



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

HILLSIDE DITCH

CODE 423

(ft)

DEFINITION

A narrow channel with a supporting ridge on the lower side, constructed across the slope on steeply sloping land.

PURPOSE

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

- Reduce erosion by reducing slope length
- Increase infiltration throughout the slope
- Divert runoff from sloping upland areas to a stable outlet

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to steeply sloping sites where there is sufficient soil depth for construction of a ridge and channel.

Do not use a hillside ditch to protect buildings, roads, or other improvements. Use NRCS Conservation Practice Standard (CPS) Diversion (Code 362) for that purpose.

CRITERIA

General Criteria Applicable to All Purposes

Location

A hillside ditch usually has a small, shallow channel and is constructed by hand in most cases. In many cases multiple hillside ditches are applied as a system and are installed at controlled gradients at defined horizontal intervals. Locate the hillside ditch or ditch system to fit the land condition and the cropping system. For instances where it is feasible to install a vegetative barrier as a supporting practice, apply it immediately upgradient of the hillside ditch in accordance with the criteria in NRCS CPS Vegetative Barrier (Code 601).

Channel stability and capacity

Channel grades may be uniform or variable. Determine minimum depth and width requirements for channel stability by using the procedures in the NRCS National Engineering Handbook (Title 210), Part 650, Chapter 9, "Diversions." Design a stable channel based on the limiting stress on the soil and vegetation such that soil particles will not be detached, and the vegetation will not be damaged. The capacity of a vegetated channel will be based on the densest and longest vegetation resulting in the highest expected retardance.

Determine the hillside ditch length to match the cropping system and to limit the contributing drainage area. Large runoff volumes from larger drainages can require channels too large for site constraints. The maximum allowable length of a hillside ditch draining in one direction is 500 feet.

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at <https://www.nrcs.usda.gov/> and type FOTG in the search field.

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Design a hillside ditch to convey the peak discharge from a 5-year frequency, 24-hour duration rainfall event.

Horizontal spacing

For multiple hillside ditches applied as a system, use table 1 to determine the maximum horizontal spacing.

Table 1. Hillside Ditch Horizontal Spacing

Land Slope (percent)	Maximum Spacing (feet)
<12	40
12–25	35
26–40	25
>40	20

Protection against sedimentation

Excess sediment accumulation in the hillside ditch channel lessens hydraulic capacity and impedes flow. For a contributing drainage area that produces a high sediment load, incorporate measures to limit the accumulation of sediment in the channel such as—

- Installing conservation practices such as land treatment, erosion control, cultural or tillage, or structural measures.
- Installing any needed conservation practices in conjunction with or before construction.
- Increasing the channel size to accommodate the estimated sediment accumulation (e.g., 1-year or 2-year) unless the operation and maintenance plan specifically addresses the periodic removal of sediment.

Outlet

Locate or establish a stable outlet prior to the construction of the hillside ditch. An outlet may be a grade control structure, a natural or constructed waterway, a stable watercourse, or a stable disposal area such as a well-established pasture. Use criteria in NRCS CPS Grassed Waterway (Code 412) for a grassed waterway outlet; Lined Waterway or Outlet (Code 468) for a lined waterway; and Grade Stabilization Structure (Code 410) for grade control structures.

CONSIDERATIONS

Additional conservation practices that improve soil function, permeability, and structure can reduce runoff and sedimentation from the contributing drainage area, reducing the required size of a hillside ditch. Consider applying additional land treatment, erosion control, and cultural or tillage practices with the hillside ditch.

When planning a hillside ditch, consider the following as applicable:

- Effects on the water budget, especially effects on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.
- Filtering effects of vegetation on movement of sediment and dissolved and sediment-attached substances.
- Potential to borrow a portion of the material needed to construct the ridge from downslope of the ridge to effectively reduce the average slope between successive hillside ditches.
- Short-term and construction related effects of this practice on the quality of downstream water.
- Potential advantages of NRCS CPS Vegetative Barrier (Code 601) compared to a Hillside Ditch on steep fields with sandy soils.
- Potential for development of saline seeps or other salinity problems resulting from increased infiltration in the presence of restrictive layers.

- Potential to affect significant cultural resources.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for constructing hillside ditches that describe the requirements for applying the practice to achieve its intended purpose. As a minimum, the plans and specifications must include—

- A plan view of the layout of the hillside ditch or the ditch system.
- A profile of the hillside ditch that includes both the channel bottom and any supporting ridge top.
- Typical cross sections of the hillside ditch.
- Quantities and material requirements.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the client. Include specific instructions for maintaining capacity, storage of runoff water, ridge height, and outlets in the plan. As a minimum include—

- Conducting periodic inspections, especially following significant storms.
- Promptly performing maintenance and repairs as necessary.
- Removing accumulated sediment in accordance with the planned schedule or periodically as necessary.
- Removing vegetative growth or debris interfering with the proper functioning of the ditch.
- Removing debris interfering with the outlet operation, as necessary.
- Maintaining well-established vegetation in the outlet to provide stability.

REFERENCES

Food and Agriculture Organization of the United Nations. 1988. Conservation Guide 13/3, Watershed Management Field Manual, Slope Treatment Measures and Practices. Rome, Italy.
<http://www.fao.org/3/ad083e/AD083e00.htm#cont>

USDA NRCS. 2021. National Engineering Handbook (Title 210), Part 650, Chapter 9, Diversions. Washington, D.C. <https://directives.sc.egov.usda.gov/>