

**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.

PURPOSES

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 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. Where a ridge and/or channel extend beyond the detention basin or level embankment, Oklahoma NRCS Conservation Practice Standards, Terrace (600) or Diversion (362) must be applied as appropriate.

CRITERIA

General Criteria Applicable To All Purposes

Install Water and Sediment Control Basins as part of a resource management system that adequately addresses resource concerns 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 Oklahoma NRCS Conservation Practice Standard, 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.

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

Earth Embankment. Minimum top widths are given in Table 1. The constructed embankment height shall conform to the Oklahoma NRCS Conservation Practice Standard, Pond (378) settlement criteria. 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	4
5 - 10	6
10 –15	8

For portions of the basin controlling only flowing 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, and neither slope shall be steeper than a 2:1. Design all slopes to be farmed no steeper than those on which farm equipment can be operated safely. Slopes may be vegetated.

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 Oklahoma NRCS Conservation Practice Standard, Pond (378) for criteria for foundation cutoff and seepage control.

Capacity. As a minimum, design Water and Sediment Control Basins must have capacity to control and prevent overtopping by 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.

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 Oklahoma NRCS Conservation Practice Standard, Underground Outlet (620) 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 1.0 ft. above the design flow depth through the auxiliary spillway. Auxiliary spillways must not contribute runoff to lower Water and Sediment Control Basins or ponds unless they are designed to handle the runoff. Refer to Oklahoma NRCS Conservation Practice Standard, 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 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.

Refer to Oklahoma NRCS Conservation Practice Standard, Critical Area Planting (342) for criteria on seed selection, seedbed preparation, fertilizing and seeding. Refer Oklahoma NRCS Conservation Practice Standard, Mulching (484) for criteria on mulching.

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.

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.

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

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.

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.

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

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 Oklahoma NRCS Conservation Practice Standard, Shallow Water Development and Management (646) for information on managing seasonal water sources for wildlife. 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.

The construction of Water and Sediment Control Basins can introduce steep and potentially dangerous slopes into crop fields or pasture hay land. 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 operator 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:

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:

- Periodic inspections, especially immediately following significant runoff events. Damaged areas shall be repaired immediately.
- Periodic removal of sediment is necessary to maintain capacity and grade of the basin. The cleanout intervals may vary depending upon the volume of sediment that has accumulated. As a general rule, the basin will lose its effectiveness when about 50 percent of the design volume is filled with sediment.
- Regularly clean inlets for underground outlets and all other structure drains to maintain functionality and insure soil is not being transported through the drainage system. 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. The screens and/or rodent guards shall also be kept in place.
- Promptly repair or replace damaged components.
- Maintain basin ridge height and outlet elevations.
- Determine and eliminate causes of settlement or cracks in the earthen sections and repair damage.
- Where vegetation is specified, maintain vigorous growth of desirable vegetative coverings. This includes reseeding, fertilization, and controlled application of herbicides when necessary. Periodic mowing and control of trees and brush is also needed. Vegetative disturbance should be scheduled to avoid the peak nesting season.
- Notify the operators of hazards associated with steep slopes on the basin.
- If fences are installed, they shall be maintained to prevent unauthorized or livestock entry.
- Remove any debris that may accumulate in or immediately upstream of the basin.
- Immediately repair any vandalism, vehicular, or livestock damage to any earth fills, spillways, or outlets.
- Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.

REFERENCES

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