

**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.

**PURPOSES**

A water and sediment control basin may be established to:

- Improve farmability of sloping land
- Reduce watercourse and gully erosion
- Trap sediment
- Reduce and manage onsite and downstream runoff
- Improve downstream water quality

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to sites where:

1. The topography is generally irregular.
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.

While this practice is typically used on non-irrigated cropland, the practice has applicability on sprinkler-irrigated areas, rangeland, construction sites, etc.

Water and sediment control basins shall not be used in place of terraces. Where a ridge and/or channel extend beyond the detention basin or level embankment, Conservation Practices

Standards for Terrace (600) or Diversion (362) must be applied as appropriate.

**CRITERIA**

**General Criteria Applicable To All Purposes**

The resource management system must 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 of the lower slope.

The design must limit inundation, infiltration, and seepage to prevent crop damage and/or other problems.

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

**Spacing.** Water and sediment control basins must generally be spaced at terrace intervals (see Conservation Practice Standard for 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 and spaced to accommodate farm machinery where needed to fit row crop spacing. On irrigated lands spacing of basins shall accommodate irrigation hardware. On center pivot irrigated lands the spacing for basins should be a multiple of the tower spacing.

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

**Cross section.** For portions of the basin controlling only flowing

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water 3 feet or less deep, embankment slopes must be two horizontal to one vertical, or flatter. For all other portions of the basin, the sum of the upstream and downstream slopes must be 5:1 or flatter with a maximum of 2:1 in either slope. Slopes may be vegetated or flattened to permit cropping. On farmed basins the sideslopes shall be 4:1 or flatter.

**Earth Embankment.** Minimum effective top widths are given in Table 1. Constructed embankment height must be at least 5% greater than design height to allow for settlement. The maximum settled height of the embankment must be 8 feet or less measured from natural ground at centerline of the embankment.

Table 1. Minimum Top Width of Embankments

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

#### **Foundation cutoff and seepage control.**

Portions of basin ridges designed to impound more than a 3-foot depth of water must include foundation cutoff and seepage control as required by the Conservation Practice Standard for Pond (378).

**Capacity.** Basins must have capacity to prevent overtopping by runoff from a 10-year frequency, 24-hour duration storm. Larger design storms may be used where needed for flood control or other purposes. As an option to storing the entire storm runoff underground outlets, Conservation Practice Standard, 620 may be installed and the storm runoff routed through the basin. The required storm runoff storage volume may be reduced by the volume of water routed through the underground outlet.

In addition to the above storage, basins must have capacity to store at least the anticipated 10-year sediment accumulation, or periodic sediment removal must be provided to maintain the required capacity. Where data is not available for the bulk density of the sediment, the designer may assume that one ton of sediment occupies one cubic yard.

On irrigated cropland basins shall be sized for the larger of the irrigation-induced sediment plus irrigation runoff or the applicable 10-year storm runoff plus sediment load.

Basin ends must be closed to an elevation that will contain design capacity. Freeboard may be added to design height to provide for safe operation of auxiliary spillways. Auxiliary spillways must not contribute runoff to a lower basin (or pond) except where the lower basin (or pond) is designed to control the flow.

**Outlets.** Water and sediment control basins must have spillways, underground outlets or soil infiltration outlets that conform to Conservation Practice Standard for Pond (378), Grassed Waterway (412), Diversion (362) or Underground Outlet (620) as appropriate, unless downstream embankment slopes are flattened and vegetated to be non-erosive during expected runoff periods. A minimum of 0.5 foot of embankment freeboard above the spillway crest shall be provided for spillways. The crest of spillways shall be located at or above the required storage elevation. Spillways shall be sized and located to convey water around the basin embankment. Spillways shall be trapezoidal in shape with a minimum width of 4 feet.

**Topsoil.** Where necessary to restore or maintain productivity, topsoil must be stockpiled and spread over disturbed areas.

**Basin Shape.** To get the desired trap efficiency, the reservoir length should be at least 4 times the average width, unless calculations show that the proposed length is adequate to trap at least 65 percent of the suspended particles. Length is defined as the shortest distance from where water enters the ponded area to the point of water exiting the pond. Appendix 10, Chapter 10, Engineering Field Manual may be used to determine sediment basin dimensions where it is applicable. The minimum distance between the point of water inflow and outflow shall be no less than that determined from the procedure in Appendix 10 or at opposite ends of the basin.

**Conduits.** The minimum pipe size for basin outlets shall be 4-inch diameter pipe. The riser pipe shall be at least one pipe diameter larger than the conduit pipe. Refer to Chapter 6, Engineering Field Manual for sizing. A minimum of one 18 inch by 18 inch cutoff collar shall be designed in the upper one half of the pipe length. Conduits placed in soils with high piping potential may require additional seepage protection.

An outlet shall be provided of earth, pipe, stone, or other devices adequate to keep the sediment in the basin and to handle the 10-year-frequency discharge without failure or significant erosion.

**Inlets and outlets.** Rock riprap, pipe drops, or other types of structural protection shall be included when the flow velocities will be erosive where the channel enters the sediment basin or the spillway channel exits the basin.

Water and sediment control basins shall have underground outlets or soil infiltration outlets that meet the requirements for Conservation Practice Standards terraces (code 600) and underground outlets (code 620).

**Vegetation.** Disturbed areas that are not cropped must be established to appropriate vegetation or otherwise protected from erosion using organic or gravel mulch or other measures.

Selection of vegetation species must consider environmental quantity and quality, endangered species needs, and wildlife food and habitat needs. Seedbed preparation, fertilizing, seeding, and mulching must be in accordance with Conservation Practice Standard for Critical Area Planting (342) and Mulching (484).

## 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.

On center pivot irrigated lands consider using a 10 to 12 foot minimum top width on the embankment and sideslopes of 8:1 or flatter.

Where possible, the basin should be configured to enhance sediment deposition. This can be accomplished by using flow deflectors, inlet and outlet selection, and by adjusting the length to width ratio. Selection of basin width should consider the types of equipment available for sediment removal as well as equipment available for the initial construction.

For cropped fields, embankment orientation 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.

Effects on streams and wetlands must be considered. Mitigation may be required where

water is diverted or degraded for downstream uses.

This practice can be used to develop/enhance seasonally ponded areas for migratory waterfowl.

Where possible, the design should enhance habitat for native and endangered species. Effects on downstream water quality and temperature may be critical for some species.

This practice may adversely affect cultural resources. Planning, installation and maintenance must comply with GM 420, Part 401.

Operation safety of vehicle and farming equipment should be considered when selecting cut and fill slopes, especially where cropping or haying is planned.

## PLANS AND SPECIFICATIONS

Plans and specifications for installing sediment and water control basins must conform to requirements of this standard and must describe requirements for applying the practice and achieving its intended purpose.

## OPERATION AND MAINTENANCE

A site specific O&M plan must be prepared for and reviewed with the landowner or operator. The plan shall contain guidance to maintain the embankment, design capacity, vegetative cover and outlet.

All plans shall include a provision that after each large storm, basins must be inspected and needed maintenance performed. When sediment storage is full, accumulated sediment must be removed or the basin must be redesigned and modified to restore capacity.

Where designs include underground outlets, O&M plans should include checking for clogging and/or pipe damage.

## REFERENCES

-Engineering Field Manual, Chapter 6, Structures

-Engineering Field Manual, Chapter 10, Gully Treatment, Idaho Appendix #10