

NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA 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 practice in place of terraces. Where the ridge and/or channel extends beyond the detention basin or level embankment, use Virginia Conservation Practice Standard *Terrace (Code 600)* or *Diversion (Code 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. 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.

Space water and sediment control basins in series according to the intervals outlined in the Virginia Conservation Practice Standard *Terrace (Code 600)*. However, adjust spacing in consideration of site conditions including watercourse grade, embankment slope lengths, top width, outlet location, and row crop spacing.

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

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.

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 Virginia Conservation Practice Standard *Pond (Code 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 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.

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.

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. Outlets must conform to Virginia Conservation Practice Standards *Pond (Code 378)*, *Grassed Waterway (Code 412)*, *Diversion (Code 362)*, or *Underground Outlet (Code 620)*, as appropriate.

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.

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 Virginia Conservation Practice Standard *Pond (Code 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 prior to construction.

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.

Seedbed preparation, fertilizing, seeding and mulching shall be in accordance with Virginia Conservation Practice Standards *Critical Area Planting (Code 342)* and *Mulching (Code 484)*.

CONSIDERATIONS

When choosing the location of a Water and Sediment Control Basin, 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 should agree in writing on the elevation and expected duration of ponding.

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 Virginia Conservation Practice Standard *Shallow Water Development and Management (Code 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. 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 landowner is aware of 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.

Record all required information in an engineer field book, on a plan sheet or design computation sheet, or in another appropriate location.

DESIGN DATA

1. Completed Environmental Evaluation and subsequent requirements.
2. Soils investigation.
3. Survey and plot data: profile(s) of the basin(s), typical cross-sections, topography, as needed.

4. Design computations, including purpose of practice and references used.
 - a. Drainage area
 - b. Basin capacity: runoff storage and sediment storage
 - c. Embankment design height
 - d. Outlet capacity and stability
 - e. Spacing if water and sediment control basins are used in series.
5. Plan view of the layout of the Water and Sediment Control basin system with existing and planned features, including dimensions, distances, etc.
6. Details of the outlet system.
7. For underground outlets, details of the inlet and profile(s) of the underground outlet.
8. Standard Cover Sheet (VA-SO-100A).
9. Materials and quantities needed. Identify borrow material and/or spoil area, as needed.
10. Vegetation and/or ground cover requirements.
11. Identification of needed Erosion & Sediment Control measures.
12. Supplemental practices required.
13. Virginia Conservation Practice Specifications (700 Series). The construction specifications shall describe, in writing, the site-specific installation requirements of the Water and Sediment Control Basin.
14. Operation and Maintenance Plan.

CHECK DATA

1. As-built survey.
2. As-built plans including dimensions, types and quantities of materials installed, and variations from design. Include justification for variations.
3. Locations of appurtenant practices.
4. Adequacy of vegetation and/or ground cover.
5. Complete as-built section of Cover Sheet.

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.

REFERENCES

USDA-Natural Resources Conservation Service. Electronic Field Office Technical Guide (eFOTG), Section IV [Online]. Available at <http://www.nrcs.usda.gov/technical/eFOTG>

USDA-Natural Resources Conservation Service. National Engineering Handbook, Part 650 Engineering Field Handbook, Chapters 6, 8, 10, 11, 14.

USDA-Natural Resources Conservation Service. Virginia 700 Series Construction Specifications. [On-line]. Available at <http://www.nrcs.usda.gov/technical/eFOTG>

Virginia Department of Conservation and Recreation, Virginia Erosion and Sediment Control Handbook.

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