Temporary Slope Drain (TSD)

SD

Practice Description

A temporary slope drain is a pipe or other conduit designed to convey concentrated runoff down the face of a cut- or fill-slope without causing erosion. This practice applies wherever concentrated stormwater runoff must be conveyed down a steep slope.

Planning Considerations

There is often a significant lag between the time a cut- or fill-slope is completed and the time a permanent runoff-conveyance system can be installed. During this period, the slope is usually not stabilized and is particularly vulnerable to erosion. This situation also occurs on slope construction that is temporarily delayed before final grade is reached. Temporary slope drains, sometimes called “downdrains,” can provide valuable protection of exposed slopes until permanent runoff-conveyance structures can be installed. See Figure TSD-1 for typical details of a temporary slope drain.

When used in conjunction with diversions, temporary slope drains can be used to convey stormwater from the entire drainage area above a slope to the base of the slope without erosion. It is very important that these temporary structures be installed properly since their failure will often result in severe gully erosion. The entrance section must be securely entrenched, all connections must be watertight, and the conduit must be securely staked. Prior approval may be required from local regulatory agencies if the downdrain outlet is tied into an existing storm sewer or in areas where municipal stormwater is regulated.

Design Criteria

Drainage Area

The maximum allowable drainage area per drain is 5 acres.

Flexible Conduit

The downdrain should consist of heavy-duty flexible material designed for this purpose. The diameter of the downdrain should be equal over its entire length. Reinforced hold-down grommets should be spaced at 10-foot (or less) intervals, with the outlet end securely fastened in place. The conduit should extend beyond the toe of the slope.

Downdrains may be sized according to the table TSD-1.

Drains should be designed to convey the peak rate of runoff from a 10-year 24-hour rainfall whenever it is desired to individually design each installation.

Table TSD-1 Flexible Conduit Diameters

Maximum Drainage Area (Acres)	Pipe Diameter (D) (Inches)
0.5	12
1.5	18
2.5	21
3.5	24
5.0	30

Entrance Sections

The entrance to the downdrain (Figures TSD-2 and TSD-3) should consist of a standard flared end-section for metal pipe culverts. All fittings should be watertight.

The toe plate should be a minimum of 8″ deep.

Extension collars should consist of 12″ long corrugated metal pipe. Avoid use of helical pipe. Securing straps should be fabric, metal, or other material well suited to providing a watertight connection. The strap should secure at least one corrugation of the extension collar.

Diversion Design

An earthen diversion should be used to direct stormwater runoff into the slope drain and should be constructed according to the *Diversion Practice.*

The height of the diversion at the centerline of the inlet should be equal to at least the diameter of the pipe (D) plus 12″. Where the dike height is greater than 18″ at the inlet, it should be level for 3 feet each side of the pipe and be sloped at the rate of 3:1 (Horizontal: Vertical) or flatter to transition with the remainder of the dike.

Outlet Protection

The outlet of the downdrain should be protected from erosion as detailed in the *Outlet Protection Practice*.

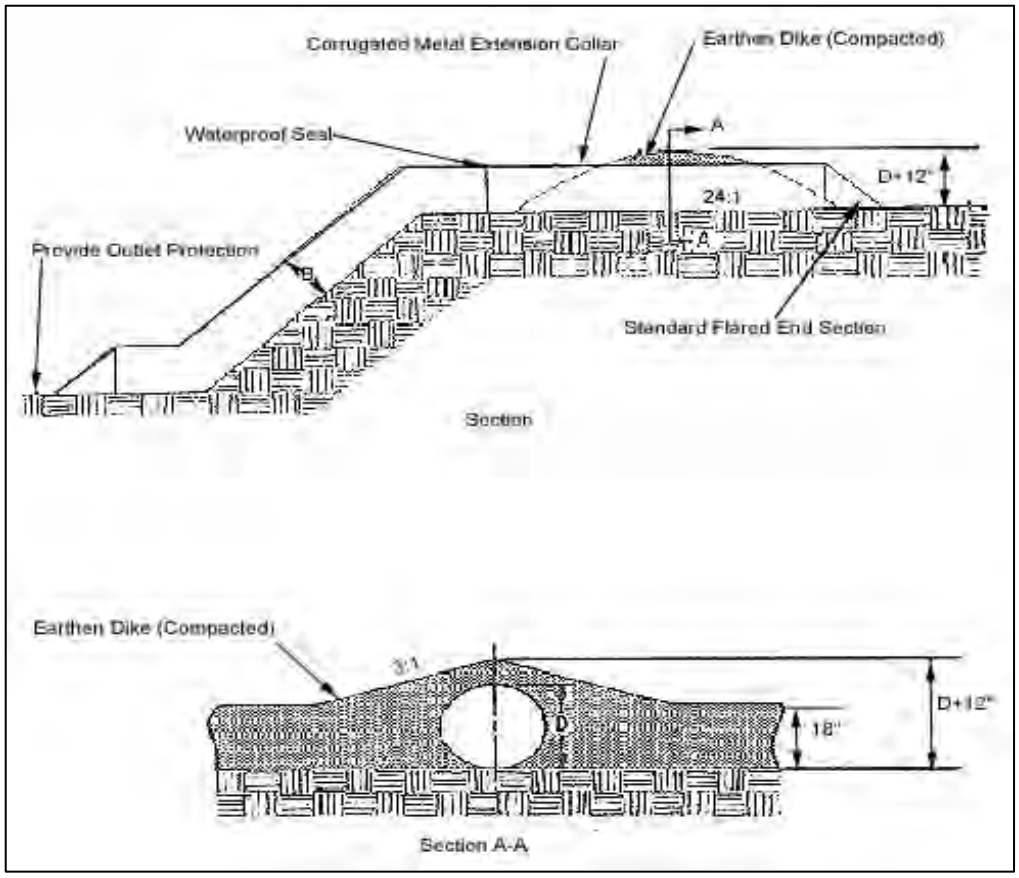


Figure TSD-1 Typical Temporary Slope Drain Detail

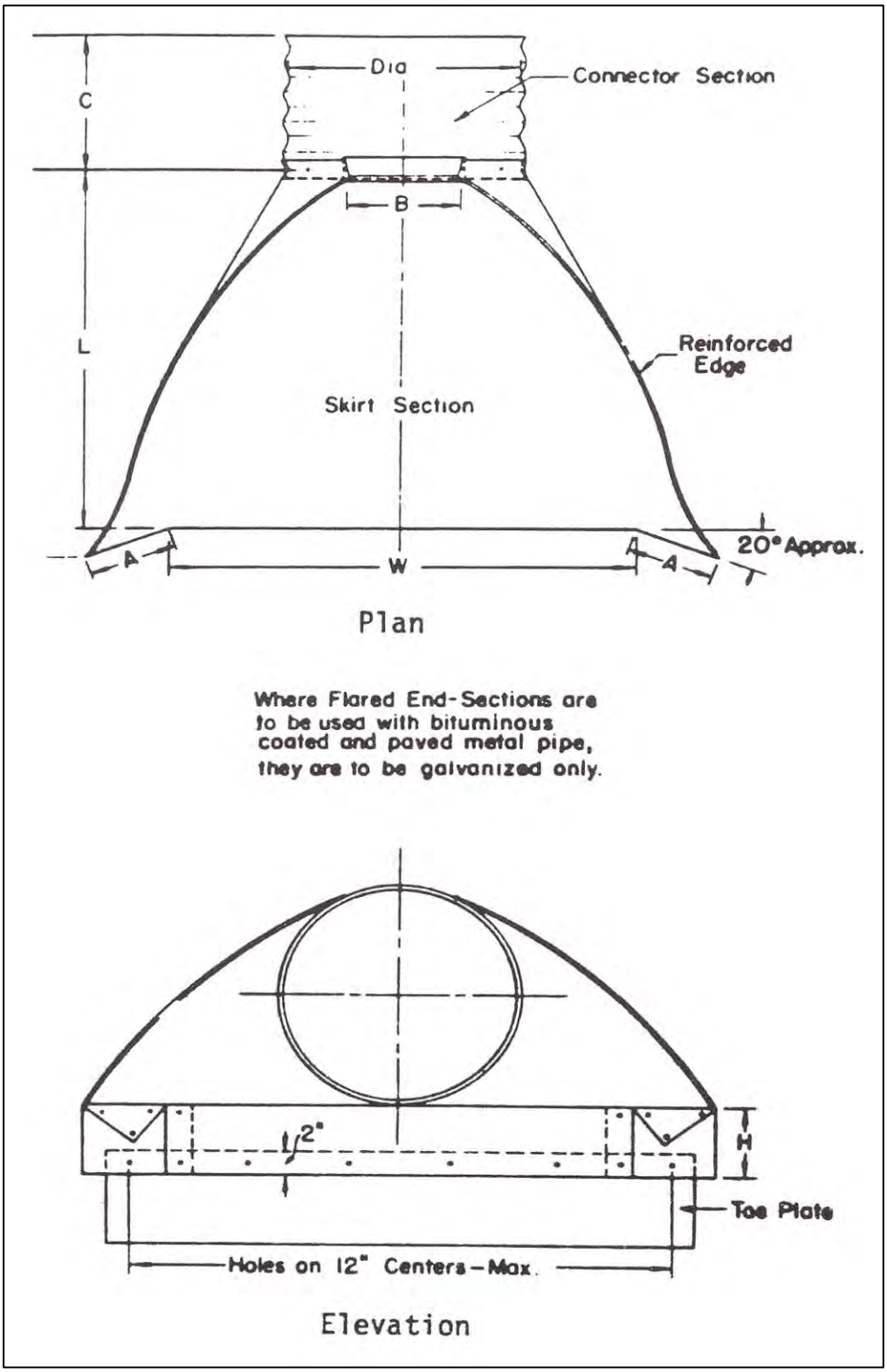
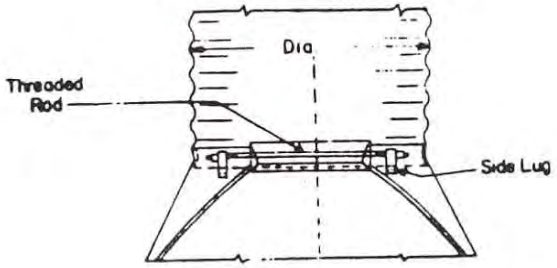


Figure TSD-2 Flared End-Section Detail

Alternate Connection



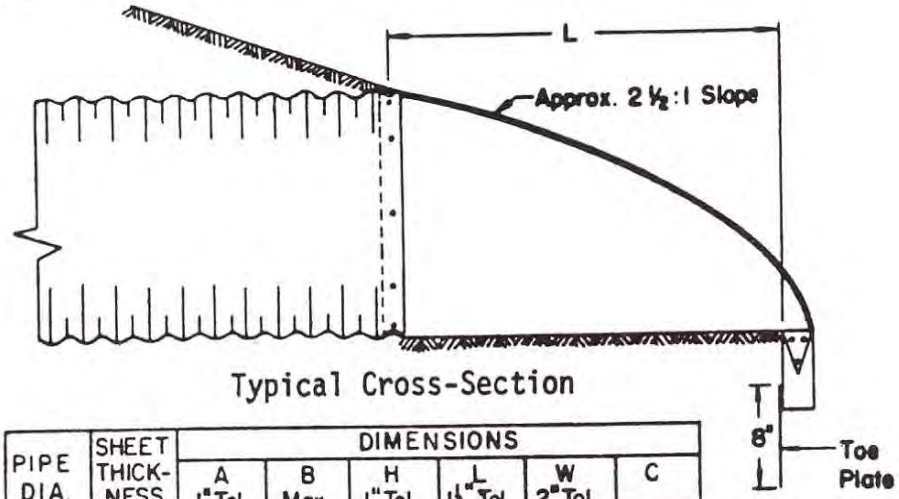
Toe plate, where needed, to be punched to match holes in skirt lip. 3/8" galv. bolts to be furnished. Length of toe plate is W+ 10" for 12" to 30" dia. pipe and W+22" for 36" to 60" dia. pipe.

Skirt Section for 12" to 30" dia. pipe to be made in one piece.

Skirt Section for 36" to 54" dia. pipe may be made from two sheets joined by riveting or bolting on center line, 60" may be constructed in 3 pieces.

Connector Section, Corner Plate and Toe Plate to be same sheet thickness as skirt.

End-sections and fittings are to be galvanized steel or aluminum alloy for use with like pipe.



Typical Cross-Section

PIPE DIA	SHEET THICK-NESS	DIMENSIONS					
		A 1" Tol.	B Max	H 1" Tol.	L 1½" Tol.	W 2" Tol.	C
12"	.064"	6"	6"	6"	21"	24"	24"
15"	.064"	7"	8"	6"	26"	30"	24"
18"	.064"	8"	10"	6"	31"	36"	24"
24"	.064"	10"	13"	6"	41"	48"	24"
30"	.079"	12"	16"	8"	51"	60"	24"
36"	.079"	14"	19"	9"	60"	72"	36"
42"	.109"	16"	22"	11"	69"	84"	36"
48"	.109"	18"	27"	12"	78"	90"	24"
54"	.109"	18"	30"	12"	84"	102"	36"
60"	.109 .138	18"	33"	12"	87"	114"	36"

Figure TSD-3 Flared End-Section Details (continued)

Construction

Prior to start of construction, temporary slope drains should be designed by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the construction process.

Site Preparation

Determine exact location of underground utilities (see Appendix C: MS One-Call and 811 Color Coding).

Place temporary slope drain on undisturbed soil or well-compacted fill at locations and elevations shown on the plans.

Grade the diversion channel at the top of the slope toward the temporary slope drain according to the design plan. Provide positive grade in the pipe under the ridge.

Hand tamp the soil under and around the pipe in lifts not to exceed 6″.

Ensure that the fill over the drain pipe at the top of the slope is placed to the dimensions shown on the design plan.

Ensure that all slope drain connections are secure and watertight.

Ensure that all fill material is well compacted. Securely anchor the exposed section of the drain according to the design.

Extend the drain beyond the toe of the slope and adequately protect the outlet from erosion.

Make the settled, compacted diversion ridge no less than 1 foot above the top of the pipe at every point.

Erosion Control

Compaction of earthfill around the pipe in the vicinity of the ridge is extremely important to avoid piping failure and blowouts.

Immediately stabilize all disturbed areas following construction according to the design plan (with vegetation or other appropriate means of protection).

Construction Verification

Verify that materials, elevations, and installation procedures meet design specifications.

Joints should be carefully inspected for separations or looseness.

Common Problems

Consult with a qualified design professional if any of the following occur:

Variations in topography on site indicate temporary slope drains will not function as intended.

Pipe separates or is displaced.

Animals are going into the pipe outlet.

Maintenance

Inspect slope drains and supporting diversions once a week and after every storm event.

Check the inlet for sediment or trash accumulation; clear and restore to proper condition.

Check the fill over the pipe for settlement, cracking or piping holes; repair immediately.

Check for holes where the pipe emerges from the ridge; repair immediately.

Check the conduit for evidence of leaks or inadequate anchoring; repair immediately.

Check the outlet for erosion or sedimentation; clean and repair, or extend if necessary.

Once slopes have been stabilized, remove the temporary diversions and slope drains so that runoff water no longer concentrates but flows uniformly over the protected slope. Stabilize the diversion and slope drain areas.

References

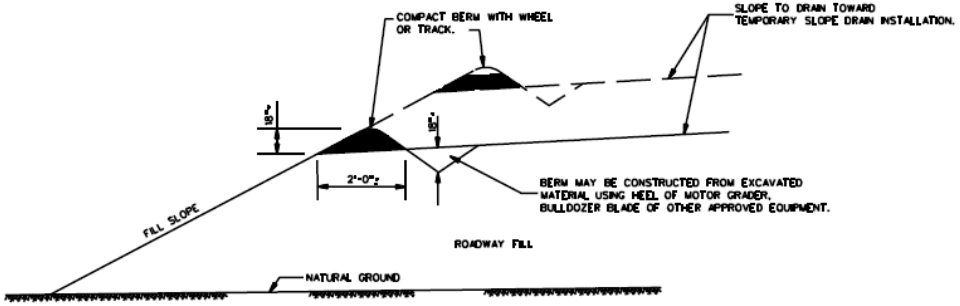
BMPs from Volume 1

Chapter 4

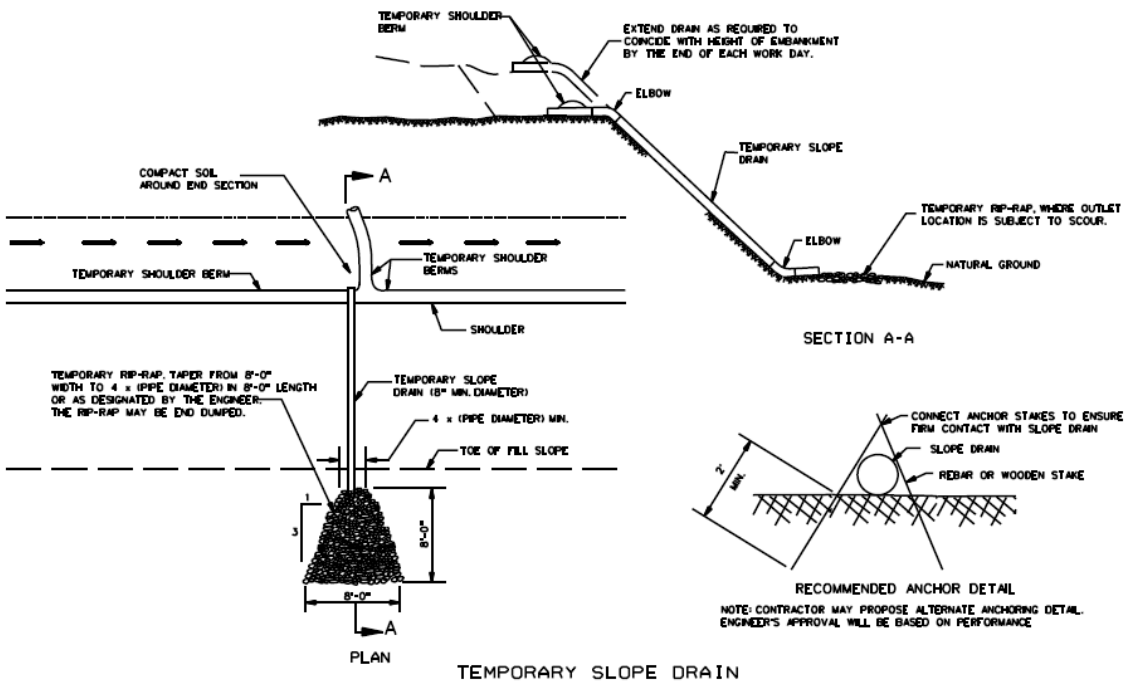
Permanent Seeding (PS)	4-53
Temporary Seeding (TS)	4-103
Diversion (DV)	4-131
Outlet Protection (OP)	4-199

MDOT Drawing TEC-2

Typical Temporary Erosion Control Measures (Slope Drain and Type A Silt Basin)	4-232



TEMPORARY SHOULDER BERM



TEMPORARY SLOPE DRAIN

NOTE: TEMPORARY SLOPE DRAINS TO BE PLACED AT LOW POINT OF ALL SAG VERTICAL CURVES. INTERMEDIATE LOCATIONS TO BE PLACED AS DESIGNATED OR DEEMED APPROPRIATE BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.

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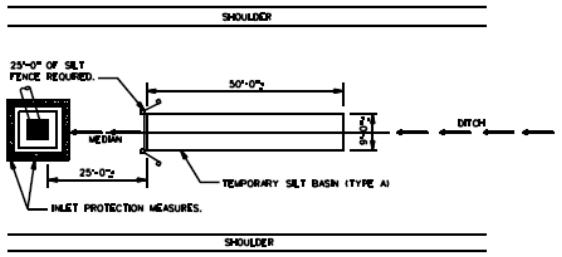
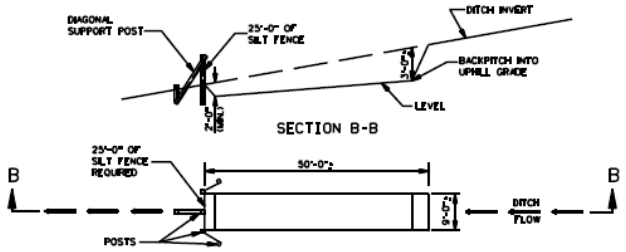


TEMPORARY MEDIAN SILT BASIN (TYPE A)



TEMPORARY SILT BASIN (TYPE A)

NOTE: TEMPORARY SILT BASIN (TYPE A) TO BE PLACED IN SURFACE DRAIN DITCHES AND SIDE DITCHES AT THE END OF CUT SECTIONS, IMMEDIATELY PRECEDING DITCH INLETS AND JUST BEFORE THE WATER (RUNOFF) LEAVES THE RIGHT-OF-WAY OR ENTERS A WATER COURSE. LOCATION AND SIZE (OTHER THAN AS SHOWN) MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.

GENERAL NOTES:

1. THE CONTRACTOR SHALL BE REQUIRED TO FURNISH ALL MATERIALS AND PERFORM ALL WORK FOR THE PROPER INSTALLATION, MAINTENANCE AND REMOVAL OF TEMPORARY EROSION CONTROL MEASURES NECESSARY TO CONTROL SILTATION.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

TYPICAL TEMPORARY EROSION CONTROL MEASURES (SLOPE DRAIN AND TYPE A SILT BASIN)

BY	REVISION	DATE

WORKING NUMBER: TEC-2

FILENAME: EROSION CONTROL\TEC-2.DGN

DESIGN TEAM _____ CHECKED _____ DATE _____

SHEET NUMBER