

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
SURFACE DRAIN, FIELD DITCH
(Ft.)

CODE 607

DEFINITION

A graded ditch for collecting excess water in a field.

PURPOSE

This practice may be applied as part of a resource conservation system to achieve one or more of the following:

- Interception of excess subsurface water and conveyance to an outlet.
- Collection or interception of excess surface water such as sheet flow from natural and graded land surfaces or channel flow from furrows and conveyance to an outlet.
- Drainage of surface depressions.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable to sites that:

- Have soils that are slowly permeable (low or very low saturated hydraulic conductivity) or are shallow over barriers such as rock or clay, which hold or prevent ready percolation of water to a deep stratum.
- Have surface depressions or barriers that trap rainfall.
- Have insufficient land slope for ready movement of runoff across the surface.
- Receive excess runoff or seepage from uplands.
- Require the removal of excess irrigation water.
- Require control of the water table.

CRITERIA

General Criteria Applicable to All Purposes

Laws, rules, and regulations. This practice shall conform to all federal, state, and local laws, rules, and regulations. Laws, rules, and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species. A wetland determination shall be used to document that National Environmental Policy Act (NEPA) and National Food Security Act Manual (NFSAM) provisions concerning wetlands are met for both the excavation and spoil areas. If a certified wetland determination does not exist for the area, one shall be completed as part of the planning process.

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.

Investigations. An investigation shall be made to ensure that adequate outlets are available for discharge of drainage water by gravity flow or pumping.

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

Size. The size of the field ditch shall be computed by using Manning's equation.

Velocity. The design velocity shall not exceed the maximum velocity contained in [Table 14-3 in National Engineering Handbook Part 650 \(NEH 650\), Engineering Field Handbook](#).

Criteria Applicable to Interception of Excess Subsurface Water

Capacity. One or more of the following shall determine the required capacity:

- Application of locally tried and proven drainage coefficients to the acreage drained, including added capacity required to dispose of surface water entering through inlets.
- Yield of groundwater based on the expected deep percolation of irrigation water from the overlying fields, including the leaching requirement.
- Comparison of the site with other similar sites where subsurface drain yields have been measured.
- Measurement of the rate of subsurface flow at the site during a period of adverse precipitation and groundwater conditions.
- Application of Darcy's law to lateral or artesian subsurface flow.
- Estimates of lateral or artesian subsurface flow.

Depth, spacing, and location. The depth, spacing, and location of field ditches shall be based on site conditions, including soils, topography, groundwater conditions, crops, land use, outlets, and saline or sodic conditions.

Criteria Applicable to Collection or Interception of Excess Surface Water

The capacity, size, depth, side slopes, and cross sectional area shall be based on the information contained in [Chapter 14 in NEH 650](#).

Design. Ditches shall be constructed to conduct flow without causing excessive erosion using a continuous bottom grade to the outlet. Where there is no natural ground slope or a slope opposite to ditch flow, a graded ditch shall be used with a minimum slope of 0.05 percent. The outlet shall be constructed with an adequate cross section to prevent restriction of flow. The minimum depth of ditches shall be 0.5 foot. The minimum cross section shall be 6 square feet.

Ditches shall be designed to provide stable side slopes based on soil characteristics. Side slopes shall not be steeper than the following:

- When the ditch is parallel to farming operations and may be crossed by farm machinery, 4 horizontal:1 vertical (4:1).
- Where farming operations are across the ditch or where drainage enters the ditch, 8:1.
- Where ditches are not crossed by farm equipment, 2:1.

Excavation and spoil. Areas to be excavated and areas to be occupied by spoil shall be cleared of trees, brush, or other debris as required for construction and maintenance.

Spoil shall be placed or graded in such a manner that surface water may move freely into the ditch from any planned outlets.

Other. Where "W" or double ditches are used, the 2 ditches comprising the "W" should be parallel (if possible) and spaced far enough apart so that any spoil spread between them shall meet the side slopes requirement listed in the Design section above. Except in special cases, the minimum spacing should usually be 100 feet. Care should be taken that surface drainage from between the ditches will flow to 1 ditch or the other without pocketing or ponding.

CONSIDERATIONS

When planning this practice, the following items should be considered as applicable:

- Ditches shall be established in straight or nearly straight courses insofar as topography and property boundaries permit. Random alignment 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.
- Permit free entry of water from adjacent land surfaces without causing excessive erosion.
- Permit crossing by field equipment if feasible.
- Provide effective removal or reuse of excess irrigation water.

- 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 providing 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

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.

OPERATION AND MAINTENANCE

A site-specific operation and maintenance plan shall be provided to and reviewed with the landowner(s) before the practice is installed.

The plan shall adequately guide the landowner(s) in the routine maintenance and operational needs of the ditch(es). The plan shall also include guidance on periodic inspections and post-storm inspections to detect and minimize damage to the ditches.

REFERENCES

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