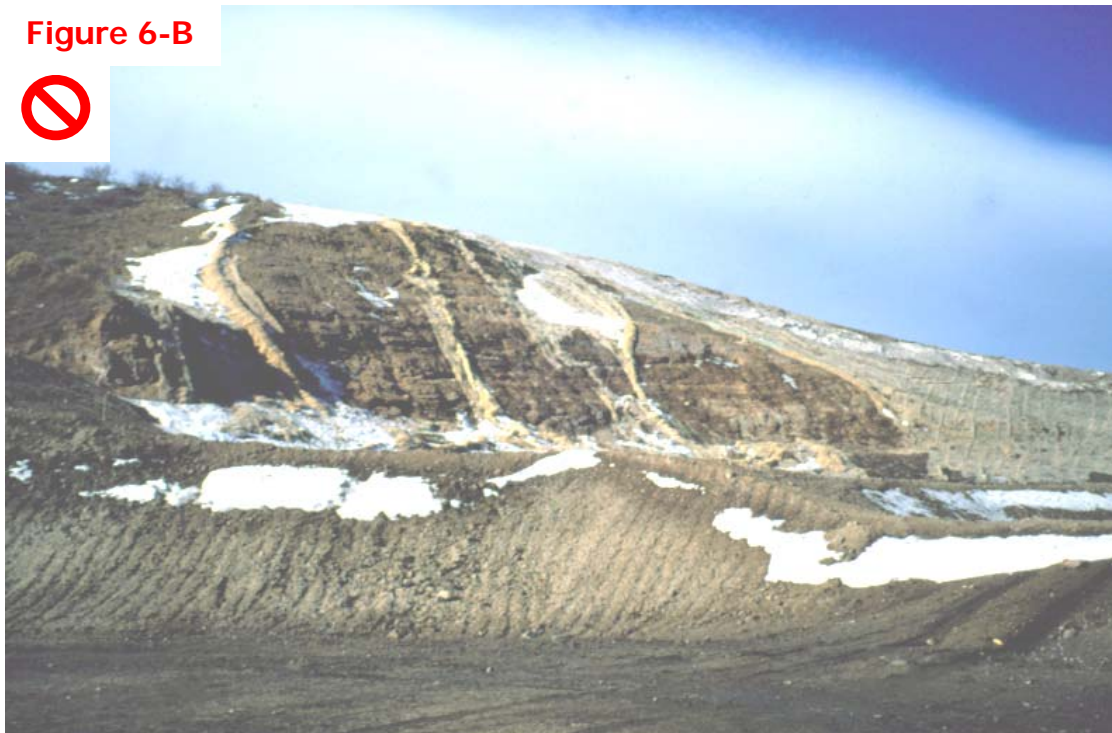
From: Virginia Soil and Water Conservation Commission, 1985

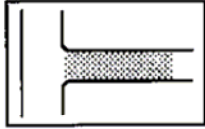
FIGURE 6 Installation of Blankets, Netting, and Matting

Figure 6-A



Figure 6-B





VEHICLE TRACKING CONTROL

Definition

A stone stabilized pad located at points of vehicular ingress and egress on a construction site.

Purposes

To reduce the amount of mud transported onto public roads by motor vehicles or runoff.

Note: Only applicable for sites greater than 2 acres in size

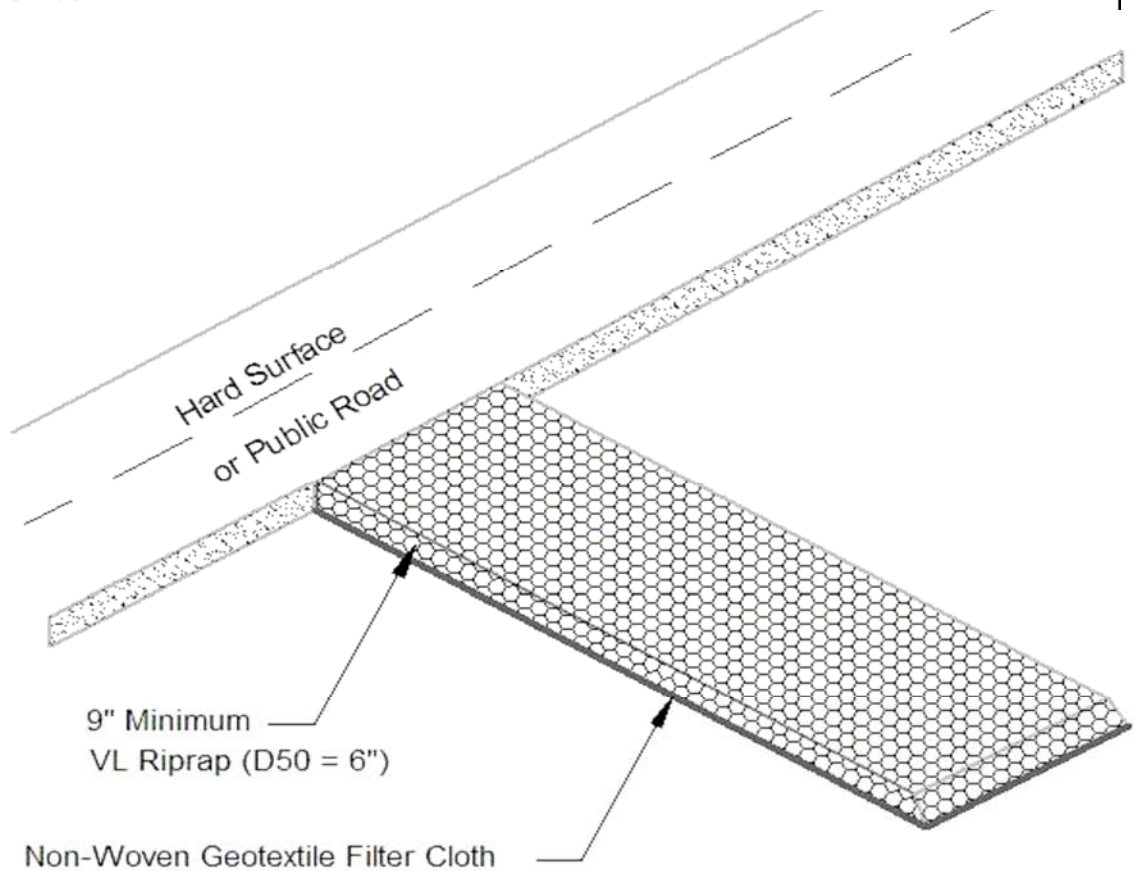


FIGURE 7

Temporary Vehicle Tracking Control

Figure 7-A

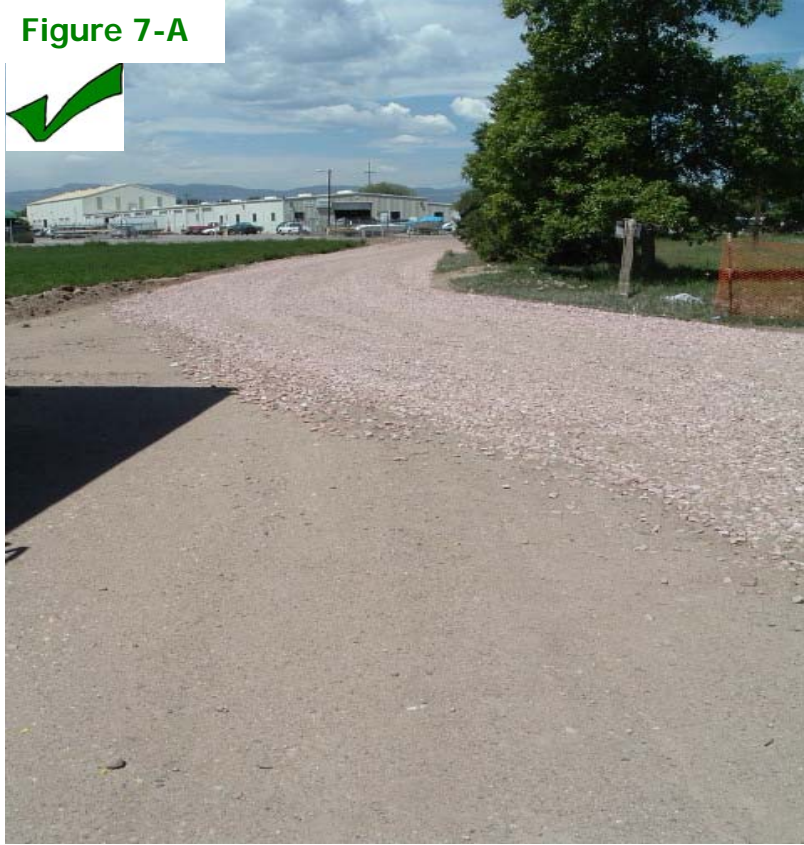
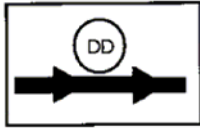


Figure 7-B





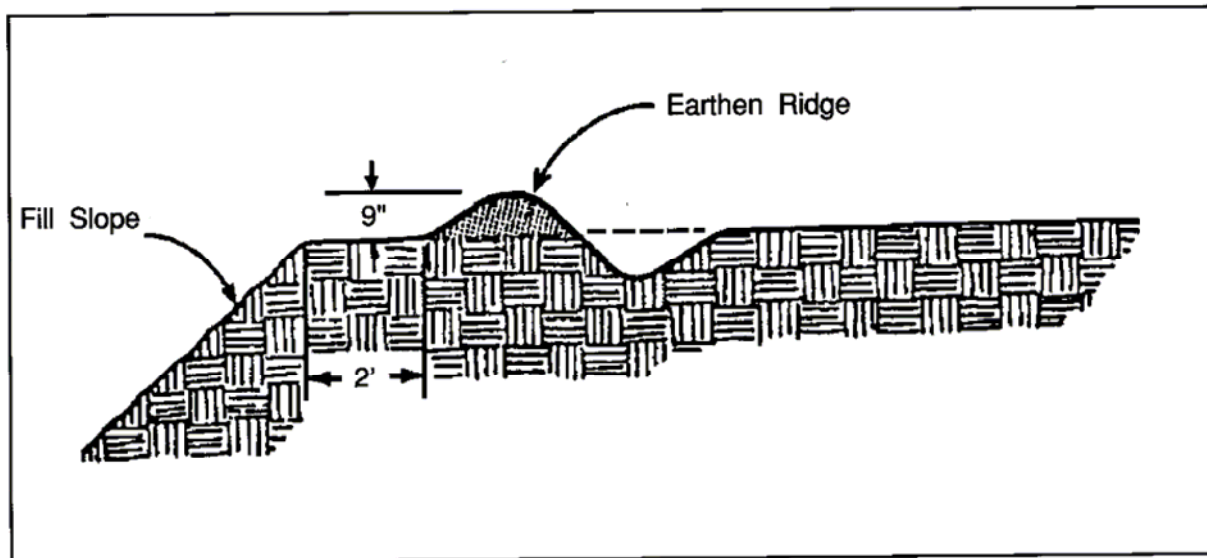
TEMPORARY DIVERSION DIKE

Definition

A temporary ridge of compacted soil located at the top, midslope, or base of a disturbed area.

Purposes

1. To divert storm runoff from higher drainage areas away from unprotected slopes to a permanent channel or temporary channel diversion.
2. To divert sediment-laden runoff from the midslope of a disturbed area to a temporary slope drain.
3. To divert sediment-laden runoff from the base of a disturbed area to a sediment trapping facility.



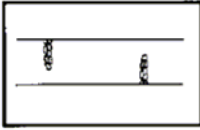
From: Virginia Soil and Water Conservation Commission, 1985
FIGURE 8 Temporary Diversion Dike

Figure 8-A



Figure 8-B





ROUGH-CUT STREET CONTROL

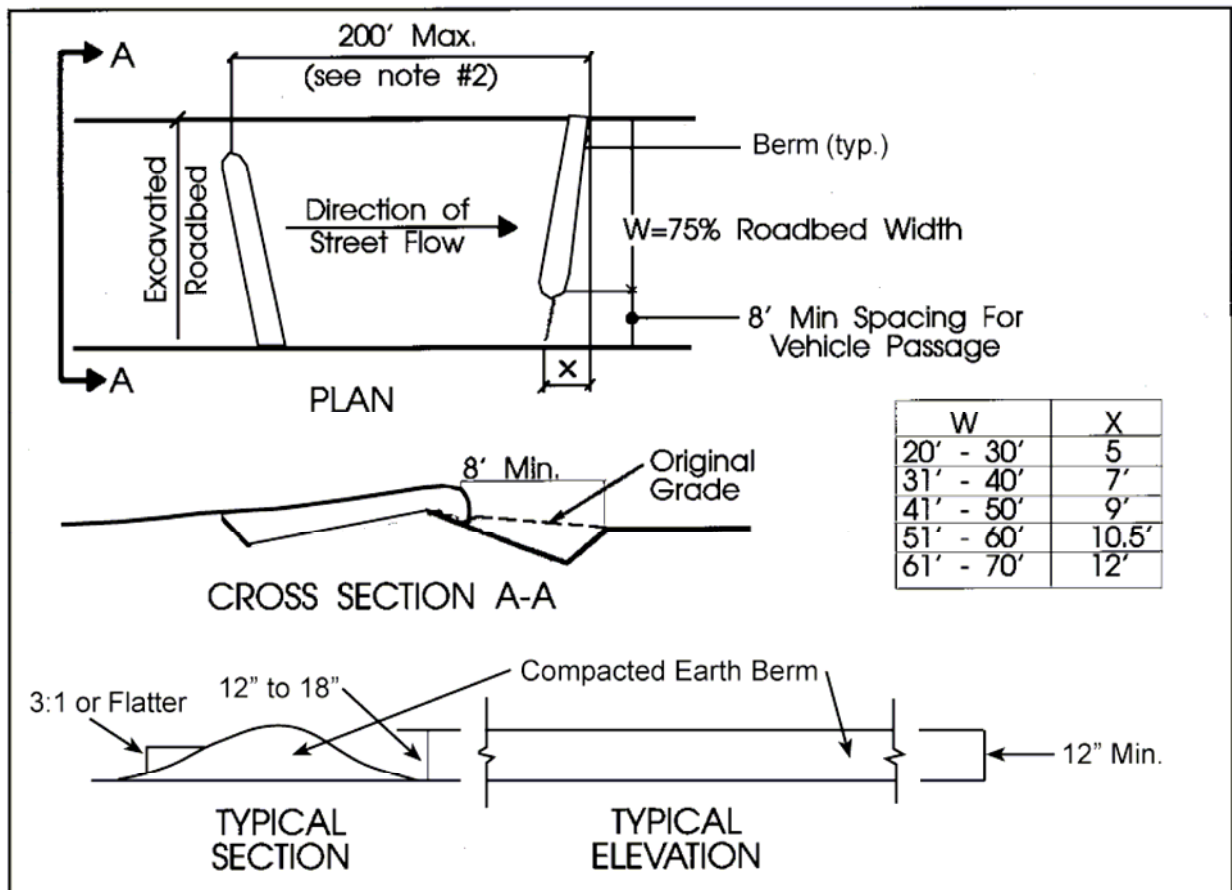
Definition

A temporary sediment barrier placed on alternate sides of a rough cut street.

Purposes

To divert sediment-laden runoff from rough-cut streets and slow the velocity of storm runoff.

- Note:**
1. Alternate materials such as curb socks or silt fences may be used where large flows are not expected.
 2. Requirements for and spacing of velocity reducers for streets with grades of less than 4% shall be as shown on the erosion control plan.



Adopted From: Orange County, California Department of Environmental Quality, 1981

FIGURE 9 Rough-Cut Street Control

Figure 9-A

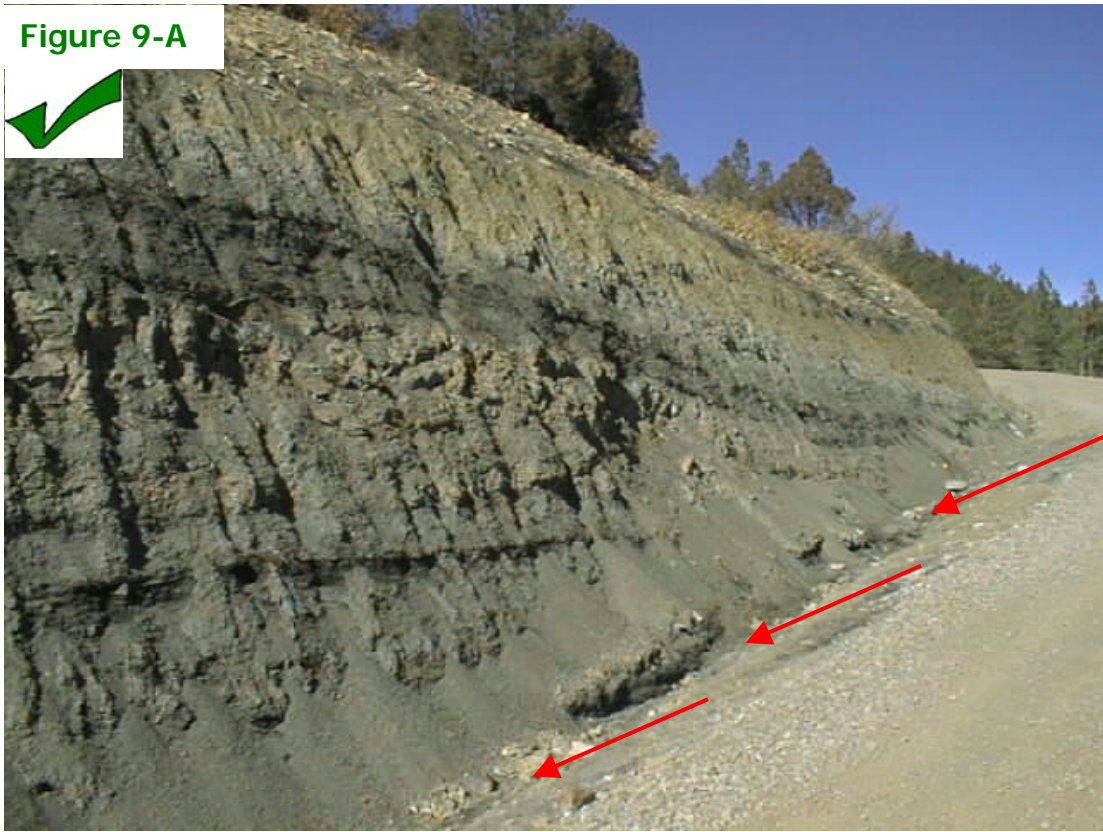
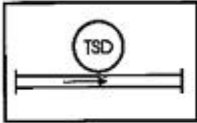


Figure 9-B





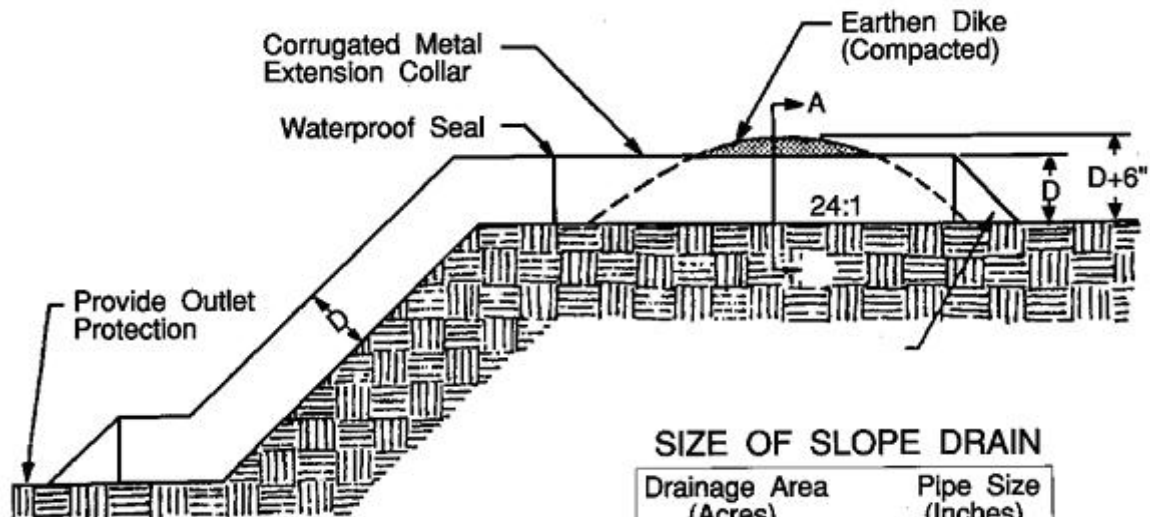
TEMPORARY SLOPE DRAIN

Definition

A flexible tube or conduit extending from the top to the bottom of a cut or fill slope.

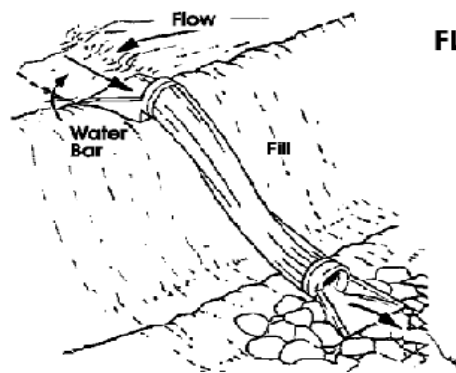
Purposes

To temporarily conduct concentrated stormwater runoff safely down the face of a cut or fill slope without causing erosion problems on or below the slope.

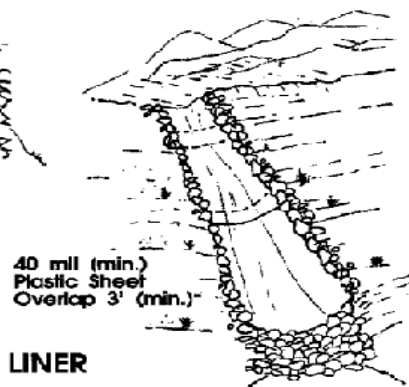


SIZE OF SLOPE DRAIN

Drainage Area (Acres)	Pipe Size (Inches)
<1.5	12"
<5.0	18"
<10.0	24"



FLEXIBLE PIPE



DITCH LINER

From: Virginia Soil and Water Conservation Commission, 1985

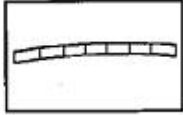
FIGURE 10 TEMPORARY SLOPE DRAIN

Figure 10-A



Figure 10-B





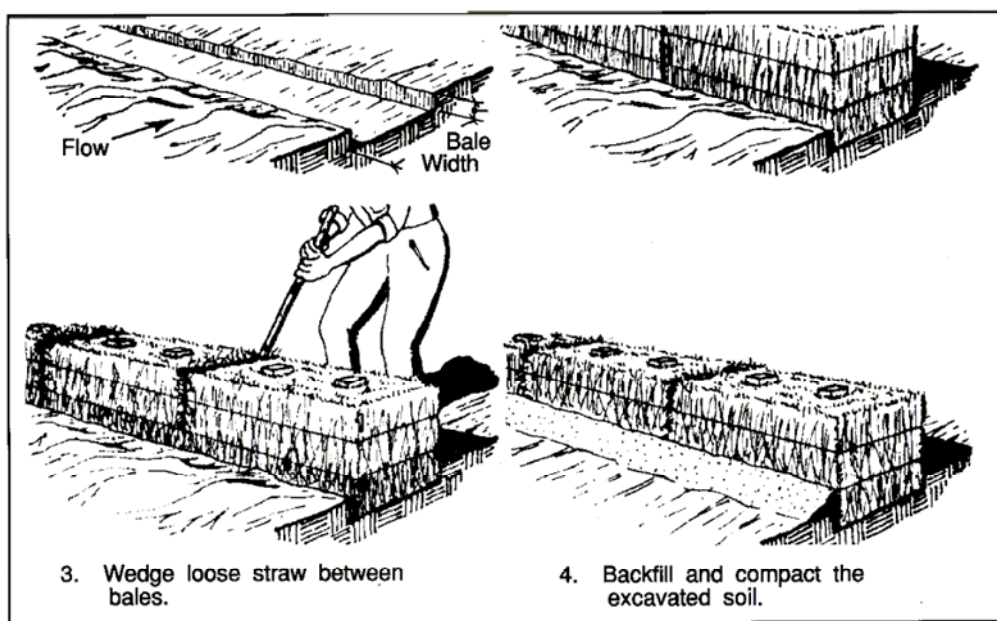
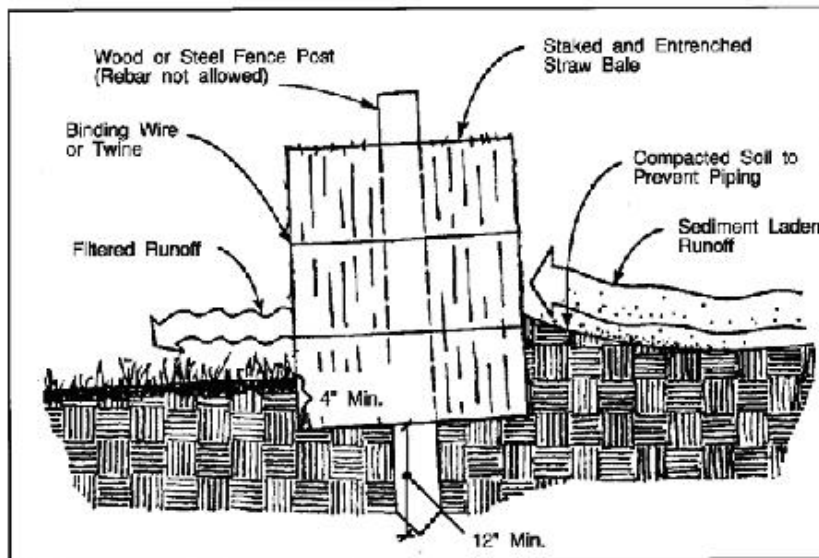
STRAW BALE BARRIER

Definition

A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas of limited extent in order to reduce sediment in runoff from leaving the site.
2. To decrease the velocity of sheet flows from hillslope areas



From: Virginia Soil and Water Conservation Commission, 1985

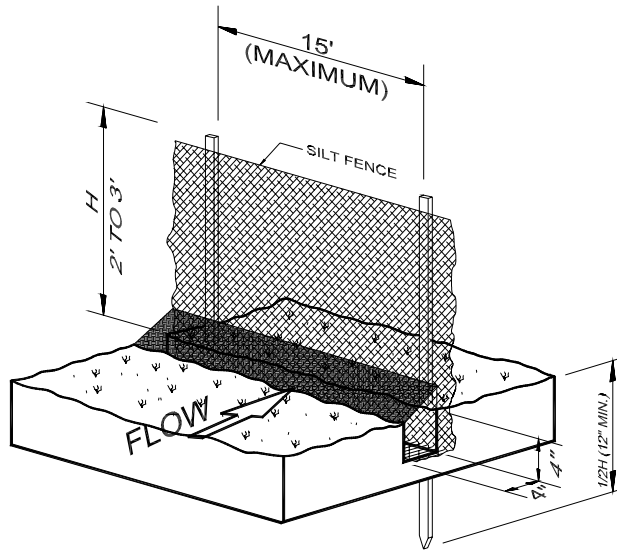
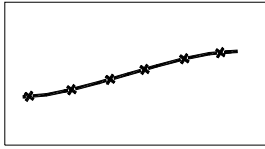
FIGURE 11 Straw Bale Barriers

Figure 11-A



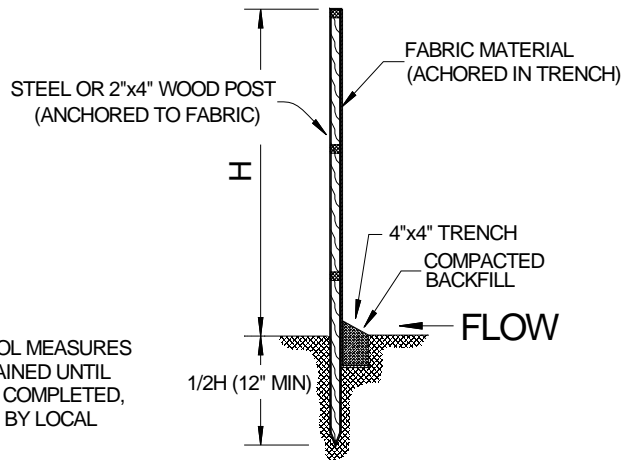
Figure 11-B





SILT FENCE INSTALLATION

-NTS-



NOTE: EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL LANDSCAPING IS COMPLETED, OR AS DIRECTED BY LOCAL JURISDICTION

SECTION

-NTS-

DETAIL

SILT FENCE EROSION BARRIER

Details provided to District by the City of Broomfield, Colorado

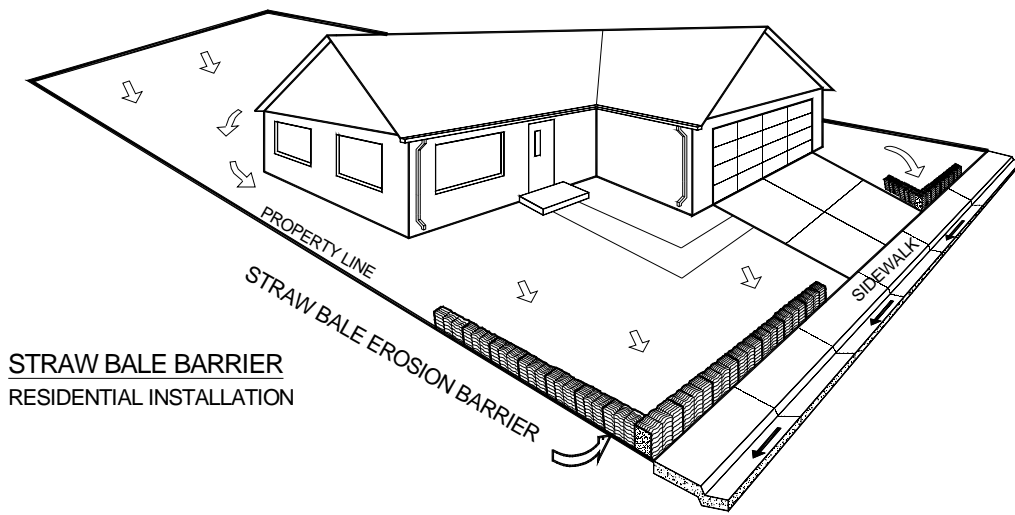
Figure 12 - Silt Fence Erosion Barrier

Figure 12-A

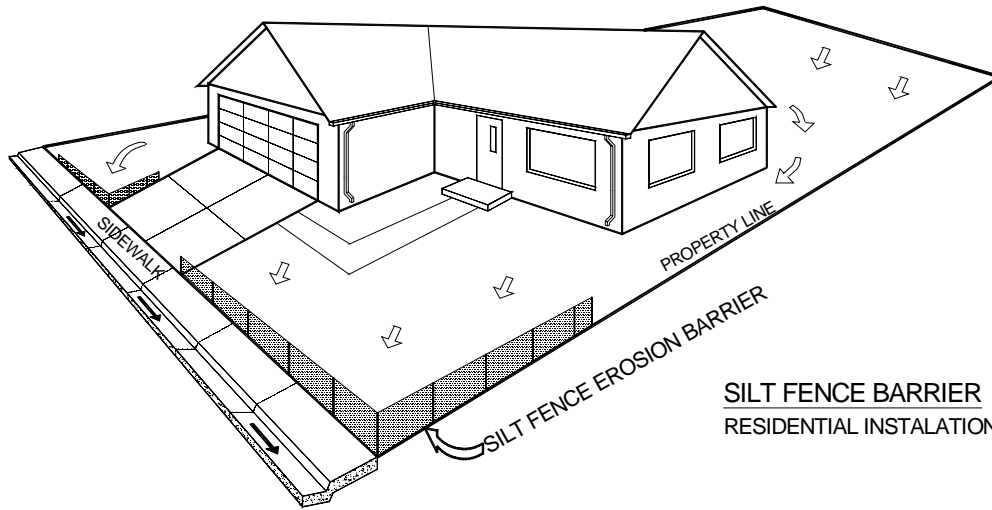


Figure 12-B





**STRAW BALE BARRIER
RESIDENTIAL INSTALLATION**



**SILT FENCE BARRIER
RESIDENTIAL INSTALLATION**

Note: Extend barriers so as to intercept all runoff from the residential lot.

Details provided to District by the City of Broomfield, Colorado

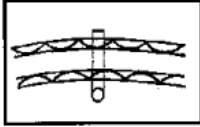
Figure 13 – Residential Erosion Control Barrier

Figure 13-A



Figure 13-B





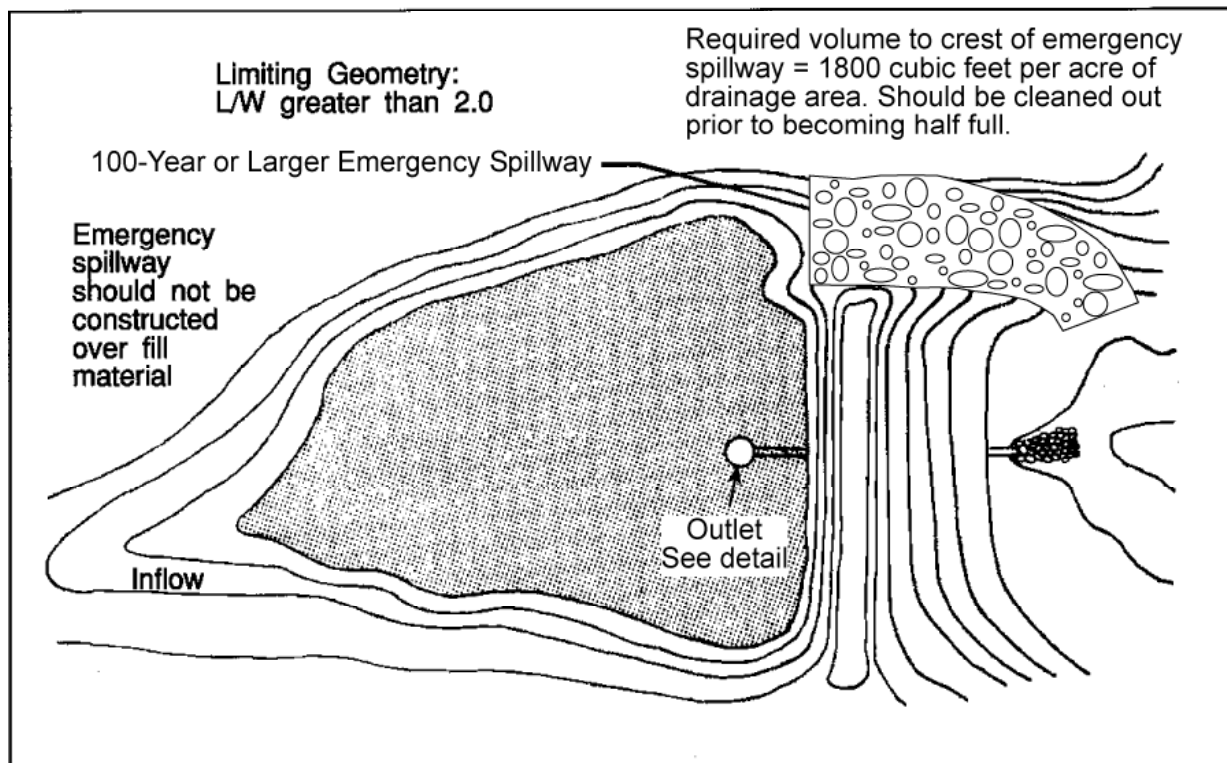
TEMPORARY SEDIMENT BASIN

Definitions

A temporary basin with a controlled stormwater release structure, formed by excavation or construction of an embankment of compacted soil. Required for all drainage areas greater than 1 acre.

Purposes

To detain sediment-laden runoff from distributed areas to allow the majority of the sediment to settle out.



From: Virginia Soil and Water Conservation Commission, 1985

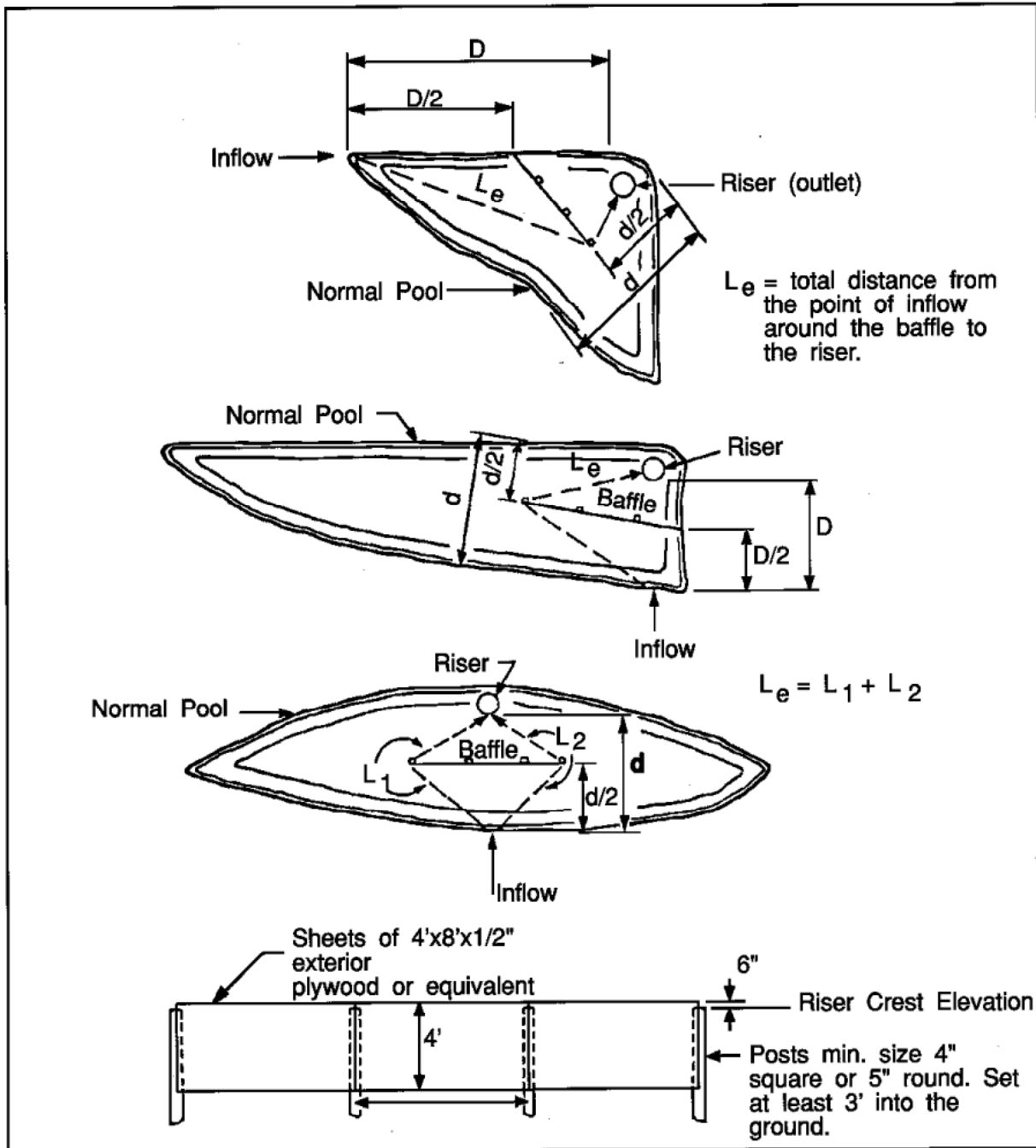
FIGURE 14 Temporary Sediment Basin

Figure 14-A



Figure 14-B





From: Environmental Protection Agency, 1976

FIGURE 15 Temporary Sediment Basin Outlet Detail

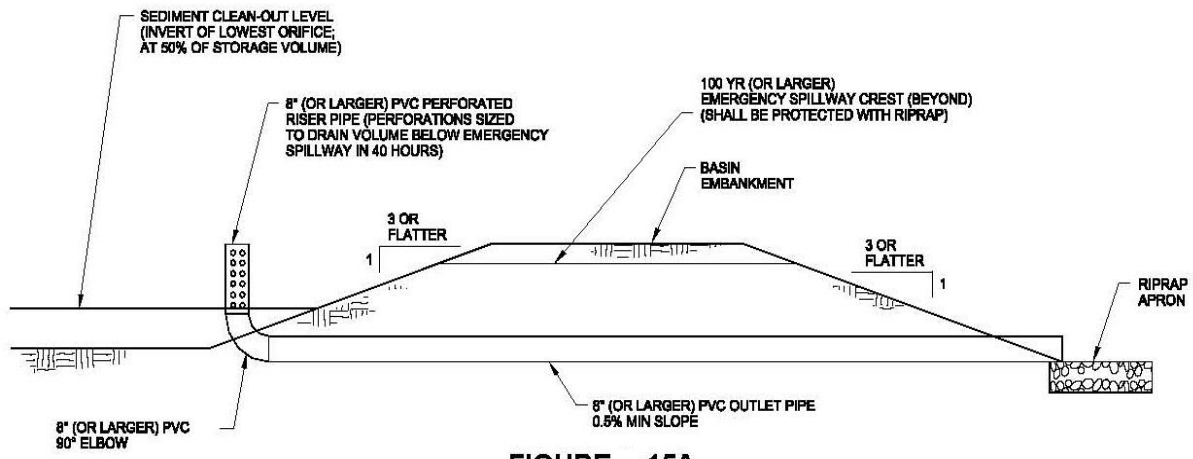


FIGURE 15A

Temporary Sediment Basin Outlet Detail

Figure 15-B



Figure 15-C





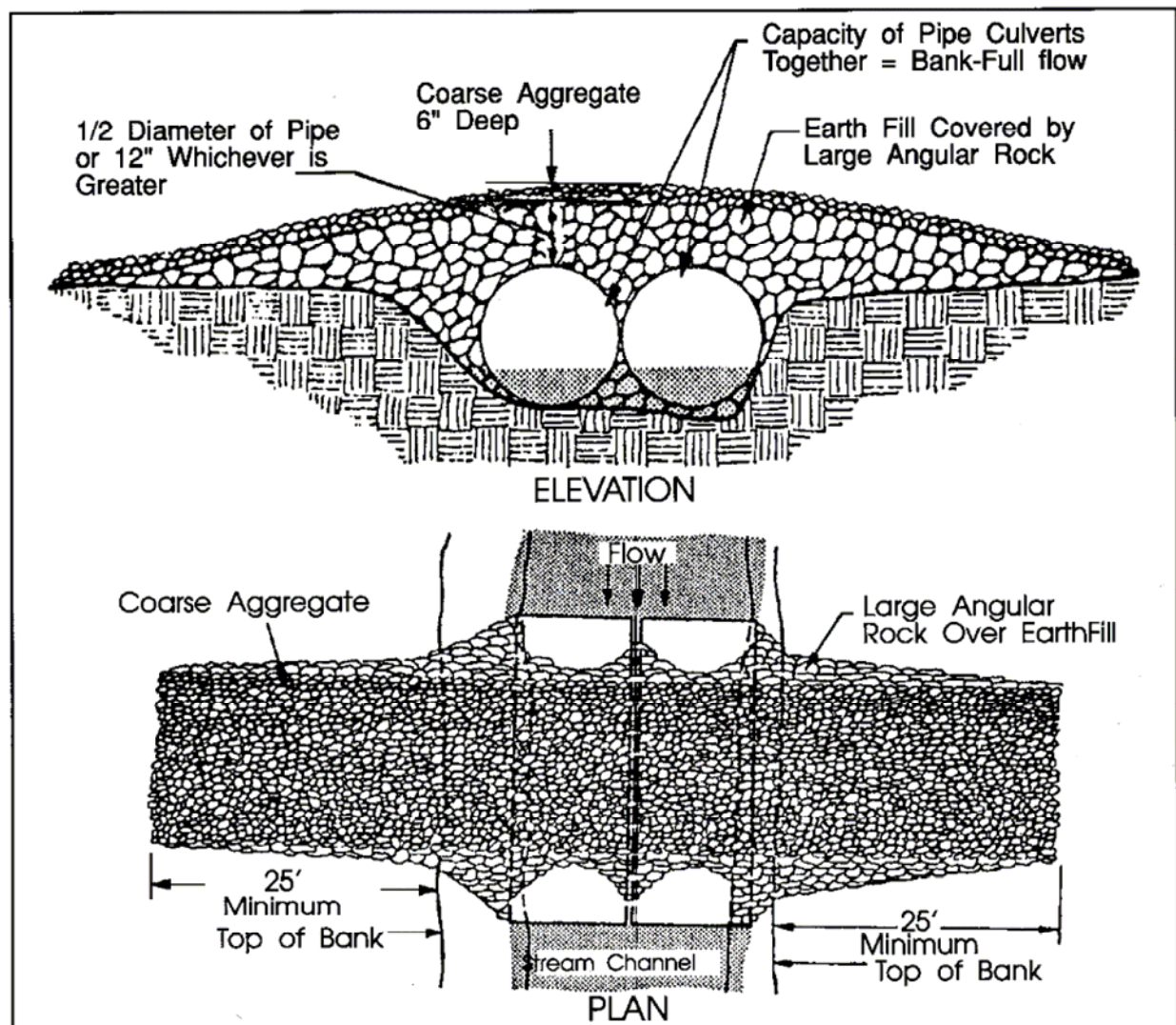
TEMPORARY STREAM CROSSING

Definition

A temporary structural span installed across a flowing watercourse for use by construction traffic. Structures may include bridges, round pipes or pipe arches.

Purposes

To stabilize stream crossings and reduce erosion created by construction traffic.



From: Virginia Soil and Water Conservation Commission, 1985

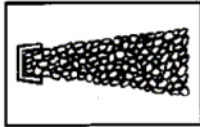
FIGURE 16 Temporary Culvert Stream Crossing

Figure 16-A



Figure 16-B





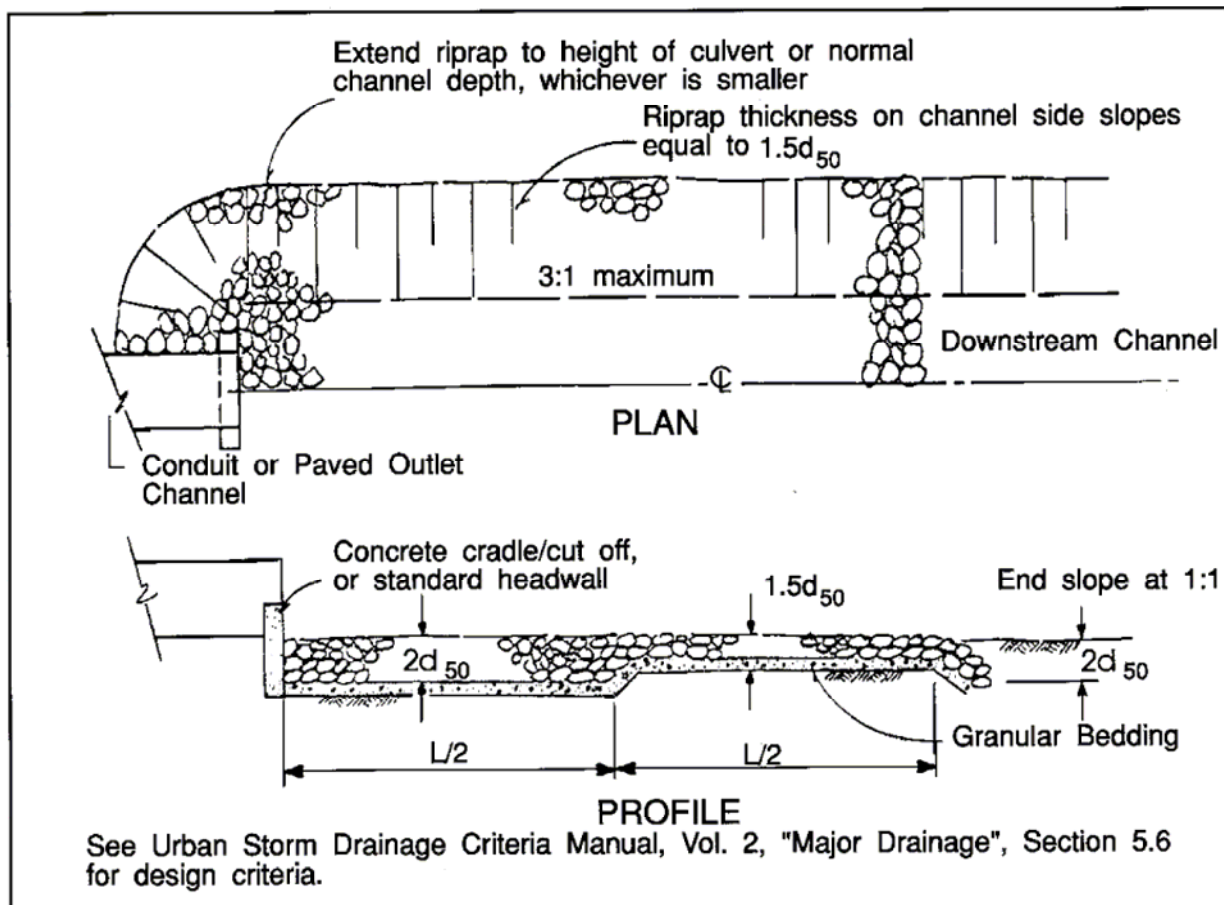
OUTLET PROTECTION

Definition

Structurally lined aprons or other acceptable energy dissipating devices placed at the outlets of pipes or paved channel sections.

Purposes

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



From: Urban Drainage and Flood Control District, 1961

FIGURE 17 Outlet Protection for a Culvert in a Channel

Figure 17-A



Figure 17-B





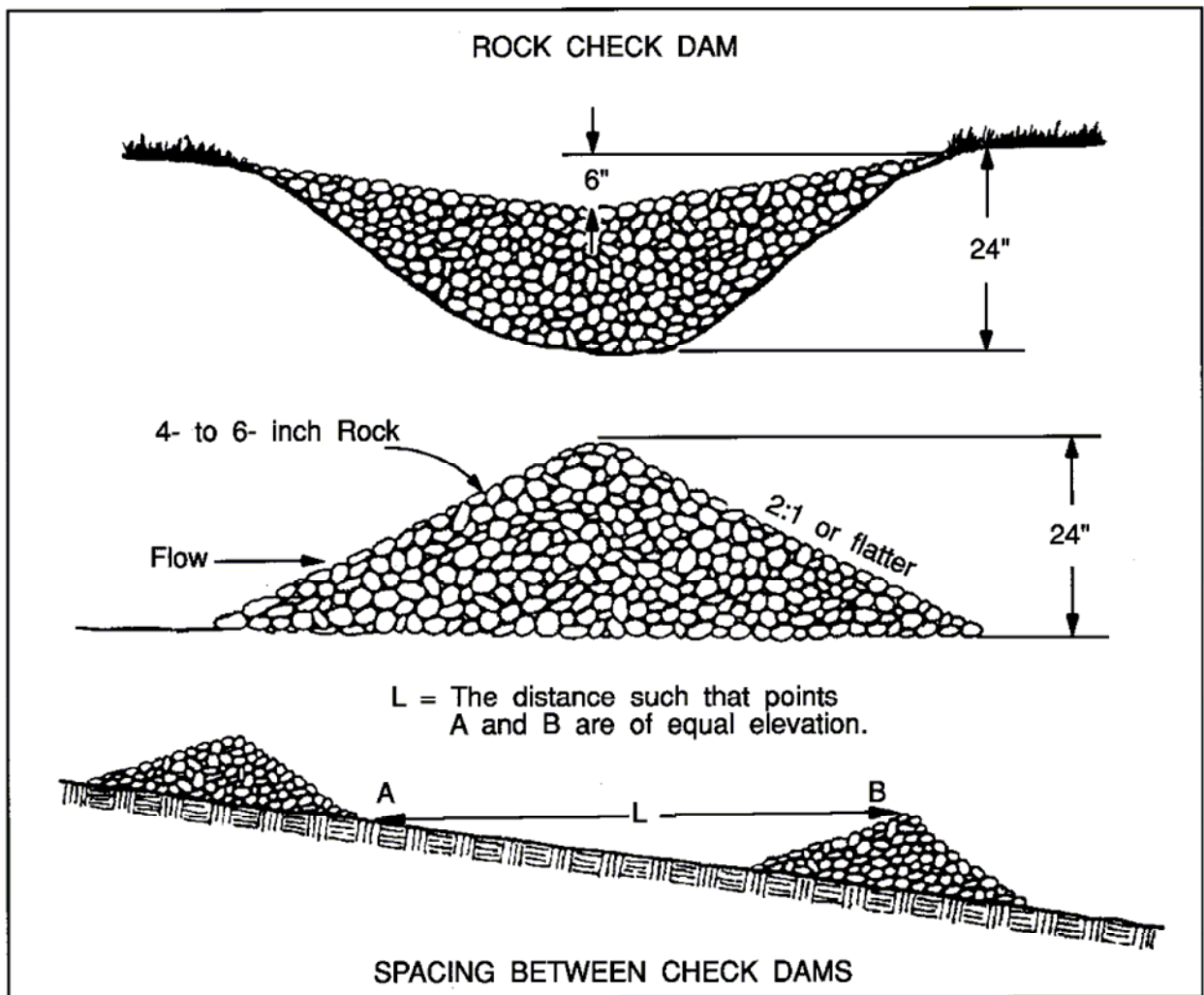
CHECK DAM

Definition

Small temporary dam constructed across a swale or drainage ditch.

Purposes

To reduce the velocity of stormwater flows and erosion of the swale or ditch.



From: Virginia Soil and Water Conservation Commission, 1985

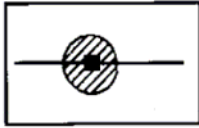
FIGURE 18 Check Dam

Figure 18-A



Figure 18-B





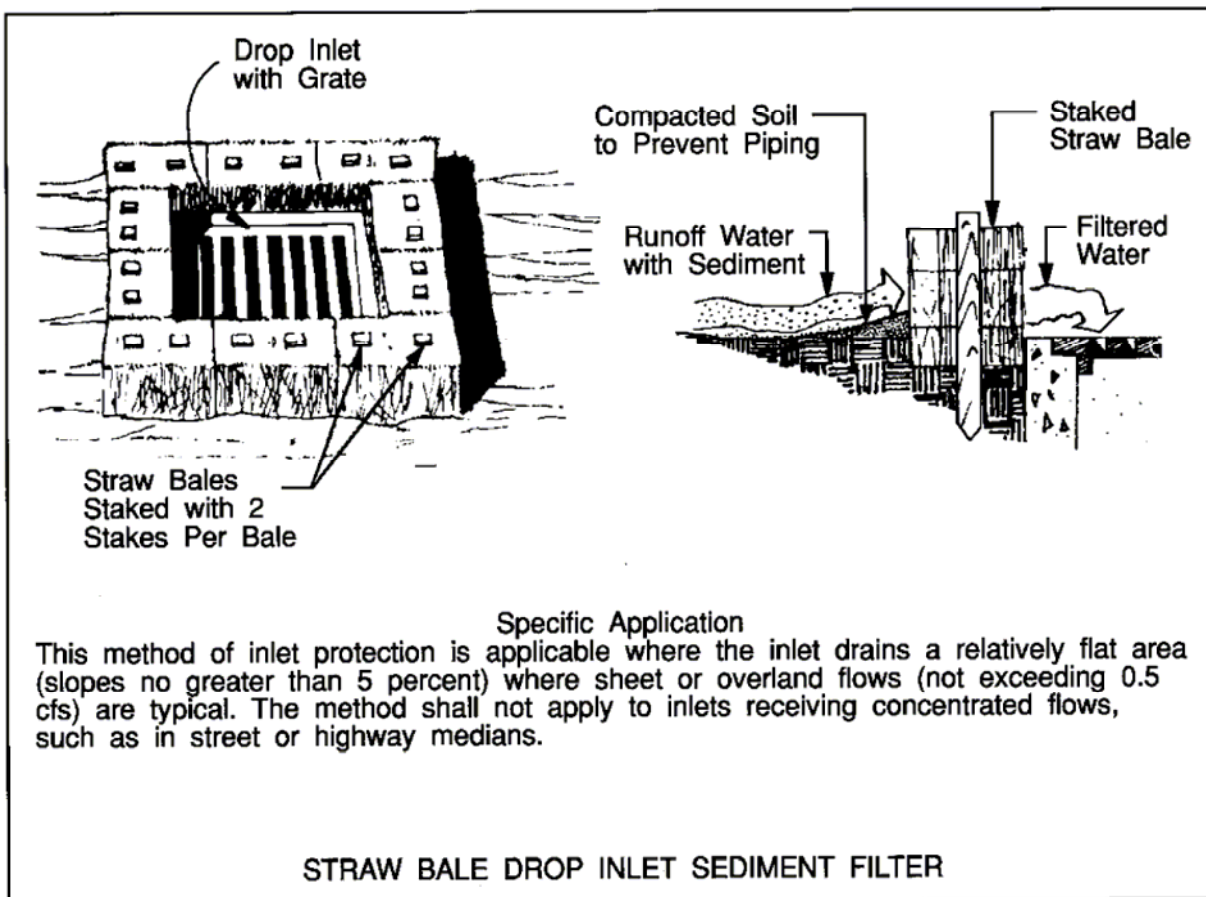
INLET PROTECTION

Definition

A sediment filter or an excavated impounding area around a storm drain drop inlet or curb inlet.

Purposes

To reduce sediment from entering storm drainage systems prior to permanent stabilization of disturbed areas.



From: Virginia Soil and Water Conservation Commission, 1985

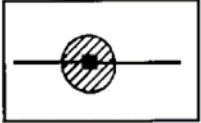
FIGURE 19 Drop Inlet Protection – Straw Bales

Figure 19-A



Figure 19-B





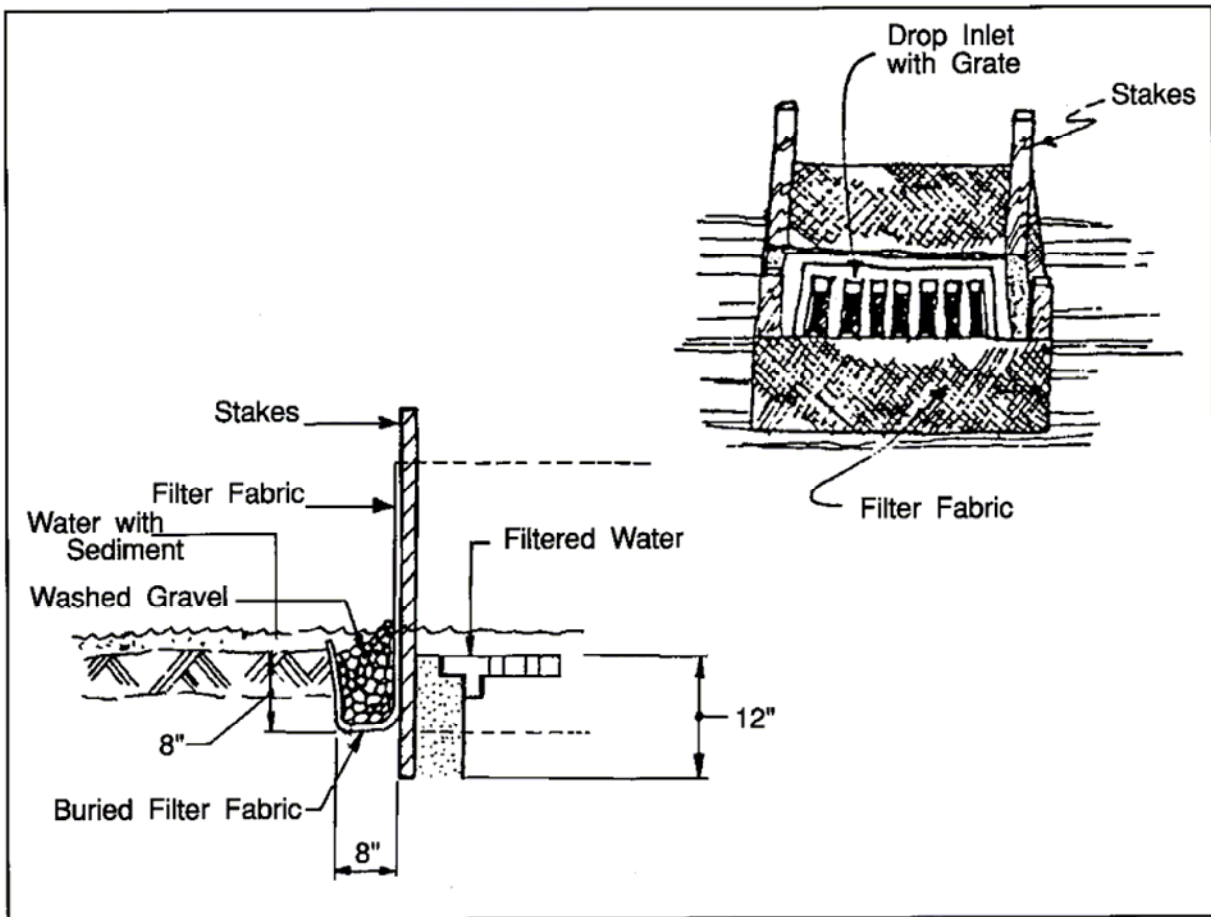
INLET PROTECTION

Definition

A sediment filter or an excavated impounding area around a storm drain drop inlet or curb inlet.

Purposes

To reduce sediment from entering storm drainage systems prior to permanent stabilization of disturbed areas.



From: Washington State Department of Ecology, 1991

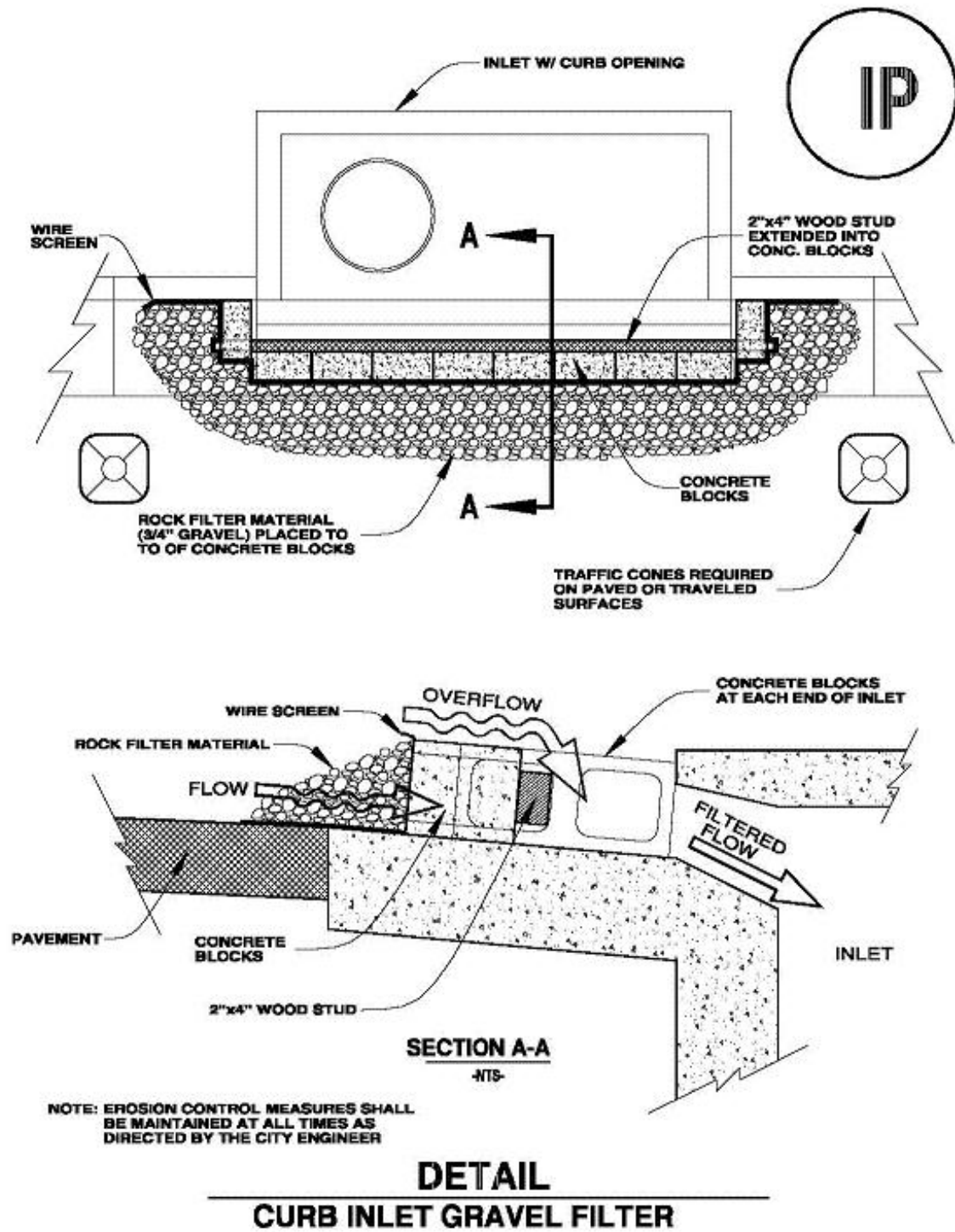
FIGURE 20 Inlet Protection – Filter Fabric

Figure 20-A



Figure 20-B





Detail provided to District by the City of Broomfield
FIGURE 21 Curb Inlet Gravel Filter

Figure 21-A



Figure 21-B





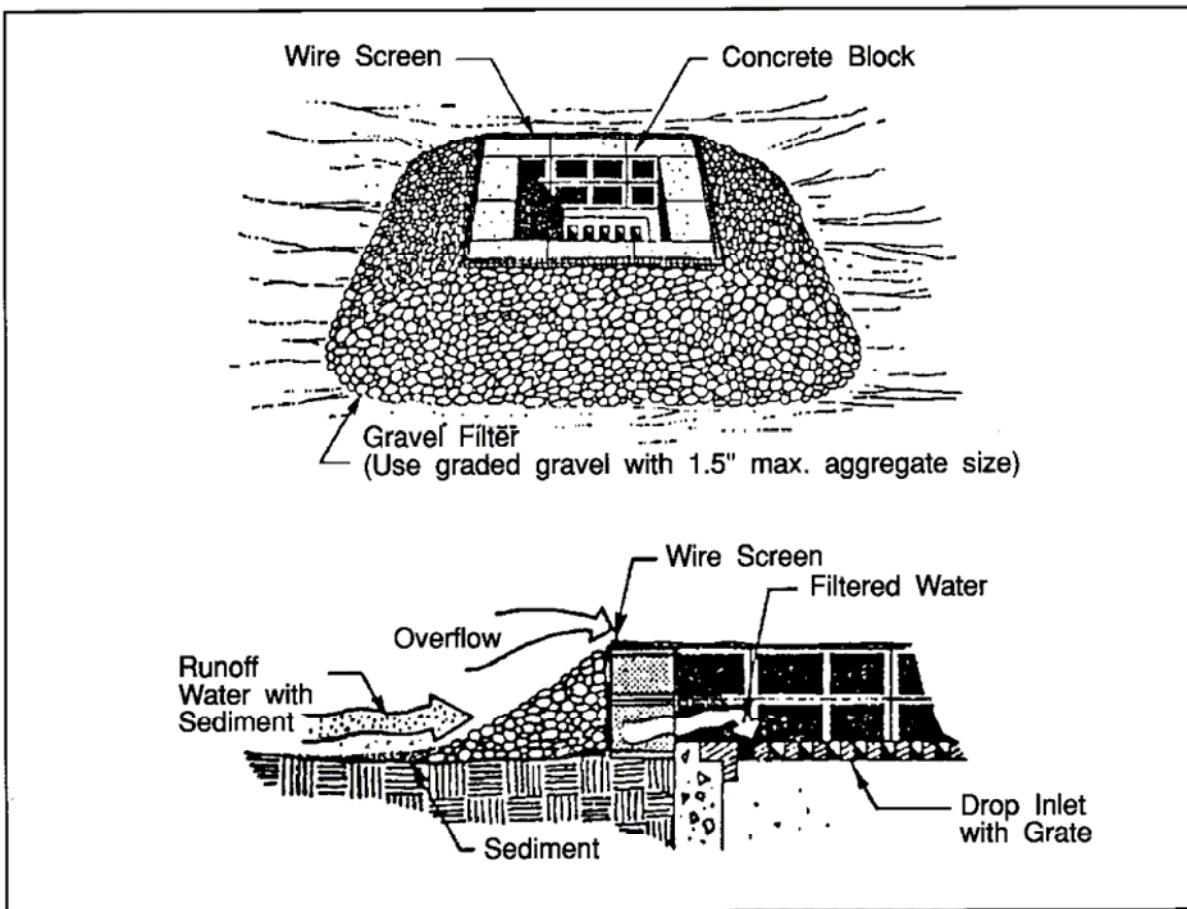
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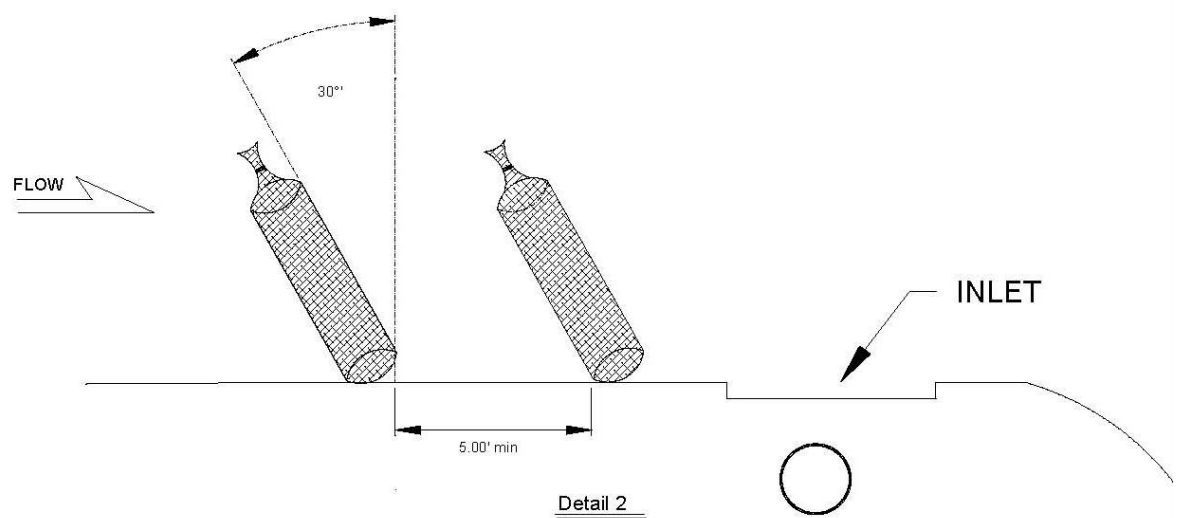
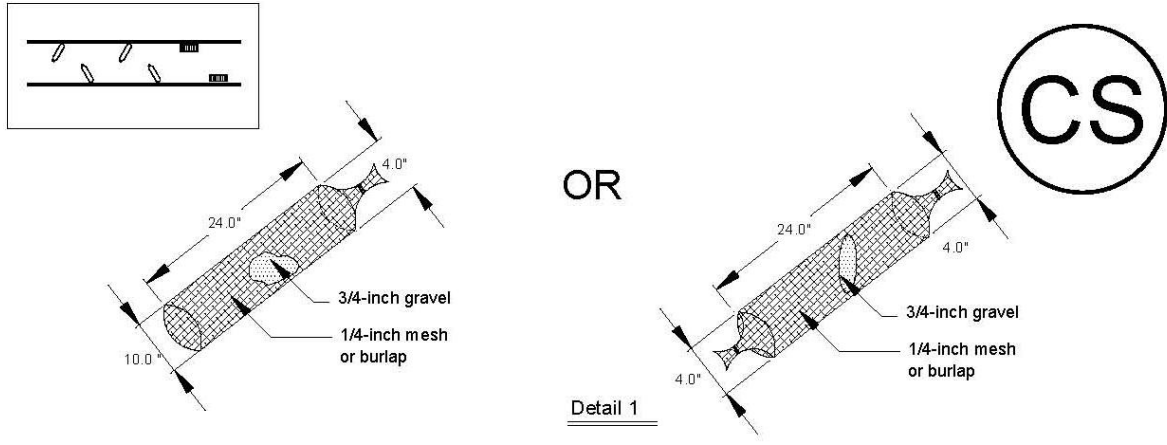
FIGURE 22 Drop Inlet Protection – Block and Gravel Filter

Figure 22-A



Figure 22-B





NOTES:

- 1) Socks will be used upgradient of inlet perpendicular to and flush with curb.
- 2) No less than two 10-inch diameter socks must be used in sequence, spaced no more than five feet apart, upgradient of inlet. No less than six socks shall be used if the 4-inch sock size is chosen.
- 3) Incline at 30 degrees from perpendicular, opposite the direction of flow (see Detail 2).
- 4) Erosion control measures shall be maintained at all times as directed by the local jurisdiction.

Details based on those provided to District by City of Lakewood, Colorado

FIGURE 23 Inlet Protection – Curb Sock

Figure 23-A



Figure 23-B



Figure 24-A



Figure 24-B



Figure 25-A



Figure 25-B



Figure 26-A



Figure 26-B



Figure 27-A



Figure 27-B

