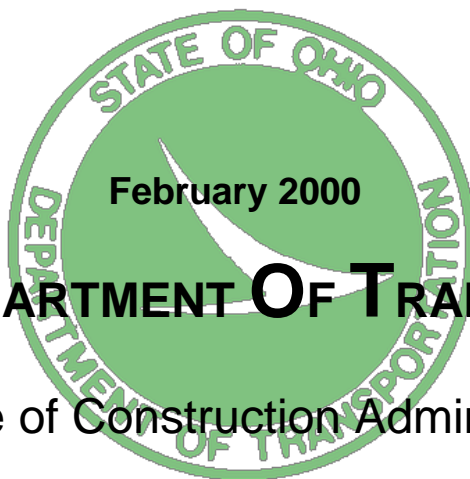


Handbook for **Sediment and Erosion Control**



OHIO DEPARTMENT OF TRANSPORTATION

Office of Construction Administration

FORWARD

This handbook is devoted to the proper installation of sediment and erosion control items on construction and maintenance projects. It is to serve as a guide to the Project Engineers and Inspectors in the performance of their duties in administering the contract for the Department. No training is required to receive this handbook but personnel assigned to sediment and erosion control should have a thorough knowledge of the applicable specifications pertaining to this function. This is not part of the contract with the Contractor. The information contained in the handbook does not replace, supersede or modify any specification, plan or proposal provision of the contract. This information was formally found in the Earthwork Construction Manual, volume one, Chapter 2.2. It has been expanded and detailed here within.

I would like to thank the following Central Office people for helping in the preparation of this handbook; Kevin White and Dave Riley of Structural Engineering, Tom Linkous and Noel Alcala of Environmental Services and John Cavello of Production.

Debbie Brown and Scott Gallagher worked diligently to complete this before the train the trainer class in 1999. Scott Gallagher, Highway Management's co-op, showed great technical skill and patience with a computer in compiling the majority of the manual. This handbook was recompiled in February 2000 thanks to the help of Bob Jessberger's technical guidance.

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INTRODUCTION

In 1972, the National Clean Water Act (40 CFR 122.26) made it illegal to discharge pollutants to rivers, streams, lakes and oceans from a single or point source without a permit. That Act, administered by the U.S. Environmental Protection Agency, established the National Pollutant Discharge Elimination System (NPDES). In 1987, Congress established the NPDES storm water permit program, which specified all construction activities disturbing five or more acres, had to develop and implement a plan to prevent pollution caused by runoff of storm water and to follow best management practices (BMP's). In 1992, federal law made it illegal to discharge storm water without a permit for regulated activities. In Ohio, the regulatory agency who administers the National Clean Water Act and NPDES requirements is the Ohio Environmental Protection Agency (Ohio EPA).

The Ohio Department of Transportation regularly administers construction projects greater than five acres. Sediment and erosion control items have become a regular feature of construction projects, especially if the project is adjacent to a major waterway of the state. NPDES permits have become a common requirement of projects sold by the Department. Administering the permit requirements has become a never-ending challenge of construction personnel. For that reason, this handbook has been developed. While it cannot answer every question, it will give project personnel the tools and information relevant to the daily construction process.

This handbook can serve as a teacher guide and overheads can be made from the pages and drawings here within. Some of the forms in the handbook are available in individual quatro pro or word perfect files and the color pictures are available individual files.

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General Explanation of the Law

The Federal Water Pollution Act and the Ohio Water Pollution Control Act authorizes the Ohio Environmental Protection Agency (Ohio EPA) to administer the NPDES permit. The NPDES permit specifies conditions of construction projects where site outfall discharges into the receiving waters of the state. The conditions which affect the Ohio Department of Transportation are summarized below:

1. Construction activities covered include any clearing, grading, excavating, grubbing and/or filling activities that result in the disturbance of five or more acres of total land.
2. All discharges shall be composed entirely of storm water.
3. The discharge of hazardous substances in the storm water shall be minimized.
4. All contractors and subcontractors shall be involved in the implementation of the storm water pollution plan (SWPPP) terms and conditions for that project.

The law supercedes the Construction and Material Specifications.

The Permit

1. Is required 45 days prior to any construction activity.
2. A copy of the permit must be displayed in a noticeable place.
3. Weekly inspections must be available if requested.

Finally, the Ohio EPA may inspect the project at any time.

EPA Regulations

The sediment and erosion control discharge is regulated by the Ohio EPA. A summary of the minimum standards for pollution controls follows. The pertinent regulation is in your sediment and erosion control manual by Dr. Gayle E. Mitchell. All construction projects greater than 5 acres are covered by this regulation. A permit is required 45 days prior to any construction activity. A copy of your storm water permit must be displayed like a building permit. A copy of your weekly inspections must be available for inspection by the EPA. The corrections to the problems found during the inspection should be corrected immediately. See inspections in minimum standards for pollution controls and in the law.

The sediment and erosion control duties should be assigned to one individual on the project. The project personnel could be held personally liable for polluting the waters of Ohio.

The Ohio EPA may inspect the project at any time.

Minimum Standards for Pollution Control

The following is derived and condensed from NPDES General Permit for construction activities. This section of the manual was to the Department by OEPA personnel. We feel these are the items they would be looking for during their inspections. Subsections refer to the specific subsections in the regulations.

Subsections refer to the specific subsections in the regulations.

Part III 5.

- b. Controls...shall develop a description of controls appropriate for the construction operation and implement such controls. ...*minimum components*:

i. Erosion and sediment controls.

A. Stabilization practices.

Preserve existing vegetation where attainable and vegetate disturbed areas as soon as practicable after grading as follows:

- Vegetate areas to remain dormant > 45 days within 7 days.
- Stabilize areas within 15 meters (50 feet) of any stream within 2 days on all inactive disturbed areas.
- Stabilize areas within 7 days after final grade on any portion of the site.
- Stabilize areas with mulch when conditions prohibit temporary or permanent seeding.

B. Structural practices.

The purpose of structural practices is to store runoff allowing sediments to settle and divert flows from exposed soils or limit runoff from eroding areas. They are to control erosion and trap sediment from all sites remaining disturbed for more than 14 days.

They must be functional throughout earth disturbing activity.

- Implemented as the first step of grading and within 7 days from the start of grubbing and to function until area is stabilized.
- Pass concentrated storm water runoff from disturbed areas through a sediment settling pond.
- Capacity = 51 cubic m/ac or 51 cubic m/4,000 cubic m (67 cubic yds/ac) drainage area.
- Use sediment barriers to protect adjacent properties and water resources from sediment transported by sheet flow.
- Protect streams from sediment runoff.
- Prevent sediment from entering storm drain systems, unless the system drains to a settling pond.
- Divert runoff from disturbed areas and steep slopes.
- Stabilize channels and outfall from erosive flows.

ii. Post Construction Storm Water Pollution Prevention

Measures installed to control pollutants in storm water discharges that will occur after construction operation have been completed.

May include among others: infiltration of runoff; flow reduction by use of open vegetated swales and natural depressions and storm water retention and detention ponds.

- Place velocity dissipation devices at the outfall of structures and along the length of any outfall channel as necessary to provide a non erosive flow velocity from the structure to a water course.

iii. Surface Water Protection

If the project site contains any streams, rivers, lakes, wetlands, or other surface waters, certain construction activities at the site may be regulated under the Clean

Water Act. Sections 404 and 401.

iv. Other Controls.

- A. Waste disposal. No solid or liquid waste shall be discharged in storm water runoff.
- B. Minimize off-site vehicle tracking of sediments.
- C. Comply with applicable State or local waste disposal, sanitary sewer or septic systems regulations.

v. Maintenance.

All control practices shall be maintained and repaired as needed to assure continued performance of their intended function.

- Design pollution prevention plan to minimize maintenance requirements.
- Assure the continued performance of control practices.

vi. Inspections

- Inspect erosion and sediment controls at least once every 7 days and within 24 hours after any storm event greater than 13 mm (0.5 inches) of rain per 24 hour period.
- Ascertain whether controls are adequate and properly implemented according to the schedule of operations or whether additional control measures are required.
- Inspect disturbed areas and storage areas for potential or evidence of pollutants entering the drainage system.
- Inspect discharge locations to ascertain whether control measures are effective in preventing significant impacts to receiving waters.
- Inspect entrances and exits of site for evidence of off-site tracking.
- Maintain records of inspections.

Further information can be obtained by reviewing your training manual “Implementation of Proper Erosion and Sediment Control Practices” by Gayle E. Mitchell.

Sediment and Erosion Control Goals

1. Perimeter Controls
 - a) No sediment or only a minimal amount should leave the project.
 - b) Sediment laden water should be filtered through as many filtering controls as possible.
2. Controls within the Project should Protect:
 - a) Erosion on cut and fill slopes
 - b) Erosion in the ditches
 - c) Erosion on large unused areas
 - d) Divert water away from the project and in particular bare areas on the project
 - e) All water bodies (ponds, streams, wetlands, etc.)
3. Final Product
 - a) All permanent controls are coordinated with temporary items
 - b) Permanent controls should function properly



Several features working together to prevent erosion (e.g., matting, slope drains, dikes and basins)

Storm Water Pollution Prevention Plan (SWPPP) and Quantities

1. This plan is based on the final plan cross sections.
2. Review and study the plan and implement the plan and specifications. If 50% of the earthwork quantities are complete, then 50% of the erosion control quantities should be complete. There should be a 1:1 correspondence between these two construction items.
3. Make field adjustments to:
 - a) Meet field conditions
 - b) Anticipated future work
 - c) Make corrections based on the weekly inspections
4. If the project non performs one item because of field conditions then they should use twice as much on other items. For example, if you non perform slope drains, then increase the number of ditch checks.
5. Before nonperforming or adding any items of work, the project should check with district design.
6. Plot the placed and non performed items on the SWPPP
 - a) Justify each
 - b) If you cannot justify a non performance, then place the item of work in the field.

Note: The Project Engineer or Erosion Control Inspector should be able to explain the sediment and erosion controls and plan to an outside inspector (i.e. Ohio EPA, Environmental Services, QAR Inspector).

Simplified Guidelines on Using Erosion Control Items

1. Protect perimeter locations from receiving sediment off the project site.
2. Use temporary seed and mulch liberally and often.
3. Place filter fabric fence around catch basins, manholes, etc. where water enters a closed storm sewer system.
4. Place sediment basins (or ditch checks for small areas) along or at the end of ditches before the main receiving channel. A series of smaller sediment basins is preferred over one larger basin.
5. Do not place sediment basins, ditch checks or other similar controls in main crossing channels where most of the contributing flow is from off the project.
6. Place filter fabric at the toe of the slope normal to the slope direction where there is sheet flow going off the project or to a large existing or proposed channel.
7. Place dikes and slope drains on top of fill slopes to protect the embankment slopes. Place ditches on top of cut slopes to minimize erosion. Place dikes to divert water from barren areas.
8. Rock ditch checks may be used where necessary to reduce velocity in newly constructed channels. Stabilize large relocated channels immediately upon construction with permanent or temporary ditch protection and/or place rock checks.

Implementation, Usage and Application of Sediment and Erosion Control Items

1. Temporary and Permanent Seed
2. Inlet Protection
3. Filter Fabric or Rock Ditch Checks
4. Bale Filter Dikes
5. Dike and Slope Protection
6. Sediment Basins or Traps

These items should be used as recommended by this document. The following pages are an attempt to illustrate:

1. What the item is used for
2. How it is used
3. When it is used (by law or specification)
4. How often should it be maintained
5. References to specifications and standard drawings

Temporary and Permanent Seed and Mulch

What is it used for?

- Planted on all exposed areas during and after construction and before or during the winter shut down.
- Seed and mulch placed in any condition will grow with just a few warm days.
- It is the cheapest and often the most effective control.
- Not used for concentrated flows

How is it used?

- See CMS 207.02 General and 659.09 Seeding and Mulching

When and Where is it used?

Temporary Seed:

- Use early and often.
- On all areas within 7 days if area is to remain dormant for 45 days or longer.
- On areas within 50 feet of a stream if dormant for more than 2 days.

Permanent Seed:

- Placed on all barren areas within 7 days of obtaining final grade

How often should it be maintained?

- Until established and covering a minimum of 70% of an area.

References:

- CMS 207.02 and 659.09
- **Law:** (page 6 of 14) Stabilization/nonstructural practices. Areas disturbed after grading or construction shall be revegetated as soon as practicable. Perform vegetative practices on all disturbed areas within seven (7) days if they are to remain dormant (undisturbed) for more than forty-five (45) days. For areas within fifty (50) feet of any stream, first order or larger, soil stabilization practices shall be initiated within two (2) days on all inactive, disturbed areas. Permanent or temporary soil stabilization shall be applied to disturbed areas within seven days after final grade is reached on any portion of the site.

Temporary Seed



Temporary Seed Placed in Idle Areas



Temporary Seed at Concentrated Area

Inlet Protection

What is it used for?

- To prevent or reduce sediment laden water from entering a storm drain system.

Note: straw and/or hay bales will no longer be allowed.

How is it used?

- Consists of a geotextile barrier supported around or across a storm drain inlet.
- Framing with 2 x 4's is required

When is it used?

- When runoff can enter the catch basin manhole or inlet.
- Should be installed as soon as inlet is completed

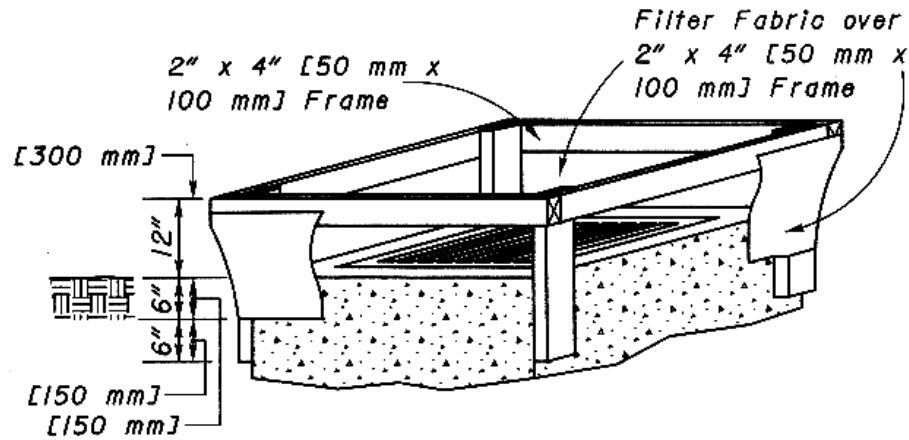
How often should it be maintained?

- It shall be maintained to be functional
- This shall include removal of trapped sediment and cleaning, repair, and/or replacement of the barrier.
- Sediment shall be removed when it reaches half the height of the lowest section.

References:

- CMS 207.02, MC-11, DM 4.3M
- **Law:** (page 6 of 14) Structural practices shall be used to control erosion and trap sediment from all sites remaining disturbed for more than fourteen (14) days. Such practices may include among others sediment traps, sediment basins, silt fences, earth diversion dikes, check dams and storm inlet protection. (i)(b)(5)....prevent sediment laden water form entering the storm system

INLET FILTER BARRIER



MATERIALS: Filter Fabric shall meet the requirements of CMS 207.02. The framing wood shall be construction grade 2" x 4" [50 mm x 100 mm] lumber.

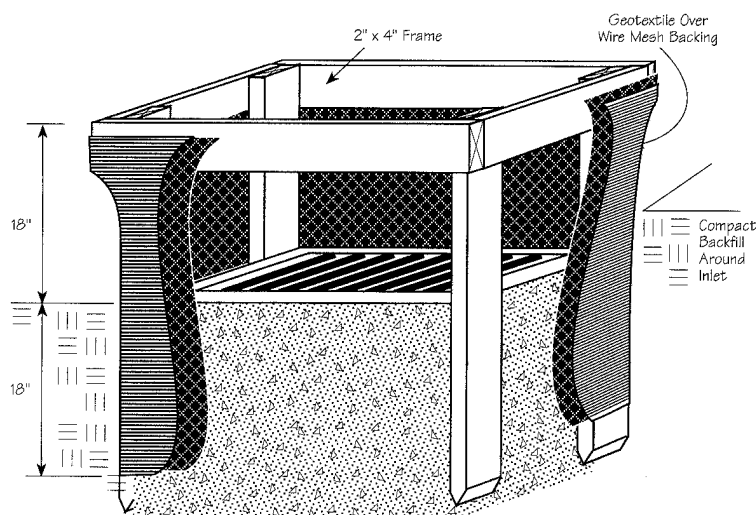
CONSTRUCTION: Excavate a 6" [150 mm] deep trench around the inlet, then drive the 2" x 4" [50 mm x 100 mm] post 6" [150 mm] below the excavated trench. Construct the wooden frame using the overlap joints detail hereon; other frame types may be provided with the approval of the Engineer. The filter fabric shall be stretched around the wooden frame and securely fastened. The filter fabric shall overlap across one side of the inlet such that the ends of the filter fabric are not attached to the same post. Backfill and compact the excavated soil.

MAINTENANCE: The filter fabric shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and/or replacement of the filter fabric. Sediment shall be removed when its depth reaches half the height of the lowest section of fence. The maintenance or replacement cost will be paid for by the Department under unit bid prices or under 109.04.

PAYMENT: The cost of all materials, construction and removal shall be paid for under Item 207, Linear Foot [Meter], Filter Fabric Fence.

Ohio Department of Natural Resources *

Specifications for Inlet Protection in Swales, Ditch Lines or Yard Inlets

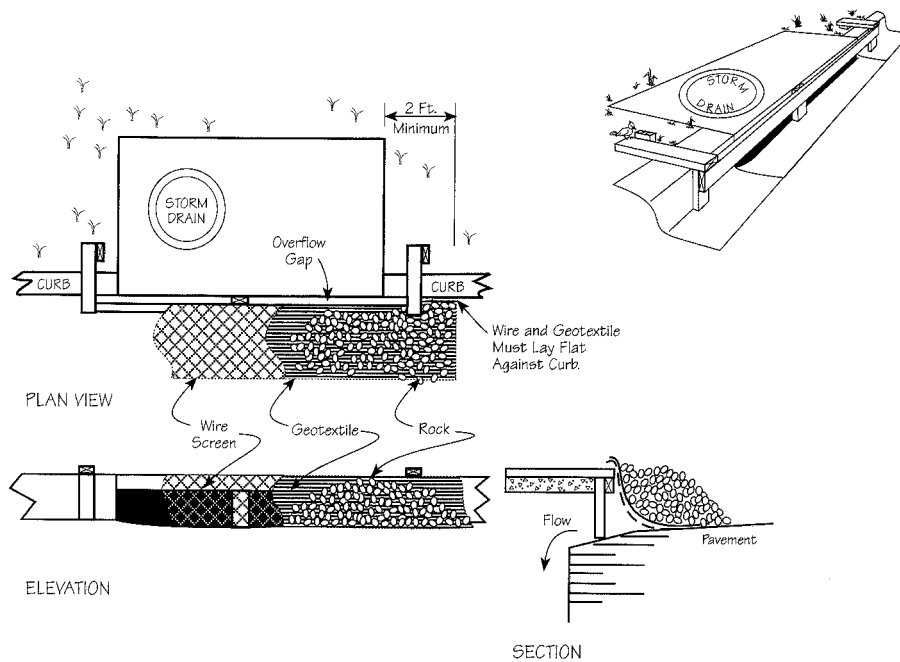


1. Inlet protection shall be constructed either before upslope land disturbance begins or before the storm drain becomes operational.
2. The earth around the inlet shall be excavated completely to a depth at least 18 in.
3. The wooden frame shall be constructed of 2-by-4-in. construction-grade lumber. The 2-by-4-in. posts shall be driven 1 ft. into the ground at four corners of the inlet and the top portion of 2-by-4-in. frame assembled using the overlap joint shown. The top of the frame shall be at least 6 in. below adjacent roads if ponded water would pose a safety hazard to traffic.
4. Wire mesh shall be of sufficient strength to support fabric with water fully impounded against it. It shall be stretched tightly around the frame and fastened securely to the frame.
5. Geotextile shall have an equivalent opening size of 20-40 sieve and be resistant to sunlight. It shall be stretched tightly around the frame and fastened securely. It shall extend from the top of the frame to 18 in. below the inlet notch elevation. The geotextile shall overlap across one side of the inlet so the ends of the cloth are not fastened to the same post.
6. Backfill shall be placed around the inlet in compacted 6-in. layers until the earth is even with notch elevation on ends and top elevation on sides.
7. A compacted earth dike or a check dam shall be constructed in the ditch line below the inlet if the inlet is not in a depression and if runoff bypassing the inlet will not flow to a settling pond. The top of earth dikes shall be at least 6 in. higher than the top of the frame.

* References made from Rainwater and Land Development Manual

Ohio Department of Natural Resources *

Specifications for Curb Inlet Protection



1. Inlet protection shall be constructed either before upslope land disturbance begins or before the storm drain becomes operational.
2. The wooden frame is to be constructed of 2-by-4-in. construction-grade lumber. The end spacers shall be a minimum of 1 ft. beyond both ends of the throat opening. The anchors shall be nailed to 2-by-4-in. stakes driven on the opposite side of the curb.
3. The wire mesh shall be of sufficient strength to support fabric and stone. It shall be a continuous piece with a minimum width of 30 in. and 4 ft. longer than the throat length of the inlet, 2 ft. on each side.
4. Geotextile cloth shall have an equivalent opening size (EOS) of 20-40 sieve and be resistant to sunlight. It shall be at least the same size as the wire mesh.
5. The wire mesh and geotextile cloth shall be formed to the concrete gutter and against the face of the curb on both sides of the inlet and securely fastened to the 2-by-4-in. frame.
6. Two-inch stone shall be placed over the wire mesh and geotextile in such a manner as to prevent water from entering the inlet under or around the geotextile cloth.

* References made from Rainwater and
Land Development Manual



Almost Good



Needs Replaced

Filter Fabric or Rock Ditch Checks

What is it used for?

- To protect ditches from erosion and to filter sediment from flowing water.

How is it used?

- The barrier is placed across the width of a ditch in an excavated trench that is backfilled with soil.
- The end elevations shall be raised to prevent flow around the end of the barrier.
- Use rock quantity from basins for rock checks.

When is it used?

- Concurrent with ditching
- Filter Fabric - for 2 acres of drainage area
- Rock - for 2 to 5 acres of drainage area
- In conjunction with sediment basins, dams and ponds when drainage areas do not exceed 2 or 5 acres.
- Not to replace basins

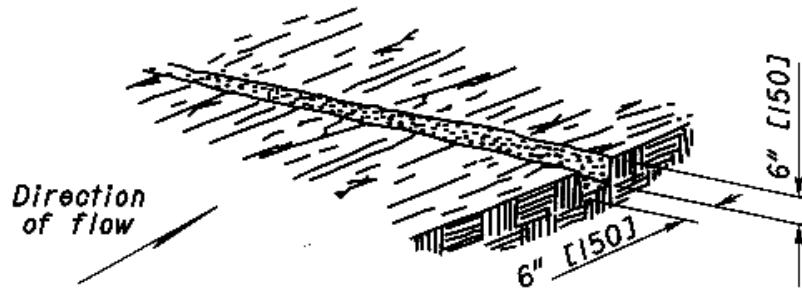
How often should it be maintained?

- Maintained functional until 70% permanent cover established.
- Includes the removal of trapped sediment and cleaning, repair, and/or replacement of the barrier.
- Sediment shall be removed when it reaches half the height of the lowest section of filter fabric fence.
- Correct these controls in the field if they fail

References:

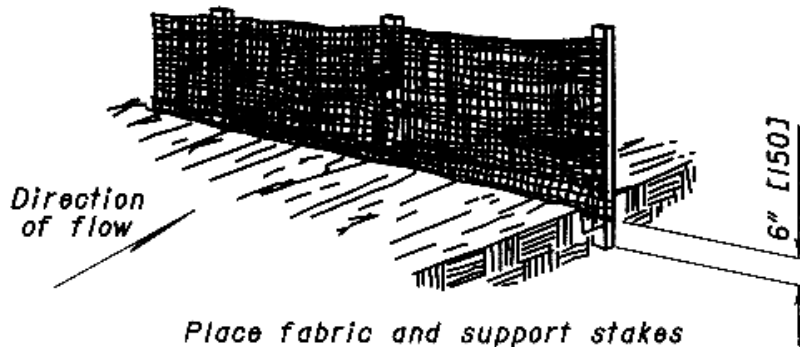
- CMS 207.02, MC-11, DM 4.3M
- **Law:** (page 6 of 14) Considered sediment barriers when used in conjunction with sediment basins, dams or ponds as long as the design capacity is not exceeded. (i)(b)(1) Use @ the first step of grading and within 7 days of grubbing

CONSTRUCTION OF A FILTER BARRIER



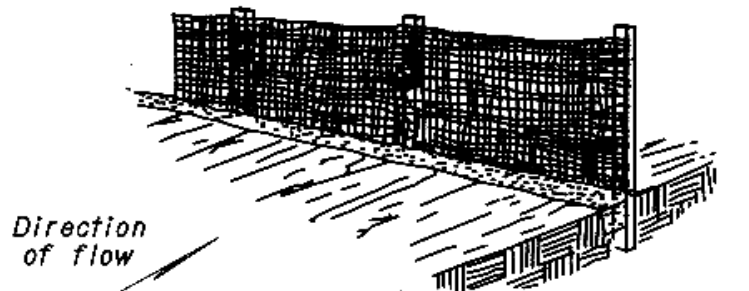
Excavate a 6" x 6" [150 x 150] trench along the proposed fence line.

STEP 1



Place fabric and support stakes and extend fabric into the trench.

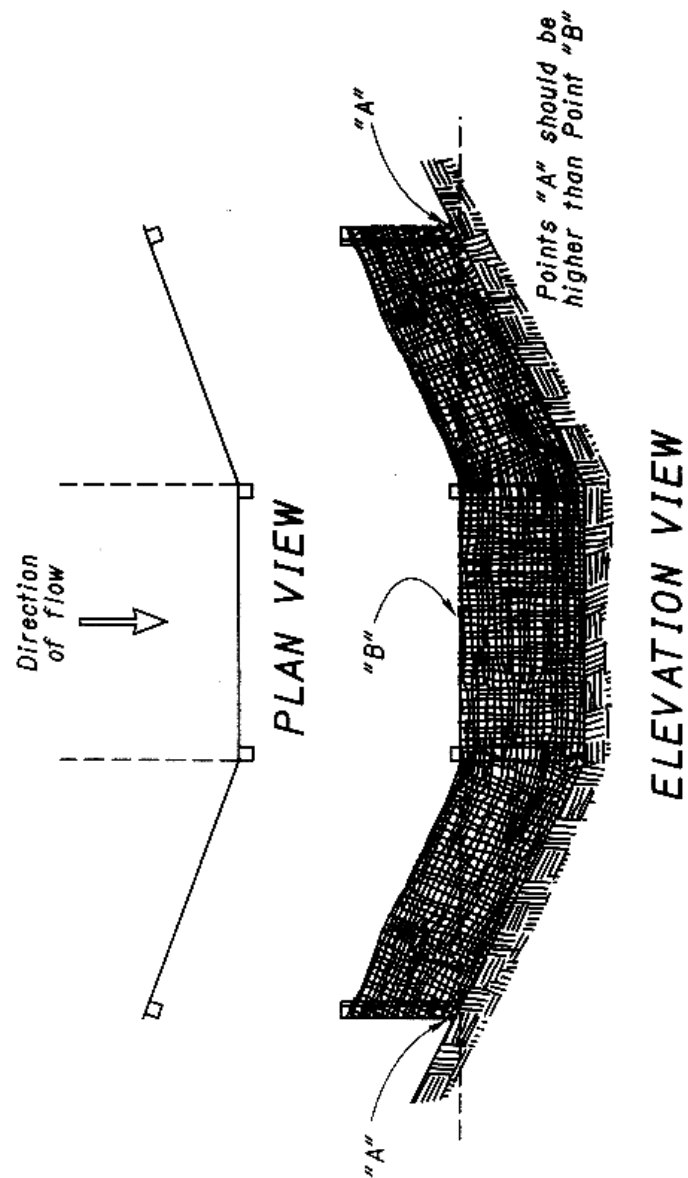
STEP 2



Backfill and compact the excavated soil.

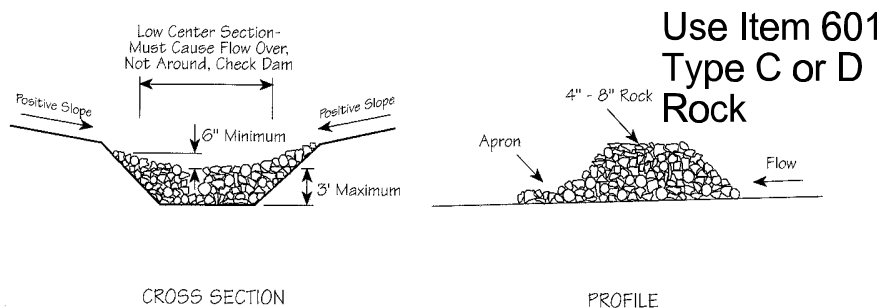
STEP 3

PROPER PLACEMENT OF A FILTER BARRIER IN A DRAINAGE WAY



Ohio Department of Natural Resources *

Specifications for Check Dam



1. The check dam shall be constructed of 4-8-in.-diameter stone, placed so that it completely covers the width of the channel.
2. The top of the check dam shall be constructed so that the center is approximately 6 in. lower than the outer edges, so water will flow across the center and not around the ends.
3. The maximum height of the check dam at the center of the weir shall not exceed 3 ft.
4. Spacing between dams shall be as shown in the plans or by the following table:

Check Dam Spacing				
Dam Height (ft.)	Channel Slope			
	< 5 %	5 - 10 %	10 - 15 %	15 - 20 %
1	65 ft.	30 ft.	20 ft.	15 ft.
2	130 ft.	65 ft.	40 ft.	30 ft.
3	200 ft.	100 ft.	65 ft.	50 ft.

* References made from Rainwater and Land Development Manual



Too Narrow(Notice the lack of control features in the background)



Bales - Not Allowed(But notice the control features in the background)

Bale Filter Dikes

What is it used for?

- To filter and direct the sediment before it enters the ditch, stream, etc.
- Collects sediment for a maximum of:
 - a) Less than 1/4 of an acre without an outlet (about 100' x 100')
 - b) Slope length of less than 100' at a maximum 2:1 slope
 - c) Use outlet or pit every 100' or greater length at flatter slopes

How is it used?

- A few feet from the toe of slopes to protect a ditch, stream, river or pond.

When is it used?

- When sediment can enter the waterway
- Within 7 days of the grubbing and concurrent with the grading operations

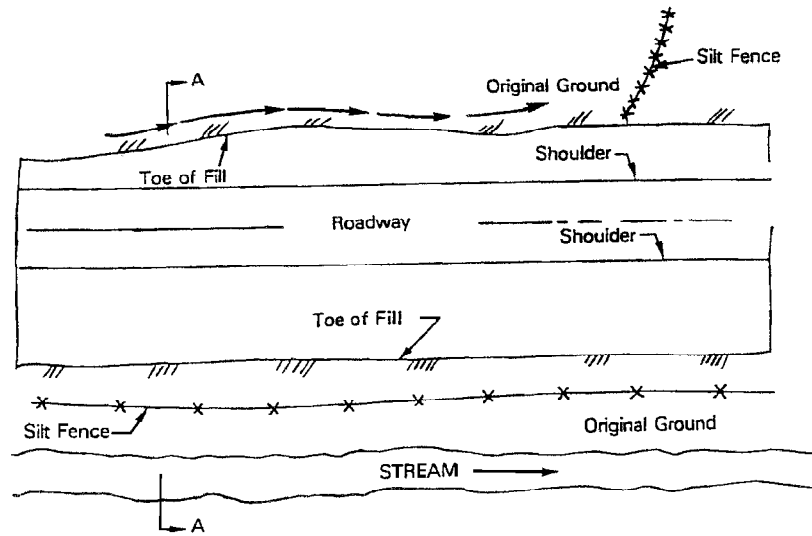
How often should it be maintained?

- Sediment shall be removed when its depth reaches half the height of the exposed portion of the lowest bale.
- Correct these controls in the field if they fail

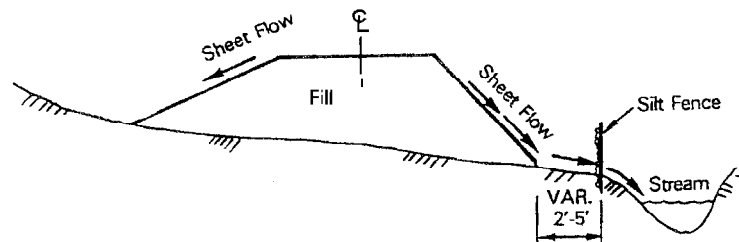
References:

- CMS 207.02, 877, MC-11, DM 4.3M
- **Law:** (page 6 of 14) Stream Protection - Structural practices shall be designed and implemented on site to protect all adjacent streams, first order and larger, from the impacts of sediment runoff.

**TYPICAL CONDITIONS WHERE
SILT FENCES ARE APPLICABLE**



PLAN VIEW



SECTION A-A

(Adapted from Richards and Middleton, 1978)



Good Application



Close-up of Bales

Dike and Slope Protection

What is it used for?

- To protect fill and cut slopes.
- To divert water from bare soil or other construction areas

Where and how is it used?

- Dike used at top of fill slopes to protect side slopes from erosion (gullies)
- Ditch used at top of cut slope to protect slopes
- Run off diversion

When is it used?

Fill Slopes:

- When no activity for three or more weeks and when slope height is greater than 8 feet
- Over the winter or if heavy rainfall is anticipated

Cut Slopes and Diverting Water:

- At the beginning of the cut
- At any time to reduce run off potential

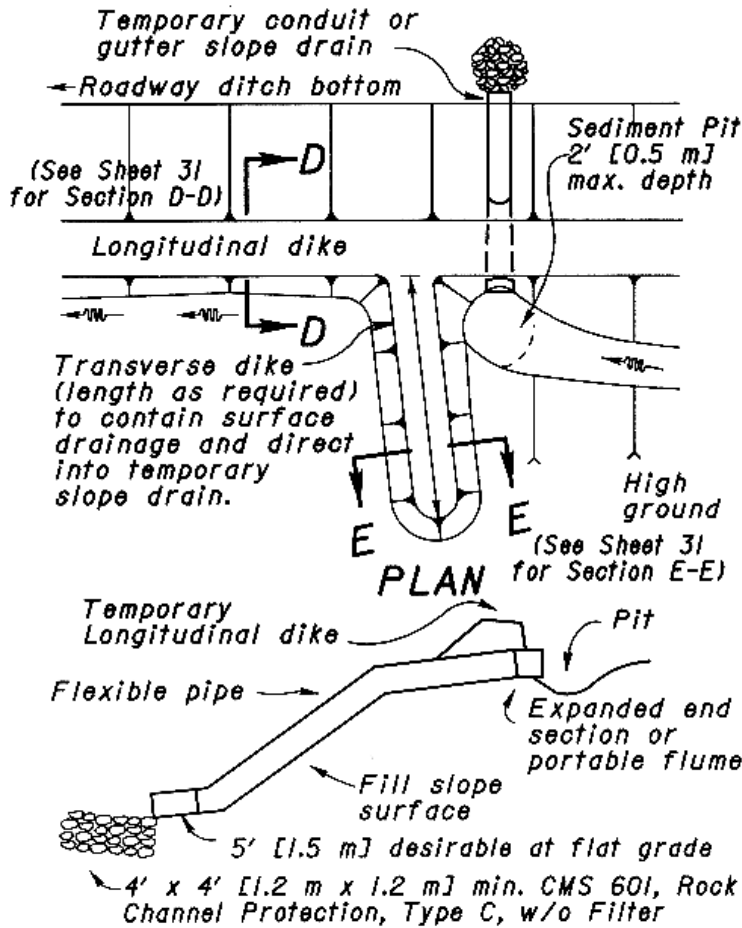
How often should it be maintained?

- When nonfunctional

References:

- CMS 877, 207.02, MC-11, DM 4.3M
- **Law:** (page 6 of 14) Erosion and sediment control practices shall divert runoff from disturbed areas and steep slopes where practicable and stabilize channels and outfall from erosion flows.

DIKES AND SLOPE PROTECTION



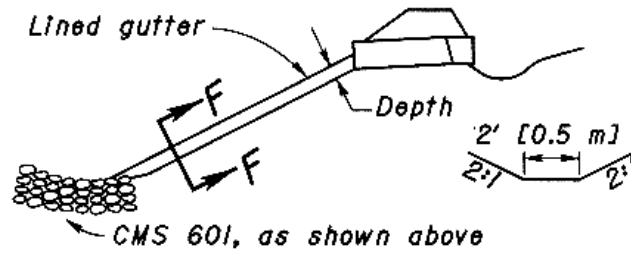
GENERAL: Dikes & drains shown shall be used when earthwork operations on slopes are higher than 8' [2.5 m] and fill operations are suspended for three weeks or more. Smaller dikes used at the end of a day's operation shall be considered as part of the earthwork. Temporary slope drains shall be suitably positioned and anchored to prevent movement or undermining.

LONGITUDINAL DIKES: Longitudinal dikes shall be constructed of suitable material as per CMS 203 and compacted to 85% of maximum density.

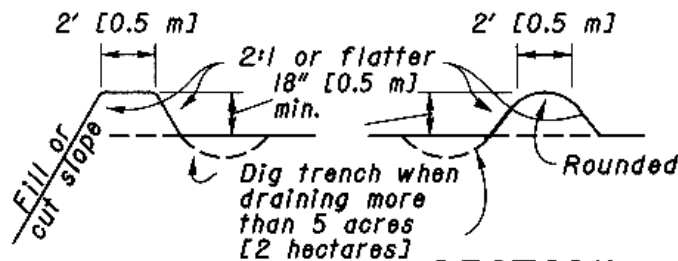
CONDUITS: Conduits for slope drains shall be corrugated steel pipe, corrugated or smooth plastic pipe, rubber conduit, or an approved equal.

CONDUIT SLOPE DRAIN

TEMPORARY SLOPE DRAINS RECOMMENDED SIZES				
Area in acres [hectares]	Pipe Sizes [mm]			Gutter depth [mm]
	Smooth	Corru- gated	Half- round	
0-4 [0-1.6]	6" [150]	6" [150]	18" [450]	8" [200]
4-8 [1.6-3.2]	8" [200]	12" [300]	18" [450]	8" [200]
8-12 [3.2-4.9]	10" [250]	15" [375]	21" [525]	12" [300]



SECTION F-F
GUTTER SLOPE DRAIN



SECTION D-D
(See Sheet 30
for Plan View)

SECTION E-E
(See Sheet 30
for Plan View)

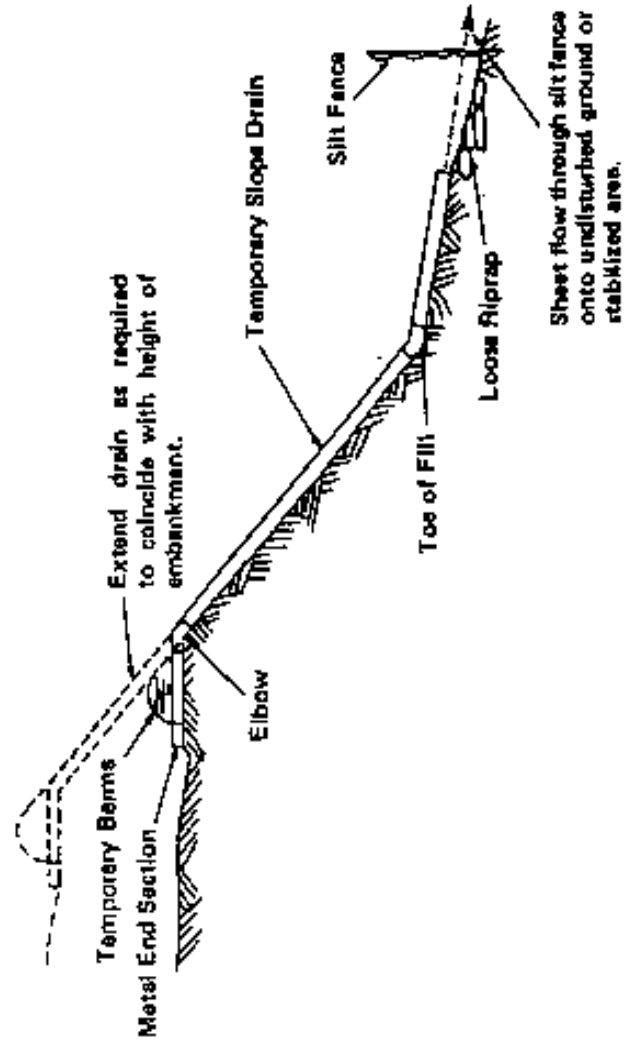
GUTTERS: Gutters for slope drains shall be lined with Type C rock channel protection, crushed aggregate slope protection, portland cement concrete, bituminous concrete, plastic sheeting (on slopes 4:1 max.), partial pipe sections or approved equal.

PITS: Sediment pits shall be provided and their cost included in the unit price bid for the adjacent CMS 207 items.

MAINTENANCE: Dikes and slope protection shall be acceptably maintained. The maintenance or replacement cost will be paid for by the Department under unit bid prices or under 109.04.

BASIS OF PAYMENT: Temporary dikes shall be paid for under Item 207, Temporary Dikes. Temporary slope drains shall be paid for under Item 207, Temporary Slope Drains. Rock required shall be paid for under Item 601, Rock Channel protection, Type C, w/o Filter.

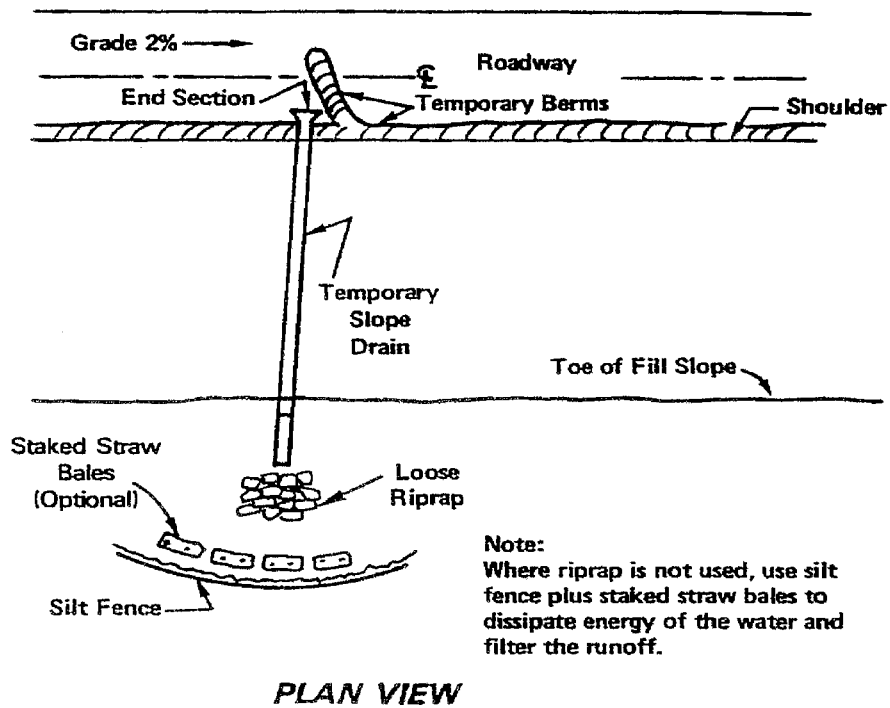
TYPICAL CONDITIONS WHERE TEMPORARY SLOPE DRAINS ARE APPLICABLE



ELEVATION VIEW

(Adapted from Richards and Middleton, 1978)

***TYPICAL CONDITIONS WHERE TEMPORARY
SLOPE DRAINS ARE APPLICABLE***



(Adapted from Richards and Middleton, 1978)



A good example of a slope drain.



Gullies are formed by not using slope drains.

Sediment Basins or Traps

What is it used for?

- Concentrated flow locations to settle sediment out before leaving the project.
- Each basin collects sediment from a drainage area of 1 to 5 acres

Where is it used?

- Collects sediment at critical locations along the project
- Placed in a ditch or at the bottom of a ravine
- At a culvert outlet or inlet
- Along or at end of a ditch
- At any sediment exit point of the project

How is it used?

- 67 cubic yards of basin or trap quantity for every acre of drainage area
- 5 to 25 acres of sediment can be collected when basins are used in a series
- **Caution:** Children and urban areas are “potential” hazards

When is it used?

- Constructed at the first step of grading and within 7 days of grubbing operation
- Maybe removed after seeding the entire project (Ohio EPA interpretation)
- But leave ditch checks in place until final grass growing at 70% coverage

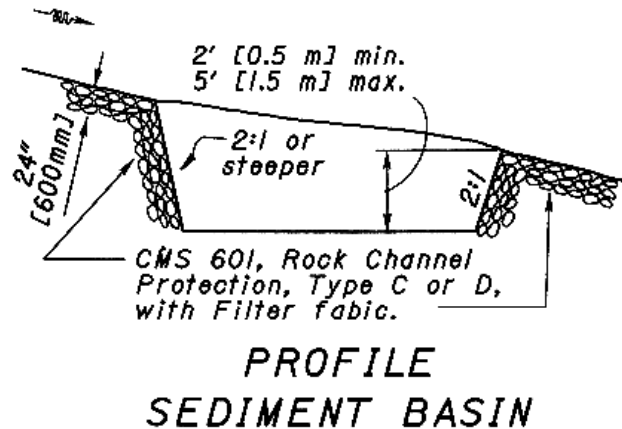
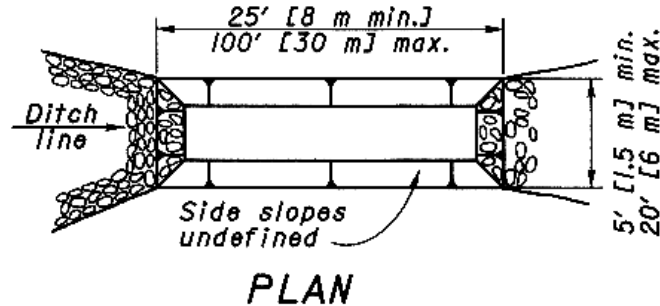
How often should it be maintained?

- Deposited sediment shall be removed when the initial volume has been reduced one-half.
- Correct these controls in the field if they fail

References:

- CMS 107.21, 877, 207.02, MC-11, DM 4.3M
- **Law:** (page 6 of 14) Concentrated storm water runoff from disturbed areas flowing at rates which exceed the design capacity of sediment barriers shall pass through a sediment settling pond. (l)(B)(1) ..use at the first step of grading and within 7 days of grubbing

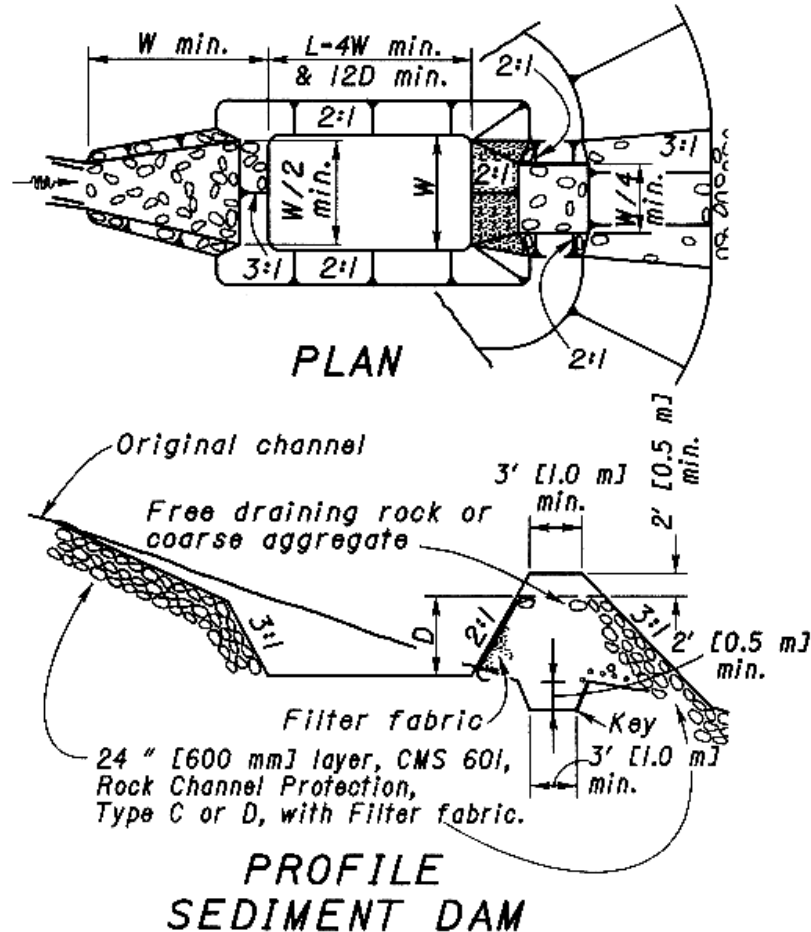
SEDIMENT BASINS & DAMS



SIZE: The volume shown on the plans is the total storage volume required for the sediment basin or dam (67 cubic yards per acre [127 cubic meters per hectare]). A series of smaller basins or dams may be substituted for a larger basin or dam.

BASIS OF PAYMENT: Sediment Dams and Basins shall be paid for under tem 207, Temporary Benches, Dams and Sediment Basins. The pay quantity shall be the actual number of cubic yards [cubic meters] of excavation and embankment required to construct the basin or dam. Rock required shall be paid for under Item 601, Rock Channel Protection, Type C or D, with Filter.

SEDIMENT BASINS & DAMS



EMBANKMENT: Sediment basin embankment construction shall be as per CMS 203 compacted as directed by the Engineer.

MAINTENANCE: Sediment pits, dams and basins shall be acceptably maintained. Deposited sediment shall be removed when the initial volume has been reduced one-half. The maintenance or replacement cost will be paid for by the Department under unit bid prices or under 109.04.

FILTERS: Filter fabric shall be as per CMS 601.02 and installed per CMS 601.08 or as detailed hereon. Such fabrics may be cleaned in lieu of replacement. The cost of all filter fabric required to construct the sediment basin or dam shall be included in the cost of the Item 601, Rock Channel Protection, with Filter Fabric.



Good example of a basin. Right dimensions and rock type.

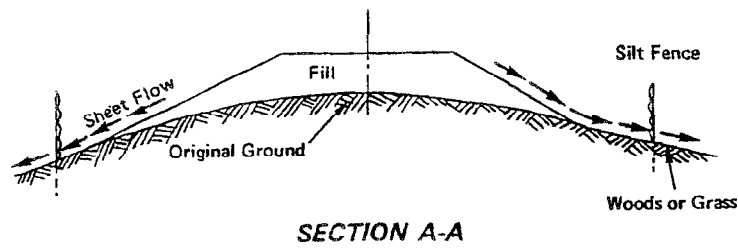
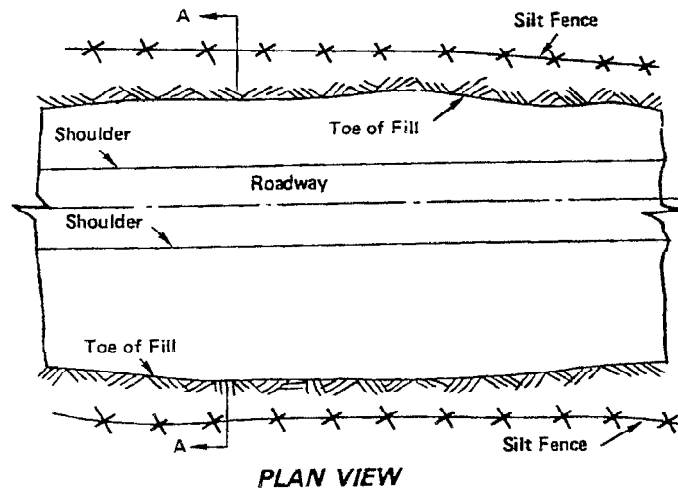


Poor example of a basin. Incorrect dimensions and no rock.

Perimeter Locations

- Protection of the perimeter locations is the number one priority
- Use filter fabric even if protecting a corn field
- All outlets to ditches, ravines, or to the project should be protected
- Divert water from flow coming onto the project or barren areas
- Law: (page 6 of 14) Sheet runoff from denuded areas shall be intercepted by sediment barriers. Sediment barriers, such as sediment fences or diversions directing runoff to settling facilities, shall protect adjacent properties and water resources from sediment transportation by sheet flow.

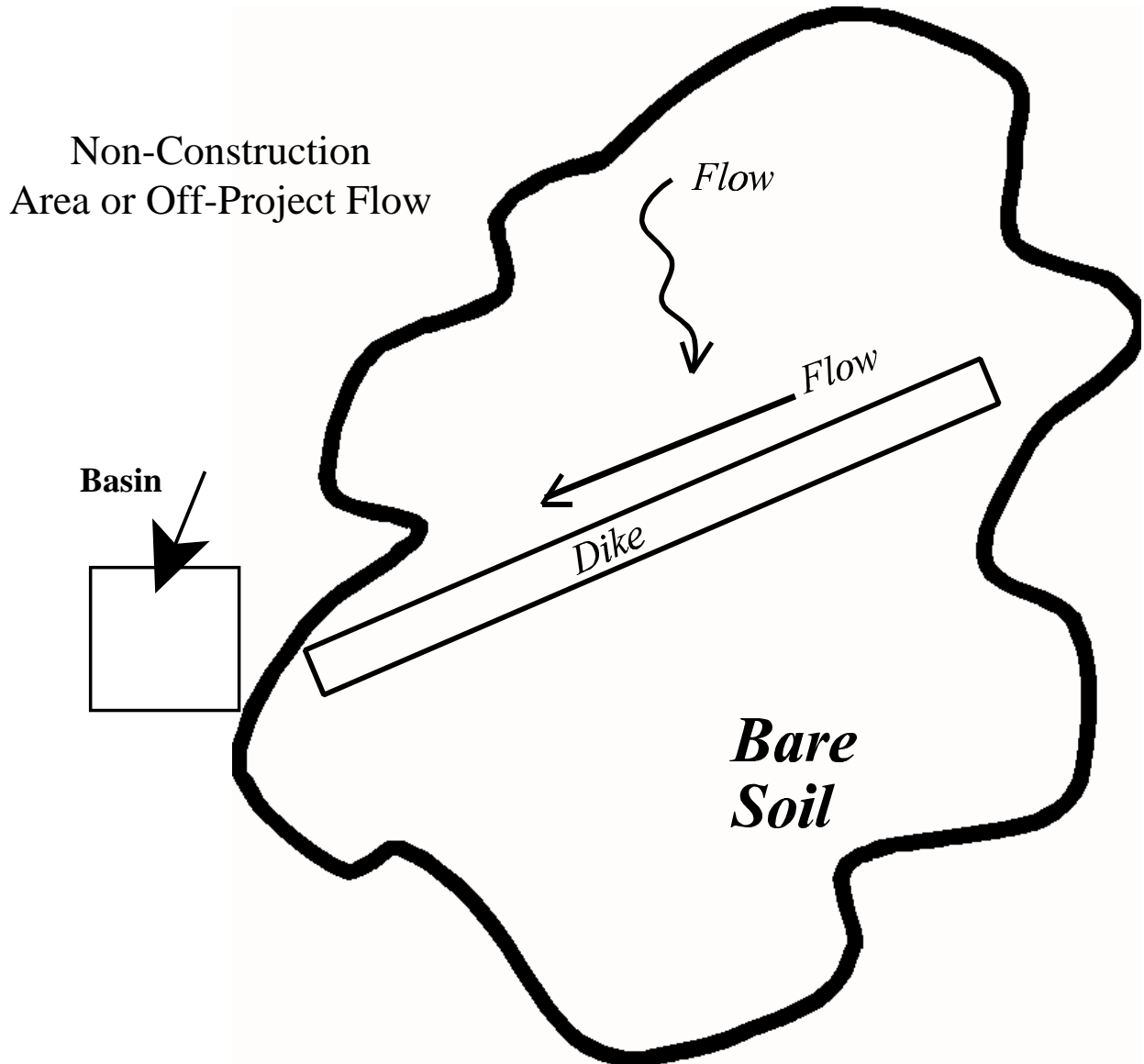
TYPICAL CONDITIONS WHERE SILT FENCES ARE APPLICABLE



(Adapted from Richards and Middleton, 1978)

Keep away from toe
to maximize storage

***Using a Dike to Separate Non-Construction Flow
from Construction or Bare Soil Areas***





Protect the exit points by using basins.



Needs rock or basin.



Protect exit points of project.

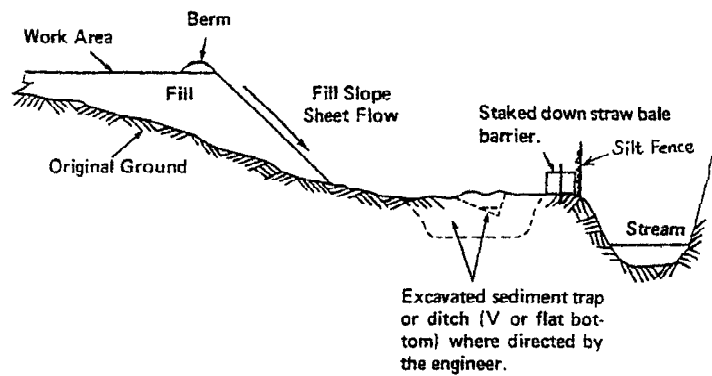
River, Stream and Water Body Protection:

- Ë Number One Perimeter Location
- Ë Protect Streams or Water bodies passing through or on the project with:
 - a) Line stream with filter fabric
 - b) Surround with temporary seed or matting
 - c) Divert flow by using dike and slope protection
 - d) Use bale filter dikes
 - e) Combination of the above
 - f) Stabilize within 50 feet and within 2 days of idle work
- Ë Relocation of Streams
 - a) Fully stabilize new stream prior to diverting flow into new channel.
- Ë Law: (page 6 of 14) Stream Protection - Structural practices shall be designed and implemented on site to protect all adjacent streams, first order and larger, from the impacts of sediment runoff.(l) (a) ...within 50 feet of the stream and within 2 days of idle work.

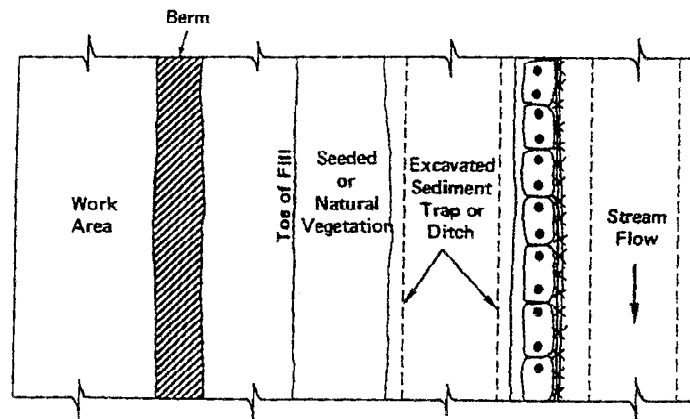
Notes: When actively working above and along a water body

- Collect the water from above with water body with Filter fabric for sheet flow, Ditch checks(2-5 acres), or Basins(>5 acres)
- Divert the water that is coming from non active locations.
- Stabilize with seed and mulch with in 2 days of inactive work.

STRAW BALE BARRIER AND DITCH OR SEDIMENT TRAP COMBINATION



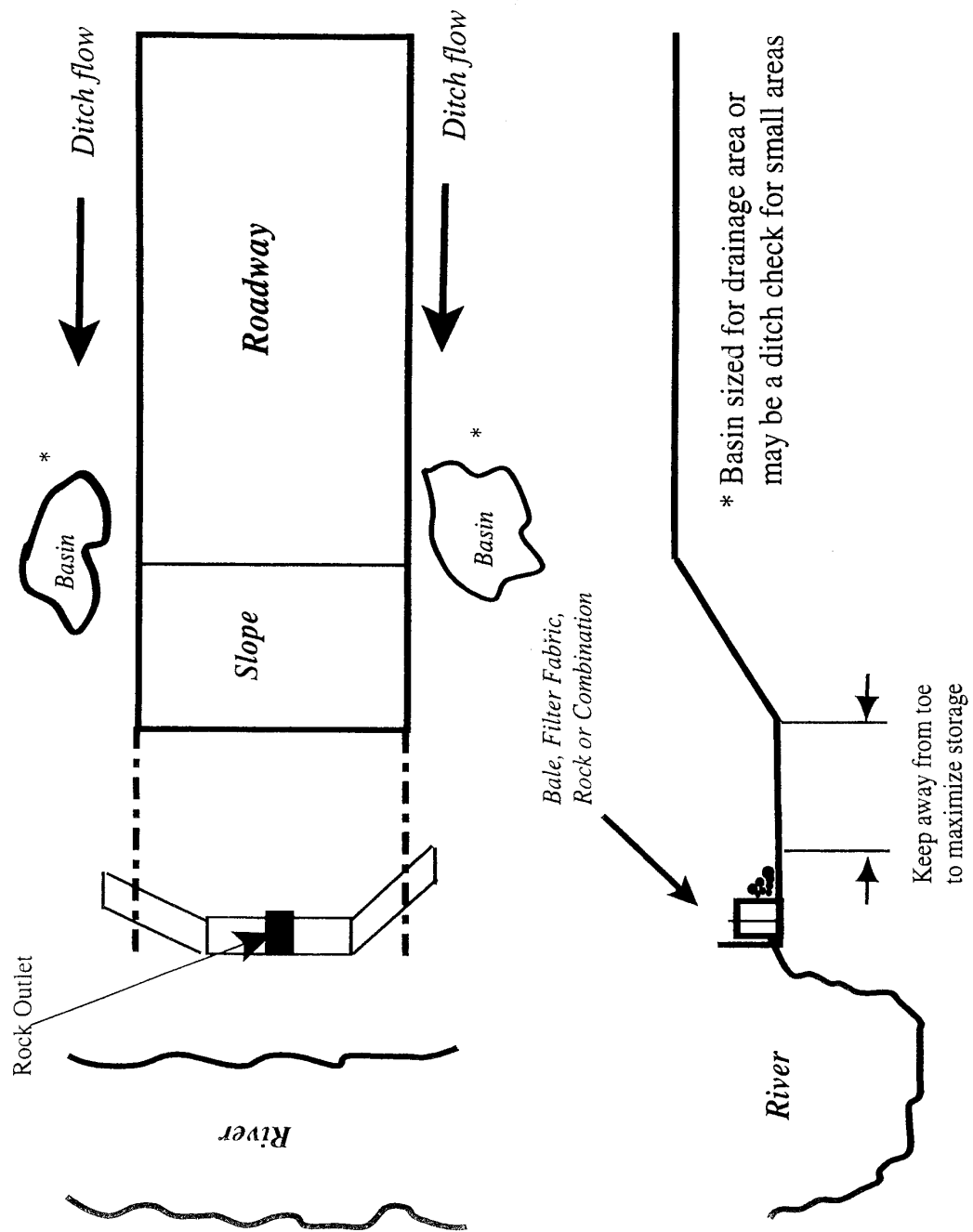
ELEVATION VIEW



PLAN VIEW

(Adapted from Richards and Middleton, 1978)

Protecting a River at Bridge Locations





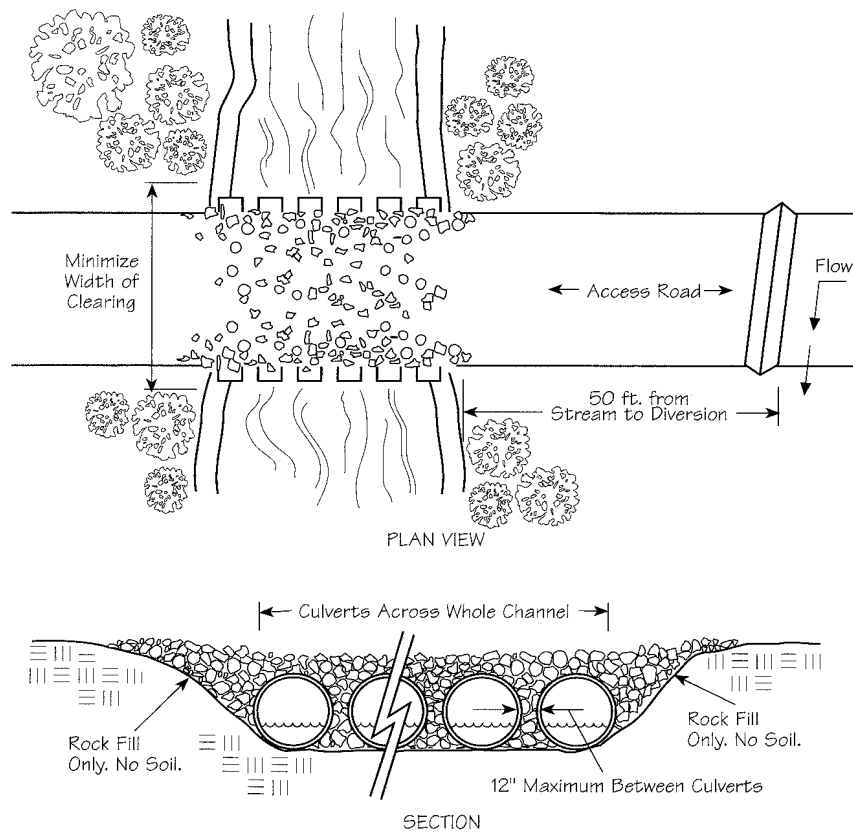
Temp. Grass, Silt Fence and Rock Channel Protection Combination



**Perimeter Silt Fence Protecting the River
Good Location but Bad Construction**

Ohio Department of Natural Resources *

Culvert Stream Crossing



* References made from Rainwater and Land Development Manual

Flow



**River
Crossing**

Sheet Flow and River Crossing(Not enough Pipe)



Work being performed in a river

Minimum Recommended Documentation Requirements:

- Weekly and Storm Checks
 - a) Kept in a separate folder
 - b) On a District, Project or Central Office form
- Storm Water Pollution Prevention Plan
 - a) Plot the placed erosion control items
 - b) Plot and date the idle barren areas
- Record and Document any visits by Outside Inspectors
 - a) Includes a Ohio EPA, Environmental Services or QAR Inspector
 - b) Respond to any inspections in a reasonable time frame
 - c) Document what the inspector is recommending before they leave the project.
- Constantly Rearrange, Modify, Adjust in accordance with:
 - a) Field conditions
 - b) Anticipated work
 - c) Weekly inspections
 - d) Outside inspections

Appendix 1

MAINTENANCE PROBLEM/SOLUTION CHECKLIST

Control Measure	Problems to Look for	Possible Corrections
Vegetative Cover	Rills or gullies forming	Regrade and reseed Add additional controls
	Bare soil patches	Reseed
	Sediment at toe of slope	Regrade Add silt fence, slope drains or filter dike if next to a body of water
Ditches	Loose soil	Regrade Recompact
	Erosion of Ditch	Regrade Add additional controls Such as Ditch Checks/ Sediment traps
	No outlet controls	Add Basins or Traps
	Gully on slope below ditch	Regrade Add Slope Drains Add rock
	Ponding in the Ditch	Regrade Make into temporary natural basin
	Sediment or debris in ditch	Clean Out Regrade and add ditch checks and/or sediment basins
	Erosion of unlined ditch surface	Line with rock Place ditch checks to slow the water
	Erosion of ditch blankets	Straighten Regrade and Reline Repin more securely Add ditch checks to slow water down

MAINTENANCE PROBLEM/SOLUTION CHECKLIST

Control Measure	Problems to Look for	Possible Corrections
Embankment or cut slope	Bare areas	Regrade or reseed
	Erosion of slopes: 1) Sheet or rill 2) Gully 2"-6" or > 6"	Seed or regrade Regrade and add slope drains, rock or tack filter fabric on the guard rail
Inlet Protection	Flooding around or below inlet Stakes and fabric leaning/falling in toward grate	Check grade Regrade or redesign Check for blockage in culvert or catch basin
	Undercutting of bales or silt fence, bale displacement, torn fabric, etc.	Replace, rearrange and/or regrade
Outlet Protection	Erosion below outlet	Add Rock Add ditch checks to slow the water
	Sediment leaving project	Add sediment basins, ditch checks, silt fence etc.
	Dislodged Rock	Add or rearrange rock
Silt Fence	Undercutting of fence	Replace, rearrange and/or regrade
	Fence collapsing	Replace or rearrange Add bales, more stakes wire, or rock
	Torn fabric	Replace Add bales, more stakes wire or rock
	Runoff escaping around fence	Lengthen the fence

MAINTENANCE PROBLEM/SOLUTION CHECKLIST

Control Measure	Problems to Look for	Possible Corrections
Ditch Checks	Sediment accumulation more than 1/2 height of barrier	Clean Out
	Displacement of silt fence, rock or bales	Replace or rearrange Reinforce with rock, bales, basins, fence or combinations.
Straw Bale Dike	Bale displacement	Replace or rearrange Reinforce with rock, bales, basins, fence or combinations.
	Undercutting of bales	Replace, rearrange and/or regrade
	Gaps between bales	Replace or rearrange Add straw
	Baling wire broken	Replace
	Sediment level at one half the bale height	Clean out
Pipe Slope Drain or Chute	Blocked inlet or outlet	Unblock and regrade
	Runoff bypassing inlet	Regrade
	Erosion at outlet	Add rock
Dikes	Gully on slope below dike breach; wheel track or low spot in dike	Regrade Add rock
	Loose soil	Regrade and compact
	Erosion of dike face	Regrade and recompact

MAINTENANCE PROBLEM/SOLUTION CHECKLIST

Control Measure	Problems to Look for	Possible Corrections
Rock Lined Ditch	Scour beneath rock	Add rock or fabric Add ditch checks to slow water above the rock
	Dislodged rock	Add rock or fabric Regrade
Sediment Traps and Basins	Sediment level more than 1/2 the depth or sediment near outlet elevation	Clean Out
	Obstructed outlet	Clean and Regrade
	Basin not dewatering between storms	Add more basins
	Damaged embankments	Regrade Redesign
	Spillway erosion	Regrade Add Rock
	Outlet erosion	Regrade Add Rock
	Riser Flotation	Redesign
	Excessive discharge to and from basin or trap	Look for breaks in basin or trap Granular material???
	Sediment storage zone fills too quickly	Add basins or traps Add ditch checks

Appendix 2

EPA Form **NPDES Storm Water Discharge Permit Construction Activity Inspection Report**

Inspector:	Date:	Time:
Owner:		Phone:
Contact:		Permit#:
Address:		County:
		Acres:
		Receiving Water/Sewer:
Project Name:		Weather:

Type of Inspection: Routine___ Follow-up___ Complaint___ Compliance___ Final___ Photos Taken___ Mark each Item as: (1) Acceptable (2) Not Acceptable (3) Not Inspected or Not Applicable If an item is not acceptable, give reason in the Comments section below and on back.	
<u>Storm Water Permit Requirements</u> 1) ___ NOI Submitted ___ NOI Posted 2) ___ Storm Water Discharges Only 3) ___ SWP3 Developed 4) ___ Post construction SWP3 5) ___ Pollutant/Toxic Material Handling 6) ___ Maximize Stream Protection 7) ___ Other Surface Water Permits Obtained 8) ___ Site Description Complete 9) ___ On-Site Inspection Records 10) ___ Off-Site Vehicle Tracking 11) ___ Other Controls/Waste Disposal 12) ___ Copy of NOI Submitted Locally 13) ___ SWP3 amended as Required 14) ___ Contractors and Subs Informed?	<u>SWPP Implementation</u> 15) ___ Structural Controls in Place ___ Slit Fence ___ Straw Bales ___ Inlet Protection ___ Sediment Ponds ___ Vegetated Buffer Zones ___ Construction Entrances 16) ___ Structural Controls Maintained 17) ___ Construction Phasing/Scheduling 18) ___ Temporary Seeding/Mulching 19) ___ Permanent Seeding/Mulching 20) ___ Topsoil Handling 21) ___ Site Finally Stabilized 22) ___ Other _____
Comments/Recommendations:	

Violation of NPDES Permit Term/Condition: ___ Yes ___ No Deadline to Correct Conditions: Person Interviewed Signature: _____ Title of Position: _____		Inspector's Phone#: _____
A person's signature acknowledges that they have read the report and received a copy and that they were given the opportunity to discuss it with the inspector. The signature does not necessarily mean they agree with the report.		
<u>FAILURE TO RESPOND BY THE DATE INDICATED MAY RESULT IN A RECOMMENDATION THAT THE OHIO EPA BEGIN ENFORCEMENT ACTION, INCLUDING THE SEEKING OF CIVIL PENALTIES.</u>		

file:quatro:w:EPAform

Appendix 3 QAR Review Form -- Erosion Control

[illegible]

Erosion Control (207, 877, Erosion Control Handbook)

!	Yes	No	NA	Does the project engineer or inspector have a handbook?
!	Yes	No	NA	Did the project engineer or inspector read the handbook?
!	Yes	No	NA	Were the features marked on plan sheet when installed?
!	Yes	No	NA	Were additional features noted on plan sheets?
!	Yes	No	NA	Was the permit required and posted ?
!	Yes	No	NA	Was the weekly storm water inspections are being done?
!	Yes	No	NA	Was the filter fabric fence trenched and backfilled with no sags as per 877
!	Yes	No	NA	Was the filter fabric fence placed at toe and top of the slope?
!	Yes	No	NA	Was the filter fabric fence maintained?
!	Yes	No	NA	Were the ditch checks installed as per 877 ?
!	Yes	No	NA	Were the ditch checks maintained and functional?
!	Yes	No	NA	If the ditch checks failed, has rock been installed as ditch checks?
!	Yes	No	NA	Were the ditch checks spaced correctly (0-2 acres FF, 2-5 acres rock)?
!	Yes	No	NA	Were the ditch checks installed concurrent with cutting the ditch?
!	Yes	No	NA	Were the sediment basins placed and sized appropriately?
!	Yes	No	NA	Were the sediment basins cleaned out as needed?
!	Yes	No	NA	Were the sediment basins constructed properly as per 877?
!	Yes	No	NA	Were the sediment basins used in conjunction with ditch checks?
!	Yes	No	NA	Were the sediment basins constructed at grading or within 7 days of grubbing?
!	Yes	No	NA	Were the inlet protection built with 2 x 4 framing as per 877?
!	Yes	No	NA	Were the inlet protection properly entrenched or anchored?
!	Yes	No	NA	Were the inlet protection installed as inlet is complete?
!	Yes	No	NA	Were the inlet protection maintained, functional and sediment removed?
!	Yes	No	NA	Was temporary stabilization placed on all dormant disturbed areas (45 days or >)?
!	Yes	No	NA	Was temporary stabilization seeded and mulched in timely manner?

- ! Yes No NA Are the areas at final grade, stabilized ,maintained and functioning?
- ! Yes No NA Are the stream or river crossings made of clean, non-erodible rock & culvert pipe?
- ! Yes No NA Are the stream or river banks lined with bales or filter fabric fence for protection?
- ! Yes No NA Are the stream or river water sheet flow diverted into a basin by ditch and dike?
- ! Yes No NA Are the stream or river sediment laden water being dewatered into a pit?
- ! Yes No NA Were the areas within 50 feet of the water bodies seed and mulched within 2 days of inactive work?
- ! Yes No NA Are the perimeter sheet flow locations protected by the use of filter fabric fence?
- ! Yes No NA Is the water coming onto project from off site source is being diverted?

Notes

Other Comments:	

(w:QAR checklist/checklist00/embamkcheck)



Appendix 4- Ohio Department of Transportation

Weekly Storm Sediment and Erosion Control Checklist

Inspection Date: _____

Weekly Check: _____

Project 491-98, FRA County I-270 Widening, Dublin Section

Rain Check: _____

Precipitation Type & Amount: _____

Area One: Mainline I-270 West Bound, Station 27+689 to 20+405 (Project Length)

1) Temporary Seeding (Note any barren area needing cover)

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

2) Ditch Erosion Protection/Ditch Checks

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

3) Silt Fence and Bale Filters

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

4) Inlet/Outlet Protection

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

Area Two: Mainline I-270 East Bound, Station 20+405 to 27+689 (Length of Project)

5) Temporary Seeding (Note any barren areas needing cover)

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

6) Ditch Erosion Protection/Ditch Checks

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

7) Silt Fence and Bale Filters

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

8) Inlet/Outlet Protection

Good Condition: _____

Needs Repair: _____

Comments and Repair Locations: _____

General Comments on the Mainline Sediment and Erosion Control: _____

Area Three: I-270 Sawmill Interchange

Ramp Quadrants:

Ramps: A B C D

9) Temporary Seeding (Note any barren area needing cover)

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

10) Ditch Erosion Protection/Ditch Checks

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

11) Silt Fence and Bale Filters

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

12) Inlet/Outlet Protection

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

Area Four: Both sides of the Scioto River under Structure FRA-27-22842 L&R

13) Temporary Seeding (Note any barren area needing cover)

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

14) Ditch Erosion Protection/Ditch Checks

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

15) Silt Fence and Bale Filters

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

16) Inlet/Outlet Protection

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

17) Structural Controls: Sediment Basins/Traps/Dams, Dikes, Ditches

**Good Condition: _____
Needs Repair: _____**

**Comments and Repair Locations: _____
_____**

**Additional Erosion Control Comments _____
_____**

Are any areas idle for 45 days or more and in need of erosion control items? Yes _____ No _____

If yes, the areas are: _____

Inspector: _____

****Note: Make Sure Contractor Receives a
Copy!***

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
WEEKLY STORM SEDIMENT AND EROSION CONTROL CHECKLIST

DATE _____	PRECIPITATION TYPE AND AMOUNT _____
PROJECT _____	_____
CTY/RT/SEC _____	_____

<u>Station No.</u>	<u>IRN*</u>	<u>Type of Controls and Recommended Checks</u>	<u>Date Corrected</u>
(*Inspector Report Number)			

1) TEMPORARY SEED

_____	Area has been dormant for _____ days (45 days maximum),	_____
_____	Area has been dormant for _____ days (45 days maximum),	_____
_____	Area has been dormant for _____ days (45 days maximum),	_____

2) EXPOSED SURFACE AREA OF ERODIBLE EARTH

_____	_____ < 70,000 Square Meters (750,000 Square Feet)> _____	_____
_____	_____ < 70,000 Square Meters (750,000 Square Feet)> _____	_____
_____	_____ < 70,000 Square Meters (750,000 Square Feet)> _____	_____

3) VEGETATION - SEEDING - SODDING

_____	_____ Adequate	_____ Seeding /Sodding Required	_____ Needs Mowed	_____
_____	_____ Adequate	_____ Seeding /Sodding Required	_____ Needs Mowed	_____
_____	_____ Adequate	_____ Seeding /Sodding Required	_____ Needs Mowed	_____

5) SILT FENCE

_____	_____ Operating Correctly	_____ Additional Fencing Required	_____
_____	_____ Debris Removal Required	_____ Remove Fence	_____

Comments _____

6) INLET/OUTLET PROTECTION

_____	_____ Operating Correctly	_____ Needs Repair	_____ Need Added	_____
-------	---------------------------	--------------------	------------------	-------

Comments _____

7) STRUCTURAL CONTROLS - BALE FILTER DIKE, DITCH CHECKS, DIKE & SLOPE PROTECTION

_____	_____ Operating Correctly	_____ Additional Controls Required	_____ Remove Sediment	_____
_____	_____ Undermined	_____ Outflanked	_____	_____

Comments _____

8) STRUCTURAL CONTROLS - SEDIMENT BASIN/TRAPS/DAMS

_____	_____ Adequate, _____ Greater than 1/2 Full, _____ Needs Maintenance, _____ Needed _____
_____	_____ Adequate, _____ Greater than 1/2 Full, _____ Needs Maintenance, _____ Needed _____
_____	_____ Adequate, _____ Greater than 1/2 Full, _____ Needs Maintenance, _____ Needed _____

9) ADDITIONAL AREAS REQUIRING TEMPORARY EROSION CONTROL

_____	TYPE OF MEASURE _____
_____	TYPE OF MEASURE _____
_____	TYPE OF MEASURE _____

General Comments _____

Inspector Signature _____

PE/PS Signature _____

Date Copy Given to Contractor _____

DOT-1645-file:erosion control :checklist

**SEDIMENT AND EROSION CONTROL
CONSTRUCTION SCHEDULE**

PROJECT: _____

CTY/RT/SEC _____

CONTRACTOR: _____

SCHEDULE FOR 19 _____

COMPLETED BY: _____

DATE: _____

*Indicate by use of a bar line or symbols when erosion control measures are scheduled for installation.
Plot the erosion control items that are placed on the Storm Water Pollution Prevention Plan or other
plan sheets.*

Modify this form as needed to keep track of the items that are to be and that were placed in the field.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
STRUCTURAL:												
Inlet Protection												
Outlet Protection												
Ditch Checks												
Silt Fence												
Bale Filter Dikes												
Dike & Slope Protection												
Sediment Trap/Basin												
Other												
NON-STRUCTURAL:												
Temporary Seed												
Permanent Seed												
Sod Installation												
Nettings/Mats/Blankets												
Weed Control												
Other												

STRUCTURES:

MAINTAINED BY: _____

SEEDING CONTRACTOR _____

Project Inspector

Project Engineer

file:quatro:w:schedule

62

BALE PLACEMENT: Bales shall be tightly placed adjacently and interlatched 2" [50] to 3" [75] before staking; or a small amount of loose soil shall be lightly compacted along the upstream edge of the bales.

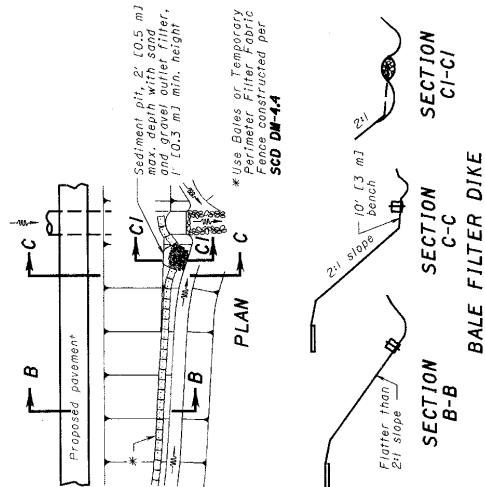
Each bale shall be firmly staked with a minimum of two stakes at least 3' [1 m] in length. Stakes shall be wooden 2"x2" [50x50], reinforcing bars or fence posts.

Loose straw or hay shall be wedged between and under staked bales.

PITS: Sediment pits shall be provided and their cost included in the unit price bid for the adjacent SS 877 items.

MAINTENANCE: The maintenance or replacement will be paid for by the Department under unit bid prices, agreed unit price, or under 109.04.

BASIS OF PAYMENT: Straw or hay bale installation shall be paid for under **Item 877 - Temporary Perimeter Filter Fabric Fence**. Cost will include placing, staking and removing.



Temporary conduit or gutter slope

Longitudinal dike

Transverse dike (length as required) to contain surface drainage and direct to sewerage pit

Sewerage pit

max. depth 10.5 m

General: Ditches

work operations on

operations are suspended for three weeks

High ground

Pipe Caps

Pit

Temporary Longitudinal dike

Longitudinal dikes

CMS 203 and CMS 203 and compacted to 85% of maximum density.

E PLAN

Slope drain.

The diagram shows a cross-section of a portable flume. It consists of a flexible pipe that is expanded at one end to form a section or flume. The flume has a flat bottom and a 5% slope. The top of the flume is labeled 'Fill slope surface'. The bottom of the flume is labeled 'Flexible pipe'. The slope is labeled '5: [1.5 m] desirable at flat grade'. The flume is shown with a corrugated bottom and a smooth top surface.

The diagram shows a cross-section of a gutter installation. A gutter is shown with a sloped bottom. Labels include:

- Gutter**: The main channel.
- Lined gutter**: The gutter with a protective lining.
- Pipe Caps**: Located at the end of the gutter.
- Depth**: The vertical distance from the top of the gutter to the bottom of the lining.
- 2' (0.5 m)**: A dimension indicating the width of the gutter.
- 1'**: A dimension indicating the width of the gutter.

— CMS 60I, as shown above

SECTION F-F

CUTTER SLOPE DRAIN

PITS: Sediment pits shall be provided and their cost included in the unit price bid for the adjacent items.

SECTION D-D

drainage area
[2 hectares]

241 or flatter

SECTION E-E

**TEMPORARY SLOPE DIMENSIONS
RECOMMENDED SIZES**

Area In Slopes (in metres)	Pipe Size			cutler depth
	Smooth	Corrugated	Half- round	
0.001 to 0.005	100	100	100	100
0.005 to 0.01	150	150	150	150
0.01 to 0.02	200	200	200	200
0.02 to 0.05	250	250	250	250
0.05 to 0.1	300	300	300	300
0.1 to 0.2	350	350	350	350
0.2 to 0.5	400	400	400	400
0.5 to 1.0	450	450	450	450
1.0 to 2.0	500	500	500	500
2.0 to 5.0	600	600	600	600
5.0 to 10.0	750	750	750	750
10.0 to 20.0	900	900	900	900
20.0 to 50.0	1000	1000	1000	1000
50.0 to 100.0	1200	1200	1200	1200
100.0 to 200.0	1500	1500	1500	1500
200.0 to 500.0	1800	1800	1800	1800
500.0 to 1000.0	2100	2100	2100	2100
1000.0 to 2000.0	2400	2400	2400	2400
2000.0 to 5000.0	2700	2700	2700	2700
5000.0 to 10000.0	3000	3000	3000	3000
10000.0 to 20000.0	3300	3300	3300	3300
20000.0 to 50000.0	3600	3600	3600	3600
50000.0 to 100000.0	3900	3900	3900	3900
100000.0 to 200000.0	4200	4200	4200	4200
200000.0 to 500000.0	4500	4500	4500	4500
500000.0 to 1000000.0	4800	4800	4800	4800
1000000.0 to 2000000.0	5100	5100	5100	5100
2000000.0 to 5000000.0	5400	5400	5400	5400
5000000.0 to 10000000.0	5700	5700	5700	5700
10000000.0 to 20000000.0	6000	6000	6000	6000
20000000.0 to 50000000.0	6300	6300	6300	6300
50000000.0 to 100000000.0	6600	6600	6600	6600
100000000.0 to 200000000.0	6900	6900	6900	6900
200000000.0 to 500000000.0	7200	7200	7200	7200
500000000.0 to 1000000000.0	7500	7500	7500	7500
1000000000.0 to 2000000000.0	7800	7800	7800	7800
2000000000.0 to 5000000000.0	8100	8100	8100	8100
5000000000.0 to 10000000000.0	8400	8400	8400	8400
10000000000.0 to 20000000000.0	8700	8700	8700	8700
20000000000.0 to 50000000000.0	9000	9000	9000	9000
50000000000.0 to 100000000000.0	9300	9300	9300	9300
100000000000.0 to 200000000000.0	9600	9600	9600	9600
200000000000.0 to 500000000000.0	9900	9900	9900	9900
500000000000.0 to 1000000000000.0	10200	10200	10200	10200
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5000000000000.0 to 10000000000000.0	11100	11100	11100	11100
10000000000000.0 to 20000000000000.0	11400	11400	11400	11400
20000000000000.0 to 50000000000000.0	11700	11700	11700	11700
50000000000000.0 to 100000000000000.0	12000	12000	12000	12000
100000000000000.0 to 200000000000000.0	12300	12300	12300	12300
200000000000000.0 to 500000000000000.0	12600	12600	12600	12600
500000000000000.0 to 10000000000000				

TEMPORARY SLOPE DRAINS RECOMMENDED SIZES						
Area In acres [hectares]	Pipe Size				Half- round	Depth
	Smooth	Corru- gated	Half- round	Depth		
0-4 [0-1.63]	6" [150]	6" [150]	18" [450]	8" [200]		
4-8 [1.63-3.2]	8" [200]	12" [300]	18" [450]	8" [200]		
8-12 [3.2-4.9]	10" [250]	15" [375]	24" [600]	12" [300]		

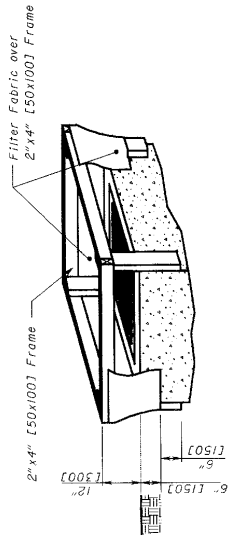
[illegible]

**PROFILE
SEDIMENT BASIN**

NUMBER	STANDARD ROADWAY CONSTRUCTION (DRAWING)	TEMPORARY EROSION CONTROL	OFFICE OF PLANNING	DESIGN NUMBER	ALL MATERIALS DIMENSIONS IN BUCKETS (L) OR CUBIC YARDS	IN MATERIALS DIMENSIONS	D. FOCKE	DATE
DN-4.5					NO. EAVNS	NO. EAVNS		4-29-99

THIS DRAWING REPLACES
OM-4.3M DATED 6-30-95.

TEMPORARY INLET PROTECTION FILTER FABRIC FENCE

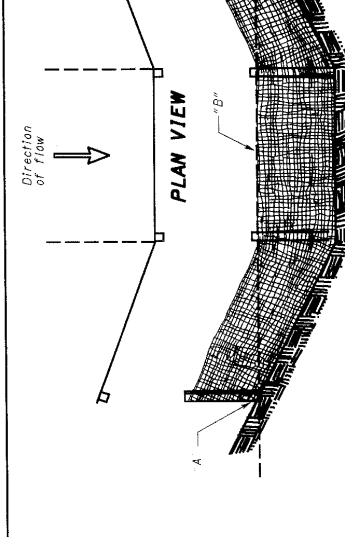


MATERIALS: Filter Fabric shall meet the requirements of CMS 712.09, Type C. The framing wood shall be construction grade 2"x4" [50x100] lumber.

CONSTRUCTION: Excavate a 6" [150] deep trench around the inlet, then drive the 2"x4" [50x100] posts 6" [150] below the excavated trench. Construct the wooden frame using the overlapped detail shown and secure the filter fabric to the frame with the approved fasteners and securely fastened. The filter fabric shall overlap across one side of the inlet such that the ends of the filter fabric are not attached to the same post. Backfill and compact the excavated soil. Other devices may be used with the approval of the Director.

MAINTENANCE: The filter fabric shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and replacement of the filter fabric. The materials and workmanship shall be approved by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

PAYMENT: The cost of all materials, construction and removal shall be paid in full at the time of construction. **Unit Price: Temporary Inlet Protection Filter Fabric Fence, Linear Foot [Meter].**



PLACEMENT AND CONSTRUCTION OF DITCH CHECK FILTER FABRIC FENCE

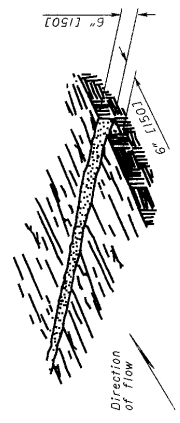
NOTES

MATERIALS: Filter fabric shall meet the requirements of CMS 712.09, Type C. Support stakes shall be a minimum of 1.5"x1.5" [38x38], nominal, and shall be hardwood of sound quality. The filter fabric shall be draped over the trench walls and the support stakes shall be 10' [3 m]. The maximum spacing between support stakes shall be 10' [3 m].

CONSTRUCTION: The bottom of the fabric shall be buried 6" [150] below the trench. The filter fabric shall be draped over the trench walls and the support stakes shall be draped with the end stake of each section wrapped together prior to installation. The ground elevation of the fence shall be held constant except that the end elevations shall be raised upslope to prevent flow around the end of the fence.

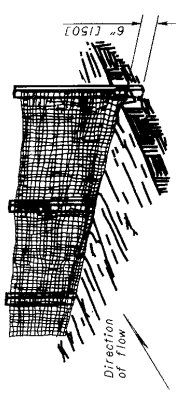
MAINTENANCE: The filter fabric fence shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and replacement of the filter fabric. The materials and workmanship shall be approved by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

PAYMENT: The cost of all materials, construction and removal shall be paid in full at the time of construction. **Unit Price: Temporary Inlet Protection Filter Fabric Fence, Linear Foot [Meter].**



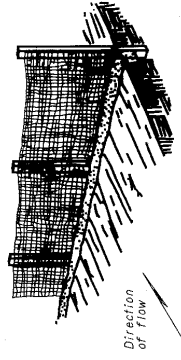
Excavate a 6'x6' [150x150] trench along the proposed fence line.

STEP 1



Place fabric and support stakes and extend fabric into the trench.

STEP 2

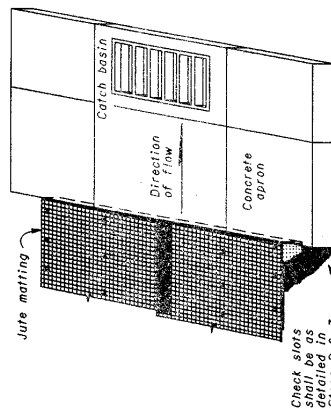


Backfill and compact the excavated soil.

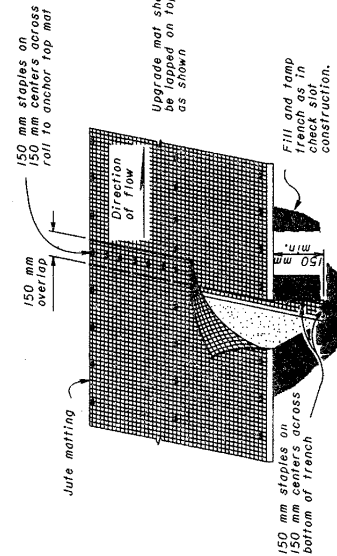
STEP 3

PLACEMENT AND CONSTRUCTION OF PERIMETER FILTER FABRIC FENCE

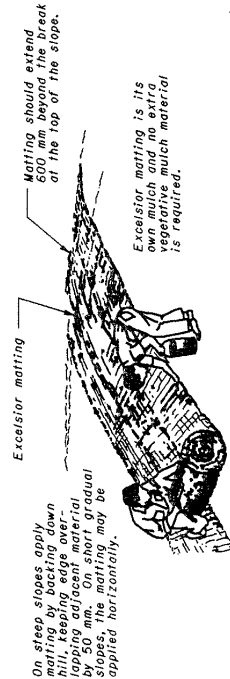
JUTE MATTING INSTALLATION



CHECK SLOT AT STRUCTURES



END OF ROLL OVERLAP



EXCELSIOR MATTING INSTALLATION

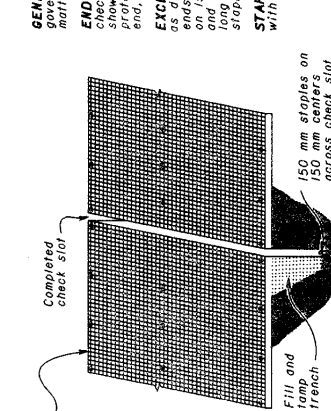
NOTES

GENERAL: The details shown hereon shall govern the installation of jute and excelsior matting unless otherwise shown in the plan.

END OF RUN: Jute matting shall have a check slot and be stapled in the slot as shown in Step 1. Excelsior matting shall have a check slot and be stapled in the slot as shown in Step 1.

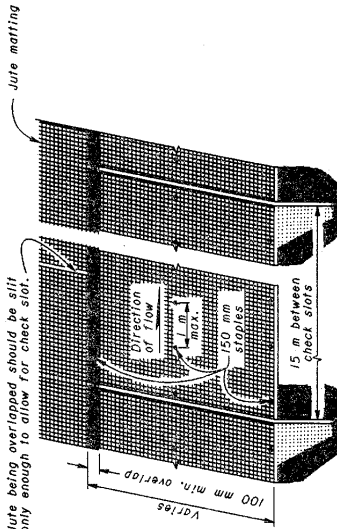
EXCELSIOR MATTING: Matting shall be stapled and detailed for jute matting except the stapled ends and 50 mm end overlaps shall be stapled on 150 mm centers without a buried end; and a 150 mm overlap shall be placed across the top of the matting and stapled on 150 mm centers.

STAPLES: Staples shall be in accordance with CWS 667.02.

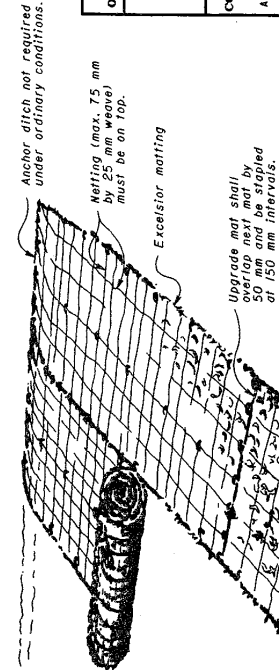


STEP 2

CHECK SLOT CONSTRUCTION DETAILS



TYPICAL INSTALLATION



This Drawing Replaces MC-10.

BUREAU OF LOCATION AND DESIGN
OHIO DEPARTMENT OF TRANSPORTATION

DATE
6-30-95

**JUTE &
EXCELSIOR
MATTING**

STANDARD
CONSTRUCTION
DRAWING
DM-4.2M
APPROVED *N. K. Hulman*
ENGR. L & D

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 877
TEMPORARY SEDIMENT AND EROSION CONTROL**

April 13, 1999

877.01 Description

877.02 Materials

877.03 Construction Requirements

877.04 Maintenance

877.05 Performance

877.06 Method of Measurement

877.07 Basis of Payment

877.01 Description. This work shall consist of temporary control measures as detailed in the plans and/or general notes during the life of the contract to control sediment and erosion through the use of straw or hay bales, dikes, slope protection, sediment pits, basins and dams, slope drains, coarse aggregate, mulches, grasses, filter fabrics, ditch lining, inlet protection and other erosion control devices or methods.

The permanent control provisions contained in the contract shall be coordinated with the temporary erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

Temporary controls are required for construction work outside the right-of-way in areas such as borrow pit operations, haul roads, equipment and material storage sites, waste areas, and temporary plant sites. This work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract prices bid for the items to which they apply.

877.02 Materials. Commercial fertilizer shall be (10-20-10) and shall conform to Item 659.

Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*). Seed and mulching materials shall be applied in accordance with Item 659.

Temporary filter fabric ditch checks shall consist of 30 inch [0.8m] wide filter fabric with sound wood supports with maximum spacing of 10 feet [3.0m] on centers. Temporary inlet filter barriers shall consist of 18 inch [0.5m] wide filter fabric fence with a securely nailed 2 x 4 wood frame.

Temporary bale filter dikes and perimeter filter fabric fence shall consist of straw or hay bales, or 30 inch [0.8m] wide filter fabric fence with sound wood supports with a maximum spacing of 10 feet [3.0m] on centers. All the above filter fabric fence shall meet the requirements of 712.09, Type C.

Temporary dikes shall consist of suitable 203 material.

Temporary slope drains shall consist of pipe, pipe caps, coarse aggregate, riprap, rock channel protection, or other materials. Sediment pits are not paid for separately but are included as part of slope drain construction.

Pipe caps shall be included in the unit bid price for the pipe. Pipe caps shall have a minimum diameter of 1/4 inch (6.4mm) holes and be specifically designed to connect to the pipe. There will be a minimum of one hole per square inch (645 mm²) of the cross sectional end area of the pipe cap.

Temporary sediment basins and dams shall be constructed by methods described in Item 203 Excavation

and Embankment and Item 601 Rock Channel Protection, Type C or D with filter.

Temporary rock check dams shall be constructed of Item 601 Rock Channel Protection, Type C or D without filter.

Temporary ditch and slope protection shall meet the requirements of Item 670.

877.03 Construction Requirements. The Storm Water Pollution Prevention Plan (SWPPP) details the placement, location and description of the temporary and permanent erosion control items. The following descriptions shall be used to supplement the plan. The Contractor shall rearrange and modify the plan quantities to meet the field conditions and the National Pollutant Discharge Elimination System (NPDES) Permit.

When the plan does not have a SWPPP, the Contractor shall submit a plan detailing control feature locations and quantities at the pre-construction meeting.

In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

(A) Clearing and Grubbing. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, and borrow and fill operations as determined by the project conditions. The Contractor shall preserve existing vegetation where attainable and temporarily seed and mulch disturbed idle areas as stated.

Inactive cleared and grubbed areas that are scheduled to remain idle for more than 45 days shall be stabilized with vegetation (i.e. temporary seed and mulch) within 7 days following the clearing and grubbing operations. If an area is within 50 feet [15 m] of any water body (i.e. stream, river, pond, etc.), then it shall be vegetated within 2 days following the clearing and grubbing operations.

(B) Installation of Control Features. Temporary erosion and sediment control items shall be installed as detailed and are to remain functional until the upper slope drainage areas are fully stabilized.

Temporary perimeter, ditch check or inlet filter fabric fence shall be constructed in accordance with Standard Drawing DM-4.4.

1. Temporary Perimeter Controls: Temporary perimeter filter fabric fence shall protect the following from sheet flow runoff: off right of way locations; off construction limit locations; around water bodies, wet lands or around other significant items designated on the plan.

Dikes shall be used to prevent flow from coming on to the project and to barren areas on the project.

The Contractor shall install perimeter filter fabric fence and dikes concurrent with the clearing and grubbing operations.

2. Inlet Protection: The Contractor shall use an 18 inch [0.5m] wide filter fabric fence supported around a storm drain inlet or manhole with securely nailed 2 x 4 inch (50 X 100 mm) lumber. The Contractor shall excavate a six inch (150 mm) trench around the inlet, and drive the posts six inches (150 mm) below the excavated trench bottom. The fabric shall be stretched around the frame, placing six inches of fabric in the trench and secure tightly. The fabric shall overlap on one side of the inlet so that the fabric ends are not attached to the same post. Backfill the excavated soil onto the fabric and compact tightly.

The Contractor shall construct the inlet protection as soon as the inlet is completed.

3. Temporary and Permanent Seeding: Use seed and mulch liberally during and after construction and before or during winter shut down. Temporary seeding areas shall be fertilized at one-half the specified rate of application in Item 659. Temporary seeding shall be annual ryegrass sown at 2 pounds per 1000

square feet [1 kg/100 m²] and mulched in accordance with Item 659. When project conditions prevent the incorporation of fertilizer into the soil and preparation of the seed bed cannot be performed in accordance with Item 659, these requirements may be waived. Temporary seed shall not be placed on frozen ground.

The Contractor shall place the permanent seed on all barren areas within 7 days of obtaining final grade. The Contractor shall place the temporary seed and mulch as stated under clearing and grubbing.

4. Slopes: Dikes, slope drains and ditches shall be installed to divert water from bare soil and to protect cut and fill slopes. The Contractor shall place dikes at the top of fill slopes to protect the sides slopes from erosion.

The Contractor shall install dikes and slope drains when no filling activity occurs for three or more weeks and when slope height is greater than 8 feet [2.5m].

The Contractor shall construct a ditch at the top of cut slopes prior to the cutting of the slope to reduce runoff potential.

5. Ditch Checks: Filter fabric fence or rock checks are placed to protect ditches from erosion and to filter sediment from flowing water. The checks are placed across the width of the ditch.

Filter fabric fences are installed for 2 acres (8,000 m²) or less of drainage area. Rock ditch checks are installed for 2 to 5 acres (8,000 to 20,000 m²) of drainage area. When no rock quantities are denoted for rock checks, use the calculated rock quantities from basins for the rock checks.

Ditch checks shall be installed in conjunction with sediment basins and dams when the above drainage areas are not exceeded.

The Contractor shall place the ditch checks as soon as the ditch is cut.

6. Bale Filter Dikes: Bale filter dikes shall be installed a few feet (meters) from the toe of a slope to filter and/or divert sediment to an appropriate control before it enters a water body on or off the project limits.

It is used to collect sediment for a maximum of:

- a) less than 1/4 acre [1,000 m²] without an outlet
- b) slope length of less than 100 feet [30 m] at a maximum slope of 2:1.
- c) use outlet or pit every 100 feet [30 m] for a 2:1 slope. Use a greater spacing for flatter slopes.

Bale filter dikes shall be constructed in accordance with Standard Drawing DM- 4.3. When filter fabric is used for the bale filter dike, the location is accordance with Standard Drawing DM-4.3 and the construction details shown in Standard Drawing DM-4.4 are used.

The Contractor shall construct the bale filter dikes concurrent with the grubbing operations.

7. Sediment Dams or Basins: Basins and dams are placed and used at concentrated and critical flow locations to settle sediment out before leaving the project. Use basins at the bottom of a ravine, at a culvert inlet or outlet, along or at the end of the ditch and at any concentrated sediment exit point of the project. Use a basin quantity of 67 cubic yards for every acre of drainage area (125 m³ per 10,000 m²).

The Contractor shall construct sediment dams and basins at the first step of grading and within 7 days of commencing grubbing operations.

8. River, Stream and Water Body Protection: Protect all streams or water bodies passing through or on the project. Use filter fabric or bale filter dikes to line the water edges. Divert project sediment flow by using dike and slope protection. A combination of the above or other control features can be used.

The Contractor shall construct the above features concurrent with the grubbing operations.

a) Stream Relocation: Fully stabilize the new stream channel prior to diverting flow into the new channel.

b) Stream and River Crossing: Provide a means for construction equipment to cross water courses without causing erosion of streambanks or deposits in the channel. Plan and locate crossings well in advance of needing them. Disturbance to water bodies shall be kept to a minimum. Crossings shall be kept to a minimum and as narrow as practical. Crossings shall be made in shallow areas rather than deep pools where possible. Clearing, grubbing and excavation of streambanks, bed and approach sections shall be kept to a minimum.

The provisions for conveyance shall anticipate high flows and shall not impede the movement of aquatic life.

If culverts are used, the following minimums shall apply: Place culverts on the existing stream bed to avoid a drop in waterfall at the downstream end of the pipe. Culvert diameter shall be at least three times the depth of normal stream flow at the point of the crossing. The minimum size culvert to be used shall be 18 inches [0.5m]. There shall be sufficient number of culverts to completely cross the channel from stream bank to stream bank with no more than 12 inches [0.3m] between each culvert.

All fill and surface material placed in the channel, around the culverts or on the surface of the crossing shall be clean non toxic dump rock fill Type B, C, or D. Extend placed rock up slope from original stream bank to catch and remove erodible material from equipment.

Aggregate used does not need to be removed. Care should be taken to avoid any impoundment or restriction to fish passage. All pipes must be removed upon project completion.

The stream crossing work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract bid prices for the items to which they apply.

When the normal water elevation is shown on the plan, the Contractor shall construct crossings to accommodate a water elevation at least one foot (0.3m) above the stated normal water elevation. Fording in accordance with 107.21 is not allowed.

877.04 Maintenance. Temporary erosion control features shall be properly maintained. The Contractor shall maintain these items with the concurrence of the Engineer. When the Contractor properly places the erosion control items in the contract in accordance with the contract documents, then the Department will pay for the additional cost to maintain or replace these items of work by the unit bid prices, agreed unit prices or by 109.04. Silt removed from erosion control features shall be disposed of in accordance with 203.05.

The Engineer or appointed inspector will check the temporary and permanent erosion control features every 7 days or within 24 hours of any rainfall of more than ½-inch (10 mm).

(A) Temporary Perimeter, Ditch Checks, Inlet Protection Filter Fabric Fence, Dikes and Bale Filter Dikes. Trapped sediment shall be removed and cleaned when it reaches half the height of the lowest section. The Contractor shall make the appropriate corrections when the above fail or become non functional. The Contractor shall maintain the items until the up slope permanent grass coverage is 70 percent or better. The Contractor shall remove the items when the up slope permanent grass coverage is 70 percent or better.

(B) Temporary and Permanent Seed: The seed bed shall be thoroughly watered in accordance with the requirements of Item 659. The quantity of water will be measured and paid for as Item 659 water. Seeded areas shall be maintained until 70 percent or better cover is established. Temporary seeded areas shall be mowed and paid for in accordance with Item 659.

(C) Sediment Dams and Basins: Deposited sediment shall be removed when the initial volume has been

reduced one-half. The Contractor shall make the appropriate corrections when these items fail or non functional. The Contractor shall remove the dams and basins when the permanent seed and mulch is placed on the entire project.

877.05 Performance. The Contractor shall install additional erosion control features, make adjustments to meet the field conditions, anticipated future work or corrections based on the weekly storm water inspections with the concurrence of the Engineer. The type and quantity will be paid by the unit bid prices, agreed unit prices or by 109.04.

In the event that the Contractor or its agents refuse or fail to adhere to the requirements of the 404 Permit, the 401 Water Quality Certification and/or the NPDES Storm Water Permit and as a result an assessment or fine is made or levied against the Ohio Department of Transportation, the Contractor shall reimburse the Department within ten (10) calendar days of the assessment or fine or the Department may withhold the amount of the fine from the Contractor's next pay estimate and deliver that sum to the permitting agencies issuing the assessment or fine.

These fines are not to be construed as a penalty but are liquidated damages to recover costs assessed against the Department due to the Contractor's refusal or failure to comply with the permit requirements.

If proper sediment and erosion controls are not being provided by the Contractor, progress estimates shall be withheld until proper controls are placed.

All temporary erosion control items shall be removed before the project is accepted. Removed materials shall become the property of the Contractor and shall be disposed of in accordance with Item 203.

877.06 Method of Measurement. Temporary erosion and sediment control work, completed and accepted, will be measured as follows:

- (A) All fertilized areas will be measured and paid for as Item 659 Commercial Fertilizer.
- (B) Temporary seeding and mulching will be measured by the square yard (square meter) of seeded and mulched area completed in accordance with these specifications.
- (C) Temporary slope drains will be measured by the linear foot (meter) complete in place.
- (D) Temporary Perimeter, Inlet Protection, Ditch Check, Filter Fabric Fence will be measured per linear foot (meter) in place. Bale filter dike will be paid under temporary perimeter fabric fence.
- (E) Rock required will be paid for under Item 601 Rock Channel Protection, Type C or D with or without filter.
- (F) Temporary sediment dams, and basins will be measured by the cubic yard (cubic meter) of excavation and embankment complete in place.
- (G) Temporary dikes will be measured by the cubic yard(cubic meter), of excavation and embankment complete in place.
- (H) Temporary slope or ditch protection will be measured by the square yard (square meter), complete in place.
- (I) Sediment Removal will be measured in cubic yards(cubic meters) completed in place. The sediment removed from dams, basins, inlet protection, ditch checks, perimeter filter fabric, bale filter dikes and all other types of filter fabrics, straw or hay bales or any other temporary sediment control items will be paid under this item.

In the event that temporary erosion and sediment control measures are required due to the Contractor's

negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, such temporary work shall be performed by the Contractor at his expense.

877.07 Basis of Payment: Accepted quantities of temporary sediment and erosion control work placed and measured as provided above, will be paid for under:

Item	Unit	Description
877	Square yard (square meter)	Temporary seeding and mulching
877	Linear foot (meter)	Temporary slope drains
877	Cubic yard (cubic meter)	Temporary sediment basins and dams
877	Linear foot (meter)	Temporary perimeter, ditch check or inlet protection filter fabric fence
877	Linear foot (meter)	Temporary perimeter filter fabric fence
877	Linear foot (meter)	Temporary ditch check filter fabric fence
877	Linear foot (meter)	Temporary inlet protection filter fabric fence
877	Cubic yard (cubic meter)	Temporary dikes
877	Square yard (square meter)	Temporary ditch protection
877	Square yard (square meter)	Temporary slope protection
877	Cubic yard (cubic meter)	Sediment removal

References

Construction and Material Specifications, 1997:

Items: 105.152, 107.09, 107.21, 108.04, 201.03, 207.01, 207.03, 207.04, 601.08, 659.01, 659.09, 660.07.

Supplemental Specification 877

Construction Project Engineers Guidelines to Successful Erosion Control

Manual of Procedures for Earthwork Construction (ECM) Section 2.2, Temporary Water Pollution, Soil Erosion and Siltation Control

Ohio EPA NPDES Permit

Rainwater and Land Development, ODNR; second edition, 1996

Implementation of Proper Erosion and Sediment Control Practices Training Session, Dr. Gayle Mitchell, Center for Geotechnical and Environmental Research; 1994