

3.21 DIVERSION STRUCTURE

Overview

Description: An excavated swale, berm, or combination of the two, constructed in such a manner as to direct water to a desired location or temporarily divert water around an area that is under construction or is being stabilized. Specific applications include perimeter control, diversion away from disturbed slopes, and diversion of sediment-laden water to treatment facilities. This is accomplished by constructing a swale and/or berm at the top of the slope, and conveying it to a letdown structure or stable outlet. On long slopes, diversion structures can be placed at regular intervals to trap and divert sheet flow before it concentrates and causes rill and gully erosion.

Problem identification: During construction, it is often necessary to divert upstream waters around the construction site, thereby reducing the erosion potential. Clean water passing through the site needs to be separated from the sediment-laden water, thus reducing the required size of the sediment removal structure at the downstream end of the construction site.

Diversion structures are also needed to keep upstream water off disturbed slopes or to carry water down the slope without attracting sediment.

Design purpose: To intercept surface and shallow subsurface flows and divert this water away from disturbed areas, active gullies, and critically eroding areas. Diversion structures can also be constructed along slopes to reduce the slope length, intercepting and carrying runoff to a stable outlet point or letdown structure.

The advantages of diversion structures include the following:

- Reduces the volume of flow across disturbed areas, thereby reducing the potential for erosion
- Breaks up the concentration of water on long slopes
- Allows sediment basins and traps to function efficiently by maintaining a separation between clean water and sediment-laden water
- Easily constructed with equipment found on most construction sites

The limitations of diversion structures include the following:

- High flow velocities can cause erosion in the diversion structure
- Diversion structures must be stabilized immediately after installation

Associated practices: Used with slope drains.

Installation: Diversion structures should be used around the perimeter of sites to prevent run-on of offsite flows over disturbed ground. If diversion structures are constructed during times when vegetation cannot be established to stabilize the surface, alternative stabilization methods such as sodding or matting may be required.

Each structure should be designed to carry peak flows from the 2-year, 24-hour storm. The maximum drainage area conveyed through a diversion structure should be 5 acres. The depth of the diversion should be based on the design capacity plus an additional 4 in. of freeboard. The minimum depth provided should be 18 inches. This may be provided solely by a berm or swale

or may be developed with a combination of berm and swale. The shape of the diversion may be parabolic, trapezoidal, or V-shaped, with side slopes of 2:1 or flatter.

The allowable velocity within the diversion structure is based on the soil characteristics of the site. Silty and sandy soils are more prone to erosion than clay soils. However, with the proper design and stabilization methods, diversion structures may be used in all appropriate locations.

The minimum slope of the diversion structure should be sufficient to carry the design flow. The maximum slope of the diversion is limited by the permissible velocities of flows within the structure, as shown in Table 3.3. Since any stabilizing vegetation will likely be destroyed upon construction of the diversion structure, the bare surface situation should be considered for most applications.

Table 3.3. Diversion structure slopes by soil type (Source: Smoot 1999)

Soil type	Permissible velocity, fps for varying channel vegetation			
	Bare	Poor	Fair	Good
Sand, silt, sandy loam, and silty loam	1.5	1.5	2.0	3.0
Sandy clay and sandy clay loam	2.0	2.5	3.0	4.0
Clay	2.5	3.0	4.0	5.0

After construction of the diversion structure, it is important to stabilize the surface immediately with seed and mulch, sod, or other materials.

Maintenance/inspection: Inspect every seven days and after any one-half in. or greater rainfall. Any damage to the vegetated lining should be repaired. All debris should be removed and properly disposed of to provide adequate flow conveyance.

Design life: One year.

Estimated cost: Cost varies with the length and sizing of the diversion structures.