

**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; and
- To reduce and manage onsite and downstream runoff.

CONDITIONS WHERE PRACTICE APPLIES

- This practice applies to sites where:
- The topography is generally irregular;
 - Watercourse or gully erosion is a problem;
 - Sheet and rill erosion is controlled by other conservation practices;
 - Runoff and sediment damages land and works of improvements;
 - Adequate outlets can be provided; and
 - Do not use this standard in place of terraces. Where the ridge and/or channel extends beyond the detention basin or level embankment, use Conservation Practice Standard (CPS) Terrace (600) or Diversion (362) as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

Install water and sediment control basins as part of a conservation system that adequately addresses resource concerns both 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 of the lower part of the slope. The uncontrolled drainage area to the basins used for this purpose shall not exceed 40 acres.

Laws and Regulations. This practice must conform to all federal, state, and local laws and regulations.

Location. Locate water and sediment control basins to control erosion in drainage ways. Basins may be installed singly or in series as part of system. Adjust the location to fit the topography, maximize storage, and accommodate farm equipment and farming operations. Water and sediment control basins must generally be spaced at terrace intervals (see CPS Terrace (600)). Adjust spacing or include other measures needed to prevent erosion in the watercourse between basins.

The system of basins and row arrangements must be parallel, where possible, and spaced to accommodate farm machinery where needed to fit row crop spacing.

Spacing design must consider embankment slope lengths, top width, and outlet location.

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 also be considered when determining basin location and row direction.

Earth embankment. Minimum top widths are given in Table 1. The maximum settled height of the embankment must be 15 feet or less measured from natural ground at the centerline of the embankment. The constructed height of the embankment shall be at least five percent greater than the designed height to allow for settlement.

Table 1. Minimum Top Width of Embankments

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

Design embankment slopes to be no steeper than 2 horizontal to 1 vertical. The sum of the upstream and downstream slopes of the embankment must be 5:1 or flatter with a maximum of 2:1 in either slope. All slopes to be farmed shall be no steeper than 5:1 to permit farm equipment to be operated safely.

Foundation cutoff and seepage control.

Where the water detention time is greater than 24 hours and the fill height is greater than 10 feet or in areas where the depth of permanent impoundment is greater than 3 feet, a cutoff trench must be included, and if conditions warrant, seepage control. The cutoff trench shall be excavated to a minimum depth of three (3) feet 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 four feet. 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 CPS Pond (378) for criteria for foundation cutoff and seepage control.

Capacity. As a minimum, design all water and sediment control basins 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. Where basins are used for flood control or to protect

other works of improvement, 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 is required in the Operation and Maintenance (O&M) Plan to maintain the required capacity.

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 Underground Outlet (620) for design criteria for underground outlets.

Outlets may include auxiliary spillways above the primary storage designed to control 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 auxiliary spillway. The freeboard shall be at least 0.5 ft. above the design flow depth through the auxiliary spillway. Auxiliary spillways must not contribute runoff to lower water and sediment control basins unless the lower basins are designed to control the runoff. Refer to CPS Pond (378) for criteria to design auxiliary spillways.

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.

Vegetation. All disturbed areas that will not be cropped must be established to appropriate vegetation or otherwise protected from erosion using organic or gravel mulch or other measures as soon as possible following construction of the water and sediment control basin..

Selection of vegetation species should consider cropping systems, herbicide use, environmental

quantity and quality, endangered species needs, and wildlife food and habitat needs. Refer to CPS Critical Area Planting (342) for criteria on seed selection, seedbed preparation, fertilizing, and seeding.

CONSIDERATIONS

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 or saturation.

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.

Sediment retention within the basin can be enhanced by using flow deflectors, inlet and outlet selection, and by increasing the length to width ratio of the basin.

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 noncropping times of the year will allow water to pond in the basin to provide temporary water for wildlife. Refer to CPS Shallow Water Development and Management (646) for information on managing seasonal water sources for wildlife.

The construction of water and sediment control basins can introduce steep and potentially dangerous slopes into crop fields. Utilize flat slopes when designing water and sediment control basins that will be safe for operating farm equipment. Where steep slopes are unavoidable, make sure that the farmer 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:

A plan view of the layout of the water and sediment control basin system;

Typical cross sections of the basin(s);

Profile(s) of the basin(s);

Details of the outlet system;

For underground outlets, details of the inlet and profile(s) of the underground outlet;

Seeding or other erosion control requirements as necessary; and

Construction specifications that describe site-specific installation requirements of the water and sediment control basin system.

OPERATION AND MAINTENANCE

An O&M Plan shall be prepared for and reviewed with the owner/operator. The minimum requirements to be addressed in the O&M 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. Vegetative disturbance should be scheduled to avoid the peak nesting season; and

Notification of the hazards related to steep embankments or excavated slopes on or near the basin.

REFERENCES

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