



**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
WATER AND SEDIMENT CONTROL BASIN
CODE 638
(NO.)**

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 on-site and downstream runoff,
- to improve farmability of sloping land, and
- to improve downstream water quality.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to rural sites where:

- the topography is generally irregular,
- watercourse and gully erosion is a problem,
- sheet and rill erosion is controlled by other conservation practices,
- runoff and sediment damage land and improvements,
- soil and site conditions are suitable,
- adequate outlets are available or can be provided, and
- 10-year, 24-hour runoff is less than 10 acre feet and the [effective height](#) of the embankment is 15 feet or less.

Do not use this standard in place of terraces. Where the ridge and/or channel extends beyond the detention basin or level embankment, use Wisconsin NRCS Conservation Practice Standard (WI NRCS CPS) Terrace (Code 600), or Diversion (Code 362), as appropriate.

CRITERIA

General Criteria

Design and install measures according to a site-specific plan in accordance with all local, State, Tribal, and Federal laws and regulations. Apply measures that are compatible with improvements planned or being carried out by others.

Design Criteria

Locate water and sediment control basins to control erosion in drainage ways. Basins may be installed singly or in series as part of a system. Adjust the location to fit the topography, maximize storage and accommodate farm equipment and farming operations.

The resource management system must reduce soil loss in the interval above and below the basin to less than, or equal to, the allowable soil loss (T).

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 basin design must limit inundation, infiltration, and seepage to prevent crop damage. Water detention areas that will be cropped shall be designed to drain within 24 hours.

Spacing

Water and sediment control basins shall generally be spaced at terrace intervals. The grade of the watercourse between basins shall be considered, and the spacing shall be set to prevent watercourse or gully erosion.

The maximum spacing between basins:	
Slope, percent	Maximum spacing, ft
0-4	700
4-6	600
6-12	500
More than 12	400

The system of basins and row arrangements shall be parallel when possible and spaced to accommodate farm machinery widths. Consideration shall be given to embankment slope lengths, top width, and inlet location when determining spacing.

Alignment

The embankment orientation and row direction shall be approximately perpendicular to the land slope to permit contouring as near as possible. The arrangement should permit farmability without excessive short point rows or sharp curves. Field boundaries and row length should also be considered when determining basin location and row direction.

Earth Embankment

The [constructed elevation](#) of the embankment shall be at least 5 percent greater than the [design fill height](#) to allow for settlement. The maximum design fill height shall be 15 feet.

The minimum top width shall be as shown in the following

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

The combined upstream and downstream side slopes of the settled embankments shall not be less than 5 horizontal to 1 vertical, and neither slope shall be steeper than 2 horizontal to 1 vertical.

Slopes to be cropped shall be 8 horizontal to 1 vertical or flatter.

Capacity

The minimum basin design capacity shall be large enough to control the runoff from a 10 year frequency, 24-hour duration storm without overtopping. The basin shall also have the capacity to store 10 years of sediment accumulation unless provisions are made for periodic sediment removal from the basin to maintain the design capacity. The following two table can be used to size basins, slotted risers, and UGOs.

Require water storage and Minimum Design Discharge with perforated/slotted risers, and UGO systems		
Duration of Flooding	Water Storage	Design Outflow
Hours	Inches per inch of runoff per unit area (IN / IN / AC)	CFS per Acre-inch of runoff
6	0.33	0.1
12	0.42	0.06
18	0.45	0.049
24	0.50	0.035
30	0.53	0.029
36	0.56	0.025
42	0.59	0.021
48	0.61	0.019

Require sediment storage (as expressed as water storage, inches)	
Soil Loss (Ton / Ac. / Year)	Estimated 10 year Sediment yield (In. / Ac.)
1	0.07
2	0.14
3	0.21
4	0.28
5	0.34
7	0.48
10	0.83

The basin shall have the ends closed to the [design elevation](#). A maximum of 1 foot of [freeboard](#) may be added to the design fill height to provide for an [auxiliary spillway](#) around one or both ends of the basin. The auxiliary spillway must not contribute runoff to a lower basin that does not have an auxiliary spillway.

Foundation Preparation

The area under the embankment shall be cleared of all sod, roots, vegetation, organic matter, and other undesirable materials.

Portions of basin ridges designed to impound more than a 3-foot depth of water must include foundation cutoff (core trench) and seepage control as required by the WI NRCS CPS Pond (Code 378).

Outlets

Water and sediment control basins shall have spillways, underground outlets or soil infiltration outlets that meet the requirements of WI NRCS CPS Pond (Code 378), or Underground Outlet (Code 620), as appropriate.

Vegetation

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

Slopes and disturbed areas that are not to be cropped shall be established to appropriate vegetation or otherwise protected from erosion using organic or gravel mulch or other suitable measures.

Environmental quality and wildlife food and habitat shall be considered in selecting the species of vegetation. Seedbed preparation, fertilizing, seeding, and mulching shall be in accordance with WI NRCS CPS Critical Area Planting (Code 342), and Mulching (484).

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the operator. The minimum requirements to be addressed in the operation and maintenance plan include the following:

- Periodic inspections, especially immediately following significant runoff events.
- Prompt repair or replacement of damaged components.
- Maintenance of basin ridge height and outlet elevations.
- Removal of sediment that has accumulated in the basin to maintain capacity and grade.
- 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.
- Where vegetation is specified, regular mowing and control of trees and brush. Vegetative disturbance should be scheduled to avoid the peak nesting season.
- Notification of hazards about steep slopes on the basin.

CONSIDERATIONS

Additional recommendations relating to design that may enhance the use of, or avoid problems with, this practice, but are not required to ensure its basic conservation functions are as follows:

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.

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 General Manual 420, Part 401, Cultural Resources (Archaeological and Historic Properties).

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

DESIGN DOCUMENTATION, PLANS AND SPECIFICATIONS

Plans and specifications for installing water and sediment control basins shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Design Documentation Requirements

Location and site map, soils, drainage area and volume computations including sediment volume required, design cross sections, spacing, and outlet requirements.

Plans and Specifications

Location map, profile along centerline of structure, cross section, outlet diameter, length, material, elevations, and seeding requirements.

As-Built Documentation

Completed cross section of structure at locations most likely to not meet design; profile along centerline of structure; outlet diameter, length, material, manufacturer, location, and elevations; vegetation adequacy.

REFERENCES

USDA, NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 2 (Estimating Runoff).

USDA, NRCS, Technical Release 55, Urban Hydrology for Small Watersheds (TR-55).

USDA, NRCS Wisconsin Field Office Technical Guide (FOTG), Section IV, Practice Standards and Specifications.

USDA, NRCS, Wisconsin General Manual, Title 420, Part 401, Cultural Resources (Archaeological and Historic Properties).

DEFINITIONS

Auxiliary spillway – The spillway designed to convey excess water through, over, or around a dam. This has been commonly referred to as an “emergency spillway”.

Constructed elevation – The sum of the design elevation and the allowance for settlement.

Design elevation – Design elevation is the required top elevation of the embankment along the centerline before allowance for settlement has been added.

Design fill height – The difference in elevation between the design elevation and foundation elevation after stripping along the centerline of embankment.

Effective height – The effective height of the dam is the difference in elevation, in feet, between the auxiliary spillway crest and the lowest point in the cross section along the centerline of the dam prior to stripping. If there is no auxiliary spillway, the design elevation for the top of the dam is the upper limit.

Freeboard – The additional depth or elevation required above computed design requirements.

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