



Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
WATER AND SEDIMENT CONTROL BASIN

CODE 638

(no)

DEFINITION

An earth embankment or a combination ridge and channel constructed across the slope of a minor drainageway.

PURPOSE

This practice may be applied for one or more of the following purposes:

- Reduce gully erosion.
- Trap sediment.
- Reduce and manage runoff.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sites where:

- The topography is generally irregular.
- Gully erosion is a problem.
- Other conservation practices typically control sheet and rill erosion.
- Runoff and sediment damages land and works of improvement.
- Stable outlets are available.

Do not use this standard in place of a terrace. Use NRCS Conservation Practice Standards (CPS) Terrace (Code 600) or CPS Diversion (Code 362) where the ridge or channel extends beyond the detention basin or level embankment.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct the water and sediment control basin to meet all Federal, State, Tribal, and local regulations. Install a water and sediment control basin as part of a conservation system that addresses resource concerns both above and below the basin. Where land ownership or physical conditions preclude treatment of the upper portion of a slope, a water and sediment control basin can separate this area and permit treatment of the lower slope.

Avoid areas of shallow or dense bedrock and acidic or saline layers that will adversely affect plant growth when locating control basins. Utilize field investigations and the soil survey to identify potential problems areas.

Location

Locate the water and sediment control basin to reduce erosion in a drainageway. Install a basin singly or in series as part of a system to fit site conditions. Adjust the location to—

- Fit the topography.
- Maximize storage.
- Accommodate farm equipment and farming operations.
- Avoid impacts to adjacent properties.

When choosing the location, evaluate the extent of ponding that will occur from the basin.

Earth Embankment

Table 1 displays the minimum embankment top width based on fill height. Construct the embankment at least 5 percent greater than design height to allow for settlement. Design the settled height of the embankment no higher than 15 feet measured from natural ground at the centerline of the embankment.

Strip the foundation surface to remove any vegetation and unsuitable material, such as crop residue or large rocks. Scarify the surface prior to fill placement for the embankment, and if applicable, prior to installing a foundation cutoff, with or without seepage control.

Table 1. Minimum top width of embankment.

Fill Height (ft)	Top Width (ft)
0–5	3
5–10	6
10–15	8

Design embankment slopes no steeper than 2 horizontal to 1 vertical. The sum of the horizontal components of the upstream and downstream slopes of the embankment must be 5 or greater.

Design all farmable slopes no steeper than 5 horizontal to 1 vertical to allow safe operation of farming equipment.

Foundation cutoff and seepage control

Portions of a basin ridge designed to impound more than a 3-foot depth of water must include foundation cutoff and if conditions warrant, seepage control. Refer to NRCS CPS Pond (Code 378) for criteria for foundation cutoff and seepage control.

Capacity

As a minimum, design the water and sediment control basin with sufficient capacity to control the runoff from a 10-year frequency, 24-hour-duration storm using a combination of flood storage and discharge through the outlet. Refer to NRCS Title 210, National Engineering Handbook (210-NEH), Part 650, Chapter 8, “Terraces” for flood routing guidance. If warranted, use a larger design storm appropriate to the risk.

Design the water and sediment control basin to have a minimum capacity to store the anticipated 10-year sediment accumulation. The sediment storage volume may be reduced if periodic sediment removal is required in the operation and maintenance plan.

Outlets

Provide an outlet that can convey runoff water to a point where it will not cause damage. Design the outlet as an underground outlet, a pipe drop structure, a soil infiltration area, a stable channel, or a combination of outlet types.

For a farmed basin, design the outlet so that the water storage time does not exceed the inundation tolerance of the planned crops. If sediment retention is a primary design goal, adjust the release rate

according to sediment particle size to retain sediment in the basin. Refer to 210-NEH, Section 3, Chapter 2, "Sediment Properties" for information on the settling rates of sediment particles and to CPS Underground Outlet (Code 620) for design criteria for underground outlets.

The basin outlet system may include an auxiliary spillway above the primary storage to handle larger storm flows. If an auxiliary spillway is used, add freeboard to the design height of the embankment to provide for the safe operation of the spillway. The freeboard should be at least 0.5 ft above the design flow depth through the auxiliary spillway. If the auxiliary spillway of another basin contributes runoff to the basin, design the basin to handle the additional runoff. Refer to CPS Pond (Code 378) for criteria to design an auxiliary spillway.

Vegetation

After construction of the water and sediment control basin, vegetate all nonfarmed disturbed areas with permanent native or noninvasive vegetation. If establishing permanent vegetation is not feasible when construction is complete, apply temporary cover until establishment of permanent vegetation can occur.

In nonfarmland settings, use other erosion protection, such as gravel or organic mulches, as necessary.

Refer to NRCS CPS Critical Area Planting (Code 342) for criteria on seed selection, seedbed preparation, fertilizing, and seeding and NRCS CPS Mulching (Code 484) for criteria on mulch selection including erosion control blankets.

CONSIDERATIONS

Consider climate change impact on determining Water and Sediment Control Basin's capacity.

Outlets might provide a direct conduit to receiving waters for contaminated runoff from cropland. Consider impacts on downstream source water due to erosion and sediment load and impacts on important fish and wildlife habitats such as streams, creeks, riparian areas, groundwater, and wetlands.

Consider providing an increased level of designed treatment for sites with high priority areas for source water protection or are upstream of community drinking water withdrawal sites.

Water and sediment control basins may be spaced at intervals down a slope, similar to terraces, in order to control erosion. Refer to NRCS CPS Terrace (Code 600) for methods to determine spacing. Install additional conservation measures in the watercourse between basins to prevent erosion as necessary.

Where necessary to restore or maintain productivity, salvage topsoil and spread over the disturbed area after construction is complete. Temporarily stockpile the topsoil away from the site and provide erosion protection, as needed.

Consider using biodegradable erosion control blankets to protect bare soil surfaces during the establishment of vegetation.

Enhance sediment retention within the basin with inlet and outlet selection and by increasing the length-to-width ratio of the basin. Determine sedimentation rates using the NRCS Revised Universal Soil Loss Equation, Ver. 2 (RUSLE2), or other approved methodology.

For cropped fields, orient the embankment and crop rows in a direction that is approximately perpendicular to the land slope to support contour farming. The design should support farmability by limiting short point rows or sharp curves. Consider field boundaries and row lengths when planning basin locations and row direction.

Underground outlets may provide a direct conduit to receiving waters for contaminated runoff. Install underground outlets and the accompanying structures or practices as part of a conservation system that addresses issues such as nutrient and pest management, residue management, and filter areas.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for water and sediment control basins that describe the requirements for applying the practice to achieve the intended purpose. As a minimum, include:

- A plan view of the layout of the water and sediment control basin system.
- Typical cross sections of the basin.
- Profile of the basin.
- Details of the outlet system.
- For underground outlets, details of the inlet and profile(s) of the underground outlet.
- Seeding and mulching requirements if needed.
- Construction specifications that describe site-specific installation requirements.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the operator. The minimum requirements in the operation and maintenance plan are:

- Periodic inspections, especially immediately following significant runoff events.
- Prompt repair or replacement of damaged components.
- Maintenance of basin ridge height and outlet elevations.
- Removal of sediment that has accumulated in the basin to maintain capacity and grade.
- Regular cleaning of inlets for underground outlets.
- Repair or replacement of inlets damaged by farm equipment.
- Removal of sediment around inlets to ensure that the inlet remains the lowest spot in the basin.
- Where vegetation is specified, regular mowing and control of trees and brush.
- Schedule vegetative disturbances to avoid the peak-nesting season.
- Notification of hazards about steep slopes on the basin or the embankment.

REFERENCES

USDA NRCS. 2004. Revised Universal Soil Loss Equation, Ver. 2 (RUSLE2).

http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm

USDA NRCS. 2011. National Agronomy Manual (Title 190), Part 501, Water Erosion. Washington, D.C.

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=29608.wba>

USDA NRCS. 2021. National Engineering Handbook (Title 210), Part 650, Engineering Field Handbook, Chapter 6, Structures, Washington, D.C.

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=46256.wba>

USDA NRCS. 2021. National Engineering Handbook (Title 210), Part 650, Engineering Field Handbook, Chapter 8, Terraces. Washington, D.C.

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=46257.wba>

USDA NRCS. 2021. National Engineering Handbook (Title 210), Part 650, Engineering Field Handbook, Chapter 14, Water Management (Drainage). Washington, D.C.

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=46289.wba>

USDA NRCS. 1983. National Engineering Handbook (Title 210), Section 3, Chapter 2, Sediment Properties. Washington, D.C.

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17508.wba>