

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

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 strip cropping systems.

CONDITIONS WHERE PRACTICE APPLIES

This practice 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.

CRITERIA

Utilities and Permits. The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including the US Army Corps of Engineers, US Environmental Protection Agency, and Illinois Department of Natural Resources – Office of Water Resources, or document that no permits are required.

The location of a diversion and outlet must be in compliance with applicable state drainage and water conveyance laws. Diversions will not outlet on public roads, highway, or other public utility without the written approval of the appropriate authorities.

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. Temporary diversions shall not be used if the drainage area exceeds 5 acres.

Diversions that protect agricultural land and those that are part of a pollution abatement system shall have a minimum capacity for the peak discharge from a 10-year frequency, 24-hour duration storm.

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 be not less than 0.33 ft.

Design depth is the channel storm flow depth plus freeboard, where required.

Cross-section. The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes. Channel cut slopes shall not be steeper than 3:1. The steepest allowable slope of a vegetated fill is 2:1. Diversions in cropland may be designed to dimensions of Conservation Practice Standard 600, Terrace, provided minimum discharge requirements are met and maximum velocities for earth channels are not exceeded.

The ridge shall have a minimum top width of 4 feet at the design depth. The ridge height shall include an adequate settlement factor. Settlement allowance shall be 10% of the design fill height or .2 feet whichever is greater.

The top of the constructed ridge at any point shall not be lower than the design depth plus the specified overfill for settlement.

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 velocities for permanently vegetated channels shall not exceed those recommended in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, Grassed Waterways or Agricultural Research Service (ARS) Agriculture Handbook 667, Stability Design of Grass-Lined Open Channels.

When the capacity is determined by the formula ($Q = A V$) and the V is calculated by using Manning's equation, the highest expected value of "n" shall be used.

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 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, a stable watercourse, a sediment body 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 insure 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 not overtop the diversion ridge.

The design depth 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 seeded as soon as practicable after construction, according to Conservation Practice Standard 342, Critical Area Planting.

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

CONSIDERATIONS

A diversion in a cultivated field should be aligned and spaced from other structures or practices to permit use of modern farming equipment. The 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 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 (O&M) plan shall be prepared for and reviewed with the landowner or operator. The plan shall specify that the treated areas and associated practices are inspected annually and after significant storm events to identify repair and maintenance needs.

The O&M plan shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice, and include:

- Maintain diversion capacity, ridge height, and outlet elevations especially if high sediment yielding areas are in the drainage area above the diversion. Establish necessary clean-out requirements.
- Each inlet for underground outlets must be kept clean and sediment buildup redistributed so that the inlet is at the lowest point. Inlets damaged by farm machinery must be replaced or repaired immediately.
- Redistribute sediment as necessary to maintain the capacity of the diversion.
- Vegetation shall be maintained and trees and brush controlled by hand, chemical and/or mechanical means.
- Keep machinery away from steep sloped ridges. Keep equipment operators informed of all potential hazards.

REFERENCES

Natural Resources Conservation Service, Engineering Field Handbook, Chapter 7, Grassed Waterways.

Temple et al, 1987. Agricultural Research Service, Agriculture Handbook 667, Stability Design of Grass-Lined Open Channels.

- Provide periodic inspections, especially immediately following significant storms.
- Promptly repair or replace damaged components of the diversion as necessary.

NATURAL RESOURCES CONSERVATION SERVICE CONSTRUCTION SPECIFICATION

DIVERSION

1. SCOPE

The work shall consist of constructing the diversion channel and ridge, and excavating, filling and shaping as required by the construction plans.

2. LOCATION

The location of the diversion shall be as shown on the construction plans or as staked in the field.

3. SITE PREPARATION

All dead furrows, ditches, and gullies shall be filled prior to or as a part of construction. Old terraces, fencerows, brush, and tall standing vegetation shall be removed from the area occupied by the terrace ridge and the area from which the earthen construction material will be taken.

4. MATERIAL

Earth fill material shall be free from frozen particles, roots, sod, brush, and other objectionable materials that might endanger the performance of the terrace. The fill material shall have no rock particles larger than 3 inches in diameter.

The moisture content of the earth fill material shall be sufficient to permit satisfactory compaction. The moisture content can generally be considered as satisfactory if the fill material can be molded into a round ball between the hands without readily separating or squeezing out free water.

For broadbase diversion ridges, required fill material shall come from the diversion channel unless otherwise specified. For grassed back and narrow base diversion ridges, fill material shall come from the downhill side of the diversion ridge, except for cuts that are required to construct the channel to the specified grade and cross section.

5. PLACEMENT OF EARTHFILL

All ridges shall be constructed to the planned alignment, grade and cross-section shown on the plans, with the specified overfill for settlement and the channel graded to drain reasonably well. Any ditch or depression at the bottom of the back slope shall be filled and smoothed so that drainage will be away from the terrace. All fill cross sections shall conform to that specified for all stations. The ridge portion of the diversion shall be compacted by

routing the hauling and spreading equipment over the fill material in such a manner that the entire surface of the completed ridge will be traversed by not less than one tread/track of equipment. The diversion channels, side slopes, ridges, cut areas, and fill areas shall be finished to a smoothness so the surface can be readily traveled upon by farm-type equipment.

When topsoil salvaging is specified, areas to receive topsoil shall be brought to within 4 inches of final grade, or as specified on the construction plans. Topsoil shall be evenly placed and spread over specified area to bring it to final grade.

6. OUTLETS

Underground tile outlets are to be installed at locations shown on the drawings or as staked in the field. Provisions must be made to prevent piping if underground conduits are located under diversion ridges. Mechanical compaction, water packing, trench sidewall sloping, and installation and backfill of conduit trenches early enough to allow adequate settlement are methods that can be used. Refer to Construction Specifications 620, Underground Outlet, for detailed installation requirements.

Diversion outlet structures are to be installed at locations shown on the drawings or as staked in the field. Refer to Construction Specifications 410, Grade Stabilization Structures, for detailed installation requirements.

Where diversions outlet into established grassed waterways or vegetated areas, care shall be taken during construction to minimize disturbance of existing vegetation. The transition from the diversion channel to the center of the waterway shall be free of abrupt changes in grade.

7. VEGETATION

A protective cover of vegetation shall be established on steep back slope and narrow-based terraces when specified in the Construction Details section. Refer to the Construction Specifications 342, Critical Area Seeding, for detailed seeding requirements.

8. UTILITIES

The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.