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Erosion and Sediment Control Basic Course



6e.

Structural Control Practices

Functions of Structural Controls



- *Vegetative Controls = erosion prevention*
- *Less \$ than structural practices*
- *Structural Controls = sediment trapping & erosion control*
- *More expensive*



Functions of Structural Controls

- **“Second line”** of defense against sediment loss.
- Must be used in conjunction with vegetative controls.
- Must not exceed design limitations



Functions of Structural Controls

- **High life cycle costs for a project.**
- **Temporary controls must be removed after final stabilization.**



Overview of Structural Controls



ESCH Practices

1 Safety Fence

2-3 Road Stabilization

- Construction Entrance
- Construction Road Stabilization

4-8 Sediment Barriers

- Straw Bale Barrier
- Silt fence
- Brush Barrier
- Storm Drain Inlet Protection
- Culvert Inlet Protection

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- Temporary Diversion Dikes
- Temporary Fill Diversions
- Temporary Right-of-Way Diversions
- Diversions

13-14 Sediment Traps and Basins

- Temporary Sediment Trap
- Temporary Sediment Basin



ESCH Practices

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- Temporary Slope Drains
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- Stormwater Conveyance Channel
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- Rock Check Dams
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- Vegetative & Structural Streambank Stabilization
- Temporary Vehicular Crossing
- Utility Stream Crossing
- Dewatering Structures
- Turbidity Curtain

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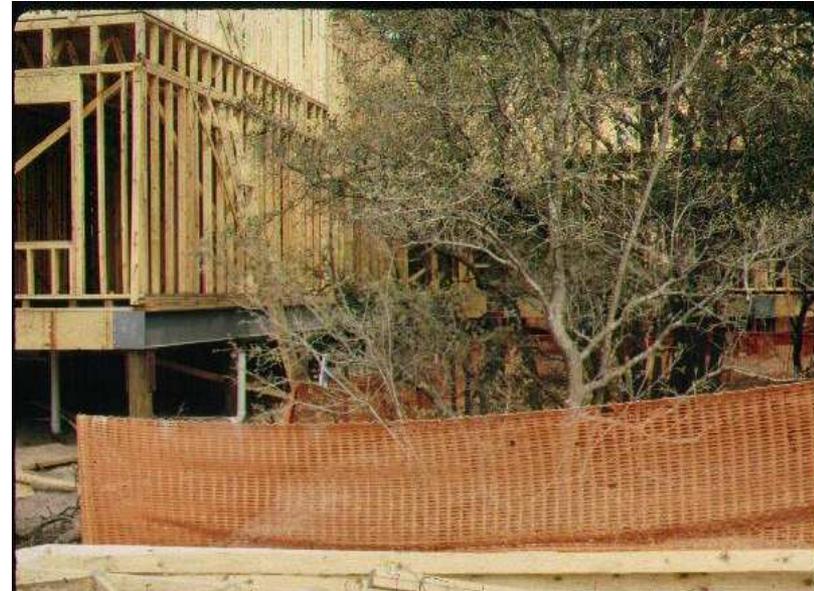


ESCH Organization

- **Definition**
- **Purpose**
- **Condition where practice applies**
- **Planning considerations**
- **Design criteria**
- **Construction specifications**
- **Maintenance**

Safety Fence (3.01)

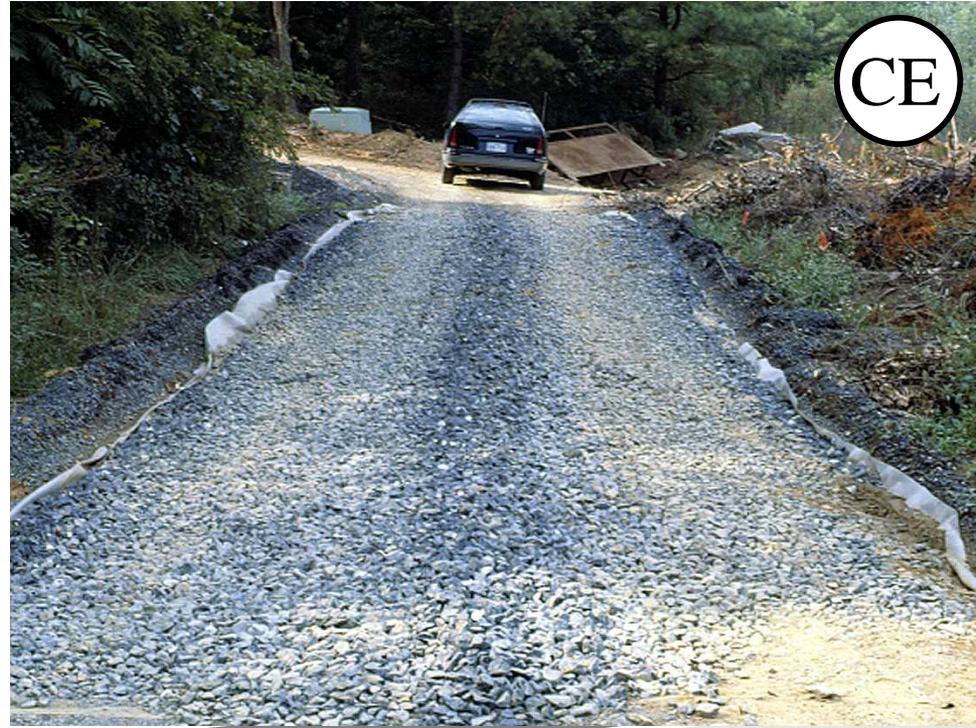
- A protective barrier installed to prohibit the undesirable access to a construction site
- Can be installed completely around the perimeter of the site or protect areas to be left undisturbed
- Usually constructed of plastic or galvanized wire





Construction Entrance (3.02)

- A stabilized stone pad with a filter fabric underliner
- Located at points of vehicular ingress and egress. Should be @ least 70 feet long
- Used to reduce the amt. of mud transported onto paved public roads by motor vehicles or runoff.
- MS-17; MS-18







Construction Road Stabilization **(3.03)**

- **Temporary stone stabilization of access roads, subdivision streets, parking areas and other traffic areas immediately after grading**
- **Prevents erosion and re-grading**
- **MS-17**





Straw Bale Barrier (3.04)

- A temporary sediment barrier composed of entrenched and anchored straw bales placed across or at the toe of a slope
- To intercept and detain small amounts of sediment from sheet flow
- Limited to 1/4 acre of drainage area per 100 ft.
- Maximum effective life - 3 months
- MS-4; MS-18. MS-3 (post removal)









Silt Fence (3.05)

- **A temporary sediment barrier with fabric stretched across and attached to posts and entrenched**
- **Used to intercept and detain small amounts of sediment from sheet flow**
- **Decrease the velocity of sheet flows and rill erosion or small concentrated flows (1 cfs max.)**
- **Limited to 1/4 acre of drainage per 100 ft.**
- **Maximum effective life - 6 months**
- **Requires constant maintenance and clean-out**
- **MS-4; MS-18**

Silt Fence



Silt Fence (3.05)

- Typically placed on contour
- Installed as a “first step” perimeter controls in land-disturbance





Clean out when sediment
is $1/2$ the height of the
silt fence.





27/11/2006



MS-18



Storm Drain Inlet Protection (3.07)

- A sediment filter or an excavated impounding area around a drop inlet or curb inlet
- Used to prevent sediment from entering storm drainage systems
- Prior to permanent stabilization
- Limited to drainage areas < 1 acre
- MS-10; MS-18





Curb Inlet



Curb Inlet



Anchor

Weir Opening

Spacer















Culvert Inlet Protection (3.08)

- To prevent sediment from entering, accumulating in and being transferred by the culvert.
- To provide erosion control at the storm sewer culvert inlets during elevation and drainage patterns change
- MS-10; MS-18

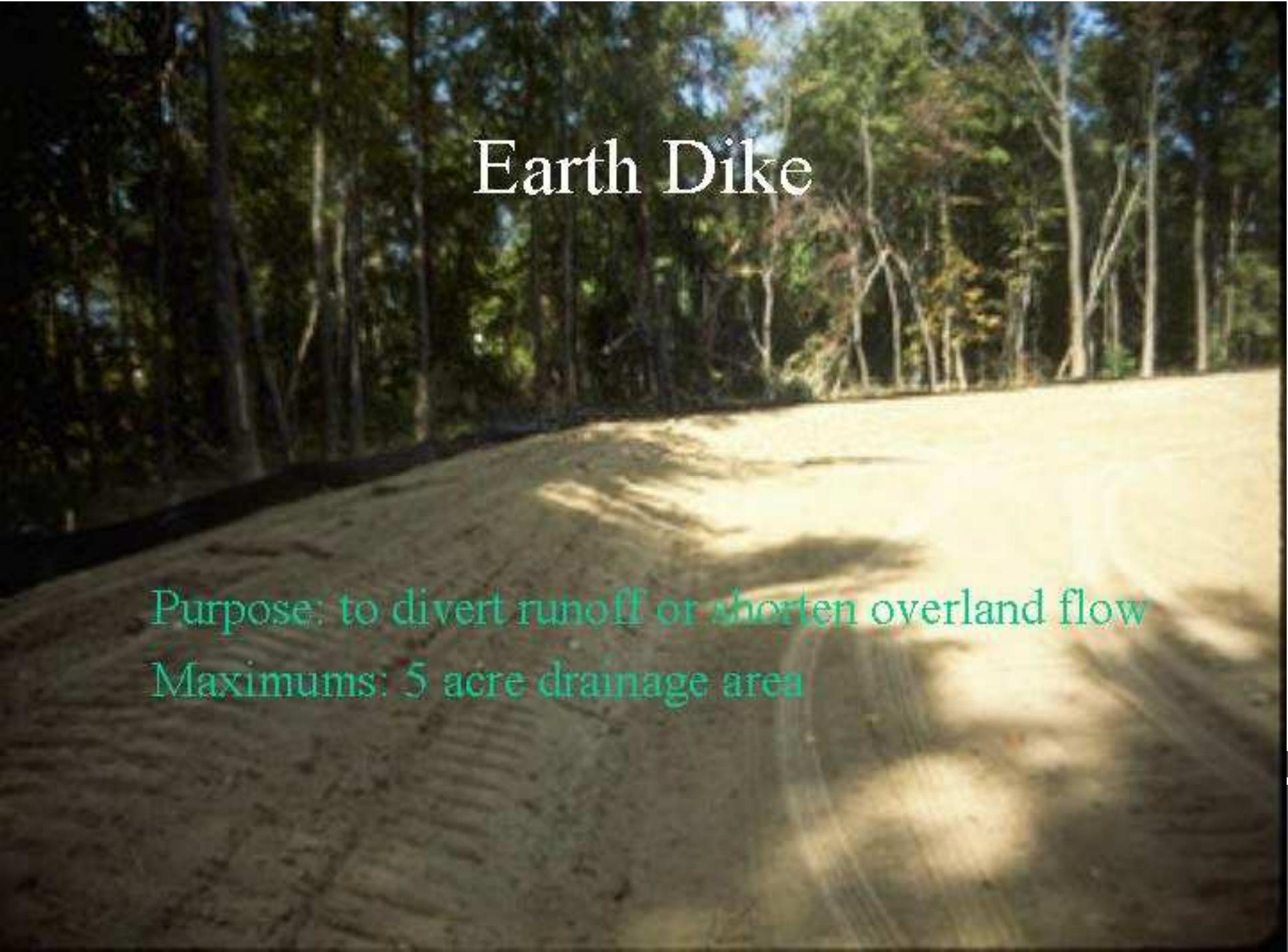




Temporary Diversion Dike (3.09)

- A temporary ridge of compacted soil to divert storm runoff from upslope drainage areas away from unprotected disturbed areas and slopes
- Stabilized immediately after construction
- To a stabilized outlet or divert to sediment-trapping structure
- Maximum life - 18 months
- Maximum drainage area - 5 acres
- MS-4; MS-5; MS-11; (MS-6; MS-7; MS-8)

Earth Dike



Purpose: to divert runoff or shorten overland flow

Maximums: 5 acre drainage area

Temporary Fill Diversion (3.10)

- **A channel with a supporting ridge of soil on the lower side**
- **Constructed along the top of an active earth fill at the end of each day**
- **To divert storm runoff away from the unprotected slope of the fill**
- **To a stabilized outlet or sediment-trapping facility**
- **Maximum effective life is one week**
- **MS-7; MS-8; MS-11**





Right-of-Way Diversion (3.11)

- **A ridge of compacted soil or loose rock or gravel constructed across disturbed rights-of-way and similar sloping areas**
- **To shorten the flow length within a sloping right-of-way**
- **Reducing the erosion potential by diverting storm runoff to a stabilized outlet.**
- **Gravel structures where vehicles travel**
- **MS-11**





Diversion (3.12)

- A permanent channel constructed across a slope with a supporting earthen ridge on the lower side
- To reduce slope length and to intercept stormwater
- To divert stormwater runoff to stabilized outlets at non-erosive velocities
- Designed to convey the runoff from a 10 year storm
- MS-11; MS-19; MS-4; MS-5



Temporary Sediment Trap (3.13)

- A ponded area formed by constructing an earthen embankment with a stone outlet across a drainage swale
- Stabilize immediately after construction
- Used to detain sediment-laden runoff from small disturbed areas long enough to allow most of the suspended solids to settle out
- Maximum drainage area - less than 3 acres
- Max effective life – 18 months
- MS-6; MS-4; MS-18



Temporary Sediment Basin (3.14)

- **A temporary barrier or dam with a stormwater release controlled structure**
- **Constructed of an embankment of compacted soil across a drainage way**
- **Used to detain sediment-laden runoff from disturbed areas long enough for most of the sediment to settle**
- **Required for drainage areas 3 acres and greater**
- **MS-6; MS-4; MS-18**

Sediment Basin

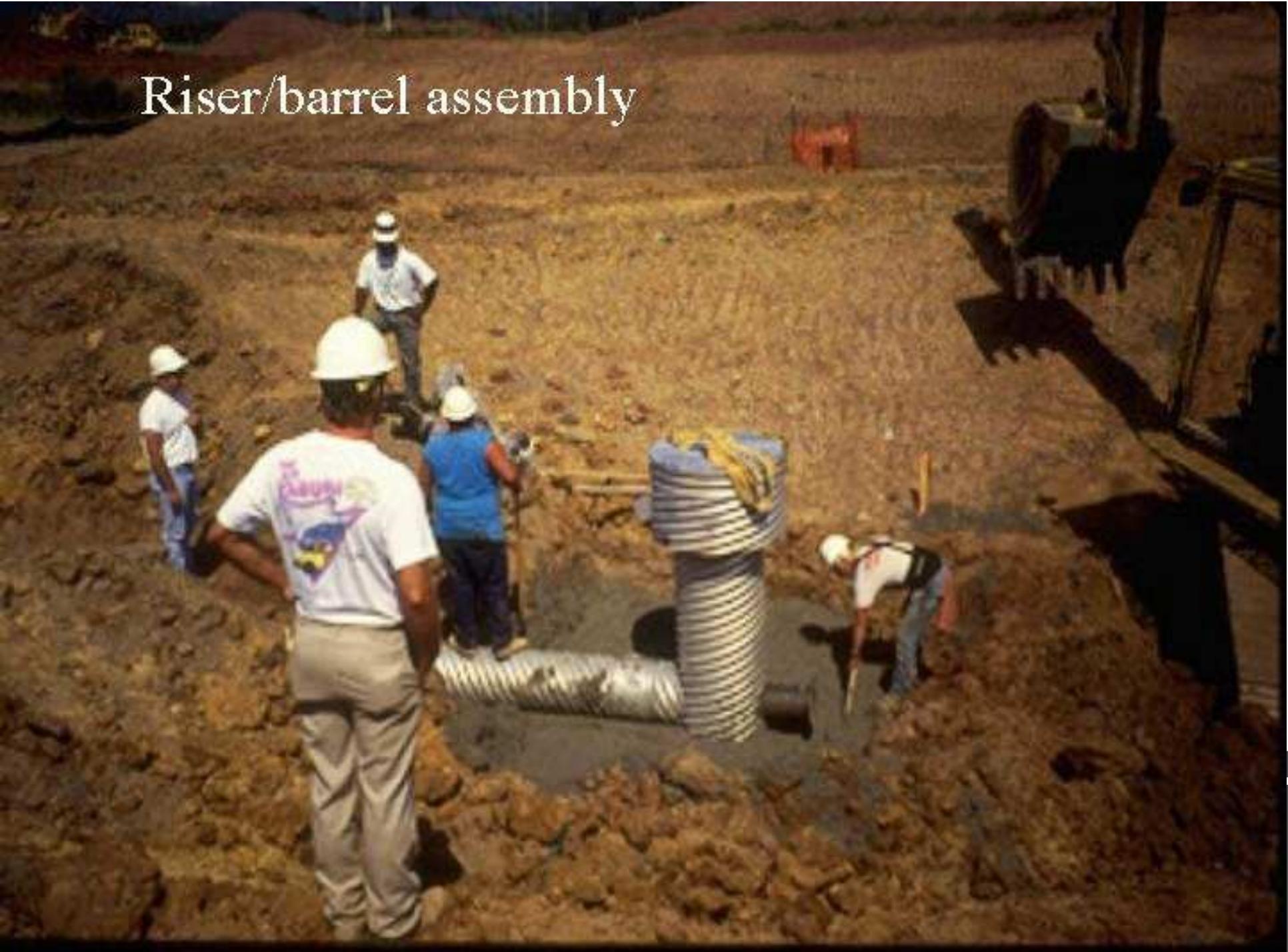
Earth Dike

Inflow Protection

Principal
Spillway



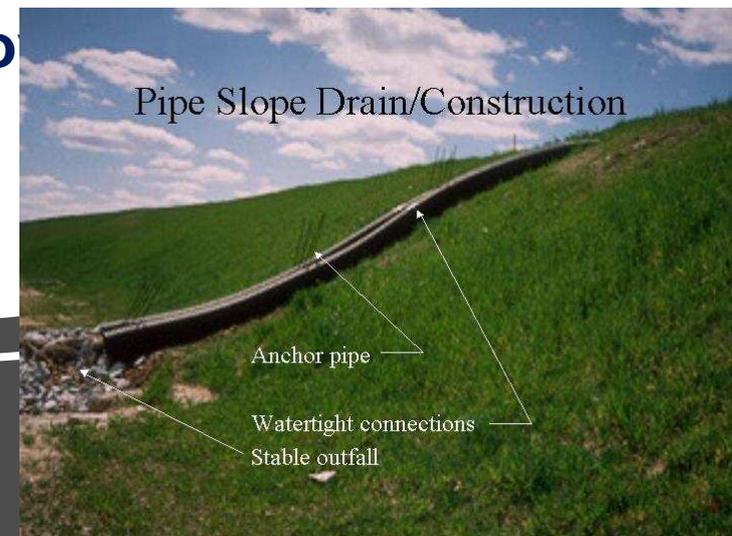
Riser/barrel assembly





Temporary Slope Drain (3.15)

- A flexible tubing or conduit
- Extending from the top to the bottom of a cut or fill slope
- To temporarily conduct concentrated stormwater runoff safely down the face of a cut or fill slope
- Without causing erosion on or below
- MS-8; MS10; MS-11





Purpose: to safely convey runoff down the face of a steep slope

Pipe Slope Drain/Construction

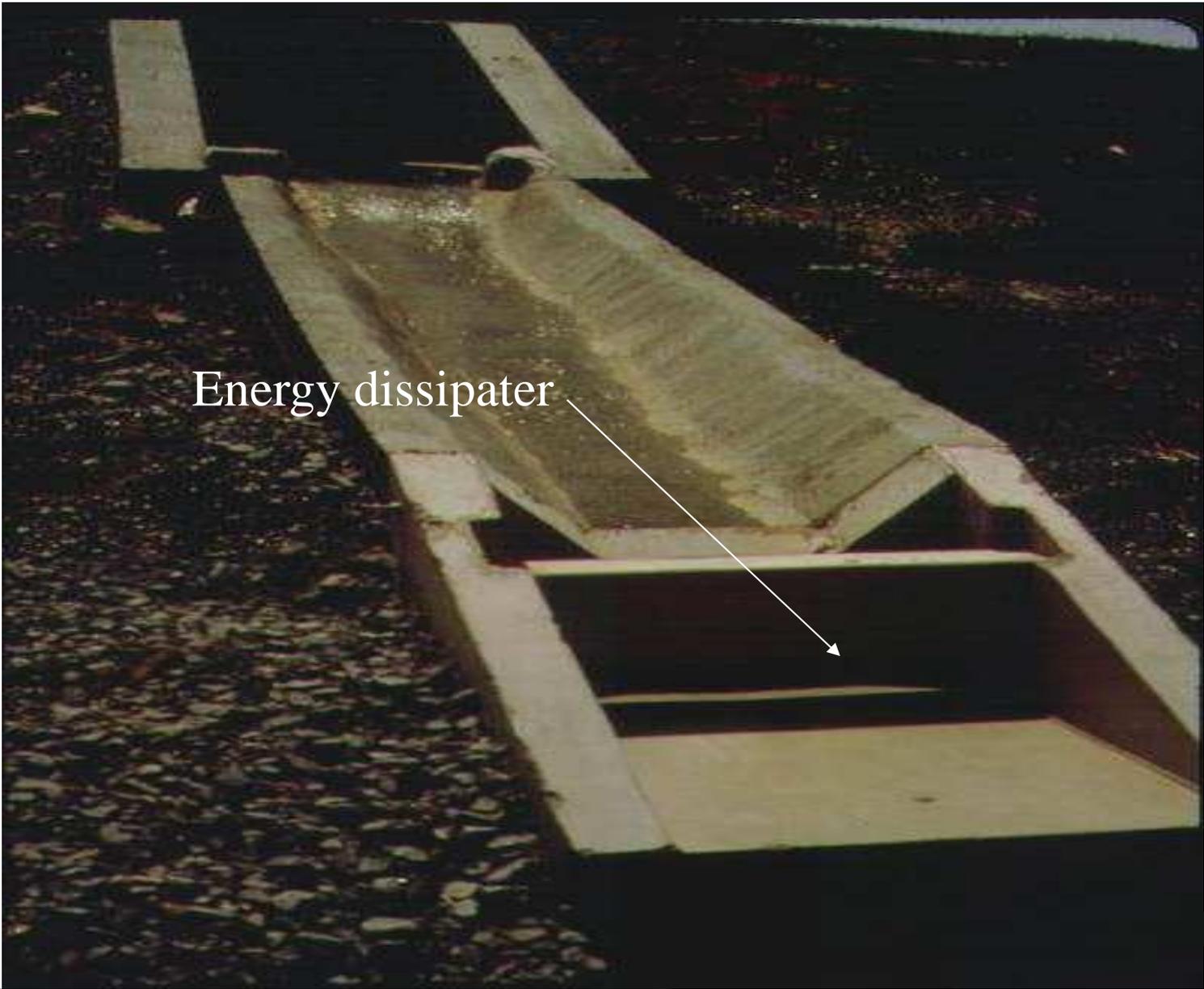




Paved Flume (3.16)

- **A permanent paved channel constructed on a slope**
- **To conduct stormwater runoff safely down the face of a slope**
- **Without causing erosion problems on or below the slope.**
- **Must convey runoff from 10 year storm**
- **MS-8; MS-19**





Energy dissipater



Stormwater Conveyance Channel

(3.17)

- **A permanent, designed waterway, shaped, sized, and lined with appropriate vegetation or structural lining**
- **Used to safely convey stormwater runoff from a 10 year storm to a receiving channel without damage from erosion.**
- **Needs outlet protection if it empties into a natural stream to prevent erosion**
- **MS-11 & 19; MS-5 & 14**





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Gabion Channel





Outlet Protection (3.18)

- Structurally lined aprons
- Placed at the outlet of pipe or paved channel to reduce erosion and under-cutting from scouring at stormwater outlets
- Apron must be constructed with no slope along its length (0% grade)
- MS-11











Riprap(3.19)

- A permanent large, loose, angular stone with filter fabric or granular underlining
- Used to protect the soil from the erosive forces of concentrated runoff
- Slow the velocity of concentrated runoff while enhancing the potential for infiltration
- Utilized to stabilize slopes with seepage problems and/or non-cohesive soils
- **MS-11 & MS-19; MS-7 & MS-9**

RR





Rock Check Dam (3.20)

- **Small temporary stone dams constructed across a swale or drainage ditch**
- **To reduce the velocity of concentrated stormwater flows and erosion of the swale or ditch**
- **This practice may also traps sediment by ponding of the stormwater runoff**
- **Not to be used in a live stream**
- **MS-4; MS5; MS-18**



Stone Check Dam

Stone weirs constructed in channels
to reduce velocity

Stone Check Dam





Temporary Vehicular Stream Crossing (3.24)

- **A temporary structural span installed across a flowing watercourse to be used by construction vehicle without damaging the channel or banks**
- **To keep sediment generated by construction vehicles out of the stream.**
- **To flowing streams with drainage areas less than 1 square mile**
- **MS-13**



SC





Utility Stream Crossing (3.25)

- For crossing small waterways when in-stream utility construction is involved
- To help protect sediment from entering the stream
- To minimize the amount of disturbance within the stream itself
- Applicable to flowing streams with drainage areas less than 1 square mile
- MS-12; MS-13







Dewatering Structure (3.26)

- A temporary settling and filter device for water being pumped from trenches, basins, traps or other areas which contains sediment laden water
- May be constructed of straw bales and filter fabric, portable boxes or tanks
- Must be sized according to pump capacity in cfs
- MS-11; MS-16c; MS-19







DS





Turbidity Curtain (3.27)

- **A floating geo-textile material which minimizes sediment transport from a disturbed area adjacent to or within a body of water**
- **Used in non-tidal and tidal watercourses**
- **Keeps sediment limited to a confined area until it settles out**
- **Should not be installed across channel flows**
- **MS-12; MS-14**



Dust Control (3.39)

- ***Most common method to control is spray water.***
- ***Phased clearing/grading can significantly reduce dust.***
- ***Additional options include other temporary stabilization.***

