

**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.

Do not use this standard in place of terraces. Where the ridge and/or channel extends beyond the detention basin or level embankment, use Indiana (IN) Field Office Technical Guide (FOTG) Standard (600) Terrace or (362) Diversion, as appropriate.

**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

**CRITERIA**

**General Criteria Applicable to All Purposes**

Use of this standard will comply with all applicable federal, state, and local laws and regulations.

Install Water and Sediment Control Basins as part of a conservation system that adequately addresses resource concerns both above and below the basin.

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

The uncontrolled drainage area to a single basin will not exceed 30 acres.

**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.

**Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service State Office, or download it from the Field Office Technical Guide for your State.**

**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.

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

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 or easements, all landowners involved must agree in writing on the elevation and expected duration of ponding.

**Earth embankment.** Minimum effective top widths are given in Table 1. Construct embankments at least 10% greater than design height to allow for settlement. The maximum settled height of the embankment must be 15 feet or less as measured from natural ground at the centerline of the embankment.

**Table 1.** Minimum Top Width of Embankments

Fill Height (feet)	Effective Top Width (feet)
0 – 5.0	3
5.1 – 10.0	6
10.1 – 15.0	8

Embankment slopes must be 2 Horizontal to 1 Vertical or flatter with the sum of the upstream and downstream slopes equal to 5H:1V or flatter. Slopes may be vegetated or flattened to permit cropping. Design all slopes to be farmed no steeper than those on which farm equipment can operate safely.

All constructed slopes steeper than 5:1 must 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 IN FOTG 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.

In addition to the above storage, Water and Sediment Control Basins must have either the capacity to store at least the anticipated 10-year sediment accumulation, or periodic sediment removal as 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. These outlets must conform to IN FOTG Standard (378) Pond, (412) Grassed Waterway, (362) Diversion, (600) Terrace, (410) Grade Stabilization Structure, or (620) Underground Outlet, 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. Refer to IN FOTG 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 must be at least 0.5 foot 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 control the flow from the additional runoff which may include an auxiliary spillway. Refer to IN FOTG 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.

**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.

Seed selection, seedbed preparation, fertilizing, seeding and mulching must be in accordance with IN FOTG Standard (342) Critical Area Planting and (484) Mulching.

## CONSIDERATIONS

Underground outlets from 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. Chemicals used must be used according to their label.

Effects on water quantity and quality should be considered. This practice may reduce the volume and rate of discharge by using underground outlets. With underground outlets, infiltration through the catchment area will increase and runoff will be decreased. Deep percolation and ground water recharge may occur when conditions permit. The effects basins may have on the discharge to the watershed should be evaluated.

Water and Sediment Control Basins can be spaced at intervals down a slope, similar to terraces, in order to control erosion. Refer to IN FOTG Standard (600) Terrace for methods to determine spacing. Adjust spacing or include additional conservation measures needed to prevent erosion in the water course between basins.

Consider adding additional height in the middle of the dam to prevent storms in excess of the design storm frequency from overtopping the middle portion. This should be considered in situations where overtopping the middle would have some likelihood of breaching the dam such as basins with short, high fills, steep backslopes, and large drainage areas.

The soil survey can be a valuable resource when planning and designing 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 willow 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.

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

Consider using grass buffers around each riser to help reduce sediment, nutrient, and pesticide contamination of the 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 IN FOTG Standard (646) Willow Water Development and Management for information on managing seasonal water sources for wildlife.

Consider constructing side slopes 4H:1V or flatter when mowing of vegetation is part of maintenance or weed control.

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

Management practices and activities should not disturb cover during the primary nesting period of April 1 through August 1.

Where underground outlets are located under a basin ridge, mechanical compaction or water packing should be used. Installation and backfill of conduit trenches should be made in advance of other fill placement to allow adequate settlement.

The construction of basins can introduce steep and potentially dangerous slopes into crop fields. Choose flat slopes that will be safe for operating farm equipment when designing basins that will be farmed. Where steep slopes are unavoidable, make sure that the farmer is aware of the location of the basin and the potential danger.

When runoff will be ponded on a neighboring property, consider recording a legal document outlining or identifying ponded area(s).

## PLANS AND SPECIFICATIONS

Plans and specifications will be prepared for the practice site. Plans include, but are not limited to:

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

An operation and maintenance plan will be provided to and reviewed with the landowner. The plan must include the following items and others as appropriate:

1. Periodic inspections, especially immediately following significant runoff events.
2. Prompt repair or replacement of damaged components.
3. Place excavated material on the cropland to maintain fertility and enhance topography.
4. Fill material for increasing the embankment height must be obtained in a manner that enhances topography and maintains productivity of the cropland.
5. Maintain vegetation on steep embankment slopes.
6. Mow regularly where vegetation is specified. Vegetative disturbance should be scheduled to avoid the peak nesting season.
7. Control all trees, woody cover and noxious weeds from the embankment areas by hand, mechanical or chemical means. Only use chemicals recommended for this purpose.
8. Maintain basin ridge height and outlet elevations.
9. When sediment storage is full, accumulated sediment must be removed or the basin must be redesigned and modified to restore capacity.
10. Clean inlets for underground outlets regularly. Repair or replace inlets damaged by farm equipment. To ensure that the inlet remains the lowest spot in the basin, remove sediment around inlets regularly.
11. Hazards of steep embankment slopes must be identified.

12. Chemicals must be used according to their label.
13. Maintain effective conservation treatment of the contributing watershed to prevent excessive siltation and the resulting loss of capacity in the basin.

## **REFERENCES**

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