

SEDIMENT BASIN

(No.)
Code 350

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

A basin constructed to collect and store debris or sediment.

II. Purpose

To preserve the capacity of reservoirs, lakes, wetlands, ditches, canals, diversions, waterways, and streams; to prevent undesirable deposition on bottom lands and developed areas; to trap sediment originating from construction sites; and to reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural wastes, and other detritus.

III. Conditions Where Practice Applies

This practice applies where physical conditions or land ownership preclude treatment of a sediment source or where a sediment basin offers the most practical solution to reduce sediment delivery to downstream areas.

Sediment basins having the primary purpose of controlling suspended solids loading and attached pollutants from runoff with a permanent pool of water shall meet the criteria set forth in Wisconsin Department of Natural Resources (DNR) Standard 1001, Wet Detention Basin.

IV. Federal, State, and Local Laws

Users of this standard should be aware of potentially applicable federal, state, and local laws, rules, regulations, or permit requirements governing sediment basins. This standard does not contain the text of federal, state, or local laws.

V. Criteria

A. General Criteria for Non-Livestock Area Sediment Basins

Sediment basins should be used in conjunction with erosion and sediment control practices, such as temporary seeding, mulching, diversions,

filter strips, etc., to reduce the amount of sediment flowing into the basins.

The basin shall be located to intercept sediment before it enters streams, lakes, and wetlands. For maximum effectiveness, the basin must be located close to the sediment source.

The capacity of the sediment basin shall equal the volume of sediment expected to be trapped at the site during the planned life of the basin or the improvements it is designed to protect.

Sediment basins meeting these design criteria are assumed to have an 80% trapping efficiency.

$$\text{volume} = \text{calculated erosion} * \text{planned life} * \text{SDR} * \text{trap efficiency} * 23.5 \text{ ft}^3/\text{ton}$$

Where:

$$\text{Volume} = \text{cubic feet (ft}^3\text{)}$$

$$\text{Calculated erosion} = \text{sheet and rill, gullies, etc. (Tons / year)}$$

$$\text{SDR} = \text{sediment delivery ratio}$$

$$\text{Trap Efficiency Assumed to be 80\%}$$

If it is determined that periodic removal of sediment will be practicable, the storage capacity may be proportionately reduced.

Provisions shall be made for draining sediment pools if necessary for safety and vector control.

Appropriate safety measures, such as warning signs, rescue facilities, and fencing, shall be provided as necessary to protect the public from floodwater and soft sediment.

Sediment storage of the basin shall be a minimum of 3 feet deep.

The minimum surface area of the sediment basin, measured at the principal spillway elevation, shall be sized based on the texture of the soil entering the basin and the peak outflow during the 1-year, 24-hour design storm.

$$S_a = 1.2 * (q_{out} / v_s)$$

Where:

S_a = Minimum treatment surface area of the sediment basin (square feet)

q_{out} = Peak outflow (cubic feet/second) during the 1-year, 24-hour design storm for the principal outlet

v_s = Particle settling velocity (feet/second)

1.2 = safety factor

Table 1

Class	V_s (ft/sec)	Size*
1	.0012	S, LS, SL
2	.000073	L, SiL, Si, SCL
3	.000012	CL, SiCL, SC, SiC

S = Sand Si = Silt C = Clay L = Loam

*Based on dominant textural class.

Shape – The length to width ratio of the flow path shall be maximized with a goal of 3:1 or greater. The flow path is considered the general direction of water flow within the basin including the treatment surface area and any forebay.

The foundation preparation and cutoff, earth embankments, principal spillways, and auxiliary spillways shall be according to NRCS Field Office Technical Guide (FOTG), Section IV, Standards 378, Pond; or according to the requirements in NRCS Technical Release 60, (TR-60), as appropriate.

1. Permanent Sediment Basins

Permanent sediment basins are used when the basins will be used longer than 2 years. They usually have earthen embankments and/or excavated basins with mechanical spillways.

Minimum sediment storage capacity shall be 0.3 acre-inches from the contributing drainage area.

Basins may have a dry or wet sediment pool. Wet sediment pool basins are more effective than dry sediment pool basins in trapping fine sediments. A normally dry sediment pool basin shall employ a drawdown device, such as a perforated riser or subsurface drain, that will drain the pool below the principal spillway crest while retaining the sediment as much as practicable. The drawdown flow rate shall be regulated by an

orifice or other device as needed. The top of the perforated riser shall be capped or a trash guard provided to prevent trash from reaching and plugging the orifice.

2. Temporary Sediment Basins

Temporary sediment basins are used where the basins will be used for periods of 2 years or less. They usually have earthen embankments and/or excavated basins, and may have mechanical spillways, crushed stone or gravel outlets, or other appropriate outlets.

Temporary sediment basins having a total embankment height of 5 feet or less and where failure of the embankment or outlet would not cause loss of life or damage to high value property, may be designed with an embankment having a minimum top width of 4 feet and side slopes of 2:1 (2 horizontal to 1 vertical) or flatter.

The minimum sediment storage capacity of a temporary sediment basin shall be 0.5 acre-inches per year from the contributing drainage area.

Removal – Temporary sediment basins shall be removed after the contributing drainage area has been stabilized. Complete final grading and restoration according to the site plans.

3. Livestock Area Sediment Basins

Sediment basins can be used to trap solids from concentrated livestock areas prior to entering storage, buffer, or filter systems. The basin can be either an off-lot basin or an on-lot basin with additional heavy use protection for the livestock area. See NRCS FOTG, Section IV, Standard 561, Heavy Use Area Protection, for surfacing options.

The bottom elevation of the sediment basin shall be at least 2 feet above bedrock or groundwater. A minimum of 0.3 feet freeboard shall be added to the storage depth.

The sediment basin discharge shall be stored or treated in accordance with NRCS FOTG, Section IV, Standards 313, Waste Storage Facility, or 635, Vegetated Treatment Area, as applicable.

The design loadings and quality of materials for wood and concrete walls shall be in accordance with the FOTG Standard 313, Waste Storage Facility.

Runoff shall be based on the 25-year, 24-hour duration storm rainfall. The suggested runoff curve numbers are 90 for unpaved lots and 95 for paved lots. The minimum runoff curve number for unpaved lots shall be 85.

The peak discharge from animal lot areas shall be a minimum of 1010 cubic feet per second per square mile for each inch of runoff. (NRCS Technical Release 55 [TR-55], Exhibit 5-II, $T_c=0.1$ Hours, Travel Time=0.0 Hours, and $I_A/P = 0.10$).

Flood routing of the sediment basin shall utilize procedures contained in TR-55, Chapter 6, or NRCS National Engineering Handbook (NEH), Part 650, Engineering Field Manual, Chapter 11.

The sediment basin shall have sufficient capacity, as a minimum, to store 65 percent of the peak inflow rate from a 25-year, 24-hour duration storm for a duration of 15 minutes. Any basin outflow shall be disregarded in computing minimum storage.

Additional storage capacity, based on frequency of cleaning, shall be provided for manure and other solids settled within the basin. The solids storage volume shall be based on the number of livestock, time on the lot (minimum of 25 percent), and seven days between cleanings. The minimum daily volume of solids per animal for design purposes shall be as specified in Table 2.

Table 2

Livestock	Minimum Daily Volume of Solids per Animal
1,400 lb. dairy cow	1.6 cubic feet
young dairy stock	1.1 cubic feet/1,000 lbs.
1,000 lb. beef animal	0.9 cubic feet

B. General Criteria for Temporary Sediment Barriers

Temporary sediment barriers are used to trap sediment from construction or other disturbed areas where the barriers are needed for less than

2 years and the drainage areas are less than 1 acre. Temporary sediment barriers include synthetic fabric silt fences, straw bale barriers, coarse aggregate barriers, and other appropriate materials.

A temporary sediment barrier may be used where the minimum barrier height is less than 5 feet, and where failure of the barrier would not cause loss of life or damage to high-value property, or significant damage to lower-value property. The barrier shall be adequate to retain the sediment and handle the 10-year, 24-hour duration storm frequency discharge without failure or significant erosion for the anticipated life of the barrier.

1. Straw Bale Sediment Barriers

Straw bale sediment traps should only be used in situations where a life span of less than 3 months is required.

Straw bale sediment traps shall be installed on the contour, except that the ends shall be extended upslope to prevent water from bypassing the ends.

The maximum length of uncontrolled slope upstream from a straw bale sediment trap should be 100 feet.

Bales shall be installed so that the bindings are oriented around the bale, not the top and bottom of the bales.

The straw bales must be entrenched at least 4 inches into the ground and anchored with two stakes driven through the bale and at least 12 inches into the ground. The stakes shall be 2" x 2" (nominal) wooden stakes, standard steel fence posts, or 1/2-inch diameter steel reinforcing bars.

Soil shall be compacted against the upstream base of the bales to prevent undermining by runoff. Gaps between bales must be filled by wedging them full of loose straw or equivalent material to prevent water flow between the bales.

Straw bale sediment traps shall not be used in channels or other areas of concentrated flow.

Straw bale sediment traps shall be removed once the disturbed area is permanently stabilized and no longer susceptible to erosion.

2. Silt Fences

Where a geotextile fabric silt fence is used to trap sediment from disturbed areas, it shall be installed on the contour, except that the ends shall be extended upslope to prevent water from bypassing the structure.

The maximum length of uncontrolled slope upstream from the silt fence should be 100 feet.

The geotextile fabric silt fence shall not be used in channels or other areas of concentrated flow.

Geotextile Fabric

The geotextile fabric may consist of either woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Non-woven fabric may be needle punched, heat bonded, resin bonded, or combinations thereof. All fabric shall meet the following requirements as specified in Table 3.

A heavy-duty nylon top support cord or equivalent shall be required.

Table 3

Test Requirement	Method	Value ¹
Minimum grab tensile strength in the machine direction	ASTM D 4632	120 lbs.
Minimum grab tensile strength in the cross machine direction	ASTM D 4632	100 lbs.
Maximum apparent opening size equivalent standard sieve	ASTM D 4751	No. 30
Minimum permittivity	ASTM D 4491	0.05 scc ⁻¹
Maximum permittivity	ASTM D 4491	.135 scc ⁻¹ or 10-gallon/minute/square foot at 50 mm constant head.
Minimum ultraviolet stability (percent of strength retained after 500 hours of exposure)	ASTM D 4355	70%

¹All numerical values represent minimum/maximum average roll values. (For example, the average minimum test results on any roll in a lot should meet or exceed the minimum specified values.)

Where joints are necessary, each end of the fabric shall be securely fastened to a post. The posts shall then be wrapped around each other to produce a stable, secure joint.

Posts

The maximum spacing of posts for non-woven silt fence shall be 3 feet and for woven fabric, 8 feet.

Wood support posts shall be a minimum length of 4 feet and the full height of the silt fence. The posts shall be a minimum dimension of 1 1/8 inches by 1 1/8 inches air or kiln-dried hickory or oak. The silt fence fabric shall be stapled, using at least 0.5-inch staples, to the upslope side of the posts in at least three places.

Steel support posts shall be the full height of the silt fence. The posts shall be at least 5 feet long with a strength of 1.33 pounds per foot and have projections for the attachment of fasteners. The silt fence fabric shall be attached in at least three places on the upslope side with 50 pound plastic tie straps or wire fasteners. To prevent damage to the fabric from fastener, the protruding ends shall be pointed away from the fabric.

All posts shall be driven at least 2 feet into the ground.

Anchor Trench

The bottom edge of the silt fence fabric must be anchored by burying in a trench 6 inches deep by 4 inches wide on the upslope side of the posts. The fabric shall be folded to fit the trench and backfilled and compacted to the existing ground line.

Silt fences shall be removed once the disturbed area is permanently stabilized and no longer susceptible to erosion.

3. Storm Drain Inlet Protection Barriers

Inlet protection barriers include, but are not limited to, filter fabric barriers, straw bales, sandbags, other material filled bags and socks, and stone weepers.

For temporary barriers that are installed around storm drain inlets, the perimeter length of the barrier must be at least 4 times the perimeter of the storm drain inlet. Where storm flows could overtop the

barrier, the top of the barrier needs to be level throughout the perimeter length.

Barriers shall be located where a traffic hazard will not be created and where traffic and construction activities will not destroy or cause constant need for maintenance of the barriers. Barriers shall be located so that any resulting ponding of storm water will not cause excessive inconvenience or damage to adjacent areas or structures.

C. Seeding

All embankments and other disturbed areas, excluding the permanent storage pond, shall be seeded in accordance with FOTG Standard 342, Critical Area Planting.

VI. 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.

- A. Effects on the water budget, especially volumes and rates of runoff, infiltration, evaporation, deep percolation, and groundwater recharge.
- B. Drainage area and patterns, and how they may change due to land use and construction activities.
- C. Potential impacts on and the opportunity to enhance existing streams, lakes, wetlands, groundwater and wildlife habit.
- D. Maximum permitted release rate from the basin and time limitation for draining the basin without causing secondary problems.
- E. Means for bypassing excess flows that can't be accommodated by the basin.
- F. Visual quality of onsite and downstream water resources

VII. Plans and Specifications

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

VIII. Operation and Maintenance

An Operation and Maintenance Plan shall be developed that is consistent with the purpose of this

practice, intended life of the components, and criteria for design.

The plan shall include but is not limited to:

- A. Inspection of basins immediately after a storm event. Temporary sediment barriers should be inspected after each rainfall event and at least daily during prolonged rainfall.
- B. Any part of a sediment basin or barrier that decomposes or becomes ineffective while it is still needed shall be replaced promptly.
- C. Sediment may need to be removed from temporary sediment barriers after each storm event. Deposits must be removed when they reach approximately one-half the height of the barrier.

Sediment in basins shall be removed and the basin restored to its original dimensions when the sediment has accumulated to one-half the designed sediment storage volume.

- D. Provisions for proper disposition of sediment removed from temporary or permanent structures.
- E. Provisions for removal of temporary sediment basins or barriers when the sediment source has been permanently stabilized and the area reshaped to conform to the existing grade and seeded.

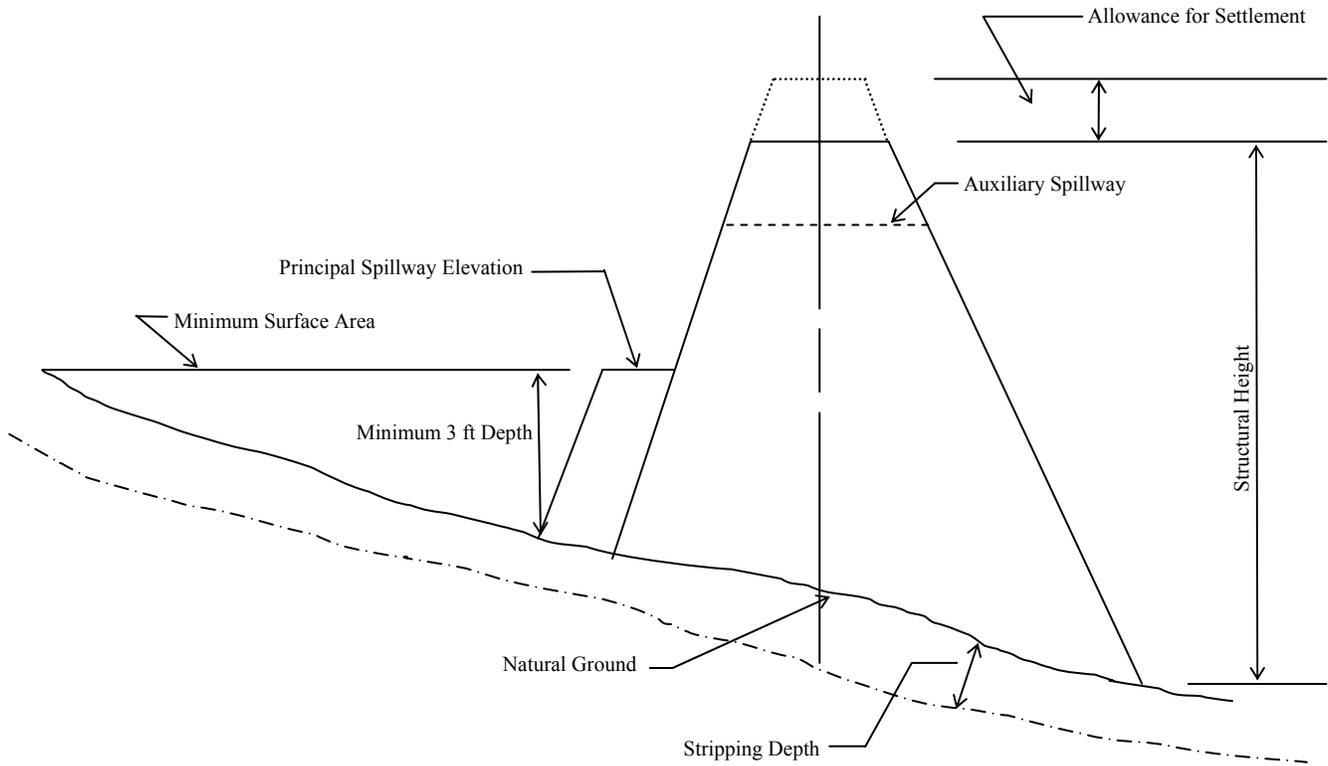
IX. References

USDA, NRCS, Wisconsin Field Office Technical Guide, Section IV, Conservation Practice Standards and Specifications.

USDA, NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook.

USDA, NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook.

USDA, NRCS, Technical Release 55, Urban Hydrology for Small Watersheds.



Sediment Basin Features