

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

DIVERSION

(Ft.)

CODE 362

DEFINITION

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

PURPOSE

This practice may be applied as part of a resource management system to support one or more of the following purposes:

- Break up concentrations of water on long slopes, on undulating land surfaces, and on land that is generally considered too flat or irregular for terracing
- Divert water away from farmsteads, agricultural waste systems, and other improvements
- Collect or direct water for water-spreading or water-harvesting systems
- Increase or decrease the drainage area above ponds
- Protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above.
- Intercept surface and shallow subsurface flow
- Reduce runoff damages from upland runoff
- Reduce erosion and runoff on urban or developing areas and at construction or mining sites
- Divert water away from active gullies or critically eroding areas.

- Supplement water management on conservation cropping or stripcropping systems

CONDITIONS WHERE PRACTICE APPLIES

This applies to all cropland and other land uses where surface runoff water control and or management is needed. It also applies where soils and topography are such that the diversion can be constructed and a suitable outlet is available or can be provided.

Diversions shall not outlet on the right-of-way of a public road or utility without written approval from the proper authority.

CRITERIA

General Criteria Applicable to All Purposes

Laws, rules, and regulations. This practice shall conform to all federal, state, and local laws, rules, and regulations. Laws, rules, and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Capacity. Diversions as temporary measures, with an expected life span of less than 2 years, shall have a minimum capacity for the peak discharge from the 2-year frequency, 24-hour duration storm. Freeboard shall not be less than 0.5 foot.

Diversions that protect agricultural land shall have a minimum capacity for the peak discharge from a 10-year frequency, 24-hour duration storm. Freeboard shall not be less than 0.5 foot.

Diversions designed to protect areas such as urban areas, buildings, roads, and animal waste

management systems shall have a minimum capacity for the peak discharge from a storm frequency consistent with the hazard involved but not less than a 25-year frequency, 24-hour duration storm. Freeboard shall not be less than 0.5 foot.

Cross section. The channel may be parabolic or trapezoidal. The diversion shall be designed to have stable side slopes. Vegetated side slopes shall not be steeper than 2:1. Side slopes to be farmed shall not be steeper than 5:1.

The ridge shall have a minimum top width of 4 feet at the design elevation. The ridge height shall include an adequate settlement factor.

The top of the constructed ridge at any point shall not be lower than the design settled height times 1.10, but not less than 1.5 feet. Designed settled height is the hydraulic flow depth (or storage depth) plus 0.5 foot for freeboard.

The design depth at culvert crossings shall be the culvert headwater depth for the design storm plus freeboard.

Grade and velocity. Channel grades may be uniform or variable. Channel velocity shall not exceed that considered non-erosive for the soil and planned vegetation or lining.

Maximum channel velocity for farmed channels shall be as follows: Maximum velocity for erosion-resistant soils is 2.5 feet per second (fps); for average soils, 2.0 fps; and for easily erodible soils, 1.5 fps. Refer to Chapter 9 (Table 9-1) of National Engineering Handbook (NEH) Part 650, Engineering Field Handbook.

Maximum velocity shall be computed by using a Manning's equation roughness coefficient "n" value of 0.035. The channel capacity shall be computed using an "n" value of 0.06.

Maximum channel velocities for permanently vegetated channels shall not exceed those recommended in Chapter 7 of NEH Part 650, Engineering Field Handbook, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels. The channel capacity shall be determined using the highest expected retardance.

Location. The outlet conditions, topography, land use, cultural operations, cultural resources,

and soil type shall determine the location of the diversion.

A diversion in a cultivated field must be aligned and spaced from other structures or practices to permit the use of modern farming equipment.

Protection against sedimentation. Diversions normally should not be used below high-sediment-producing areas. When they are, a practice or combination of practices needed to prevent damaging accumulations of sediment in the channel shall be installed. This may include practices such as land treatment erosion control practices, cultural or tillage practices, vegetated filter strip, or structural measures. Install practices in conjunction with or before the diversion construction.

If movement of sediment into the channel is a problem, the design shall include extra capacity for sediment or periodic removal as outlined in the operation and maintenance plan.

Outlets. Each diversion must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, a lined waterway, a vegetated or paved area, a grade stabilization structure, an underground outlet, soil infiltration, a stable watercourse, a sediment basin, 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 and established before diversion construction to ensure establishment of vegetative cover in the outlet channel.

The release rate of an underground outlet, when combined with storage, shall be such that the design storm runoff will be stored and/or detained with the required freeboard.

All components of the underground outlet shall be designed according to the Conservation Practice Standard 620, Underground Outlet.

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.

Level diversion. A level diversion with closed ends may be used above a level terrace system on land of good permeability. Soil infiltration must permit draining the design storm from the diversion channel within a reasonable period so crops or vegetation are not significantly

damaged by water. Generally level diversions should only be built on soils with an intake rate of 0.5 or greater. Refer to Section KS652.0204 in NEH Part 652, Irrigation Guide.

A level diversion may use a combination of outlets including use of design methods from Chapter 6 of Technical Release No. 55.

Generally the design water depth should not exceed 2 feet. This recommendation can be varied depending on climate, soils, and producer acceptance of crop damage due to flooding and untimely farming operations in wet areas. Channels should be deep ripped a minimum of 6 inches.

Landuser desires, soil parameters, rainfall, runoff, crops, management, irrigation, and farm equipment are to be considered when establishing the allowable tolerance between the high and low points in the channel of level diversions. Unless the conditions dictate a lesser amount, the maximum tolerance between high and low points in the channel of all level diversions is 1 foot for channel widths of 30 feet or less, and 0.4 foot for channel widths greater than 30 feet.

Vegetation. Disturbed areas that are not to be cultivated shall be seeded as soon as practicable after construction. Seedbed preparation, seeding, fertilizing, and mulching shall comply with Conservation Practice Standard 342, Critical Area Planting.

Lining. If the soils or climatic conditions preclude the use of vegetation for erosion protection, non-vegetative linings such as gravel, rock riprap, cellular block, or other approved manufactured lining systems may be used.

CONSIDERATIONS

The diversion side slope lengths should be sized to fit equipment widths when cropped.

At non-cropland sites, consider planting native vegetation in areas disturbed due to construction.

Maximize wetland functions and values with the diversion design. Minimize adverse effects to existing functions and values. Diversion of upland water to prevent entry into a wetland may convert a wetland by changing the hydrology.

Any construction activities should minimize disturbance to wildlife habitat. Opportunities should be explored to restore and improve wildlife habitat, including habitat for threatened, endangered, and other species of concern.

On landforms where archeological sites are likely to occur, use techniques to maximize identification of such sites prior to planning, design, and construction.

PLANS AND SPECIFICATIONS

Plans and specifications for installing diversions shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be prepared for use by the client. The plan shall include specific instructions for maintaining diversion capacity, storage, ridge height, and outlets.

The minimum requirements to be addressed in the operation and maintenance plan are to:

1. Provide periodic inspections, especially immediately following significant storms.
2. Promptly repair or replace damaged components of the diversion as necessary.
3. Maintain diversion capacity, ridge height, and outlet elevations especially if high-sediment-yielding areas are in the drainage area above the diversion. Establish necessary cleanout requirements.
4. Clean each inlet for underground outlets and redistribute sediment buildup so that the inlet is at the lowest point. Inlets damaged by farm machinery must be replaced or repaired immediately.
5. Redistribute sediment as necessary to maintain the capacity of the diversion.
6. Vegetation shall be maintained and trees and brush controlled by hand, chemical, and/or mechanical means.
7. Keep machinery away from steep-sloped ridges and keep equipment operators informed of all potential hazards.