

**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 constructed across the slope of minor watercourses to form a sediment trap and water detention basin with a stable outlet.

**PURPOSE**

This practice may be applied as part of a resource management system for one or more of the following purposes:

- To reduce watercourse and gully erosion.
- To trap sediment.
- To reduce and manage on-site and downstream runoff.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to sites where:

1. The topography precludes installing and farming terraces with reasonable effort.
2. Watercourse or gully erosion is a problem.
3. Sheet and rill erosion is controlled by other conservation practices.
4. Runoff and sediment damage land and improvements.
5. Soil and site conditions are suitable.
6. Adequate outlets can be provided.

Water and sediment control basins shall not be used in place of terraces and other conservation measures. Where a ridge and/or channel extends beyond the detention basin or level

embankment, [Conservation Practice Standard \(CPS\) 600, Terrace](#), or [CPS 362, Diversion](#), must be applied as appropriate.

**CRITERIA**

**General Criteria Applicable to All Purposes**

This practice applies to structures that have a settled fill height of 15 feet or less and a 10-year frequency, 24-hour storm runoff of 20 acre-feet or less. Larger structures shall be designed using the requirements for [CPS 378, Pond](#), or [CPS 410, Grade Stabilization Structure](#), as appropriate.

In areas where the climate, the soils, and the crops grown are suited to terraces, water and sediment control basins may be constructed if they are to be used in combination with planned management practices. These practices (including residue management systems and crop rotations) must adequately reduce soil loss to acceptable limits in the intervals above and below the basin(s).

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 of the lower slope.

**Location.** Locate water and sediment control basins to control erosion in drainageways. Basins may be installed singly or in series as part of a system. Adjust the location to fit the topography, maximize storage, and accommodate farm equipment and farming operations.

**Earth embankment.** The constructed height of the embankment shall be increased 5 percent to allow for settlement. The increased height to

allow for settlement shall not exceed 1 foot. The maximum settled height of the embankment must be 15 feet or less measured from natural ground at centerline of the embankment. The minimum top width shall be as specified in Table 1.

**Table 1—Minimum top width of the embankment**

| Fill Height (feet) | Effective Top Width (feet) |
|--------------------|----------------------------|
| 0 - 5              | 4                          |
| 5 - 10             | 6                          |
| 10 - 15            | 8                          |

Design embankment slopes no steeper than 2 horizontal to 1 vertical (2:1). The sum of the horizontal components of the upstream and downstream slopes of the embankment must be 5 or greater. Design all slopes that are to be farmed no steeper than 5:1. Design all vegetated slopes no steeper than 2:1. If the depth of the water impounded is 3 feet or deeper, the front slope shall not be steeper than 3:1.

**Foundation cutoff and seepage control.**

Portions of basin ridges designed to impound more than a 3-foot depth of water against the embankment must include foundation cutoff and, if conditions warrant, seepage control. Refer to [CPS 378](#) for criteria for foundation cutoff and seepage control.

**Capacity.** As a minimum, design water and sediment control basins with sufficient capacity to control the runoff expected for a 10-year frequency, 24-hour duration storm using a combination flood storage and discharge through the outlet. A minimum of 0.5 foot shall be added to the design height for freeboard.

Where basins are used for flood control or to protect other works of improvement (if warranted), use larger design storms appropriate to the risk.

In addition to the above storage, water and sediment control basins must have the capacity to store at least the anticipated 10-year sediment accumulation, or periodic sediment removal shall be required in the operation and maintenance plan to maintain the required capacity.

The capacity of basins designed to provide flood protection or to function with other structures shall be adequate to control a storm of a frequency consistent with the potential hazard.

Standard floodrouting procedures may be used to determine pipe size and storage requirements. An accepted procedure is in the [Kansas Supplement to Chapter 8 of National Engineering Handbook Part 650 \(NEH 650\), Engineering Field Handbook](#). The [Terrace \(Storage\) Spreadsheet](#) (or equivalent) may be used.

**Outlets.** A water and sediment control basin must have an adequate outlet. The outlet must convey runoff water to a point where it will not cause damage. Outlets can be underground outlets, pipe drop structures, soil infiltration, stabilized channels, or a combination of outlet types.

If the basin is cropped, design the outlet so that the flow release 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 so that sediment is retained in the basin. Refer to [CPS 620, Underground Outlet](#), for design criteria for underground outlets.

Outlets can include auxiliary spillways above the primary storage to handle large 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. Auxiliary spillways must not contribute runoff to lower water and sediment control basins unless they are designed to handle the runoff. Refer to [CPS 378](#) for criteria to design auxiliary spillways. Standard floodrouting procedures may be used to determine spillway size. Use SITES or the procedure in [Chapter 11 of NEH 650](#) to determine size and flow depths.

**Topsoil.** Where necessary to restore or maintain productivity, spread topsoil over areas disturbed by construction. Topsoil can be salvaged and stockpiled from the site of the water and sediment control basin prior to construction.

**Vegetation.** Disturbed areas that are not to be farmed shall be established to grass as soon as practicable after construction. Non-vegetative means such as mulches or gravel may be used if soil or climatic conditions preclude the use of

vegetation. Seedbed preparation and seeding, fertilizing, and mulching rates shall comply with recommendations in [CPS 342, Critical Area Planting](#), and [CPS 484, Mulching](#).

**Laws and regulations.** This practice must conform to all local, state, tribal, and federal laws and regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

## CONSIDERATIONS

Water and sediment control basins should be part of a resource management plan including such practices as terraces, grassed waterways, contouring, a conservation cropping system, conservation tillage, and crop residue management.

Water and sediment control basins can be spaced at intervals down a slope (similar to terraces) in order to control erosion. Refer to [CPS 600](#) for methods to determine spacing. Additional conservation measures may be needed in the watercourse between basins to prevent erosion.

When choosing the location of a water and sediment control basin, be sure to consider the extent of ponding that will occur from the basin. If the basin will cause water to pond near or across property lines, both landowners should agree in writing on the elevation and expected duration of ponding.

The detention time for basins should be a minimum of 4 hours and a maximum of 48 hours (based on site conditions).

The soil survey can be a valuable resource when planning and designing water and sediment control basins. The soil survey can identify potential problems such as the presence of limiting layers to plant growth in the soil profile. Field investigations can then identify problem areas to avoid such as shallow bedrock or dense, acid, or saline layers that will adversely affect plant growth (if construction brings them into the root zone).

Where possible, the basin should be configured to enhance sediment deposition. Sediment retention within the basin can be enhanced by using low flow deflectors and inlet and outlet

selection and by increasing the length to width ratio of the basin.

The controlled overflow (when the design storm is exceeded) should be planned to occur where the landscape can best accept the flowage.

For cropped fields, embankment orientations and crop row direction should be approximately perpendicular to the land slope to support contour farming. The design should support farmability by limiting short point rows or sharp curves. Field boundaries and row lengths should also be considered in planning basin location and row direction.

Underground outlets from water and sediment control basins can provide a direct conduit to receiving waters for contaminated runoff from cropland. To reduce the impact of this runoff, water and sediment control basins should be installed as part of a conservation system that includes such practices as grassed waterways, contouring, a conservation cropping system, conservation tillage, nutrient and pest management, crop residue management, and filter areas to reduce or mitigate contaminated runoff.

Seasonal water sources can be very important for migratory waterfowl and other wildlife. Partially blocking the outlet of a basin during non-cropping times of the year will allow water to pond in the basin to provide water for wildlife.

Effects on streams and wetlands must be considered. Mitigation may be required where water is diverted or degraded for downstream uses.

The construction of a water and sediment control basin can disturb large areas and potentially affect cultural resources. Be sure to follow state cultural resource protection policies before construction begins.

The construction of water and sediment control basins can introduce steep and potentially dangerous slopes into crop fields. When designing water and sediment control basins that will be farmed, choose flat slopes that will be safe for operating farm equipment. Where steep slopes are unavoidable, make sure that the producer is aware of the location of the basin and the potential danger.

## **PLANS AND SPECIFICATIONS**

Prepare plans and specifications for water and sediment control basins that describe the requirements for applying the practice according to this standard. As a minimum the plans and specifications shall include the following:

1. A plan view of the layout of the water and sediment control basin system.
2. Typical cross sections of the basin(s).
3. Profile(s) of the basin(s).
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**

Prepare an operation and maintenance plan for the operator. The minimum requirements to be

addressed in the operation and maintenance plan 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.