Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

# SURFACE DRAIN, FIELD DITCH

## CODE 607

## (ft)



### DEFINITION

A graded channel on the field surface for collecting excess water.

### PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Intercept excess surface and shallow subsurface water from a field, conveying it to a surface main or lateral
- Collect excess irrigation water for a tailwater reuse system

### CONDITIONS WHERE PRACTICE APPLIES

This standard applies to fields having one or more of the following conditions:

- Soils with low permeability or shallow barriers such as rock or clay, which impede percolation of water to a deep stratum.
- Surface depressions or barriers that trap rainfall.
- Areas of insufficient land slope for sufficient movement of runoff across the surface.
- Excess runoff or seepage from uplands.
- Excess irrigation water.

### CRITERIA

**General Criteria Applicable to All Purposes**

Plan the field ditch as an integral part of the drainage system for the field served. Design the field ditch to collect and intercept water and convey it to an outlet with continuity and without unacceptable ponding. Design the field ditch to permit free entry of water from adjacent land surfaces without causing excessive erosion.

The design of the surface drainage system must comply with all local, state, and Federal drainage and water regulations.

If wetlands may be present, then complete an appropriate wetland determination per established procedures.

**Investigations**

Investigate the site to ensure adequate outlets are available for discharge of drainage water by gravity flow or pumping.

**Location**
Surface drain pattern, length, and location will depend on topography. Install collection or interception ditches as required for effective drainage.

**Capacity**
Size the capacity of the surface drain to provide for the removal of excess water, based on climatic and soil conditions and the needs of crops. Base the design capacity on the watershed area; the topographic, soil, and land use information; and use of the appropriate drainage curves or coefficients. Compute the size of the surface drain using Manning's formula.

**Velocity**
Design the surface drain so as not to exceed the maximum velocity contained in Table 14.3 of NRCS National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water Management (Drainage). Depending on the velocity of the drain, account for additional capacity for accumulation of sediment deposit through the life of the conservation practice.

**Criteria Applicable to Collection of Excess Surface Water**

**Capacity**
Base the depth, spacing, and location of field ditches on site conditions, including soils, topography, ground water conditions, crops, land use, outlets, and saline or sodic conditions. Use hydrologic models as appropriate to the conditions.

**Criteria Applicable to Interception of Excess Shallow Subsurface Water**

**Capacity**
Determine the required capacity using one or more of the following methods:

- Application of drainage coefficients to the acreage drained taken from the Ohio drainage guide, if available. Include added capacity required to convey the calculated volume of surface water.
- Measurement of the rate of shallow subsurface flow at the site during a period of adverse precipitation and groundwater conditions.
- Estimates of locally tried and proven lateral shallow subsurface flow rates.

**Depth, Spacing, and Location**
Base the capacity, size, depth, side slopes, and cross-sectional area on the Ohio Drainage Guide recommendations, if available. If State or local information is not available, use the information contained in NRCS National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water Management (Drainage).

**Criteria Applicable to Collection of Excess Irrigation Water**

Base the capacity, size, depth, side slopes, and cross-sectional area on guidance in the State irrigation guide or local information of potential runoff volume for the current irrigation system.

Apply all reasonable measures to minimize irrigation runoff.

Add additional capacity for surface runoff that occurs outside the irrigation season, if that runoff water is available for collection.

## CONSIDERATIONS

When planning this practice, consider the following items as applicable:

- Establish ditches, insofar as topography and property boundaries permit, in straight or nearly straight courses. Use random alignment to follow depressions and isolated wet areas of irregular or undulating topography. Avoid excessive cuts and the creation of small irregular fields.
- Allow crossing by field equipment if needed and feasible.

- Potential impacts on downstream flows or aquifers that would affect other water uses or users.
- Potential water quality impacts for soluble pollutants, sediments and sediment-attached pollutants.
- Potential for uncovering or redistributing toxic materials.
- Impacts on cultural resources.
- Effects on wetlands or water-related wildlife habitats.
- Potential benefits of drainage water management, including reduction of nutrient concentrations, improved plant productivity, and enhancement of seasonal wildlife habitat.
- Potential effects of drainage water management on downstream water temperatures or salinity of soils.
- The need for riparian buffers, filter strips, and fencing.
- Effects on water budget components, especially the relationships between runoff and infiltration.

## PLANS AND SPECIFICATIONS

Prepare plans and specifications for constructing the drainage field ditch in keeping with this standard and describing the requirements for properly installing the practice to achieve its intended purpose.

Requirements for all drawings prepared by NRCS/SWCD as well as by others (Professional Engineer or Registered Architect) are contained in the National Engineering Manual (NEM) Part 541- Drafting and Drawings.

Provide instruction in the specification or on the drawings that the landowner or operator is responsible for securing all required permits or approvals and for performing in accordance with such laws and regulations. The landowner and/or contractor is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

As a minimum, there shall be—

- A cover sheet with utility notification responsibilities and location map,
- A plan view showing benchmark location and descriptions. The plan view will also show the drained area and location of the planned surface drains including stationing with sufficient reference to site features so that layout will be accurate.
- Profile along centerline of channel with upstream and downstream planned grade elevations; show grade break stations and elevations.
- A typical section of the surface drains and elevation information on the construction drawings; show side slopes and bottom width.
- Information about grade, spacing and outlet erosion protection as needed.
- Areas identified needing vegetative establishment after construction and indicate the area to dispose of excavated materials.
- Quantities

## OPERATION AND MAINTENANCE

Provide a site-specific operation and maintenance plan to the landowner or operator prior to installing the practice.

- Include guidance in the plan for the routine maintenance and operational needs of the ditch.
- Include guidance on periodic inspections and post-storm inspections to detect and minimize damage to the surface drain.
- Include adequate guidance for periodic removal of sediment and other debris.

## REFERENCES

USDA NRCS National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water Management (Drainage).