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.

This practice applies to all graded and level diversions. It does not apply to Terraces (600). Level diversions do not impound or store design storm runoff. Level diversions shall be open-ended structures.

Diversions shall not be substituted for terraces on land with slopes greater than one percent when terracing is required for erosion control.

CRITERIA

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.

Diversions that protect agricultural land 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.

Design depth is the channel storm flow depth plus freeboard*. Minimum freeboard for all graded diversions shall be 0.3 foot. Minimum freeboard for level diversions shall be 0.5 foot.*

Cross section. The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes.

The ridge shall have a minimum top width of 4 feet at the design depth. Ridge height shall include an adequate settlement factor *(See Texas, General Specification, Diversion, GS-362)*.

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

For ridge type diversions, the ridge height shall include an adequate settlement factor.

For channel type diversions with design flow depths of 2.0 feet or less, allowance for settlement is normally not needed because of construction method and low height of fill in the ridge. However, survey readings for constructed ridge dimensions should be taken in a person's footprint. Ridge heights for design flow depths in excess of 2.0 feet will require the appropriate percentage allowance for settlement. In all cases fills shall be full-bodied and be built to sufficient height to equal or exceed the design height of the ridge after settling

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.

Grade of diversions on cultivated land may be variable, but should not exceed 0.3 foot per 100 feet except that a grade of 0.5 foot in the last 100 feet will be acceptable. The normally recommended grade in rainfall areas averaging less than 30 inches annually is 0.05 to 0.10 foot per 100 feet with the previously stated allowance for the last 100 feet.

Grade of diversions on grassland may be variable, but the grade should not exceed 0.5 foot per 100 feet.

Diversions shall be designed for required capacity in accordance with procedures and guidelines contained in NRCS Engineering Field Handbook (EFH) Part 650, Chapter 9, Diversions, and the Handbook of Channel Design for Soil and Water Conservation, SCS-TP-61.

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.

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) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels (Sept. 1987)*; or the Handbook of Channel Design for Soil and Water Conservation, SCS-TP-61.*

Diversions shall be designed for a stable velocity. In cropland maximum allowable velocity shall be 3.0 feet per second for erosion resistant soils and 2.0 feet per second for easily eroded soils. In grassland the velocity shall not exceed that considered non-erosive for the soil and planned vegetation or lining.

Location. The outlet conditions, topography, land use, cultural operations, cultural resources, and soil type shall determine the location of the diversion.

Diversions installed to break up concentrations of rainfall runoff on cropland with long slopes of zero to one percent should not be spaced more than 1320 feet apart.

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 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 insure establishment of vegetative cover in the outlet channel.

The release rate of an under ground 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.

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.

PLANNING 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 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.

A diversion may increase the opportunity for surface water to infiltrate into soil upstream of the practice. A diversion diverts surface water away from the downslope area, reducing the opportunity for water to infiltrate into the soil. Since the downslope area is generally a larger percentage of the watershed, the net effect would be a decrease in the amount of water infiltration. Diversions may change the location in which surface water may flow, but they are likely to have little effect on the quantity of surface or groundwater.

Diversions reduce sheet and rill erosion by reducing length of slope. Sediment may be reduced by elimination of ephemeral and large gullies. This may reduce the amount of sediment and related pollutants delivered to surface waters. By diverting surface runoff away from particular areas, this practice may prevent incorporation of pollutants present within these areas into runoff, and transport of those pollutants to receiving waters.

Construction activities may adversely effect downstream waters. The potential exists for uncovering or redistributing toxic materials and low productivity soils.

PLANS AND SPECIFICATIONS

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

Construction specification describing the requirements for applying this practice shall be developed from the Construction Practice

General Specifications (Texas) for Diversion. The Construction Details section shall be used to describe site specific job requirements.

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:

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 clean-out requirements.
4. 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.
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. Keep equipment operators informed of all potential hazards.

APPROVAL AND CERTIFICATION

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PRACTICE STANDARD APPROVED:

/s/ John W. Mueller	07/18/2002
State Conservation Engineer	**Date**

NRCS, Texas

June, 2002