

NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA CONSERVATION PRACTICE STANDARD

DIVERSION

(Feet)

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 conservation 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.

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 agricultural waste management system components 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 0.3 ft.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

362-VA-2

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.

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 ridge top width may be 3 feet at the design elevation for diversions installed above cropland, pastureland, or woodland that have less than 10 acres of contributing drainage area.

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

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 nonerosive 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 9, or Agricultural Research Service (ARS) [Agricultural Handbook 667](#), Stability Design of Grass-Lined Open Channels (Sept. 1987).

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 use of modern farming equipment.

PROTECTION AGAINST SEDIMENTATION

Diversions normally 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 in conjunction with or before the diversions.

If movement of sediment into the channel is a significant problem, the design shall also 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 before diversion construction to ensure establishment of vegetative cover in the outlet channel.

Underground outlets consist of an inlet and underground conduit. 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 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 ESTABLISHMENT

The diversion ridge, channel, and other disturbed areas that are not to be cultivated shall be established in permanent vegetation as soon as practicable after construction. Seedbed preparation, seeding, fertilizing, and mulching shall be appropriate for the site-specific conditions. Refer to the *NRCS Plant Establishment Guide for Virginia* for allowable species, seeding mixtures, and recommended seeding dates. The vegetation shall be maintained and trees and shrubs controlled by hand, machine, or chemicals as necessary.

LINING

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

ENVIRONMENTAL CONCERNS

The diversion shall not affect the hydrologic regime of adjacent wetland areas. Minimize adverse effects to existing functions and values. Impacts to existing wetland functions shall be assessed. USDA wetland conservation provisions apply. The practice must comply with NRCS wetland technical assistance policy contained in GM 190, Part 410.26.

Planning and implementation of this practice will be preceded by an environmental evaluation using the "Environmental Evaluation Data Sheet", form VA-EE-1 and related guidelines found in GM-190, part 410 (Virginia Amendments).

OTHER CONSTRUCTION REQUIREMENTS

All ditches or gullies shall be filled, and trees and other obstructions shall be removed before construction begins unless planned as part of the diversion construction activities.

If underground conduits are located under diversion ridges, mechanical compaction, water packing, and installation and backfill of conduit trenches shall be made in advance to allow adequate settlement. The materials used for the inlet and conduit shall be suitable for the purpose intended and shall meet the requirements of Virginia Conservation Practice Standards *Subsurface Drain (Code 606)* or *Underground Outlet (Code 620)*. Diversion ridges constructed across gullies or depressions shall be compacted by machinery travel or other means sufficient to ensure proper functioning of the diversion. The surface of the finished diversion shall be reasonably smooth and present a workmanlike appearance.

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.

In outlets such as a grassed waterway, the transition section may be susceptible to erosion damage. If vegetation proves inadequate in the transition section, it may be necessary to line this section of channel.

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

On large watersheds, runoff flows are usually too large to outlet entirely through underground outlets. A combination of outlet practices may be needed.

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.

Diversions may affect the water budget, especially the volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge. The effects on the water budget should be considered in the planning and design of diversions, especially where water is diverted for other uses.

Consideration should be given to the effect on surface water quality from the movement of sediment, pathogens, soluble nutrients and pesticides attached to sediment and carried by runoff.

Construction related effects on downstream water resources should be considered. Measures should be taken during design, construction and establishment to minimize erosion and pollution.

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 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.

DESIGN DATA

As a minimum, record and maintain the following planning and design data:

1. Document tract number, field number, and acres.
2. Record all design data in an engineering field notebook, and/or on a plan, or on a design sheet.
3. Locate the diversion on a plan map or location sketch.
4. Delineate and size the contributing drainage area.
5. Profile along the centerline of the proposed diversion channel. Record the planned length of each diversion.
6. Determine design flow, channel grade, and maximum permissible velocity.
7. Determine the channel and ridge dimensions along the centerline for each change in the designed section.
8. Locate and describe the adequate outlet(s) to be used.
9. Include specifications for seeding including necessary preparation, seed species, and mulching, liming, and fertilizer rates.
10. Complete form VA-EE-1.

CHECK DATA

As a minimum, record and maintain the following check data:

1. Rod readings taken at least every 100 feet along the diversion showing elevations of the bottom of the channel and the top of the ridge opposite it.

2. A cross-section of entire channel and ridge for each design section.
3. Length of completed diversion.
4. A statement that the following have been satisfactorily completed:
 - a) The diversion was installed according to standard.
 - b) Seeding or successful establishment of vegetation on all disturbed areas.
 - c) Proper disposal of stumps, logs, brush, soil and other debris resulting from site preparation.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be established to maintain diversion capacity, storage, ridge height, and outlets. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practices installed under this standard. Diversion ridges can be hazardous for farming operations or mowing. Any hazards must be brought to the attention of the responsible person.

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 sediment removal 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.

REFERENCES

1. National Engineering Handbook - Part 650, Engineering Field Handbook, Chapter 9, Diversions.
2. NRCS Virginia Field Office Technical Guide.
3. General Manual 190, Part 410, Compliance with NEPA.
4. Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels (September 1987).
5. NRCS, *Plant Establishment Guide for Virginia*.

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DIVERSION

Approved Practice Narratives

(Feet)

CODE 362

362 D1 Diversion: Establish and maintain a diversion in accordance with the Virginia Conservation Practice Standard *Diversion (Code 362)* and any design(s) or specification(s) provided.

362 D2 Diversion: Maintain existing diversion in accordance with the Virginia Conservation Practice Standard *Diversion (Code 362)* and any design(s) or specification(s) provided.

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