WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division Of Highways

1900 Kanawha Boulevard East • Building Five • Room 110

Bob Wise
Governor

Charleston, West Virginia 25305-0440 • 304/558-3505

Fred VanKirk, P. E.
Secretary/Commissioner

October 1, 2004

M E M O R A N D U M

TO: ALL HOLDERS OF THE EROSION AND SEDIMENT CONTROL MANUAL

FROM: JAMES E. SOTHEN, DIRECTOR
ENGINEERING DIVISION

SUBJECT: ADDENDUM 1 TO THE 2003
EROSION AND SEDIMENT CONTROL MANUAL

Attached for your use is Addendum 1 to the 2003 Erosion and Sediment Control Manual. This addendum is necessary to revise the West Virginia Department of Transportation, Division of Highways, Erosion and Sediment Control Manual, dated March 1, 2003.

Also included in this package are the sections of the Erosion and Sediment Control Manual that are affected. The revisions are as follows:

- Remove and destroy the existing Section 20, Temporary erosion and Sediment Control Features, dated March 1, 2003 and replace it with the attached revised Section 20, Temporary erosion and Sediment Control Features, dated September 1, 2004.

- Remove and destroy the existing Section 30, Design, dated March 1, 2003 and replace it with the attached revised Section 20, Design, dated September 1, 2004.

JES:Lf

Attachments

SECTION

20

TEMPORARY EROSION AND

SEDIMENT CONTROL FEATURES

20 - TEMPORARY EROSION AND SEDIMENT CONTROL FEATURES:

The principle effect highway development projects have on the natural geologic erosion process consists of temporarily exposing disturbed soils to precipitation and to surface runoff. This exposure of the soil and resulting reshaping of the topography can create situations where detrimental erosion and sediment may temporarily occur.

This section will give a detailed description as well as typical details of applicable temporary erosion and sediment control features. Applicable features will be defined in terms of description, purpose, conditions where applicable, design criteria, and construction methods.

Temporary erosion and sediment control features may be divided into three groups as follows:

- Vegetative soil stabilization methods;
- Water conveyance and energy dissipation; and
- Sediment basins.

The first two groups are used to limit erosion. The last group is used to control, not contain, the sedimentation process to limit the deposition of off-site sediment in streams, ponds, lakes, rivers, etc.

20.1 - VEGETATIVE SOIL STABILIZATION METHODS:

This work shall cover all operations incidental to the establishment of grass and legume vegetation, including the furnishing and sowing of seed, furnishing and applying fertilizer, agricultural limestone, and mulch material.

Seeding and mulching shall be preformed on all cut and fill slopes, including cut and fill slopes associated with waste sites and borrow sites, during the construction process. The seeding and mulching of these exposed and/or disturbed areas as quickly as possible is essential for proper erosion and sediment control. When using straw or hay mulch, the sequence of application shall be as follows: (1) Seed and fertilizer shall be sown prior to mulching. (2) Mulch and mulch binder shall be placed within 24 hours of sowing seed.

All additional disturbed areas such as diversion ditches, sediment basins, areas around sediment structures, haul road cut and fill slopes, cleared and grubbed areas, storage areas, batch plant locations, etc., shall be seeded and mulched as quickly as possible following disturbance to minimize erosion.

Any areas failing to establish a satisfactory stand of grass due to weather conditions, adverse soil conditions, or due to erosion, shall be reseeded, fertilized, and mulched as defined in the Specifications.

Seeding and mulching of all disturbed areas shall be done at a minimum of once every 14 days unless otherwise noted in the plans. When all construction activities in an area is planned to cease for more than 14 days, that area shall be seeded and mulched within seven days.

All cut slope bench areas shall be seeded and mulched after completion of each bench, regardless of height.

All disturbed areas such as diversion ditches, sediment control structures, haul road slopes, etc., are to be seeded and mulched upon completion of each operation, including maintenance of such areas or within one week of completion of each operation, including maintenance.

Refer to Section 642 and 652 of the Standard Specifications and all applicable project special provision for details on application rates, mixtures, type, planting seasons, etc., for seed, mulch and fertilizer items.

20.2 - WATER CONVEYANCE AND ENERGY DISSIPATION:

These measures are used to divert, slow down, or convey storm runoff from or away from disturbed areas to stabilized controlled outlets. Through the use of these measures, erosion and its resulting sediment can be reduced. This group includes measures such as temporary berms, slope drains, temporary pipe, contour ditches, ditch checks, diversions, sediment traps, etc.

20.2.1 - TEMPORARY BERMS:

20.2.1.1 - Definition: A temporary ridge of compacted soil, with or without a shallow ditch, used to divert water flow.

20.2.1.2 - Purpose: To divert storm runoff from a recently constructed erodible area to a controlled, stabilized release point.

20.2.1.3 - Conditions Where Applicable: At the top of newly constructed erodible embankment slopes. Three types of temporary berms will be utilized under conditions listed below:

20.2.1.3.1 - Type "A" Berm:

a) At the end of each day's operations on embankments.

20.2.1.3.2 - Type "B" Berm:

a) When embankment operations are shut down over the winter season.

b) When the embankment reaches final elevation and fine grading is not expected to begin within a one-week period on that embankment.

c) When the fill slope just adjacent to the grade has been seeded and work is not expected to begin again on that embankment for at least one week.

d) When work is to be discontinued for at least a month on that embankment. Temporary seeding and mulching of the berm must be done it will remain in place longer than 30 days.

20.2.1.3.3 - Transverse Berms:

a) Are used to intercept water flow across the roadbed when grades in excess of one (1) percent are encountered. They are used to direct the water flow to a point where temporary or permanent slope drains will carry it over the fill slope.

b) They are to be constructed at a 10^0 minimum angle to a Type A or B berm. Transverse berms are to be placed at a maximum of 500 foot ***(150 m)*** spacing and immediately down station to the placement of a slope drain.

20.2.1.4 - Design Criteria: None. The construction details are shown on **Figure 20.2.1.**

20.2.1.5 - Construction Methods:

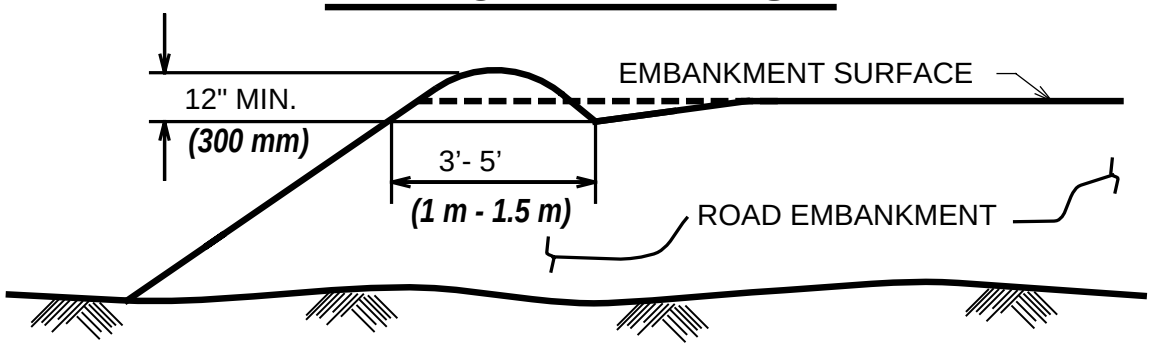
20.2.1.5.1 - Type "A" Berm: Type "A" Berms will be constructed to the approximate dimensions as shown on Figure 20.2.1. These berms will be machined compacted with a minimum of one pass over the entire width of the berm with a dozer track, grader wheel, etc.

20.2.1.5.2 - Type "B" Berm: Type "B" Berms will be constructed to the approximate dimensions as shown on Figure 20.2.1. These berms will be machine compacted with a minimum of 3 passes over the entire width of the berm with a dozer track, grader wheel, etc.

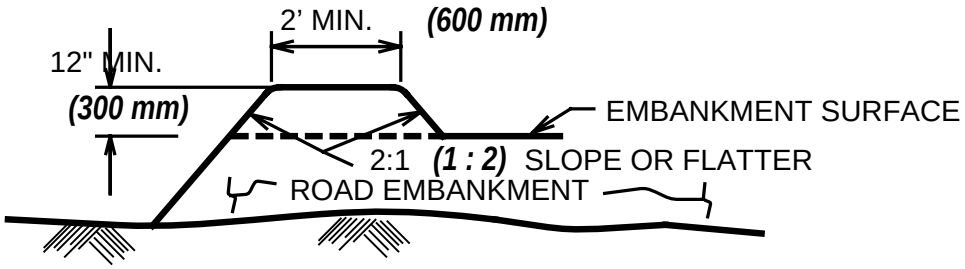
20.2.1.5.3 - Transverse Berms: Transverse Berms will be constructed to the approximate dimensions as shown on Figure 20.2.1. These berms will be machine compacted to the minimum number of passes over the entire width of the berm as the type of berm it is being used in conjunction with as described above.

20.2.1.5.4 - General: Temporary berms must have a positive grade draining to a compacted outlet. The area adjacent to the temporary berm in the vicinity of the outlet must be properly graded in order for the temporary berm/outlet combination to function efficiently. All transverse berms required to be on the downstream side of a temporary berm outlet will extend across the grade to the highest point at approximately a 10^o angle with a line perpendicular to the centerline. The top width may be wider and the side slopes flatter on transverse berms to allow equipment to pass over with minimal disruption. When practical and until final roadway elevations are approved, embankments may be constructed with a gradual slope to one side of the embankment to permit placement of temporary berms on only one side of the embankment.

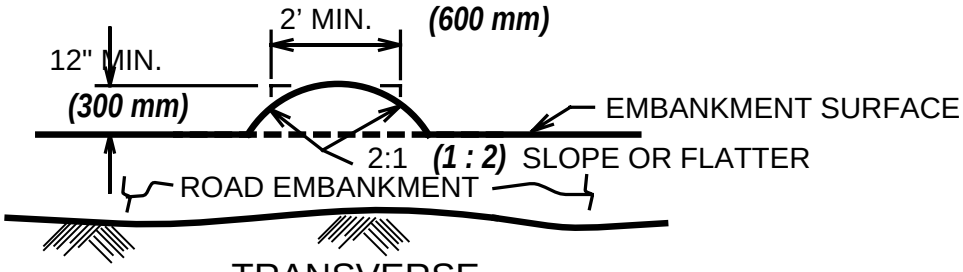
TEMPORARY BERMS



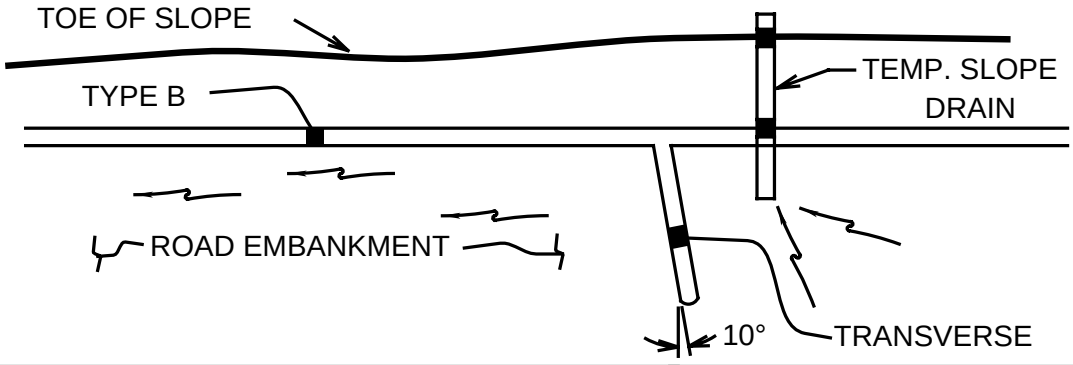
TYPE A



TYPE B



TRANSVERSE



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.1

20.2.2 - SLOPE DRAINS:

20.2.2.1 - Definition: A facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, metal pipe, plastic pipe, flexible rubber pipe, etc., used to transport water down slopes.

20.2.2.2 - Purpose: To transport collected water from cuts and fills down slopes prior to installation of permanent facilities and/or adequate vegetative cover on the slopes.

20.2.2.3 - Conditions Where Applicable: Slope drains are required at all outlets of temporary berms to carry water flowing on fill slopes. Also, they are required at all cut/fill transitions prior to the time permanent facilities are installed. If a gutter type slope drain is used, it should be placed to coincide with a permanent gutter if possible.

20.2.2.4 - Design Criteria: Slope drains should be placed at a maximum spacing of 250 feet ***(75 m)*** when draining temporary berms.

1) Use a conduit or gutter in accordance with Table 20.2.2.4 A ***(20.2.2.4 B)*.**

2) Fiber matting and plastic sheeting should not be utilized on slopes steeper than 4:1 ***(1:4)*** except for short distances, 20 feet ***(6 m)*** or less, where water cannot reach erosive velocities.

3) Minimum bottom width of a temporary gutter will be 2 foot ***(600 mm)*** with a minimum depth of 8 inches ***(200 mm)*** with 2:1 ***(1:2)*** side slopes.

Where slope drains are required at the end of cut sections it may be necessary to increase the size of the pipe, or gutter to accommodate a greater flow if the area to be drained exceeds 5 acres ***(2 ha)***. Table 20.2.2.4 A can be used as a guideline for the sizes required when the drainage area is less than 5 acres; while Table 20.2.2.4 B can be utilized for sizes when the drainage area is less than 2 ha. For drainage areas greater than 5 acres ***(2 ha)*** the sizing of slope drains shall be in accordance with 20.2.3.4.

DRAINAGE AREA (Acres)	CORRUGATED PIPE SIZE (Inches)	GUTTERS (Inches)	
		Depth	Width
0 – 1.5	12	8	24
1.5 – 3.0	15	12	24
3.0 - 5.0	18	12	48

TABLE 20.2.2.4 A

DRAINAGE AREA *(ha)*	CORRUGATED PIPE SIZE *(mm)*	GUTTERS *(mm)*	
		Depth	Width
0 – 0.6	*300*	*200*	*600*
0.6 – 1.2	*375*	*300*	*600*
1.2 - 2.0	*450*	*300*	*1200*

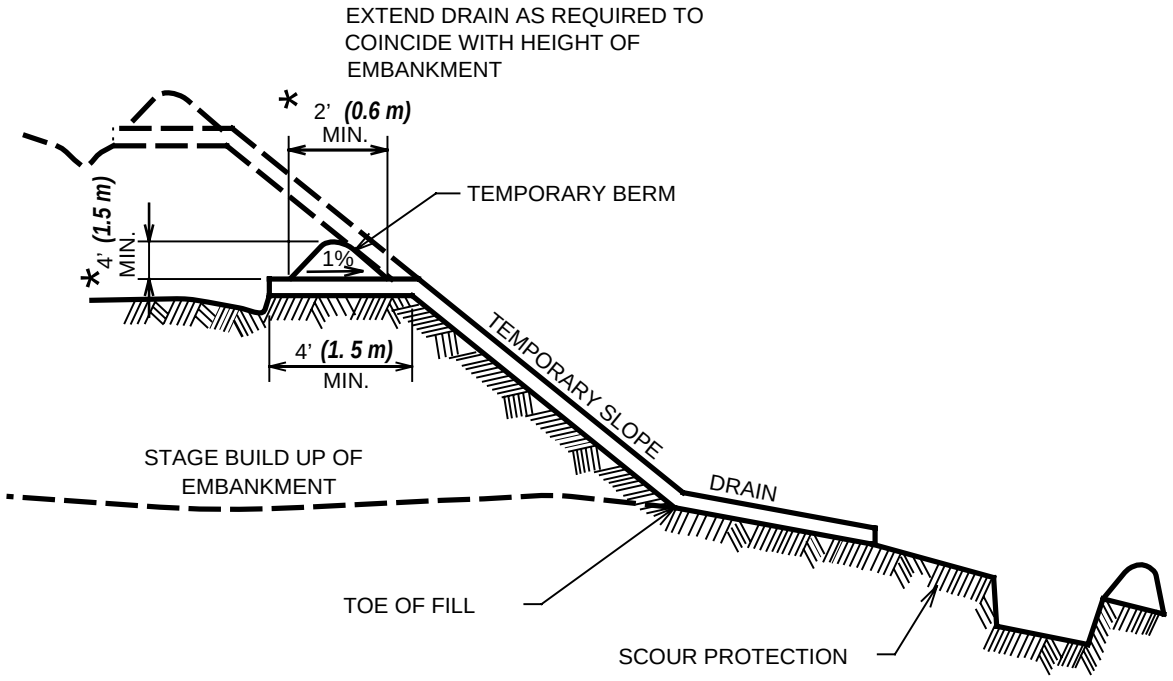
TABLE 20.2.2.4 B

20.2.2.5 - Construction Methods: Temporary slope drains must be adequately anchored to the slope to prevent disruption by the force of the water flowing in these drains.

Anchors are to be placed at the pipe joints. Method of anchoring is to be submitted and approved by the Project Supervisor.

The outlet end of temporary slope drains must have a method of dissipating the energy of transported water to prevent downstream erosion. An ideal dissipater would be dumped rock gutter and/or a sediment basin that would slow the water as well as retain sediment (Figure 20.2.2.5).

TEMPORARY SLOPE DRAIN



NOTES:

1. TEMPORARY SLOPE DRAIN TO BE ANCHORED TO EMBANKMENT.

2. ROCK GUTTER OR CONTOUR DITCH MAY ALSO BE UTILIZED TO DIRECT STORM WATER.

3. SEE TABLE 1 & 2 FOR TEMPORARY SLOPE DRAIN SIZE.

* 4. THE AMOUNT OF COVER PLACED ON THE SLOPE DRAIN SHALL BE ADEQUATE TO SECURE THE PIPE.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.2.5

20.2.3 - TEMPORARY PIPE:

20.2.3.1 - Definition: A conduit utilized to carry water under a haul road.

20.2.3.2 - Purpose: To prevent equipment from coming in direct contact with water when crossing an active stream, intermittent stream or ephemeral stream created during heavy rainfall.

20.2.3.3 - Conditions Where Applicable: In streams that must be crossed by equipment or low areas that may become streams during heavy rainfall that are traversed by equipment.

20.2.3.4 - Design Criteria: The Contractor shall provide documentation to the Project Supervisor that Corps of Engineers Section 404 requirements have been satisfied prior to placing any temporary pipe in a stream. The temporary pipe shall be sized to handle a 1-year/24-hour storm event.

For drainage areas greater than 10 Acres ***(4 ha)*** or if the assumptions listed for Table 20.2.3.4 are not applicable, the Contractor shall submit the hydraulic calculations for sizing of temporary pipes as a part of the Erosion and Sediment Control Plan.

The following table is to be used as a guide for sizing temporary pipes utilizing the SCS Method. The following assumptions were used to develop the table:

24-Hour Precipitation = 2.5 inches ***(62.5 mm)***

Hydrologic Soil Group = C

Steep Slope (SCS Method Assumes 16%)

Curve Number Based On Cultivated Land: CN=78, Rounded to 80

Pipe Slope = 1% (The pipe slope is the minimum slope of any part or section of the pipe run.)

HW/D = 1

n = 0.024

A tail water condition does not exist.

AREA		DISCHARGE		PIPE SIZE	
Acres	*ha*	cfs	*cms*	Inches	*mm*
5	*2.0*	6	*0.17*	18	*450*
6	*2.4*	7	*0.20*	24	*600*
7	*2.8*	9	*0.25*	24	*600*
8	*3.2*	10	*0.28*	24	*600*
9	*3.6*	11	*0.31*	24	*600*
10	*4.0*	12	*0.34*	24	*600*

TABLE 20.2.3.4

20.2.3.5 - Construction Methods: All temporary pipes shall be installed in the same manner as permanent pipe as defined in Section 604 of the Standard Specifications. Crushed aggregate backfill is not required. Compaction testing will not be required. However; at a minimum, the inlet end of the pipe shall be protected to prevent erosion.

20.2.4 - CONTOUR DITCHES:

20.2.4.1 - Definition: A channel constructed either across, at the top, at the midpoint, or at the toe of a slope.

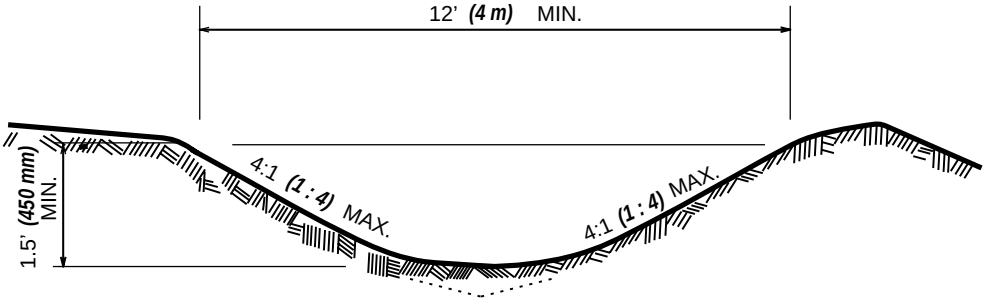
20.2.4.2 - Purpose: To intercept and convey water at non-erosive velocities to an adequate and stable outlet.

20.2.4.3 - Conditions Where Applicable: Contour ditches are utilized to convey sediment laden storm water to a sediment trapping structure. Contour ditching can also be utilized at the top of cut slopes to divert "clean" water away from the project thereby reducing the necessary capacities of sediment basins.

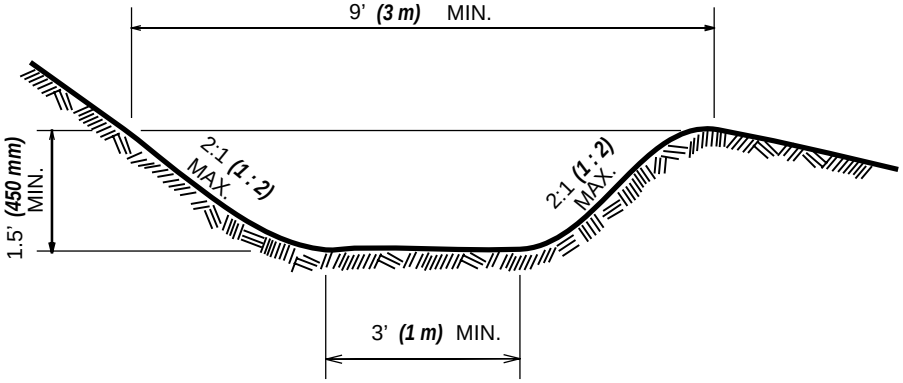
20.2.4.4 - Design Criteria: None. The construction details are shown on Figure 20.2.4.4.

20.2.4.5 - Construction Methods: Care must be taken to outlet contour ditches into adequately controlled, stabilized areas. All contour ditches are to be stabilized by seeding and mulching in accordance Section 642 and 652 of the Standard Specifications. It may be necessary to use matting and/or dumped rock gutter to stabilize contour ditches. If contour ditches are placed above the top of cut slopes, they should be set back a minimum of 10 feet *(3 m)*.

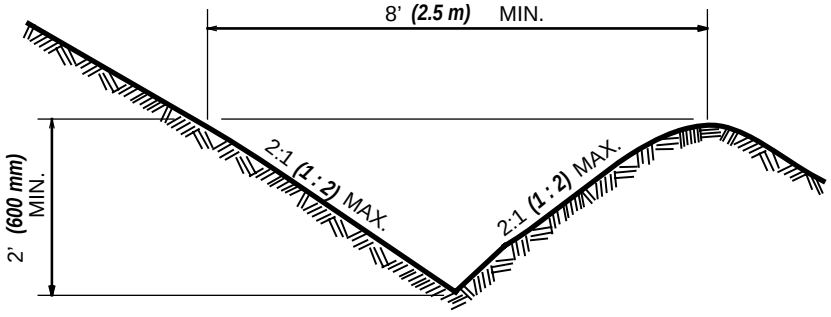
CONTOUR DITCHES



PARABOLIC



TRAPEZOIDAL



TRIANGULAR (VEE)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.4.4

20.2.5 - DITCH CHECKS:

20.2.5.1 - Definition: A barrier constructed of clean, non-erodible rock or other manufactured devices (i.e.; triangular site dikes, core logs, etc.) across a cut or median ditch.

20.2.5.2 - Purpose: The primary purpose is to control velocities thereby reducing erosion in the ditch.

20.2.5.3 - Conditions Where Applicable:

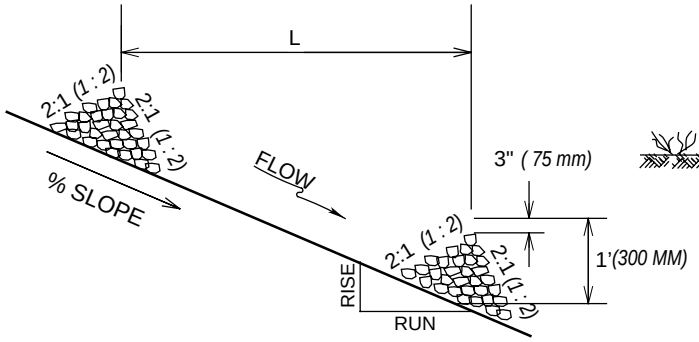
1) Constructed median ditches or cut ditches until a vegetative cover has been established and permanent structures (i.e.; dumped rock gutter) have been placed.

2) In natural drain ways (ephemeral streams) close to disturbed areas to catch initial sediment loads.

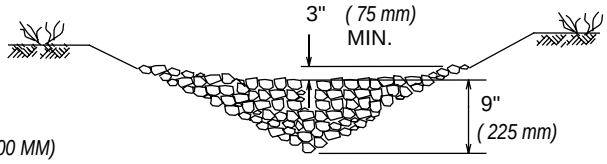
20.2.5.4 - Design Criteria: Care shall be taken to insure that the ditch check will not erode around the end. The elevation of the ditch check should be lowest at the center of the ditch. Refer to the details on Figure 20.2.5.4.

20.2.5.5 - Construction Methods: Construction of a rock ditch check is to follow the criteria shown on Figure 20.2.5.4. All other methods or materials utilized to construct ditch checks must be clearly illustrated in the Contractor's Erosion and Sediment Control Plan. The prefabricated ditch checks shall be installed as outlined in the manufacturer's instructions. These methods or materials can be reviewed and approved, approved with modifications, or disapproved in conjunction with the total plan.

SPACING OF DITCH CHECKS

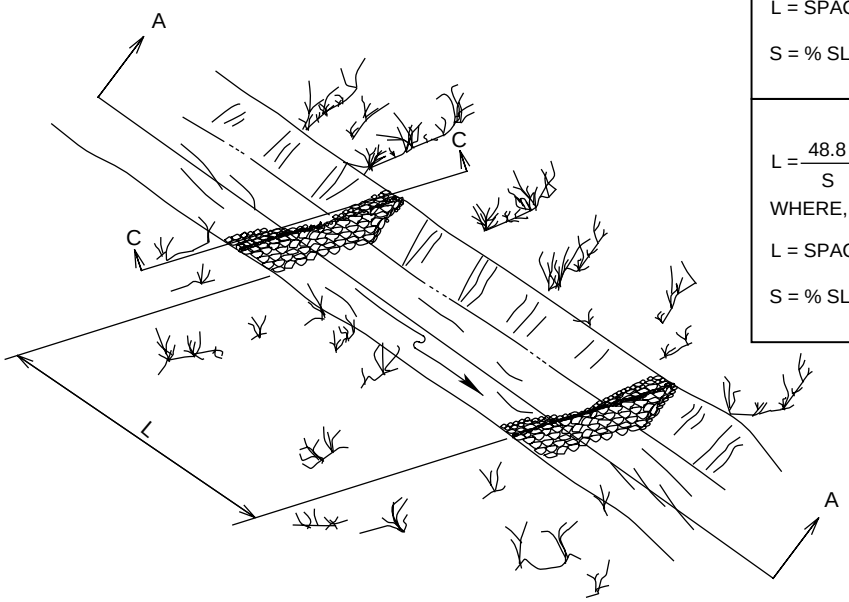


SECTION A-A



SECTION C-C

STONE DITCH CHECK



ENGLISH

$L = \frac{160}{S}$,WITH A 50' MAX

WHERE,

L = SPACING IN FEET

S = % SLOPE = $\frac{\text{RISE}}{\text{RUN}}$ X 100

METRIC

$L = \frac{48.8}{S}$,WITH A 15m MAX

WHERE,

L = SPACING IN METERS

S = % SLOPE = $\frac{\text{RISE}}{\text{RUN}}$ X 100

NOTE:
SPACING OF PREFABRICATED DITCH CHECKS SHALL BE THE SAME AS STONE DITCH CHECKS.

THE MINUMUM DITCH DEPTH IS 1' *(300 MM).*

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.5.4

20.2.6 – STORM WATER DIVERSIONS:

20.2.6.1 - Definition: Bales of hay or straw, silt fence, contour ditches, etc. used as a means of controlling erosion and directing sediment to a basin.

20.2.6.2 - Purpose: To reduce the velocities of water and direct and/or divert the flow of water to a slope drain, sediment basin, or other erosion control structure.

20.2.6.3 - Conditions Where Applicable: (Figure 20.2.6.3)

1) At the toe of embankment slopes.

2) At the top of cuts.

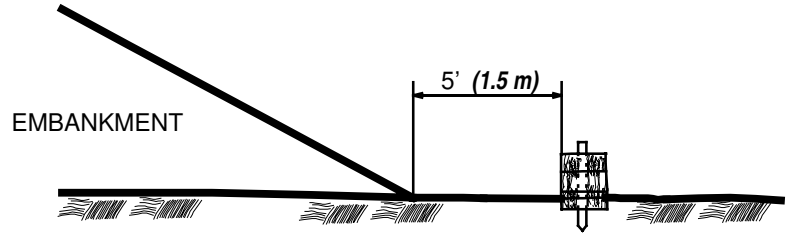
3) Across embankments once the embankment reaches 30 feet ***(10 m)*** in height. If the embankment has reached 30 feet ***(10 m)***, the diversions are to be placed at 15 feet ***(5 m)*** intervals.

4) On the lower side of cleared areas.

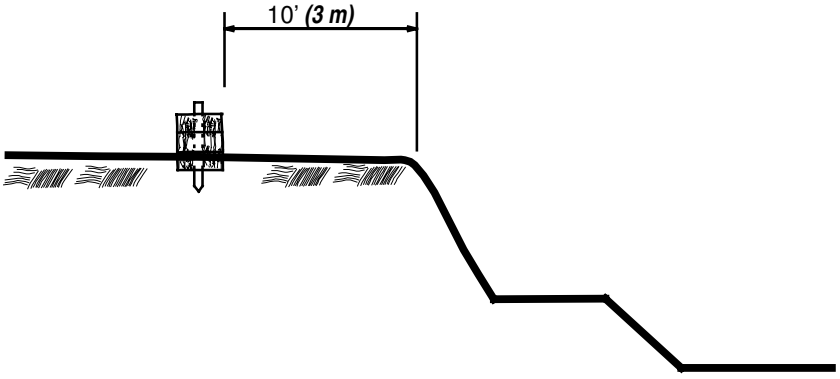
20.2.6.4 - Design Criteria: None.

20.2.6.5 - Construction Methods: Bales of hay or straw, or silt fence must be adequately trenched and braced into place as per Figures 20.2.6.5 A, B and C. The contour ditches are to be constructed in accordance with Figure 20.2.4.4. **BALES OF HAY OR STRAW AND SILT FENCE ARE NOT PERMITTED IN DITCH LINES BY SPECIFICATION.** Once the capacity of a diversion has been reduced by 50 percent, the accumulated sediment is to be removed and disposed of in an appropriate manner.

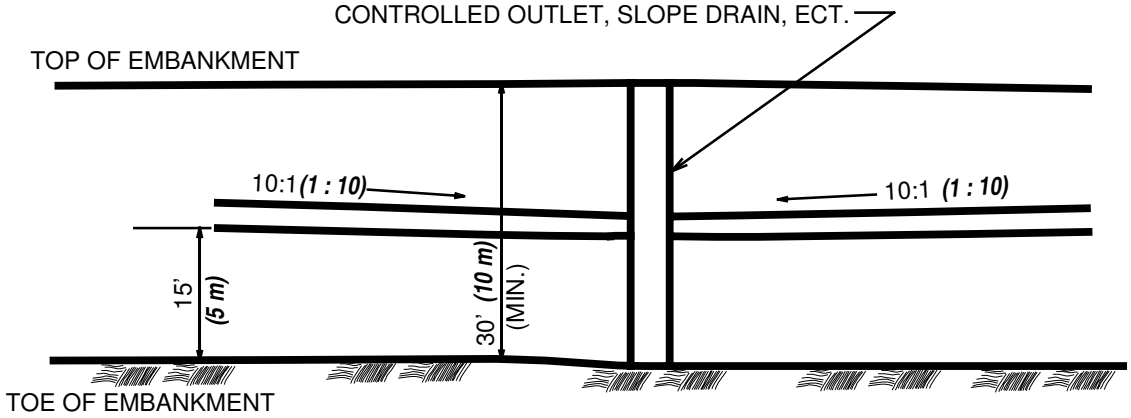
STORM WATER DIVERSIONS



TOE OF EMBANKMENT

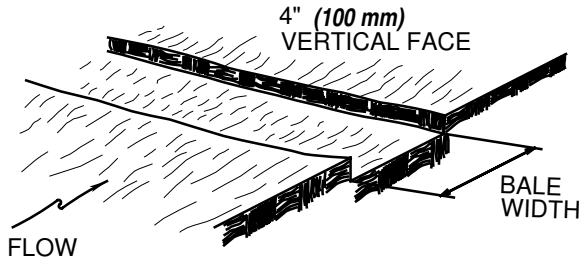


TOP OF CUTS

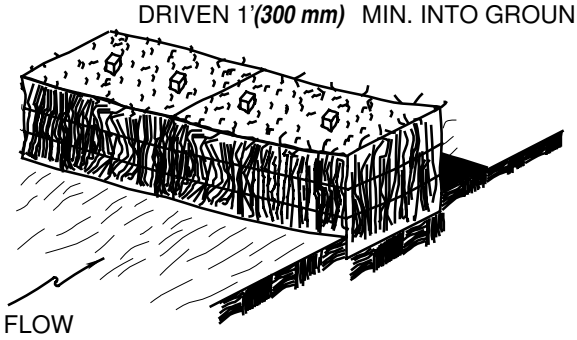


WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.6.3

STORM WATER DIVERSIONS

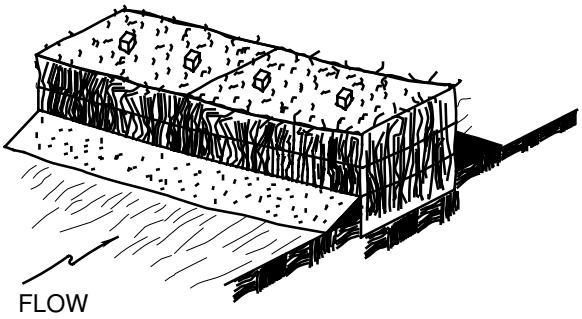


1. EXCAVATE THE TRENCH



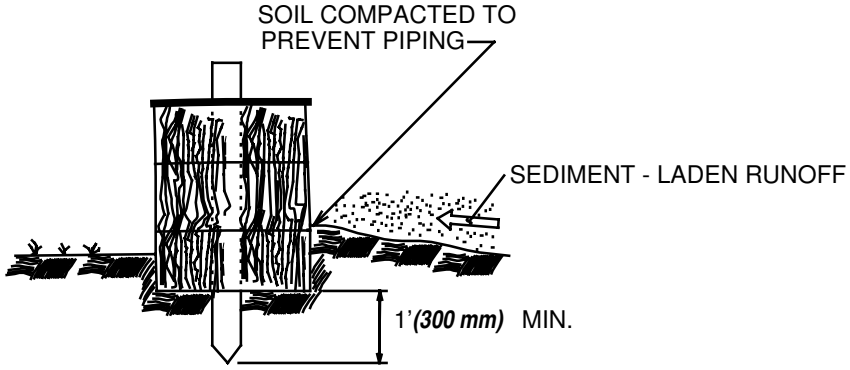
2.PLACE AND STAKE THE BALES

3. WEDGE LOOSE STRAW BETWEEN BALES



4. BACKFILL AND COMPACT THE EXCAVATED SOIL

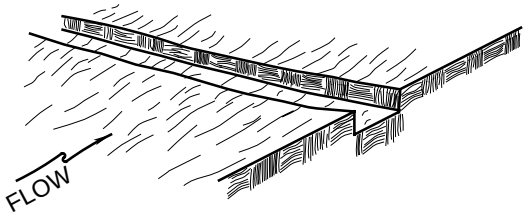
HAY OR STRAW BALE INSTALLATION SEQUENCE



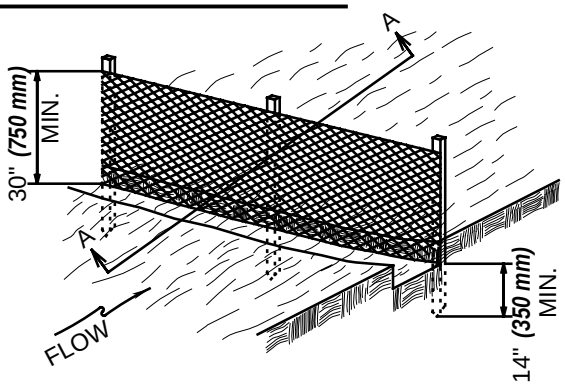
PROPERLY INSTALLED BALE

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.6.5A

STORM WATER DIVERSIONS

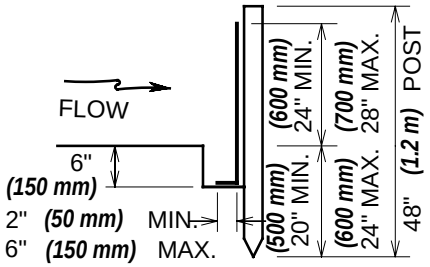


1. EXCAVATE 6" x 6" ***(150 mm x 150 mm)*** TRENCH

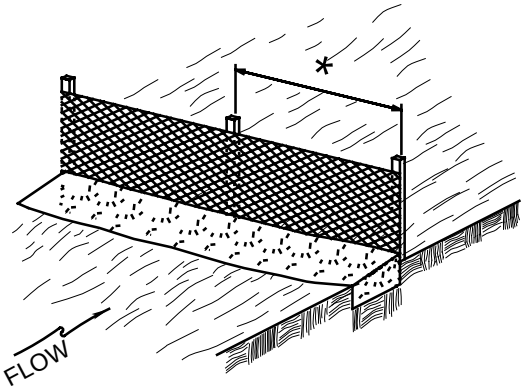


2. PLACE FENCE AT BACK EDGE OF TRENCH (FABRIC FACING DIRECTION OF FLOW)

3. DRIVE POST UNTIL FABRIC REACHES BOTTOM OF TRENCH



SECTION A-A



* SEE SPECIFICATIONS FOR REQUIRED POST SPACING.

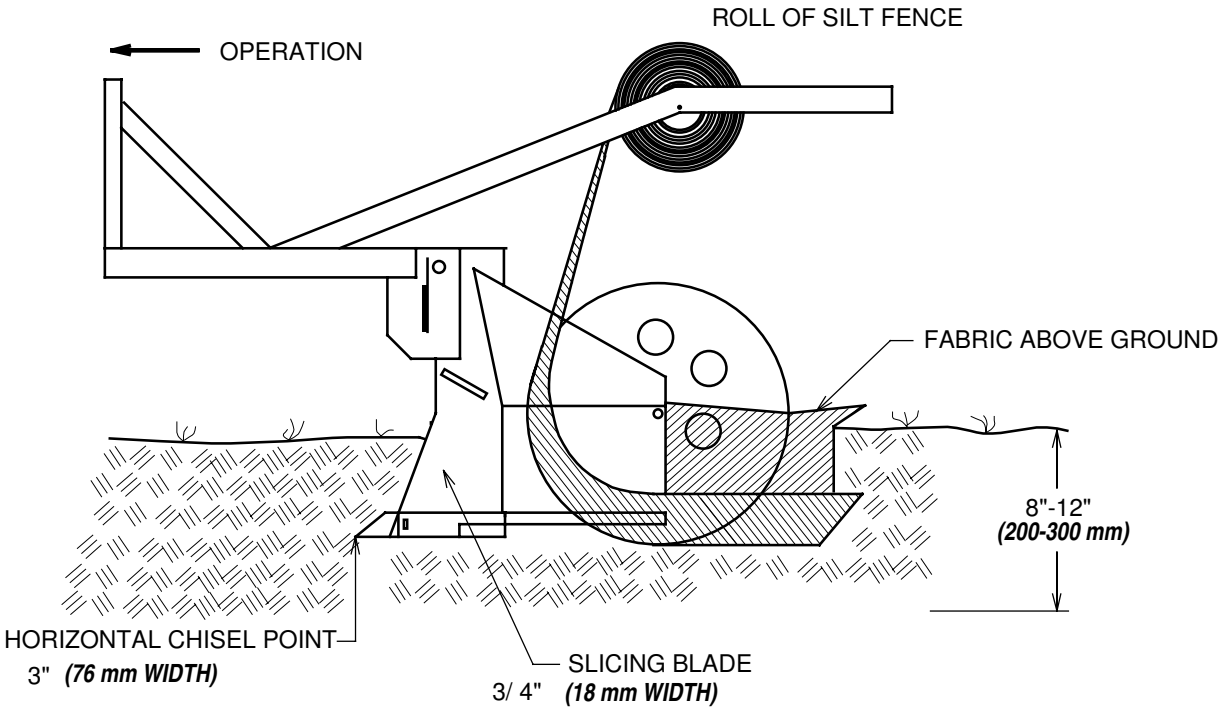
4. FILL TRENCH W/ EMBANKMENT & TAMP

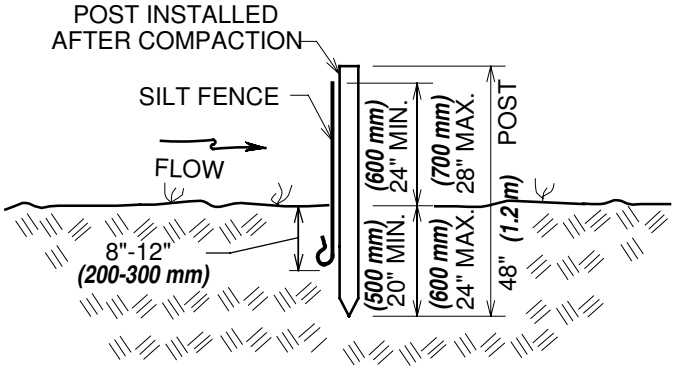
NOTE: WHEN MORE THAN ONE ROLL OF SILT FENCE IS USED, THE FENCE AT THE JUNCTURE MUST BE PLACED SO THAT THE LAST POST OF THE FIRST RUN & THE FIRST POST OF THE SECOND RUN OVERLAP & ARE TIED TOGETHER.

SILT FENCE INSTALLATION USING TRENCH METHOD

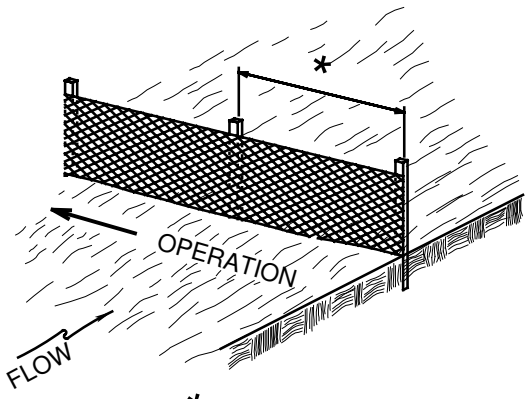
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.6.5B

STORM WATER DIVERSIONS





COMPLETED INSTALLATION



* SEE SPECIFICATIONS FOR REQUIRED POST SPACING.

SILT FENCE INSTALLATION USING SOIL SLICING METHOD

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.2.6.5C

20.2.7 – SEDIMENT TRAP:

20.2.7.1 - Definition: A sediment trap is an excavated storage area without defined side slopes. The trap is to be stabilized by seeding and mulching as well as having a stabilized outlet. The trap is a short-term sediment control structure.

20.2.7.2 - Purpose: To trap and store sediment as well as reduce the velocities of water.

20.2.7.3 - Conditions Where Applicable:

1) As directed by the Project Supervisor and/or their designee.

2) At the foot of embankments where temporary and permanent slope drains outlet.

3) At the bottom as well as in the ditch lines of waste sites and in the ditch lines of borrow pits.

4) At the downgrade end of a cut section when saturation of this area would not harm the area.

5) In the median to prevent excessive siltation of pipe structures.

20.2.7.4 - Design Criteria: None

20.2.7.5 - Construction Methods: When traps are incorporated in a final grade situation, it may be necessary to line them with a material such as polyethylene to prevent saturation. When sediment removal is required, it should be performed with care because of the danger of rupturing the lining.

Once the capacity of the trap is 50 percent filled with sediment, the accumulated sediment is to be removed and disposed of in an appropriate manner.

20.3 - SEDIMENT BASINS:

Despite using vegetative soil stabilization methods and or water conveyance and energy dissipation devices, soil erosion is inevitable. Sediment basins are used to capture and retain sediment caused by erosion.

20.3.1. Definition: Sediment basins, as used in this manual, may be either a sediment pond or sediment dam.

1) A sediment pond has an excavated storage area in addition to an embankment to provide the required storage volume.

2) A sediment dam is an embankment sized to provide the required storage volume with minimal excavation.

20.3.2 - Purpose: To trap and store sediment.

20.3.3 - Conditions Where Applicable: They are required to control runoff and sediment from areas of disturbance that cannot be effectively controlled by utilizing ditch checks, sediment traps, etc., or are not appropriate for the particular area.

20.3.4 - Design Criteria:

20.3.4.1 – General:

a) Sediment basins are to be designed to provide a storage volume equal to 3600 cubic feet per acre ***(252 cubic meter per ha)*** of drainage area leading to the basin. ***Half of this volume is to be dry storage while the remaining half is to be wet storage.***

b) Sediment basins are to be designed to set outside the main watercourse and shall not be designed to set in a stream that would require a section 404 permit from the US Army Corp of Engineers without obtaining prior approval from the Deputy State Highway Engineer, Development.

c) If “clean” water can be diverted from running through the disturbed areas of your project, the sediment basins can be designed for the remaining drainage area. The required storage volume remains as stated in a) above. This diversion feature is to be shown on the plans as the reason for downsizing the basin.

d) Sediment basins are to have stabilized inlets and outlets.

e) The basin length should be at least twice the basin width.

f) Sediment basins should be built as close as possible to the source of the sediment.

g) Sediment basins should be built outside the existing watercourse to minimize the quantity of water flowing through the basins thereby reducing the overall size of the basin.

h) In some areas the minimum design criteria as defined herein may be unfeasible, impractical, or impossible to meet. In those cases, sediment basins shall be designed and constructed as close as possible to the design criteria specified. Under certain circumstances it may be desirable to build several small sediment basins in a series in lieu of one large basin. Documentation as to the reasons for not designing the basins to the required volume is necessary. ***Right-of-way constraints are not justification for downsizing a basin.*** The designer shall establish right-of-way limits that allow for the full development of a properly designed sediment basin. The exception to this rule would be the taking of an occupied building, cultural resources, or the disturbance to construct the basin is greater than the disturbed area leading to the basin.

i) All sediment basins must be located and designed such that failure of the basin ***would not*** result in loss of life; damage to homes, commercial or industrial buildings, highways or streets; or in interruption of the use or service of public utilities.

j) When a sediment basin is to remain in place it shall be fenced or incorporated within the controlled access fence.

k) Construction of sediment basins in wetlands is prohibited.

l) The retained volume in any one structure shall not exceed 48 acre-feet ***(59,200 cubic meters)***.

m) Sediment basins shall be removed at the end of construction unless approved to remain in place by the Deputy State Highway Engineer, Development. When a sediment basin is approved to remain in place after construction it shall be designed for overtopping in accordance with section 20.3.4.3.5.

n) Since the removal of sediment basins will occur after access to the basins is limited, the designer shall provide a site restoration plan that provides the quantities required to remove the basins and shall consider the access required as a factor in preparing the plan. The designer should set the right-of-way limits for the required access to the sediment basins. The work required for the restoration plan shall be bid as its own category. See section 20.3.5 and section 30 for restoration plan requirements.

20.3.4.2. Sediment Ponds: (Figures 20.3.4.2 A and B)

a) Inlet and outlet channels lined with select embankment-18" ***(450 mm)*** minimum thickness.

b) Side Slopes: 2:1 ***(1:2)***.

c) Pond Depth: minimum 4' ***(1 m)***, maximum 24' ***(7 m)***.

d) Length is to be at a minimum, twice the width.

e) The minimum pond crest width shall be 12 feet ***(4 meters)***.

f) A riser outlet as shown in Figure 20.3.4.2A shall be utilized except when the contributing drainage area is less than 5 acres ***(2 ha)*** and one of the following is true:

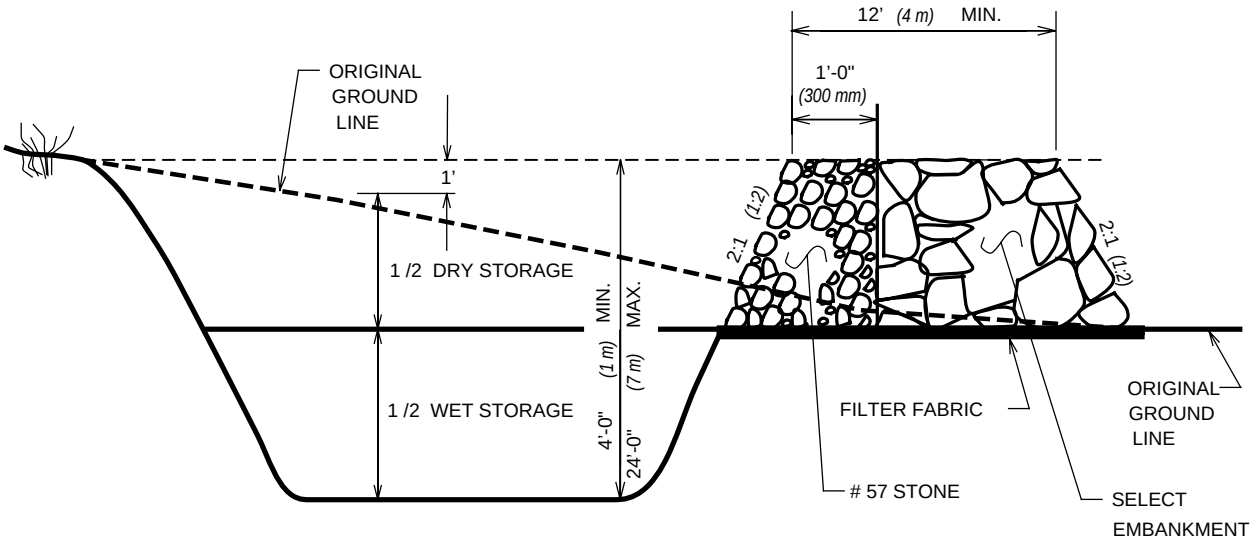
   1) The pond pipe outlet can't be satisfactorily stabilized without causing damage to a environmentally sensitive area or

   2) The water velocity from the pond pipe outlet causes damage to the receiving stream and the water velocity can't be mitigated prior to entering the receiving stream or

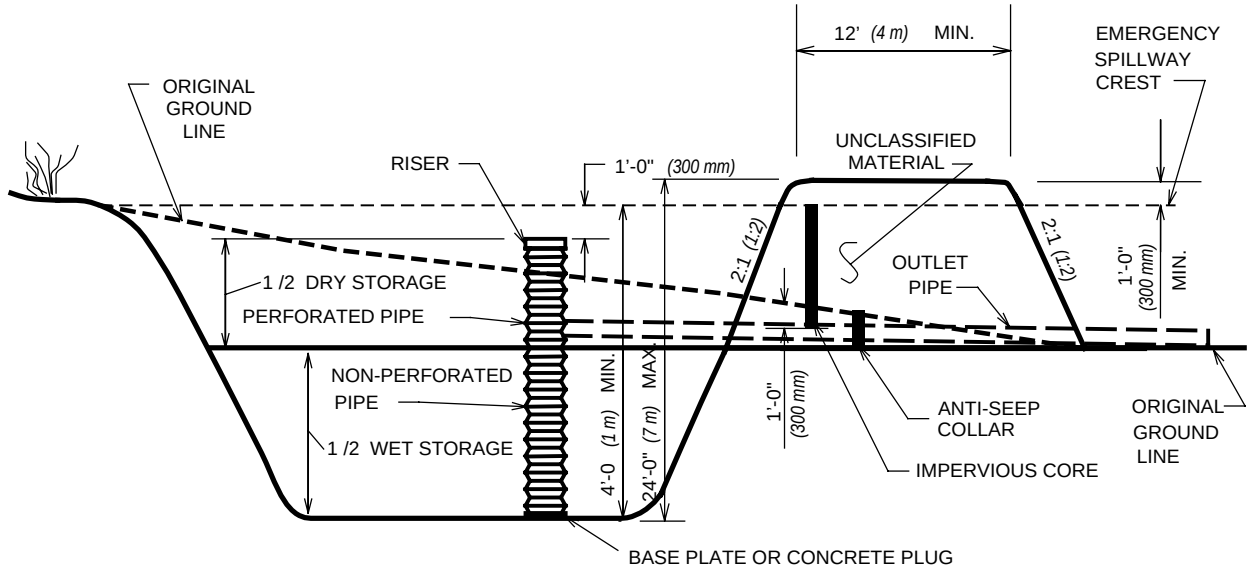
   3) When other environmental concerns or requirements mandate a wick drain outlet.

g) The spillways and riser will be designed in accordance with Section 20.3.4.3, when a riser outlet is utilized.

SEDIMENT POND PROFILE



WICK DRAIN OUTLET DETAIL

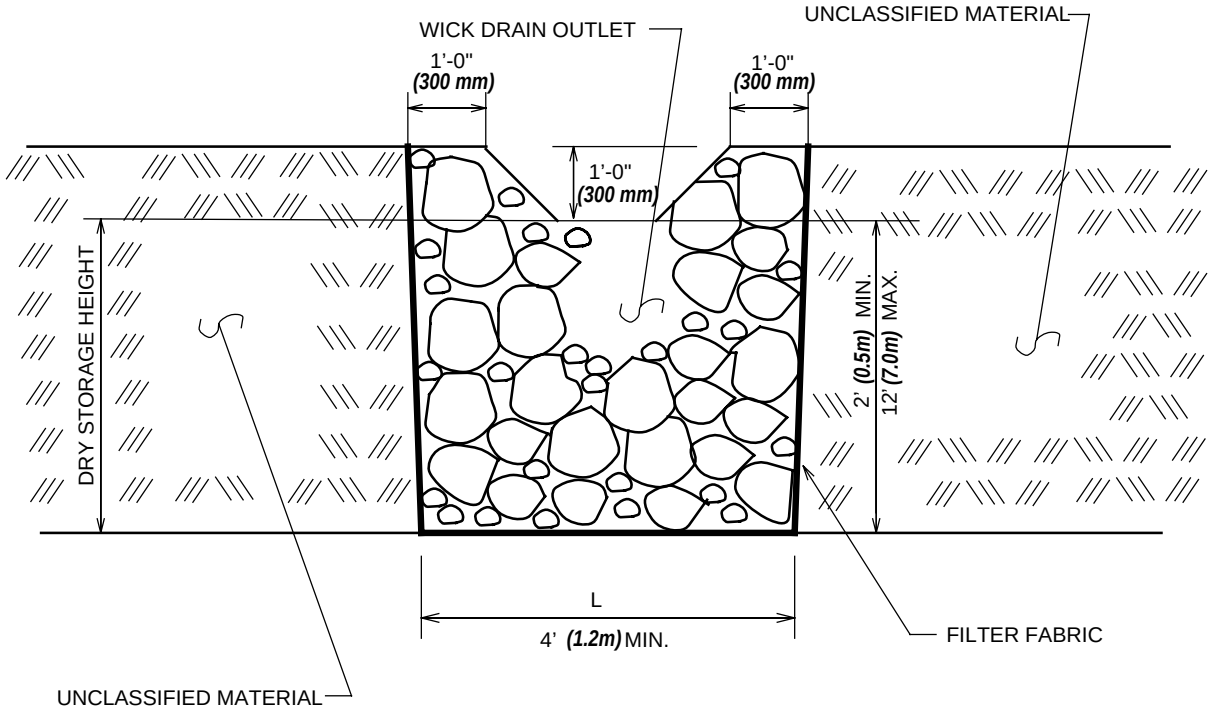


NOTE: MAX IMPOUNDMENT
48 ACRES-FT. *(59,200 CU. METERS)*

RISER OUTLET DETAIL

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.3.4.2A

SEDIMENT POND
WICK DRAIN OUTLET X-SECTION



ENGLISH	METRIC
L = (30/H) X AREA	L = (6.9/H) X AREA
WHERE,	WHERE,
L = LENGTH IN FEET	L = LENGTH IN METERS
H = DRY STORAGE HEIGHT IN FEET	H = DRY STORAGE HEIGHT IN METERS
AREA = CONTRIBUTING DRAINAGE AREA IN ACRES	AREA = CONTRIBUTING DRAINAGE AREA IN HECTARES

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.3.4.2B

20.3.4.3 - Sediment Dams: (Figures 20.3.4.3 A and B)

20.3.4.3.1- General:

1) The maximum height of the dam from the lowest point along the centerline of the dam to the crest of the emergency spillway shall not exceed 24' ***(7 m)***.

2) The minimum dam crest width shall be 12 feet ***(4 meters)***.

3) The upstream slope of the dam will be 3:1 ***(1:3)*** or flatter and the downstream slope will be 4:1 ***(1:4)*** or flatter.

4) If an emergency spillway is provided around the end of the dam, the downstream slope may be 2:1 ***(1:2)*** on the dam.

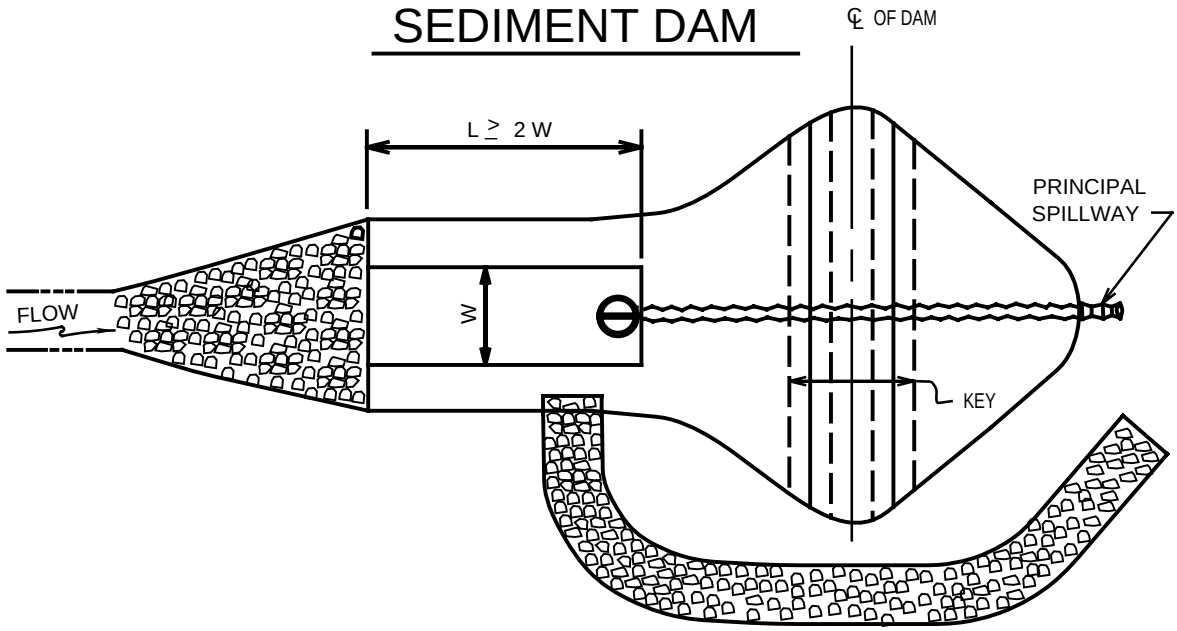
5) The dam will have an impervious core beginning a minimum of 1' ***(300 mm)*** below the original ground and ending at the top of the dry storage.

6) If the emergency spillway is provided over the dam face, it must be lined with clean, non-erodible rock to prevent erosion of the dam face.

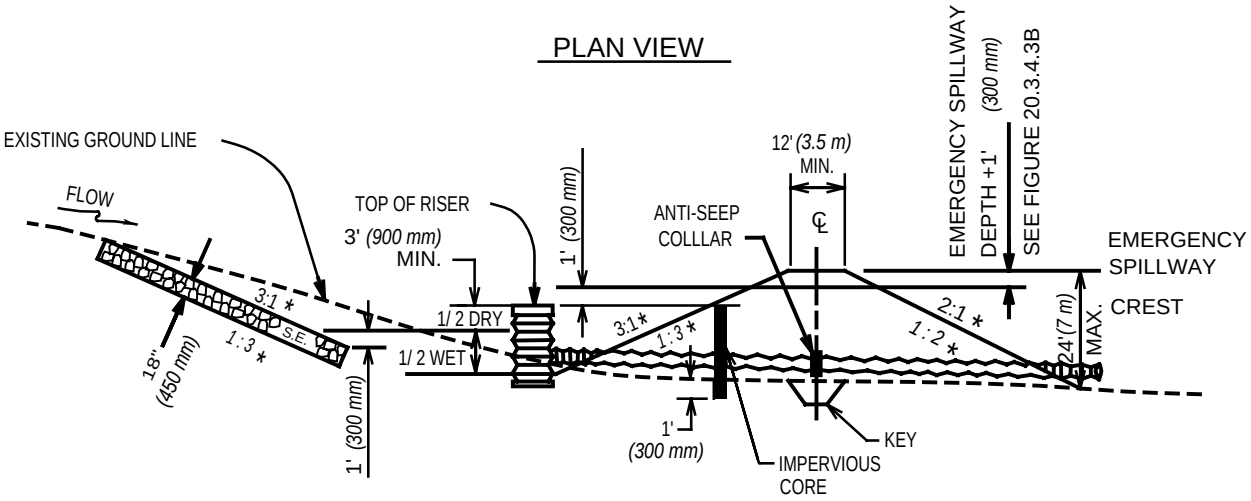
7) In cases where an emergency spillway goes around the end of the dam, as shown in Figure 20.3.4.3A, rock will not be required to line the dam face, unless the structure is to remain in place after construction then rock may be required to Line the face of the dam see section 20.3.4.3.5.

8) Runoff will be calculated in accordance with the WVDOT, Division of Highways Drainage Manual and should be based on soil conditions expected to prevail during the anticipated effective life of the dam. Combined capacity of the principal and/or emergency spillways will be designed to handle a 25-year frequency storm (Q_{25}) with one foot of freeboard.

SEDIMENT DAM



PLAN VIEW



PROFILE

NOTE: STORAGE = DRY & WET

SEE PAGE II -27

MAX IMPOUNDMENT

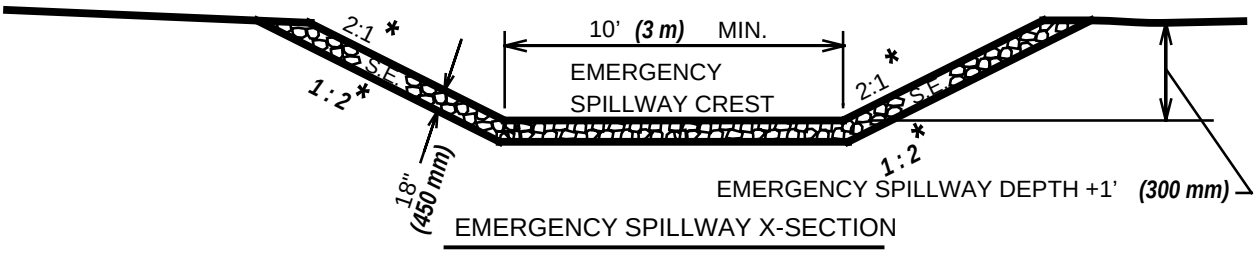
48 ACRE-FT. *(59,200 CUBIC METERS)*

* SLOPE RATIOS MAY BE FLATTER

CONDUIT SPILLWAY (PG. 1 OF 2)

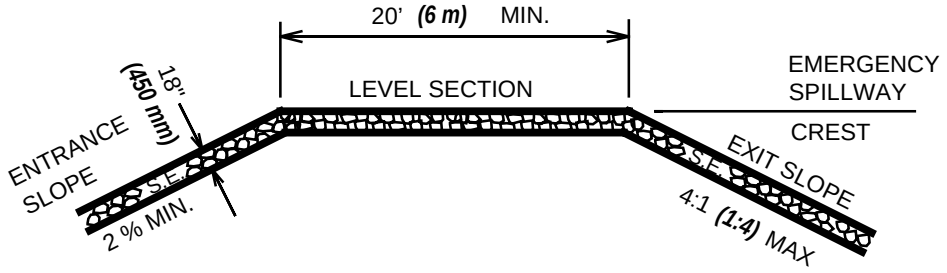
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.3.4.3A

SEDIMENT DAM



EMERGENCY SPILLWAY X-SECTION

NOTE: FOR EMERGENCY SPILLWAY DEPTH SEE TABLE 20.3.4.3.4A & B



EMERGENCY SPILLWAY PROFILE

NOTE: THE LEVEL SECTION OF THE SPILLWAY IS 1' *(300 mm)* ABOVE THE TOP OF THE RISER.

IF THE EMERGENCY SPILLWAY IS BUILT OVER THE SEDIMENT DAM, THE TOP OF THE DAM AND THE DOWNSTREAM SLOPE LINED WITH SELECT EMBANKMENT - 18" *(450 mm)* THICK. THE RATIO OF THE DOWNSTREAM SLOPE SHALL BE 4:1 *(1 : 4)* OR FLATTER.

* SLOPE RATIOS MAY BE FLATTER

CONDUIT SPILLWAY (PG. 2 OF 2)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.3.4.3B

20.3.4.3.2 - Principal Spillway:

1) The principal spillway shall be a pipe and riser. The pipe shall meet the requirements of Section 604 of the Standard Specifications.

2) The principal spillway will be designed using one of the following methods:

   a) If the basin has a contributing drainage area of 30 acres or less then normally the pipe used as the principal spillway is designed to carry the 25 yr 24 hour storm with the head on the pipe being at the dry storage elevation and an emergency spillway **is not** required.

   b) If the basin has a contributing drainage area that is greater than 30 acres then the principle spillway is designed to carry a minimum of the 1 yr 24 hour storm with the head on the pipe being at the top of the dry storage elevation and an emergency spillway **is** required. The size of the principle spillway may need to be increased in order to provide the required freeboard of the emergency spillway when the height of the basin is limited.

3) An emergency spillway will be required if the principal spillway is designed to carry less than the 25 yr 24 hour storm or in order to provide the required freeboard when the height of the basin is limited.

20.3.4.3.3 – Riser:

1) When an emergency spillway is provided. The crest elevation of the principal spillway must be at least 1 foot ***(300 mm)*** below the crest elevation of the emergency spillway.

   When an emergency spillway is not provided. The maximum design flow elevation of basin must be at least 1 foot ***(300 mm)*** below the crest elevation of the dam. Therefore the crest elevation of the riser must be at least 1 foot ***(300 mm)*** plus the depth of flow required over the riser below the crest of the dam.

2) The riser shall have a diameter of at least 1 foot ***(300 mm)*** larger than the principal spillway and shall be designed to pass the flow of the principal spillway with the water elevation above the riser being 3 feet ***(900 mm)*** or less.

3) From Chart 20.3.4.3.3A & B the depth of flow required over the riser in order to pass the flow of the principle spillway con be obtained.

4) The dry storage portion of the riser will be perforated with holes. The wet storage portion of the riser shall be solid in order to provide the wet storage requirement.

5) The perforations in the dry storage portion of the riser shall be designed to dewater the dry storage volume of the dam in no less than 48 hours and no more than 72 hours. The hole spacing in the riser shall be designed utilizing a recognized storage routing method. For design purposes the basin shall be considered empty when the water discharge is 0.01 cfs ***(0.00025 cms)*** or less.

   It is preferred that the perforations in the riser be 1½-inch ***(35 mm)*** diameter holes with a minimum of 2 horizontal rows with a minimum of 2 holes per row. When less than 5 holes are utilized or the hole diameter is less than ¾-inch ***(18 mm)*** then special protection of the perforations should be considered to ensure the perforations do not become clogged.

6) An anti-vortex device consisting of a thin vertical plate placed normal to the centerline of the dam and firmly attached to the top of the riser will be provided. The plate length is equal to the diameter of the riser pipe plus 12 inches ***(300 mm)***; and the plate height is equal to the diameter of the horizontal pipe.

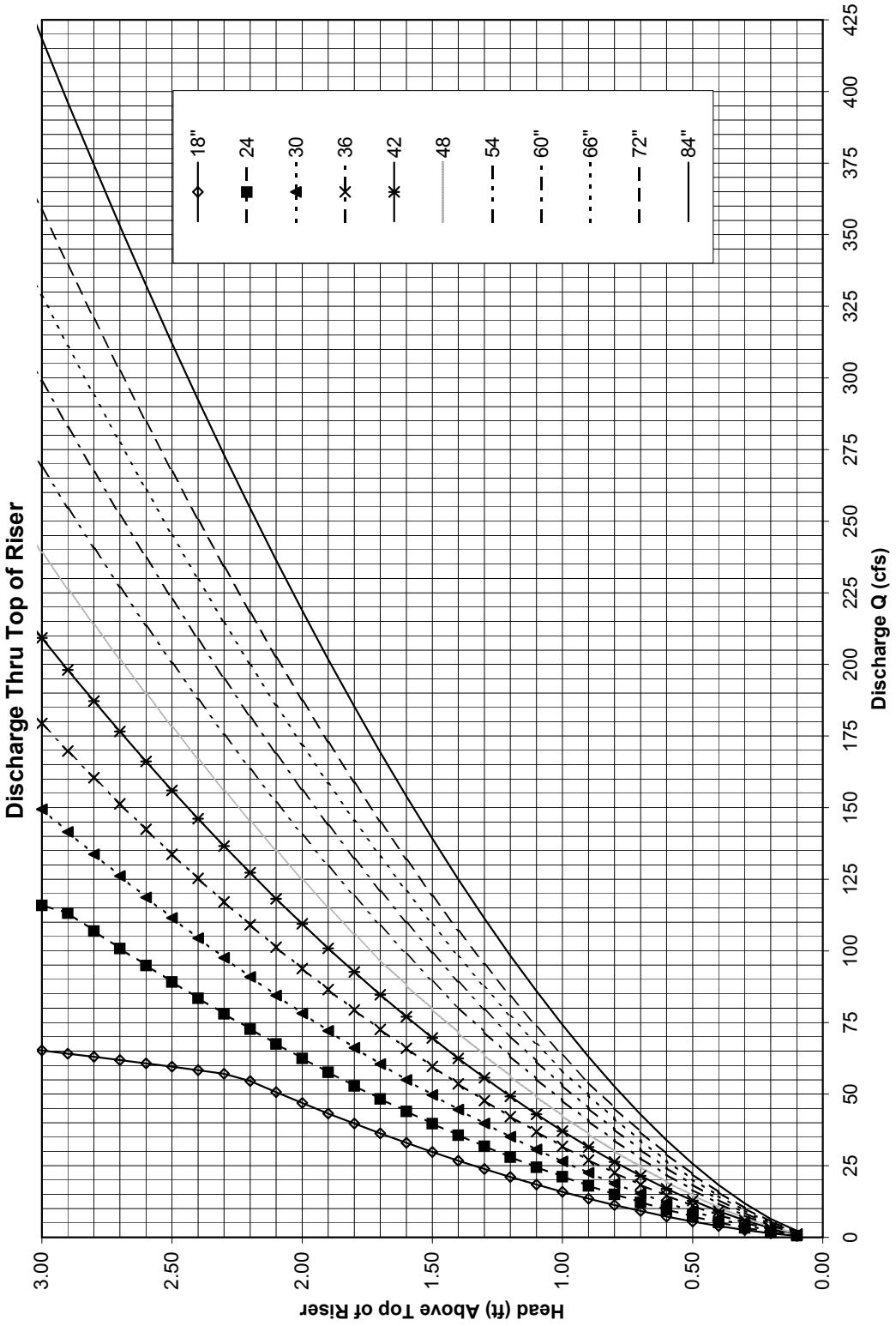
7) The riser shall have an attached base with sufficient weight to prevent flotation. Two acceptable bases are:

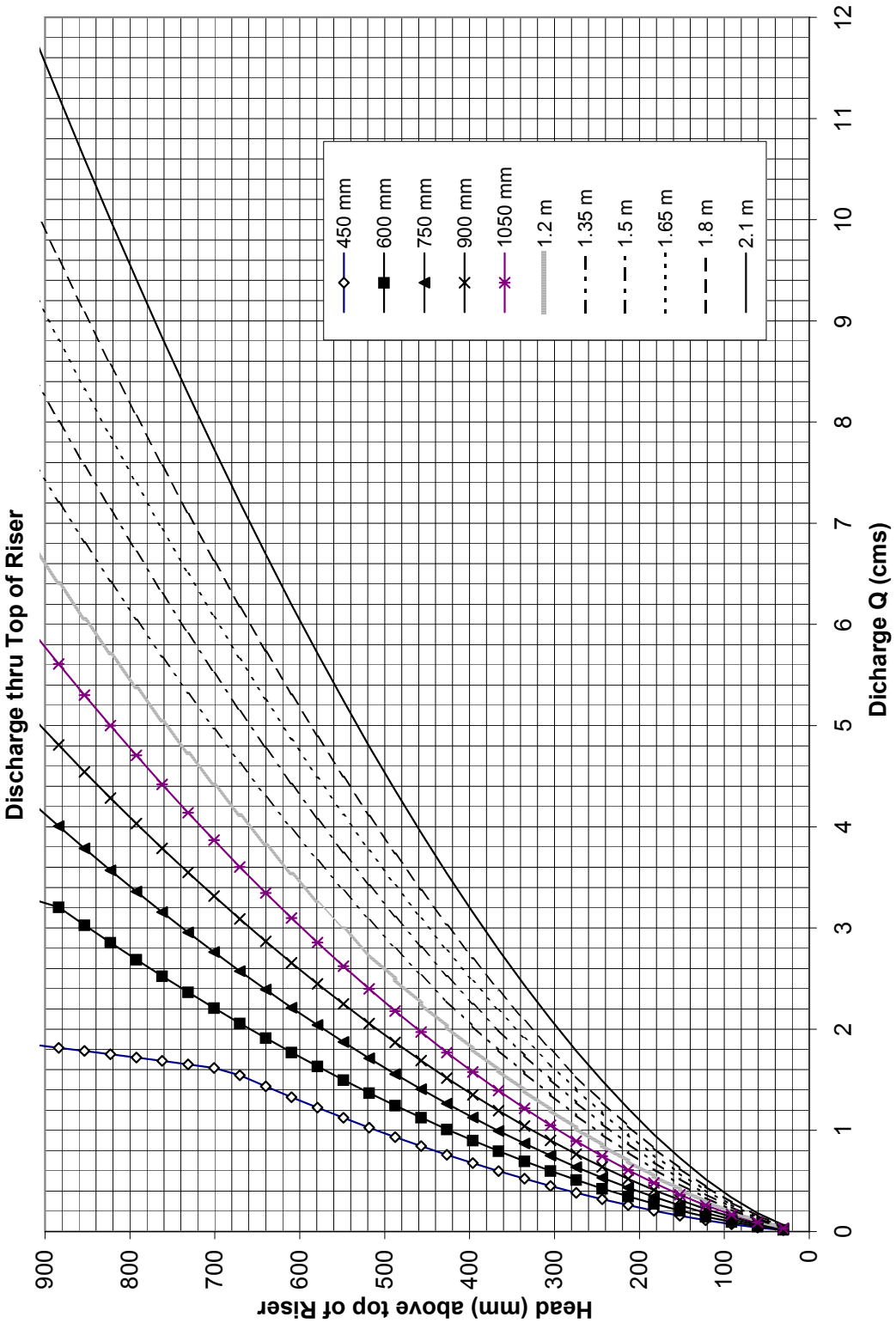
   (a) A concrete base 18 inches ***(450 mm)*** thick with the riser imbedded 6 inches ***(150 mm)*** into the base. The base should be square with each dimension 1 foot ***(300 mm)*** greater than the riser diameter.

   (b) A ¼ inch ***(6 mm)*** thick steel plate welded around the base of the riser to form a watertight connection. The plate shall be square with each side equal to 2 times the riser diameter. Two foot ***(600 mm)*** of stone, gravel, or tamped earth will be placed on the plate.

8) A trash rack must be attached to the top of the riser. It shall have openings no larger than ¾ of the conduit diameter and no smaller than 4 inches ***(100 mm)***.

9) A minimum of one anti-seep collar must be utilized on each conduit through a sediment dam. It should be located at the centerline of the dam.


Discharge Thru Top of Riser
Head (ft) Above Top of Riser
Discharge Q (cfs)
18"
24
30
36
42
48
54
60"
66"
72"
84"
0.00
0.50
1.00
1.50
2.00
2.50
3.00
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425


Discharge thru Top of Riser
Head (mm) above top of Riser
Dicharge Q (cms)
0
100
200
300
400
500
600
700
800
900
0
1
2
3
4
5
6
7
8
9
10
11
12
450 mm
600 mm
750 mm
900 mm
1050 mm
1.2 m
1.35 m
1.5 m
1.65 m
1.8 m
2.1 m

20.3.4.3.4 - Emergency Spillway:

1) The top of the dam must be at least 1 foot ***(300 mm)*** above the maximum design flow elevation of the emergency spillway.

2) The crest elevation of the emergency spillway must be at least 1 foot ***(300 mm)*** above the crest elevation of the principal spillway.

3) The minimum bottom width of an emergency spillway is 10 feet ***(3 m)***.

4) The minimum level distance of the emergency spillway in the direction of flow is 20 feet ***(6 m)*** unless the emergency spillway goes over the dam.

5) The emergency spillway should be placed in undisturbed ground. If field conditions require the emergency spillway to be constructed over the dam, the downstream slope must be constructed as shown on Figure 20.3.4.3 A.

6) Charts 20.3.4.3.4 A and B can be used to find the Q thru the emergency spillway. The velocity can be determined by the formula V = Q/A.

CHART 20.3.4.3.4 A
EMERGENCY SPILLWAY HYDRAULICS

SPILLWAY Width – b (Feet)	10	15	20	25	30	35	40	45	50	55	60	65	70	75
Height – H (Feet)	DISCHARGE (CUBIC FEET/SECOND)													
1.0	20	30	40	50	60	70	80	90	100	110	120	130	140	150
1.5	39	59	70	98	110	137	157	176	196	216	235	255	274	294
2.0	64	96	128	160	192	224	256	288	320	352	384	416	448	480
2.5	94	141	188	235	282	329	376	423	470	517	564	611	658	705
3.0	129	194	258	323	387	452	516	581	645	710	774	839	903	968
3.5	169	254	338	423	507	592	676	761	845	930	1014	1099	1183	1268
4.0	212	318	424	530	636	742	848	954	1060	1166	1272	1378	1484	1590
4.5	259	387	516	645	774	903	1032	1161	1290	1419	1548	1677	1806	1935
5.0	305	458	610	763	915	1068	1220	1373	1525	1678	1830			
5.5	364	546	728	910	1092	1274	1456	1638	1820					
6.0	422	633	844	1055	1266	1477	1688	1899						
6.5	482	723	964	1205	1448	1687	1928							
7.0	550	825	1100	1375	1650	1925								
7.5	618	927	1236	1545	1854									
8.0	690	1035	1360	1735										
8.5	764	1146	1538	1910										
9.0	845	1268	1690											
9.5	924	1386	1848											
10.0	1010	1515												

Reference: SCS Technical Release No. 35 (z=2, n=0.040, L=100 Ft.) April 1971

CHART 20.3.4.3.4 B

EMERGENCY SPILLWAY HYDRAULICS

SPILLWAY *Width–b (m)*	*3.0*	*4.5*	*6.0*	*7.5*	*9.0*	*10.5*	*12.0*	*13.5*	*15.0*
Height-H (m)	DISCHARGE *(CUBIC METERS/SECOND)*								
0.5	*1.1*	*1.7*	*2.0*	*2.8*	*3.1*	*3.9*	*4.4*	*5.0*	*5.6*
1.0	*3.7*	*5.5*	*7.3*	*9.1*	*11.0*	*12.8*	*14.6*	*16.5*	*18.3*
1.5	*7.3*	*11.0*	*14.6*	*18.3*	*21.9*	*25.6*	*29.2*	*32.9*	*36.5*
2.0	*12.0*	*17.9*	*23.9*	*29.9*	*35.8*	*41.8*	*47.8*	*53.8*	
2.5	*17.5*	*26.2*	*35.0*	*43.7*	*52.5*				
3.0	*23.9*	*35.9*	*47.9*						

(Assumed: z=2, n=0.040, L=30 m)

20.3.4.3.5 - Overtopping:

All sediment basin structures that are to remain in place shall be designed for overtopping.

If the combined capacity of the principal spillway (Q_{ps}) plus the emergency spillway (Q_{es}) at the dam crest elevation is not capable of passing the 100-year frequency storm (Q_{100}) then the dam face must be designed for the overtopping flow (Q_{over}). The design overtopping storm frequency shall be a 100-year frequency storm (Q_{100}).

Design method:

1) Determine Overflow by the following equation:

$$Q_{over} = Q_{100} - Q_{ps} - Q_{es}$$

Where:

Q_{over} = Overtopping Flow cfs ***(cms)***
Q_{100} =100-year Frequency Storm (cfs) ***(cms)***
Q_{ps} = Principal Spillway Flow (cfs) ***(cms)***
Q_{es} = Emergency Spillway Flow (cfs) ***(cms)***

2) Find the cubic foot per second per foot of dam width (q) at the base of the dam. It may be required to calculate the rock size at higher elevations in the dam face when large D_{50} rock sizes are calculated. This would allow the D_{50} rock size to decrease as it reaches the top of the structure.

$$(q) = Q_{over} / \text{Flow width}$$

3) See Fig. 20.3.4.3.5A&B to determine the required D_{50} size at that elevation.

Flow width is the width of the dam at the elevation on the dam face being analyzed.

Example:

Dam has a 2.5:1 face slope, Base width of 10 feet, Total dam height is 10 feet, Q_{100} = 200cfs, Q_{ps} = 40cfs, Q_{es} = 60cfs

Q_{over} = 200cfs – 40cfs – 60cfs
Q_{over} = 100cfs

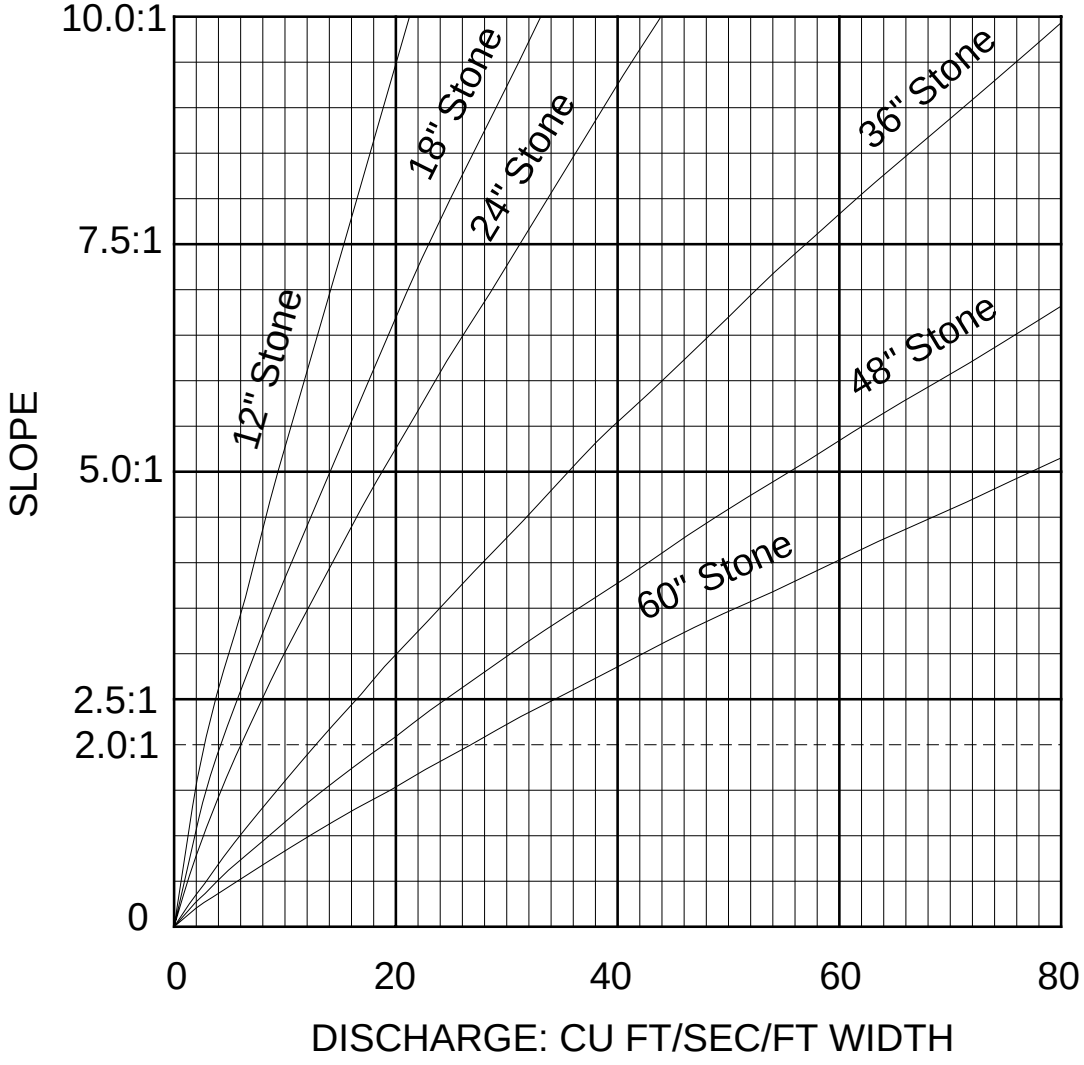
Base width is 10 feet

q_0 = 100cfs / 10ft
q_0 = 10cfs/ft

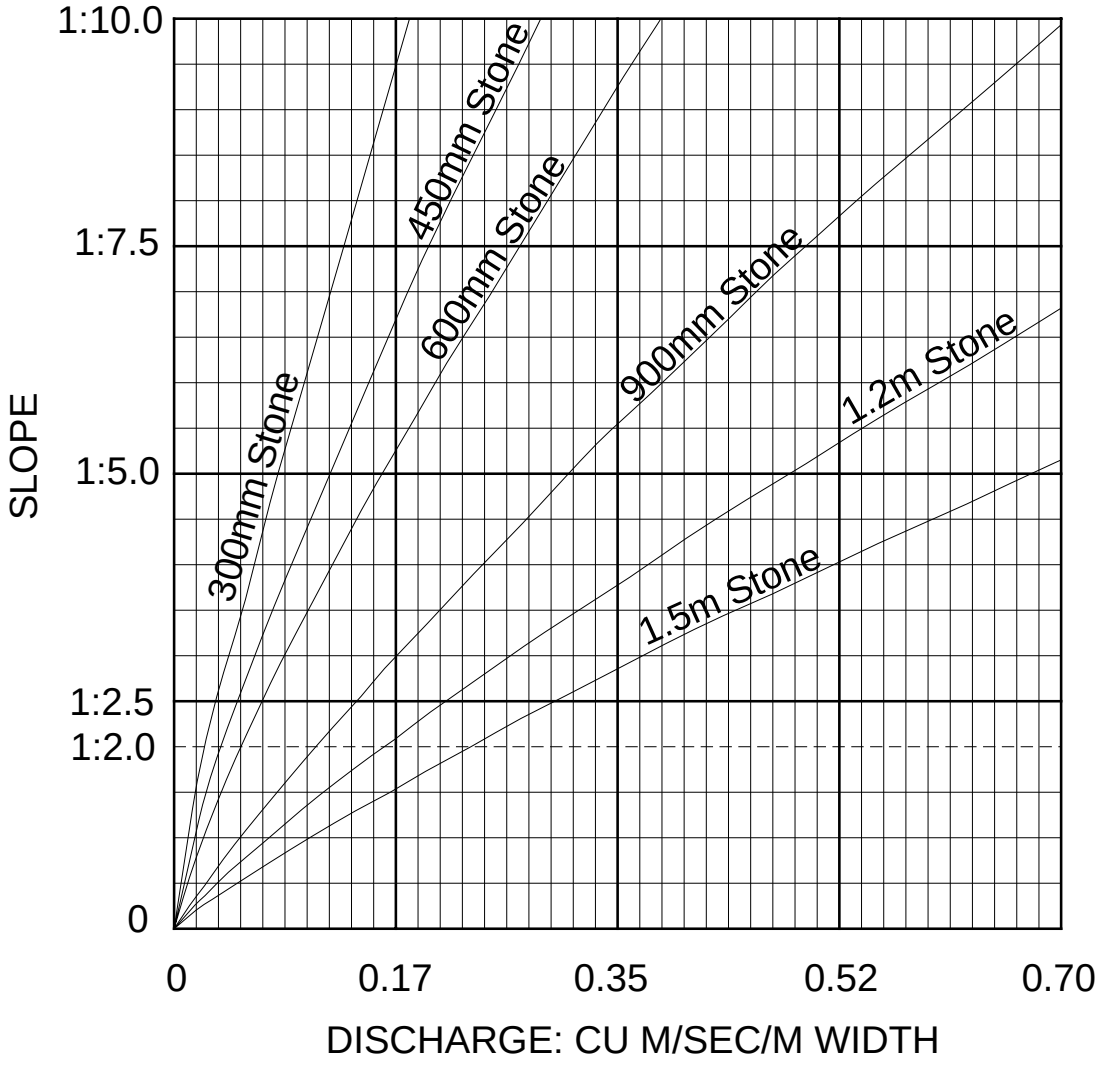
Using Fig. 20.3.4.3.5A and the 2.5:1 Slope the required D_{50} is 30" rock.

The dam width 5 feet higher in the dam is 20 feet.
q_5 = 100cfs / 20 ft
q_5 = 5cfs/ft

Using Fig. 20.3.4.3.5A and the 2.5:1 Slope the required D_{50} is 18" rock.



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.3.4.3.5A



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	EROSION CONTROL MANUAL FIGURE 20.3.4.3.5B

20.3.5 - Construction Methods: Sediment basins should be located outside the normal slope limits so that they can be built prior to the start of construction and remain in service throughout the construction period. Low areas adjacent to the highway should be utilized where possible so that water pollution during construction of these basins can be minimized. In order to gain the maximum benefits from sediment basins, they shall be constructed as the first order of work, even before clearing and grubbing operations begin.

The area where a sediment dam will be constructed will be cleared of vegetation to allow the dam to be keyed into the existing ground. Likewise, the area behind the dam to be flooded will be cleared to facilitate future sediment removal. The key shall be a minimum of 3 foot ***(900 mm)*** wide and 2 foot ***(600 mm)*** deep and shall extend the full width of the dam. It will be required on all dams over 5 feet ***(1.5 m)*** in height.

The material utilized for construction of the sediment dam may be obtained from the unclassified excavation if available without creating significant disturbance. If the material is not available, an item and quantity for rock borrow excavation will be established in the contract.

The material will be placed in 6-8 inch ***(50-200 mm)*** lifts and compacted by the hauling and spreading equipment tracks covering the entire surface or by the use of a roller.

When the principal spillway is a conduit, it will be sized as described in Section 20.3.4 of this manual.

The inlets of sediment basins should be constructed with a wide cross-section and a minimum grade to prevent turbulence.

Basins that remain in place are to be fenced in accordance with Section 608 of the Specifications. If additional right-of-way is required to construct basins that remain in place, the additional taking **shall be right-of-way** and not a temporary construction or drainage easement.

The accumulated sediment in a basin shall be removed once the wet storage volume has been reduced by 50 percent. Removed accumulated sediment shall be disposed of in such location that the sediment will not erode into construction areas, natural waterways or streams, or wetlands. This is also applicable for excavated material removed during construction and/or removal of the sediment basin.

Prior to removing sediment from the ponds and/or dams as described above, the basin must be dewatered. A "Dewatering Device" as specified in Section 642 of the Specifications, shall be utilized.

When removing a sediment basin all sediment accumulation may be required to be removed, all excavations backfilled and properly compacted, all dam structures removed and the existing ground restored to its natural or intended condition unless otherwise noted.

SECTION

30

DESIGN

30 – DESIGN:

The designer will evaluate the land disturbing activities for a particular project to determine what erosion and sediment control features are necessary and appropriate to be included in the project plans.

For projects such as resurfacing and latex modified concrete bridge deck overlays, erosion and sediment control features will not be required.

All projects with land disturbing activities, individual bid items as per Section 642 of the Specifications will be established. Plan quantities will be developed utilizing criteria set forth in this manual and/or any appropriate Design Directive. Sediment basins will be designed and shown on the plans as they may require additional right-of-way or temporary easement.

In accordance with the December 5, 2002 National Pollutant Discharge Elimination System (NPDES) General Permit all land disturbing activities of 1 acre ***(0.4 ha)*** and greater are required to be registered with the West Virginia Department of Environmental Protection. Registration under the new permit is divided into two types. Those projects involving disturbed areas of 1 to 3 acres ***(0.4 to 1.2 ha)*** will require the submission of a "Notice of Intent" (NOI) form. A "Site Registration Application Form" (SRA) is to be submitted for those projects involving greater than 3 acres ***(1.2 ha)*** of disturbance. The WVDOH method of calculating disturbed area is to utilize the Clearing and Grubbing (C&G) quantity.

General guidelines as to which form are to be completed and submitted will be as follows:

1. Any project with 1 to 3 acres ***(0.4 to 1.2 ha)*** of C&G activities will require a completed NOI form.

2. Any project with less than 1 acre ***(0.4 ha)*** of C&G activities and an undefined waste site, borrow site or undefined construction access area will require a completed NOI form.

3. Any projects without C&G, which may involve significant disturbed areas for waste sites, borrow sites or any other construction activities will require a completed NOI form.

4. Any project with C&G of $1^1/_2$ acres ***(0.6 ha)*** and a substantial amount of waste or borrow that cannot be placed in the remaining $1^1/_2$ acres ***(0.6 ha)*** will require a completed SRA form.

5. Any project with a construction phase of 1 calendar year or greater, regardless of C&G or other land disturbance activities, will require a completed SRA form.

The designer shall complete and submit the appropriate NPDES registration form to the Technical Section of the Engineering Division during the final phases of design. The

Engineering Division will submit the permit registration to the WVDEP in the name of the West Virginia Department of Transportation, Division of Highways.

The WVDOH will register all projects with any land disturbing activities. Projects such as resurfacing, bridge deck overlays, traffic signal installation, guardrail placement, ditch pulling, etc. will not require and NPDES registration. However, the use of ***BMP's*** is strongly encouraged.

All designers are cautioned to pay particular attention to Section 20 and all the necessary requirements and criteria for the sizing of sediment basins. The tentative locations of sediment basins are to be indicated on the Preliminary Field Review plan submission. All sediment basins are to be completely designed and shown on the Final Field Review plan submission. Concurrence/approval (of the sediment basins) in writing from the appropriate WVDEP personnel is to be obtained at the conclusion of the review. If the concurrence/approval cannot be given subject to comments made at the review, then corrections are to be made promptly and resubmitted for approval.

If the required size of a sediment basin cannot be accomplished, written justification explaining in detail the reasons for not meeting the necessary criteria is to be available at the Final Field Review. ***Right of way constraints are not justification for downsizing a basin*** unless the taking of an occupied building, encroaching on a cultural/natural resource or the disturbance to constructing the basin is greater than the area being protected. The designer shall establish right-of-way limits that allow for the full development of a properly designed sediment basin.

The designer is to provide all the necessary bid items and quantities that will allow the Contractor to develop an Erosion and Sediment Control plan for submittal to the WVDOH as outlined in Section 40 of this manual.

The quantities are to be calculated using the following guidelines:

Item 642001-*, Temporary Berms, per linear foot ***(meter)*** – For estimating purposes, use length of the embankment in profile times 2.5.

Item 642002-*, Slope Drain, per linear foot ***(meter)*** – Use the embankment length divided by 250 +1, multiplied by the average slope of the embankment.

[(Embankment Length/250) + 1] x (Average of the finished slope of the embankment)

This calculation is for one side of the embankment.

Item 642004-*, Seed Mix, "Type", per pound ***(kilogram)*** – See current specifications for rate of seed per acre ***(hectare)*** and schedule of seeding operations. For estimating purposes, assume the entire project will be seeded twice per construction season.

Item 642005-*, Mulch, "Type", per ton ***(megagram)*** – See current specifications for rate of mulch per acre ***(hectare)*** of area to be seeded and mulched. For estimating purposes, assume the entire project will be mulch twice per construction season.

Item 642006-*, Fertilizer, per ton ***(megagram)*** – Fertilizer shall be applied at the rate of 800 lb. per acre ***(900 kilogram per hectare)*** of area to be seed and mulched. For estimating purposes, assume the entire project will be fertilized twice per construction season.

Item 642007-*, Fiber Matting, per square yard ***(square meter)*** – Use when contour ditch velocities exceed that allowable as set forth in the Drainage Manual.

Item 642008-*, Temporary Pipe, per linear foot ***(meter)*** – Use as outlined in Section 20 of the Erosion and Sediment Control Manual.

Item 642009-*, Contour Ditch, per linear foot ***(meter)*** – For estimating purposes, use three times the project length rounded to the nearest 100 foot ***(30 meters)***.

Item 642010-*, Agricultural Limestone, per ton ***(megagram)*** – Use 1.5 ton per acre ***(3.4 megagram per hectare)*** of area to be seeded and mulched unless the pH tests indicate otherwise.

Item 642011-*, Hay or Straw Bales, per each – Use 0.25 times the project length. For estimating purposes, a hay or straw bale is 3 feet ***(1 meter)*** in length.

Item 642012-*, Silt Fence, per linear foot ***(meter)*** – Use 2 times the project length.

Item 642015-*, Super Silt Fence, per linear foot ***(meter)*** – When sediment basins have been downsized, the design may include a bid quantity for Super Silt Fence and shall indicate on the plans where it is to be used.

Item 642031-*, Ditch Checks, per each - Use as outlined in Section 20 of the Erosion and Sediment Control Manual.

Item 642033-*, Sediment Trap, per cubic yard ***(cubic meter)*** - For estimating purposes, use 100 cubic yards ***(77 cubic meters)*** per 1000 foot ***(300 meters)*** of project length. When sediment basins have been downsized, the quantity for sediment trap shall be increased.

Item 642035-*, Riser, per each – A riser is to be used for all sediment basins except as noted in Section 20.3. The outlet pipe is to be bid as a regular pipe item.

Item 642036-*, Sediment Removal, per cubic yard ***(cubic meter)*** – For estimating purposes, use 100 cubic yards ***(77 cubic meters)*** per 1000 feet ***(300 meters)*** of project length or 50% of the total sediment basin (ponds and dams) volume, which ever is greater, per construction season.

Item 642042-*, Flocculant Block, per each – For estimating purposes, use 2 flocculant block per sediment basin per construction season and 1 flocculant block per 50 cubic yards of Sediment Trap bid per construction season.

Item 642043-*, Premanufactured Ditch Checks, per each – When sediment basins have been downsized, the designer may include a bid quantity for Premanufactured ditch checks and shall indicate on the plans where they are to be used. Such areas could include upstream of inlet or culverts prior to a gutter or a slope drain.

Item 642050-*, Dewatering Device, per each – For estimating purposes, use 1 dewatering device per sediment basin and 1 dewatering device per excavated pier or abutment when the excavation is anticipated to be wet.

Sediment Basins are to be site specific designs as outlined in Section 20 and shown on the construction plans. Each sediment basin is to be considered as its own project and earthwork cannot be considered from any other part of the project. Quantities for each basin are to be calculated for the bid items as indicated on the "Sediment Basin" Table shown below and itemized in the Summary of Quantities under its own category.

SEDIMENT BASIN SUMMARY

STATION	LEFT / RIGHT	BASIN NUMBER	207001 UNCLASSIFIED EXCAVATION CY	207034 FABRIC FOR SEPARATION SY	211001 UNCLASSIFIED BORROW EXCAVATION (NOTE 1) CY	211002 ROCK BORROW EXCAVATION TON	211017 IMPERVIOUS CORE SF	606030 OUTLET PIPE LF	642035 RISER EA	642036 SEDIMENT REMOVAL CY	201001 CLEARING AND GRUBBING ACRE	(NOTE 3) SEED MIX LB	(NOTE 3) MULCH TON	(NOTE 3) FERTILIZER TON	(NOTE 3) AGRICULTURAL LIMESTONE TON	REMARKS
TOTALS																

NOTE 1 – UNCLASSIFIED BORROW EXCAVATION QUANTITY FOR EACH BASIN ON THE TOTAL REQUIRED EXCAVATION FOR EACH BASIN.
NOTE 2 – COST AND QUANTITY INCLUDED IN THE UNIT PRICE BID FOR ITEM 201001, CLEARING AND GRUBBING, PER LS – QUANTITY IS FOR INFORMATION ONLY.
NOTE 3 – COST TO BE INCLUDED IN UNIT BID PRICE FOR ITEM 207001, UNCLASSIFIED EXCAVATION, PER CY. MATERIAL CERTIFICATION REQUIREMENTS FOR THESE ITEMS SHALL BE WAIVED. QUANTITIES FOR INFORMATION ONLY.
NOTE 4 – SHRINK AND SWELL FACTORS AS WELL AS UNSUITABLE MATERIAL FOR SEDIMENT BASINS HAVE NOT BEEN CONSIDERED IN THE EARTHWORK CALCULATIONS.

All Sediment Basins are to be removed unless approved per Section 20 and a site specific restoration plan should be shown on the construction plans. Each sediment basin restoration is to be considered as its own project and earthwork cannot be considered from any other part of the project. Quantities for each basin restoration is to be calculated for the bid items as indicated on the "Sediment Basin Restoration" Table shown below and itemized in the Summary of Quantities under its own category. Sediment basins that are approved to be left in place upon completion of construction they are to be fenced in accordance with Section 608 of the specifications.

SEDIMENT BASIN RESTORATION

STATION	LEFT / RIGHT	BASIN NUMBER	207001	633003	(NOTE 2)		(NOTE 3)				REMARKS
			UNCLASSIFIED EXCAVATION (NOTE 1)	DUMP ROCK GUTTER	STOCKPILING ROCK	STOCKPILING UNCLASSIFIED MATERIAL	SEED MIX	MULCH	FERTILIZER	AGRICULTURAL LIMESTONE	
			CY	CY	CY	CY	LB	TON	TON	TON	
TOTAL											

NOTE 1 – UNCLASSIFIED EXCAVATION QUANTITY FOR EACH BASIN ON THE TOTAL REQUIRED EXCAVATION FOR EACH BASIN RESTORATION. SHRINK AND SWELL FACTORS AS WELL AS UNSUITABLE MATERIAL HAVE NOT BEEN CONSIDERED IN THE EARTHWORK CALCULATIONS. PLACING THE STOCKPILED MATERIAL EXCEPT FOR THE DUMP ROCK GUTTER HAS BEEN INCLUDED IN THE UNCLASSIFIED EXCAVATION QUANTITY.

NOTE 2– COST TO BE INCLUDED IN UNIT BID PRICE FOR ITEM 207001, UNCLASSIFIED EXCAVATION, PER CY. STOCKPILING OF MATERIAL IS TO BE PERFORMED DURING THE EXCAVATION OF THE CONSTRUCTION PROJECT. QUANTITIES FOR INFORMATION ONLY.

NOTE 2– COST TO BE INCLUDED IN UNIT BID PRICE FOR ITEM 207001, UNCLASSIFIED EXCAVATION, PER CY. MATERIAL CERTIFICATION REQUIREMENTS FOR THESE ITEMS SHALL BE WAIVED. QUANTITIES FOR INFORMATION ONLY.

The method of calculating the quantities for pay items shown in this section is to be used as a guide. Conditions of individual projects may dictate the need for adjustment of these methods.