

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WATER AND SEDIMENT CONTROL BASIN

(No.)
CODE 638

DEFINITION

An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin.

SCOPE

This standard applies to planning, designing, and constructing water and sediment control basins. It does not apply to Conservation Practice Standard (362), Diversions, (410), Grade Stabilization Structures or (350), Sediment Basin.

PURPOSE

To improve farmability of sloping land, reduce watercourse and gully erosion, trap sediment, reduce and manage onsite and downstream runoff, and improve downstream water quality.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sites where:

1. The topography is generally irregular.
2. Watercourse and gully erosion are a problem.
3. Sheet and rill erosion are controlled by other conservation practices.
4. Runoff and sediment damage land and improvements.
5. Soil and site conditions are suitable.
6. Adequate outlets are available or can be provided.

DESIGN CRITERIA

Water and sediment control basins can be part of the treatment needed to protect the soil resource base. In addition, practices such as terraces, contouring, a conservation cropping system, conservation tillage, and crop residue management shall also be used to control erosion.

Water and sediment control basins shall not be used in place of terraces. When a ridge and channel extend beyond the detention basin or level embankment, terraces shall be designed. The

resource management system shall reduce soil loss in the interval above and below the basin to prevent excessive maintenance and operation problems.

Where land ownership or physical conditions preclude treatment of the upper portion of a slope, a water and sediment control basin may be used to separate this area from, and permit treatment to, the lower part of the slope. The uncontrolled drainage area to the basins used for this purpose shall not exceed 40 acres.

Spacing. Water and sediment control basins shall generally be spaced at terrace intervals. The grade of the watercourse between basins shall be considered, and the spacing shall be set to prevent watercourse or gully erosion. The drainage of each basin shall be limited so duration of flooding, infiltration, or seepage does not damage crops or create other problems. The maximum spacing between basins shall be as shown in the following table:

Slope, percent	Maximum spacing, ft
0-2	700
2-4	700
4-6	600
6-9	500
9-12	500
12-18	400
More than 18	300

Basins do not have to be spaced closer than 200 ft.

The system of basins and row arrangements shall be parallel when possible and spaced to accommodate farm machinery widths. Consideration shall be given to embankment slope lengths, top width, and inlet location when determining spacing.

Alignment. The embankment orientation and row direction shall be approximately perpendicular to the land slope to permit contouring as near as possible. The arrangement should permit farmability without excessive point rows or sharp curves. Field boundaries and row length should

NRCS-Minnesota
May 2009

also be considered when determining basin location and row direction.

Cross section. Embankment slopes shall not be steeper than two horizontal to one vertical. The sum of the horizontal components of the upstream and downstream slopes of the embankment must be 5 or greater. Design all slopes to be farmed no steeper than those on which farm equipment can be operated safely.

The effective top width and height shall be at least as wide as shown in the following.

Fill height (ft)	Effective top width (ft)
0 - 5	3
5 - 10	6
10 - 15	8

For uncontrolled drainage areas, not exceeding five acres, the cross sections used shall be those specified for Conservation Practice Standard (600), Terrace, and may be broad based, grassed backslope, or narrow based, as applicable.

The constructed height of the embankment shall be at least 5 percent greater than the designed height to allow for settlement. The maximum settled fill height shall be 15 ft. Fill heights are measured from the natural ground at the centerline of the embankment (not to gully bottom). Slopes may be vegetated or flattened to permit cropping.

Foundation Cutoff. Where the water detention time is greater than 24 hours and the fill height is greater than 12 ft or in areas where the depth of permanent impoundment is greater than 3 feet, a cutoff trench should be provided and, if conditions warrant, seepage control. The cutoff trench shall be excavated to a minimum depth of 4 ft below the existing ground level or to bedrock, whichever is less. The bottom width of the cutoff trench shall be wide enough to accommodate excavation, backfill and compaction operations and shall not be less than 4 ft. The side slopes shall be 1:1 or flatter. The most impervious material available shall be used as backfill in the cutoff trench. Refer to Conservation Practice Standard (378), Pond for additional criteria for foundation cutoff and seepage control.

Capacity. The basin shall be large enough to control the runoff during a 10-year, 24-hour-frequency storm without overtopping. The capacity of basins designed to provide flood protection or to function with other structures may be larger and shall be adequate to control the runoff from a storm

of a frequency consistent with the potential hazard. The basin also shall have the capacity to store the anticipated 10-year sediment accumulation, unless provisions are made for periodic sediment removal from the basin to maintain the design capacity.

The basins shall have the ends closed to the elevation needed for the design capacity. A maximum of 1 ft of freeboard may be added to the design height to provide for an auxiliary spillway around one or both ends of the basin. If an auxiliary spillway is used, the freeboard shall be at least 0.5 ft above the design flow depth through the auxiliary spillway. The auxiliary spillway must not contribute runoff to a lower basin in series that does not have an auxiliary spillway. Refer to Conservation Practice Standard (378), Pond for criteria to design auxiliary spillways.

Outlets. Water and sediment control basins shall have underground outlets or soil infiltration outlets that meet the requirements for Conservation Practice Standard (600), Terrace and (620), Underground Outlet.

Vegetation. Slopes and distributed areas that are not to be farmed shall be established to suitable erosion-resistant vegetation. Environmental quantity and quantity and wildlife food and habitat shall be considered in selecting the species of vegetation. If soil or climatic conditions preclude the use of vegetative cover and protection is needed, an organic or gravel mulch may be used. Seedbed preparation, fertilizing, seeding, and mulching shall be in accordance with Conservation Practice Standard (342), Critical Area Planting, and (484), Mulching. Where it is necessary, topsoil is to be stockpiled and spread over excavations and other areas to facilitate restoration of productivity.

PLANS AND SPECIFICATIONS

Plans and specifications for installing water and sediment control basins shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. As a minimum the plans and specifications shall include:

1. A location map showing the layout of the Water and Sediment Control Basin system.
2. Typical cross sections of the basin(s).
3. Profile(s) of the existing ground, basin(s) ridge and channel.
4. Details of the outlet system.

5. For underground outlets, details of the inlet and profile(s) of the underground outlet.
6. Seeding requirements if needed.
7. Construction specifications that describe in writing site specific installation requirements of the Water and Sediment Control Basin system.

OPERATION AND MAINTENANCE

A maintenance job sheet or operation and maintenance plan shall be provided for each resource management system and practice.

The sediment and design capacity shall be maintained by cleaning the basin or by raising the embankment height. Excavated material spread on the cropland shall be placed to maintain fertility and enhance topography. Fill material for increasing the embankment height shall be obtained in a manner that enhances topography and maintains productivity of the cropland. The vegetation shall be maintained to prevent sheet and rill erosion or gulying of the embankment. Trees and woody cover generally create problems on embankments and should be controlled.

When an operation and maintenance plan is provided, the minimum requirements to be addressed are:

1. Periodic inspections, especially immediately following significant runoff events.
2. Prompt repair or replacement of damaged components.
3. Maintenance of basin ridge height and outlet elevations.
4. Removal of sediment that has accumulated in the basin to maintain capacity and grade.
5. 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.
6. Where vegetation is specified, regular mowing and control of trees and brush. Vegetative disturbance should be scheduled to avoid the peak nesting season.
7. Notification of hazards about steep slopes on the basin.

REFERENCES

USDA, NRCS. National Engineering Handbook, Part 650, Engineering Field Handbook, Chapters 6, 8 and 14.