

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 onsite and downstream runoff

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 damages land and works of improvements.
5. Adequate outlets can be provided.

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 (600), Terrace or (362) Diversion as appropriate.

This practice standard does not apply where Conservation Practice Standard (410) Grade Stabilization Structure or Conservation Practice Standard (350) Sediment Basin is appropriate.

Maximum drainage area for a water- and sediment-control basin is 20 acres.

This practice is not applicable to watercourses where its installation would destroy important woody wildlife cover and the present watercourse is not seriously eroding. Such situations are usually recognizable by a meandering condition, steep side slopes which are stabilized by woody plants and herbaceous vegetation and the watercourse is without rapidly advancing overfalls.

CRITERIA

General Criteria Applicable to All Purposes

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.

Install Water and Sediment Control Basins as part of a conservation system that adequately 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 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 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. 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 land owners shall agree in writing on the elevation and expected duration of ponding.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service or download the standard from the electronic Field Office Technical Guide for Missouri.

NRCS MOFOTG
December 2015

Earth embankment. Minimum top widths are given in Table 1. Construct embankments at least 5% greater than design height to allow for settlement. Measured from natural ground at the centerline of the embankment, the maximum settled height of the embankment must be 15 feet or less.

Table 1. Minimum Top Width of Embankments

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

The design height of the basin embankment shall be increased by the amount needed to insure that after settlement the height of the embankment equals or exceeds the design height. The actual percent increase selected by designer shall be based on (1) soil mechanics test results, (2) history of embankments in the surrounding area, and (3) the type of compaction designated. The following minimum shall be met:

- 5 percent increase where fill material is placed in 9-inch layers and compacted by heavy hauling equipment or liquid filled tamping roller. (Sheepsfoot or wedgefoot drum rollers are considered tamping rollers.)
- 5 to 10 percent increase where fill construction and compaction is by bulldozer or light hauling equipment, i.e., unloaded scrapers. Individual layers shall be 5 inches in thickness or less.

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 slopes to be farmed no steeper than those on which farm equipment can be operated safely, 5 (H):1(V) or flatter.

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 if conditions warrant, seepage control. Refer to Conservation

Practice Standard (378), Pond 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 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, if warranted, use larger design storms appropriate to the risk.

Where settled fill height is 8 feet or more and total storage is 2 acre-feet or more, then Conservation Practice (410) Grade Stabilization Structure principal and auxiliary spillway design criteria shall be met.

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 Plan to maintain the required capacity.

Procedures for computing sediment volume from cropland and pastureland are shown in Missouri supplement to the NRCS, National Engineering Handbook (NEH), Part 650, Engineering Field Handbook (EFH), Chapter 8 - Terraces. For drainage areas over 5 acres, for strip mined land, and for other disturbed areas, use procedures in Missouri supplement to EFH, Chapter 10 - Gully Treatment to compute sediment 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 Conservation Practice Standard (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. 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 they are designed to handle the runoff. Refer to Conservation Practice Standard (378), Pond 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 prior to construction. Where topsoiling is necessary, the topsoil shall be salvaged from both the channel and ridge footprint area. Topsoiling criteria is located in the Missouri Supplement to EFH, Chapter 8 – Terraces, MO650.0811.

Vegetation. After construction of the Water and Sediment Control Basin, revegetate disturbed areas that will not be cropped as soon as possible. In non-cropland settings other erosion protection such as gravel or organic mulches can also be used.

Refer to Conservation Practice Standard (342), Critical Area Planting for criteria on seed selection, seedbed preparation, fertilizing and seeding.

CONSIDERATIONS

Water and Sediment Control Basins can be spaced at intervals down a slope, similar to terraces, in order to control erosion. Refer to Conservation Practice Standard (600), Terraces for methods to determine spacing. Additional conservation measures may be needed in the water course between basins to prevent erosion.

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.

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.

Underground outlets from Water and Sediment Control Basins can provide a direct conduit to receiving waters for contaminated runoff from crop land. 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. Refer to Conservation Practice Standard (646) Shallow Water Development and Management 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. 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 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

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according to this standard. As a minimum the plans and specifications shall include:

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.
7. Notification of hazards about steep slopes on the basin.

The following University of Missouri Agricultural Guides provide information on the operation and maintenance of terrace systems and their outlets:

1501 "Operating and Maintaining Underground Outlet Terrace Systems"

REFERENCES

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

University of Missouri Agricultural Guide Sheets:

1501 "Operating and Maintaining Underground Outlet Terrace Systems"