

NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA CONSERVATION PRACTICE STANDARD
SURFACE DRAINAGE, FIELD DITCH

(Feet)

CODE 607

DEFINITION

A graded ditch for collecting excess water in a field.

PURPOSE

To collect or intercept excess surface water, such as sheet flow, from natural and graded land surfaces or channel flow from furrows and carry it to an outlet; and collect or intercept excess subsurface water and carry it to an outlet.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to drainage ditches installed to collect water from a field. It does not apply to Virginia Conservation Practice Standards *Surface Drainage, Main or Lateral (Code 608)* or *Grassed Waterway (Code 412)*.

Applicable sites are flat or nearly flat and:

1. Have soils that are slowly permeable (low permeability) or that are shallow over barriers, such as rock or clay, which hold or prevent ready percolation of water to a deep stratum.
2. Have surface depressions or barriers that trap rainfall.
3. Have insufficient land slope for ready movement of runoff across the surface.
4. Receive excess runoff or seepage from uplands.

5. Require the removal of excess irrigation water.
6. Require control of the water table.
7. Have adequate outlets available for disposal of drainage water by gravity flow or pumping.

CRITERIA

Drainage field ditches shall be planned as integral parts of a drainage system for the field served and shall collect and intercept water and carry it to an outlet with continuity and without ponding. Compliance with federal, state, and local laws and regulations is required.

INVESTIGATIONS

An adequate investigation shall be made of all sites. This should include as a minimum, soils, topographic feature, wetlands, and other environmental considerations.

LOCATION

Ditches shall be established, insofar as topography and property boundaries permit, in straight or nearly straight courses. Random alinement may be used to follow depressions and isolated wet areas of irregular or undulating topography. Excessive cuts and the creation of small irregular fields shall be avoided.

On extensive areas of uniform topography, collection or interception ditches shall be installed as required for effective drainage.

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

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DESIGN

The size, depth, side slopes, and cross section area shall:

1. Be adequate to provide the required drainage for the site.
2. Permit free entry of water from adjacent land surfaces without causing excessive erosion.
3. Provide effective disposal or reuse of excess irrigation water (if applicable).
4. Conduct flow without causing excessive erosion.
5. Provide stable side slopes based on soil characteristics.
6. Permit crossing by field equipment if feasible.
7. Permit construction and maintenance with available equipment.

DRAINAGE RUNOFF

Drainage runoff shall be determined from the following tables:

Coastal Plain and Lower Piedmont Area

Area	Field Crops	Improved Pasture
<320 acres	0.092 cfs/acre	0.06 cfs/acre
320–640 acres	0.075 cfs/acre	0.042 cfs/acre

Upper Piedmont and Mountain Area

Area	Field Crops	Improved Pasture
<320 acres	0.12 cfs/acre	0.06 cfs/acre
320–640 acres	0.12 cfs/acre	0.042cfs/acre

Actual values from established NRCS drainage coefficient curves or from the applicable Virginia drainage guide may be substituted for design purposes. Spacing or layout shall be according to recommendations in the local drainage guide.

CROSS-SECTION

The design ditch cross-section shall be set below the design hydraulic grade line and shall meet the combined requirements of capacity, limiting velocity, depth, side slope, bottom width, and, if needed, allowance for initial sedimentation. Side slopes and minimum depth shall be in accordance with the following tables or as shown in the local drainage guide:

Ditches for Collecting Excess Surface Water

Type of Ditch	Min. Depth	Min Side Slopes
V or Trapezoidal	12 inches	4:1
Double V or W	6 inches	4:1

All V and W type ditches shall be cut not less than six inches below design grade to allow initial silting.

Ditches for Collecting Excess Surface Water and Subsurface Water

Soil	Min. Side Slopes
Clay and Loams	1:1*
Peat, muck, or sands	0.7:1*

*Minimum side slopes of 1.5 to 1 in clay and loam and 1 to 1 in peat, muck, or sand are recommended unless local experience has shown that the steeper slopes will remain stable.

VELOCITY

Allowable maximum velocities for designed depth of flow, when determining ditch sizes, shall be as follows:

Sandy and Sandy Loam	2.5 feet per second
Silt Loam	3.0 feet per second
Sandy Clay Loam	3.5 feet per second
Clay Loam	4.0 feet per second
Graded Silt to Cobbles	4.5 feet per second
Clay, Fine Gravel	
Graded Loam to Gravels	5.0 feet per second

Shale, Hardpan
and Coarse Gravels 6.0 feet per second

Cobbly material which
provides shingled effect 8.0 feet per second

A desirable minimum velocity is 1.5 feet per second. On flat grades where the design velocity is below this value, the cross-section shall be adjusted to obtain the highest velocity that depth and maintenance limits permit.

CULVERTS AND ROAD CROSSINGS

Culverts or bridges for farm road crossings over drainage ditches must have sufficient opening and capacity to pass the designed flow within the ditch banks. Culverts under public roads shall be designed or replaced in cooperation with the Virginia Department of Transportation to ensure ample capacity for an outlet.

OUTLETS

The outlet for each ditch shall have capacity to provide free discharge for the system.

BERMS AND SPOIL BANKS

Adequate berms shall be provided for maintenance equipment to eliminate the need for moving spoil banks in future operations, to provide for work areas and facilitate spoil spreading, to prevent excavated material from washing or rolling back into ditches, and to lessen sloughing of banks caused by loads too near the edge of the ditchbanks, except in those cases where spoil is spread per the Virginia Conservation Practice Standard, *Spoil Spreading (Code 572)*. When berms are used, provisions must be made to channel surface water to the ditch without causing erosion.

VEGETATION ESTABLISHMENT

All spoil banks and side slopes of ditches that are 1.4 to 1, or flatter, shall be seeded for erosion protection. The ditch bottom, side slopes, and other disturbed areas 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* Mixture Numbers 1 through 4 for allowable species, seeding mixtures, and recommended seeding dates. Other mixtures shall be used only with the concurrence of the TAST engineer.

The vegetation shall be maintained and trees and shrubs controlled by hand, machine, or chemicals as necessary.

ENVIRONMENTAL CONCERNS

All required federal, state, and local permits must be obtained by the owner prior to NRCS construction assistance.

Potential impacts to adjacent wetland areas must be addressed. 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).

CONSIDERATIONS

Effects on water budget components, especially relationships between runoff and infiltration, should be considered.

Evaluate the effect of changes in the water table on the rooting depth for anticipated land uses.

Downstream effects of erosion and yields of sediment and sediment-attached substances should be identified.

The effects on the loadings of dissolved substances downstream should be evaluated.

There may be changes in downstream water temperature.

Effects on wetlands or other water-related wildlife habitat should be investigated and documented according to current policy.

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The potential impacts on cultural resources should be identified.

There may be a need for riparian buffers, filter strips, and fencing.

Consider the effects on the visual quality of downstream watercourses.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing drainage field ditches shall be in keeping with this standard and shall describe the requirements for properly installing the practice to achieve its intended purpose.

DESIGN DATA

As a minimum, record and maintain the following planning and design data. Include information on either the drawings, approved forms, or in the engineering field book as appropriate:

1. Completed Environmental Evaluation Form VA-EE-1.
2. Location map. Including tract number, field number(s), and acreage in field(s). Include plan view of ditch in relation to an identifiable point.
3. Drainage area, soil type drained, and drainage coefficient.
4. Engineering layout surveys.
5. Grade, bottom width, average depth, side slopes, hydraulic gradient, and berm width for each design section of new ditch.
6. Cross-section and profile of existing ditch if it is to be part of a new ditch.
7. Structures where applicable.
8. Soil borings where applicable.
9. Outlet conditions.
10. Cross-reference to appropriate engineering field books will be made on the drawings and plans.

11. Recommendations for channel vegetation.

CHECK DATA

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

1. For each design section, record cross-section notes to show grade, bottom width, top width, depth, side slopes, berm width, and spoil banks, if specified. Random (single) lines require a freehand sketched plan view and a profile and cross-section obtained with a survey instrument. Uniformly sized parallel field ditches require a typical cross-section, plan view sketch of ditches on plan map, and ditch length paced or scaled from photographs.
2. Length of all ditches installed.
3. Data on all structures installed.
4. Adequacy of outlet.
5. Certification that practice meets standards and specifications. Note any exceptions.
6. A statement that the following have been satisfactorily completed:
 - a) Spoil spreading
 - b) Seeding or successful establishment of vegetation

All field survey notes and construction check data will be recorded in a standard engineering field book or other approved forms in accordance with Technical Release 62 and Chapter 1, Engineering Field Handbook.

OPERATION AND MAINTENANCE

Operation and maintenance requirements shall be established for maintenance of the ditches installed under this standard. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practices installed under this standard.

Ditches shall be maintained by:

- Keeping channels clean and free of materials that can reduce the flow.
- Repairing eroded areas as necessary.
- Inspecting side slopes to ensure stability is maintained. Reshape and re-seed slopes as necessary.
- Checking outlet to ensure free flow and a stable outlet condition.

REFERENCES

1. National Engineering Handbook - Part 650 - Engineering Field Handbook, Chapter 1, Engineering Surveys and Chapter 14, Drainage.
2. *Virginia Drainage Guide*-April 1985.
3. Technical Release 62- Engineering Layout, Notes, Staking and Calculations (January 1979).
4. NRCS, Virginia, *Plant Establishment Guide for Virginia* (December 2000).
5. NRCS, Virginia Field Office Technical Guide (FOTG), Section IV.
6. General Manual-190, Part 410, Compliance with NEPA.
7. 700 Series Virginia Construction Specifications.

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Approved Practice Narratives

(Feet)

CODE 607

607 D1 Surface Drainage, Field Ditch:
Establish and maintain ditch(es) in accordance
with the standard and any design(s) or
specification(s) provided.

607 D2 Surface Drainage, Field Ditch:
Maintain existing ditch(es) in accordance with
the standard and any design(s) or
specification(s) provided.

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