

**Natural Resources Conservation Service  
Conservation Practice Standard**

**DIVERSION  
(Ft.)  
CODE 362**

**DEFINITION**

A channel constructed across the slope with a supporting ridge on the lower side.

**PURPOSE**

To divert excess water from one area for use or safe disposal in other areas.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to sites where:

1. Runoff damages cropland, pastureland, farmsteads, feedlots, or conservation practices such as terraces or stripcropping.
2. Surface flow and shallow subsurface flow caused by seepage are damaging sloping upland.
3. Runoff is in excess and available for use on nearby sites.
4. A diversion is required as part of a pollution abatement system.
5. A diversion is required to control erosion and runoff on urban or developing areas and construction or mining sites.
6. A Type 2 diversion placed along top of streambank is required to collect and divert runoff to a grade stabilization structure.

**CRITERIA**

Capacity. Diversions as temporary measures, with a life span of less than 2 years, shall carry as a minimum the 2-year, 24 hour-duration storm. Diversions that protect agricultural land and those that are part of a pollution abatement system must have the capacity to carry the peak runoff from a 10-year-frequency, 24-hour-duration storm as a minimum.

Diversions designed to protect areas such as urban areas, buildings, and roads, shall have enough capacity to carry the peak runoff expected from a storm frequency consistent with the hazard involved but not less than a 25-year-frequency, 24-hour-duration storm.

All diversions shall have a minimum freeboard above design height of 0.3 feet. Additional design information and design charts for parabolic, V-shaped, and trapezoidal diversions are found in Chapter 9 of Engineering Field Manual for Conservation Practices.

Cross-section. The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes but shall not have slopes steeper than 3:1. The ridge height shall include an adequate settlement factor. The ridge shall have a minimum top width of 4 feet at the design elevation. The minimum cross section shall meet the specified dimensions but not be less than 10 square feet. The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement.

Type 2 diversions placed at top of streambank carrying runoff to a grade stabilization structure shall have an embankment height a minimum of 1 foot above the emergency spillway crest elevation. The design height shall also be a minimum of 1 foot above natural ground at station being checked.

Grade and velocity. Channel grades may be uniform or variable. Grades of 0.3 to 0.5 foot/100 feet are usually acceptable grades for most soil conditions. The upper 100 feet of channel may have a grade up to 1.5 percent when no flow concentrations are present. Channel grades exceeding this condition or exceeding 0.6 percent along the rest of the diversion shall have the channel velocity checked by the Area Engineer. Channel velocity shall not exceed that considered

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nonerosive for the soil and planned vegetation or lining.

Type 2 diversions along streambanks connecting adjacent drainage area to the outlet structure shall provide full drainage by filling depressed areas or lowering outlet channel. Consideration may be given to dedicating depressed areas to permanent or temporary pools (until filled with sediment) for ease of construction, farm ability, and structure maintenance. Use of an underground outlet may also be considered for draining small, depressed areas.

Location. The location of the diversion shall be determined by outlet conditions, topography, land use, cultural operations, and soil type. A diversion in a cultivated field must be aligned to permit use of modern farming equipment.

Diversions shall not be substituted for terraces on a field needing a terrace system for erosion control.

Protection against sedimentation. Diversions should not be used below high-sediment-producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversions. If movement of sediment into the channel is a significant problem, a vegetated filter strip shall be used where soil or climate does not preclude its use. Then, the design shall include extra capacity for sediment and be supported by supplemental structures, cultural or tillage practices, or special maintenance measures. A minimum 30-foot-wide vegetative filter strip uphill from diversion channel centerline shall be used for all diversions having a significant sediment problem to help control the movement of sediment into the channel.

Outlets. Each diversion must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, a vegetated or paved area, a grade stabilization structure, an underground outlet, a stable watercourse, or a combination of these practices. The outlet must convey runoff to a point where outflow will not cause damage. Vegetative outlets shall be installed before diversion construction to ensure establishment of vegetative cover in the outlet channel. Underground outlets consist of an inlet and underground conduit and shall be installed in accordance with Conservation Practice Standard 620 - Underground Outlet. The release rate when combined with storage is to be such that the design storm will not overtop

the diversion ridge. On large watersheds, runoff flows are usually too large to outlet entirely through underground outlets.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Vegetation. Disturbed areas that are not to be cultivated shall be established to grass as soon as practicable after construction. If the soils or climatic conditions preclude the use of vegetation for erosion protection, nonvegetative linings such as gravel, rock riprap, or cellular block may be used. Seedbed preparation, seeding, fertilizing, and mulching shall comply with standards in local technical guides. The vegetation shall be maintained and trees and shrubs controlled by hand, machine, or chemicals.

## CONSIDERATIONS

### Water quantity

- Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge.
- The type of outlet, time of water detention, geology, and topography of the site.

### Water quality

- Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances carried by runoff.
- Effects of nutrients and pesticides on surface and ground water quality.
- Filtering effects of vegetation on movement of sediment and dissolved and sediment-attached substances.
- Short-term and construction-related effects on the quality of downstream water.
- Effects on the movement of dissolved substances below the root zone and toward the ground water.
- Potential for uncovering or redistributing toxic materials and low productive soils that might cause undesirable effects on the water or plants.

## OPERATION AND MAINTENANCE

A maintenance program shall be established to maintain diversion capacity, storage, ridge

height, and the outlets. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practices installed with NRCS assistance. Diversion ridges can be hazardous for farming operations or mowing. Any hazards must be brought to the attention of the responsible person.

#### **PLANS AND SPECIFICATIONS**

Plans for installing diversions shall be in keeping with this standard and shall describe

the requirements for applying the practice to achieve its intended purpose.

Specifications for construction and installation of a diversion shall use or be in conformance with the requirements of the attached "Construction Specifications." Any variation from these specifications shall be approved by an engineer.

## Natural Resources Conservation Service Construction Specifications

### DIVERSION

#### 1. SCOPE

Work shall consist of constructing the diversion, including the channel, supporting ridge, and outlets to the lines and grades as shown on the drawings or as staked in the field. The location of the diversion shall be as shown on furnished drawings or as staked in the field.

#### 2. SITE PREPARATION

All old terraces, fence rows, brush, and tall standing vegetation shall be removed from the area occupied by the diversion ridge and the area from which the earthen construction material will be taken. All brush, logs, stumps, or other debris must be removed from the diversion ridge or channel area and disposed of by burning, burying, or removal from field area.

#### 3. MATERIAL

Materials for earthfills shall be obtained from one or a combination of the following locations: (1) excavation in the channel, (2) immediately downhill of supporting ridges, or (3) other designated areas. Earthfill shall be free of objectionable materials such as brush, roots, and rock particles that endanger the performance of the diversion. Topsoil should be stockpiled and spread over excavated channel and borrow areas to facilitate revegetation.

#### 4. PLACEMENT OF EARTHFILL

All fills shall be full-bodied, with cross section conforming to that specified at all stations. Top of the constructed ridge shall not be lower at any point than the design elevation with required freeboard plus the specified overbuild for settlement. The specified overbuild for settlement shall be as follows:

- 5% of the designed fill height for motorgraders and similar equipment
- 10% of the designed fill height for dozers, disk plows, and similar equipment

All survey rod readings taken to determine ridge dimensions shall be taken in a man's

footprint that has had his full weight applied. Construction equipment shall be routed over the fill to provide compaction such that no bridging results. The ridge top, side slopes, end closures, channel, and other excavated areas shall be finished to a smoothness so the surface can be readily traveled upon by farm type equipment.

Final construction shall be considered satisfactory when:

- Fill elevations are at or within 0.5 foot above design height (including settlement).
- Excavation elevations are within  $\pm$  0.2 foot of design grade and have a positive slope toward the outlet.
- Fill slopes are no steeper than 3.0:1 on the diversion ridge or steeper than 6.0:1 on uphill channel slope.

#### 5. UNDERGROUND CONDUIT

Underground conduits, when used, will be located under the diversion and be installed using mechanical compaction or water packing procedures. Installation and backfill of conduit trenches shall be made in advance of diversion construction to allow adequate settlement. Materials used for the inlet and conduit shall be suitable for the purpose intended and meet the requirements of subsurface drains (606).

Underground conduit installations shall be considered satisfactory when the pipe is within +0.3 foot of design grade and has a positive slope toward the outlet.

#### 6. MEASUREMENT

Measurement will be along the diversion ridge. The amount of earthfill or excavation, as appropriate, will be the design yardage computed from the natural ground line to the neat line as specified. Linear measurement along the diversion ridge shall be to the nearest 1 foot. When used, volume of earthfill or excavation will be computed to the nearest cubic yard.

Measurement for vegetative planting area will cover all disturbed areas (ridge, channel,

borrow, disposal) that are not to be cultivated. Areas will be measured to the nearest 0.1 acre.

Measurement of underground conduit will be the field laying length from the inlet end to the outlet end. No separate accounting of appurtenances (band, tee, ell, etc.) will be made. The length of each pipe size used will be identified.

**7. CONSTRUCTION DETAILS**

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