

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**SURFACE DRAIN, MAIN OR LATERAL**

(Ft.)

Code 608



**DEFINITION**

An open drainage ditch constructed to a designed cross section, alignment and grade.

**PURPOSE**

This practice is applied as part of a water management system to collect and convey excess surface or subsurface water.

**CONDITIONS WHERE PRACTICE APPLIES**

This standard applies to ditches for conveyance of surface and subsurface drainage water collected primarily by drainage field ditches and subsurface drains. It provides minimum drainage requirements for multiple-purpose channels that provide drainage outlets for agricultural lands.

This standard does not apply to collection of water with a surface field ditch. Florida NRCS Conservation Practice Standard Surface Drain, Field Ditch, Code 607 should be used for that situation.

All lands to be drained shall be suitable for agriculture, after installation of required drainage and other conservation practices.

Whether the outlet is by gravity flow or by pumping, the outlet shall be sufficient for the quantity and quality of water conveyed.

**CRITERIA**

Impact to cultural resources, wetlands and Federal and state protected species shall be evaluated and avoided or minimized to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

Compliance with all applicable Federal, State and local regulations and ordinances is required. The landowner(s) shall be responsible for obtaining and complying with all applicable permits.

Base the design and installation on adequate surveys and investigations.

**Drainage requirements.** Locate and design mains and laterals to serve as integral parts of a surface or subsurface drainage system that meets the conservation and land use needs. Determine the degree of drainage required by the crops and express it in terms of drainage coefficients.

**Capacity.** The ditch capacity shall be adequate to provide for the removal of excess water, based on topographic, climatic and soil conditions and the needs of crops. Obtain the required capacity by determining the watershed area, the required topographic, soil, and land use information, and use of the minimum drainage coefficients contained in the Florida NRCS Drainage Guide.

Determine the required capacity of open ditches for subsurface drainage in irrigated areas by evaluating site conditions, including irrigation water deliveries, irrigation canal or ditch losses,

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soil stratification and permeability, deep percolation losses, field irrigation losses, subsurface drain discharge, and quantity of surface water to be carried by the drainage ditch. Design capacities can be obtained from the Engineering Field Handbook (EFH) Chapter 14, Section 650.1412 (d).

Whether the outlet is by gravity flow or by pumping, the outlet shall be sufficient for the quantity and quality of water conveyed.

Structures constructed under this practice shall not compromise the structural integrity or flow capacity of existing structures within the system (e.g., bridges or culverts).

**Hydraulic gradeline.** Determine the hydraulic gradeline for the drainage ditch design from control points, including elevations of significant low areas served by the ditch and hydraulic gradelines of any tributary ditches and the outlet. If control point elevations are estimated rather than computed from survey data, the hydraulic gradeline shall be no less than:

1. 1.0 foot below fields that will receive normal drainage from ditches draining more than 640 acres (1 mi<sup>2</sup>).
2. 0.5 feet for ditches draining 40 to 640 acres.
3. 0.3 feet for ditches draining less than 40 acres.

For lands to be used only for water-tolerant crops, such as certain trees and grasses, these requirements may be modified and the hydraulic gradeline set at ground level. These provisions do not apply to channels where dikes hold back flow.

Consider the effects of hydraulic losses caused by culverts, bridges, or other obstructions in the channel section. Culverts and bridges shall have sufficient hydraulic capacity and depth to satisfy drainage needs and to minimize obstruction to flow.

**Depth.** Design drainage ditches with sufficient depth to allow for normal siltation. Design ditches that serve as outlets for subsurface drains for a normal water surface at or below the invert of the outlet end of the drain. The normal water surface is the elevation of the usual low flow during the growing season. Where site conditions allow, the clearance between a subsurface drain invert, or a field ditch invert shall be at least 1 foot above the main or lateral invert to account for sediment accumulation.

**Cross section.** Set the design ditch cross section below the design hydraulic gradeline to meet the combined requirements of capacity, limiting velocity, depth, side slopes, bottom width, and, if needed, allowances for initial sedimentation. Side slopes shall be stable, shall meet maintenance requirements, and shall be designed on the basis of on-site conditions.

Use the Florida NRCS Drainage Guide or other local information to determine side slope limits for specific soils and/or geologic materials. If such information is not available, the design side slopes in the main or lateral shall not be steeper than those shown in EFH Part 650, Chapter 14, Section 650.1412 (d). Consider stability during rapid drawdown conditions.

**Velocity.** Base the maximum permissible design velocity on site conditions to ensure stability of the ditch bottom and side slopes. Design velocities should not be less than 0.5 ft/s to avoid excessive sedimentation.

The velocity for newly constructed channels with drainage areas in excess of 1 square mile shall meet the stability requirements specified in Florida NRCS conservation practice standard Open Channel, Code 582.

Use Manning's equation to determine the design velocity. Base the value of *n* on alignment, probable vegetative growth expected with normal maintenance, other roughness factors, and the hydraulic radius. Unless special site studies are available to justify other values, use the values of *n* in the EFH Part 650, Chapter 14, Section 650.1412 (d) or the Florida NRCS Drainage Guide, shall be used to determine the required design capacity.

**Berms and spoil banks.** Provide and shape adequate berms at a safe distance from the drain, as required to:

- provide access for maintenance equipment,
- eliminate the need for moving spoil banks in the future;
- provide for work areas and facilitate spoil bank spreading; prevent excavated material from washing or rolling back into ditches, and
- lessen sloughing of ditch banks caused by heavy loads too near the edge of the ditch banks.

Spread the spoil material as soon as practical. Minimum berm widths shall be those recommended in EFH Part 650, Chapter 14,

Section 650.1412 (d) or the Florida NRCS Drainage Guide, except where the spoil is spread according to Florida NRCS conservation practice standard Spoil Spreading, Code 572.

Where spoil material is to be placed in banks along the ditch rather than spread over adjacent fields, the spoil banks shall have stable side slopes. Make provisions to convey water flows through the spoil bank and into the ditch without causing serious erosion.

When a berm is to be used as a travel way for inspection and maintenance, design the berm width to be a minimum of 10 feet in width. All drainage mains and laterals with drainage areas in excess of one square mile shall be provided with a travel way for maintenance as specified in Florida NRCS conservation practice standard, Open Channel, Code 582. Spoil material placed in banks along the ditch rather than spread over adjacent fields shall have stable side slopes.

**Related structures and ditch protection.**

Protect mains and laterals against erosion where surface water or shallow ditches enter deeper ditches. This may be achieved through the use of chutes, drop structures, pipe drops, other suitable structures, grassed waterway, critical area seeding, filter strips, or specially graded channel entrances.

Use grade control structures, bank protection, or other suitable measures if necessary to reduce velocities and control erosion. Grade control structures shall meet the Florida NRCS conservation practice standard, Grade Stabilization Structure, Code 410.

Culverts and bridges shall have sufficient hydraulic capacity and depth to satisfy drainage needs and to minimize obstruction to flow.

Determine capacities of pipe or drop structures by using applicable drainage coefficients. Use the "island-type" method of construction to protect the structure from washout from flows exceeding design capacity.

Design each structure for an open ditch system according to applicable NRCS conservation practice standard(s) for the kind of structure and type of construction used.

**Channel vegetation.** Establish vegetation according to Florida NRCS conservation practice standard Critical Area Planting, Code 342.

**CONSIDERATIONS**

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

- The use of a low-flow or two stage channel design.
- Impacts of sedimentation downstream.
- Possible damages above or below the point of discharge that might involve legal actions or other offsite impacts.
- Use of riparian buffers, filter strips and fencing.
- Potential water quality impacts for soluble pollutants and attached sediment pollutants.
- Impacts to wildlife.
- Impacts on invasive species movement and establishment through the drainage network.
- Sizing and locating crossings to accommodate farming equipment.

**PLANS AND SPECIFICATIONS**

Keep plans and specifications for constructing drainage field ditches with this standard and shall describe the requirements for properly installing the practice to achieve its intended purpose.

The plans and specifications shall include as a minimum, but not limited to, the following items:

- Site plan layout, grade size, alignment, profile, and cross-sections.
- Details of appurtenance structures including location, dimensions and elevations.
- Type, quality, and quantity of all materials.
- Disposal requirements of excavated material.
- Vegetative requirements.
- Location of utilities and notification requirements.

**OPERATION AND MAINTENANCE**

Prepare an operation and maintenance (O&M) plan for use by the landowner or operator responsible for each drainage system installed.

The O&M plan shall document needed actions for routine maintenance and operational needs of the main(s) and/or lateral(s) to ensure the practice performs adequately throughout the expected life.

O&M requirements shall be included as an identifiable part of the design. Depending on the scope of the project, this may be accomplished by brief statements in the plans and specifications, the conservation plan narrative, or as a separate O&M plan.

The O&M plan shall adequately guide the landowner(s) in the routine maintenance and operational needs of the drainage system. The plan shall also include guidance on periodic inspections and post-storm inspections to detect and minimize damage to the drainage system.

The O&M plan shall include as a minimum, but not limited to, the following items:

- Periodic inspections and post-storm inspections to detect and minimize damage to the drain.
  - As applicable, check structures to ensure that capacity is maintained. Promptly repair damage to structures as needed.
  - Remove debris from channel and structure to maintain capacity.
  - Prompt repair or replacement of damaged components if necessary.
  - Remove foreign materials and vegetation that are interfering with proper operation only when necessary
- Maintain vigorous vegetative growth in riparian areas and for erosion control.
  - Maintain travel-ways for operation and maintenance.
  - Maintain cross section and gradient by controlling channel erosion and sloughing.

#### REFERENCES

Engineering Field Handbook (EFH) Part 650,  
Chapter 14, Section 650.1412 (d)  
Florida NRCS Conservation Practice Standards:  
Critical Area Planting, Code 342  
Open Channel, Code 582  
Spoil Spreading, Code 572  
Surface Drainage, Field Ditch, Code 607  
Florida NRCS Drainage Guide  
General Manual  
Title 420-Part 401  
Title 450-Part 401  
Title 190-Parts 410.22 and 410.26  
National Cultural Resources Handbook  
National Environmental Compliance Handbook  
National Food Security Act Manual  
National Planning Procedures Handbook  
Florida Supplements to Parts 600.1 and 600.6