

# SEDIMENT BASIN (NO.) CODE 350

Natural Resources Conservation Service  
Conservation Practice Standard

## Definition

A basin constructed to collect and store debris or sediment.

## Scope

This standard applies to the installation of all basins where the primary purpose is to trap and store waterborne sediment and debris.

## Purpose

To preserve the capacity of reservoirs, 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.

## Conditions where practice applies

This practice applies where physical conditions or land ownership preclude treatment of a sediment source by the installation of erosion-control measures to keep soil and other material in place or where a sediment basin offers the most practical solution to the problem.

## Planning considerations

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 following items should be considered when planning sediment basins:

1. Site topography and available space.

2. Effects on the water budget, especially volumes and rates of runoff, infiltration, evaporation, deep percolation, and groundwater recharge.
3. Drainage area and patterns, and how they may change due to land use and construction activities.
4. Length of time the basin will be needed.
5. Potential impacts on and the opportunity to enhance existing streams, lakes, wetlands, groundwater and wildlife habit.
6. Maximum permitted release rate from the basin and time limitation for draining the basin without causing secondary problems.
7. Means for bypassing excess flows that can't be accommodated by the basin.
8. Visual quality of onsite and downstream water resources.
9. Safety precautions.
10. Operation and maintenance, including cleanout and disposal of sediment.

## Types

There are three general types of sediment basins:

1. Permanent sediment basins are used when the basins will be used longer than 2 yr or if the drainage areas are more than 5 acres. They usually have earthen embankments and/or excavated basins with mechanical spillways.
2. Temporary sediment basins are used where the basins will be used for periods of 2 yr or less and the drainage areas are 5 acres 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.

3. Temporary sediment barriers are used to trap sediment from construction or other disturbed areas where the barriers are needed for less than 2 yr and the drainage areas are less than 2 acres. Temporary sediment barriers include synthetic fabric silt fences, straw bale barriers, coarse aggregate barriers, and other appropriate materials.

#### Location

The basin(s) should be located to intercept sediment before it enters streams, lakes and wetlands. For maximum effectiveness, the basin must be located in a low area or natural drainage way close to the sediment source.

#### **Design Criteria**

The capacity of the sediment basin shall equal the volume of sediment expected to be trapped at the site during the planned useful life of the basin or the improvements it is designed to protect. If it is determined that periodic removal of sediment will be practicable, the storage capacity may be proportionately reduced. The volume of sediment and basin trap efficiency may be estimated by using the Wisconsin SCS publication "Determining Sediment Volumes From Sheet, Rill, Streambank and Gully Erosion in Wisconsin". The basin design must comply with requirements specified by local ordinances. Where no requirements are specified by ordinance, the desired trap efficiency must be chosen based on potential damage that could be caused by sediment. Normally the trap efficiency should be 70 pct or greater.

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.

#### Permanent sediment basins

The design of dams, spillways, and drainage facilities shall be according to SCS standards for ponds (378) and grade stabilization structures (410) or according to the requirements in SCS Technical Release No. 60, Earth Dams and Reservoirs (TR-60), as appropriate for the class and kind of structure being considered.

Basins may be normally ponded or normally dry. Normally ponded basins are more effective than dry basins in trapping fine sediments. A normally dry 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.

#### Agricultural areas

Sediment basins can be used to trap solids from concentrated livestock areas prior to entering storage or filter systems. Detention storage, in excess of the minimum required, shall be added as needed to reduce basin outflows for the system being designed.

The design loadings and quality of materials for wood and concrete walls shall be in accordance with the SCS standard for waste storage structure (313).

Runoff shall be based on the 10-yr, 24-h rainfall. The following values of rainfall and runoff may be used:

Rainfall = 4.0 in	
Runoff Curve No.	Runoff (in)
85	2.5
90	2.9
95	3.4
98	3.8

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 the lot area can be determined from exhibit 5-II, Tabular Hydrograph Unit Discharges (csm/in) for Type II Storm Distribution, SCS Technical Release No. 55, (TR-55) Urban Hydrology for Small Watersheds, or by using other approved hydrology methods. Peak discharges in table WI-1 in the SCS Agricultural Waste Management Field Manual (AWMFM), chapter 12, may be used for the respective lot sizes and runoff curve numbers.

Flood routing procedures described in TR 55 or the SCS Engineering Field Manual, pages 11-55b and 11-55c may be used when applicable. Sediment and/or manure storage volume must be considered in all settling basins.

The sediment basin shall have sufficient capacity, as a minimum, to store 65 pct of the peak inflow rate

from a 10-yr, 24-h storm for a duration of 15 min. 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 head, percent of time on the lot, and a minimum of 10 days between cleanings. The minimum daily volume of solids per animal for design purposes shall be: (1) 1,400# dairy cow--1.6 cubic ft; (2) young dairy stock--1.1 cubic ft/1,000#; (3) 1,000# beef animal--0.9 cubic ft. The stock shall be considered to be on the lot at least 25 pct of the time.

The bottom elevation of the settling basin shall be at least 2 ft above bedrock or groundwater.

#### Temporary sediment basins

Temporary sediment basins having a total embankment height of 5 ft 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 less conservative criteria if conditions warrant. The embankment shall have a minimum top width of 4 ft and side slopes of 2:1 or flatter. An outlet shall be provided of earth, pipe, stone, or other devices adequate to keep the sediment in the trap and to handle the 10-yr, 24-h frequency discharge without failure or overtopping of the basin.

Gravel or stone outlets shall be located in the low point in the basin. The gravel or stone shall be of a size and gradation to remain stable during design flow conditions. The crest of the outlet must be at least 1 ft below the top of the embankment to ensure that larger storm flows will travel over the outlet and not overtop the embankment. Alternately, an emergency spillway may be provided with the crest at least 1 ft below the top of the embankment.

The minimum sediment storage capacity of a temporary sediment basin shall be 0.5 in of runoff from the drainage area (0.5 acre-in per acre.)

#### Temporary sediment barriers

A temporary sediment barrier may be used where the drainage area is less than 2 acres, the barrier will be in place less than

2 yr, the minimum barrier height is less than 5 ft, 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-yr, 24-h frequency discharge without failure or

significant erosion for the anticipated life of the barrier.

#### Straw bale sediment trap

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 turned uphill 1-2 ft in elevation to prevent water from bypassing the ends. The maximum length of uncontrolled slope upstream from a straw bale sediment trap should be 150 ft. The straw bales must be entrenched at least 4 in into the ground and anchored with two stakes driven through the bale and at least 8 in into the ground. The stakes shall be 2" x 2" (nominal) wooden stakes or standard steel fence posts or equivalent. 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. Straw bale sediment traps shall not be used in channels or other areas of concentrated flow.

#### Silt fence

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 turned uphill 1-2 ft in elevation to prevent water from bypassing the structure. The maximum length of uncontrolled slope upstream from the silt fence should be 150 ft. The geotextile fabric silt fence shall not be used in channels or other areas of concentrated flow.

The geotextile fabric shall consist of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene-chloride with the following requirements:

- a. Woven fabric shall have the minimum strength values in the weakest principal direction.
- b. Nonwoven fabric may be needle punched, heat bonded, resin bonded or a combination thereof.

c.

Test	Method	Minimum Requirement (1)
Grab Tensile strength (pounds)	(4)	100
Mullen Burst strength (pounds/square inch)	ASTM D 3786	200
Apparent opening size	CW-02215-77 Corp of Engineers	50-80 fine soils (2) 30-60 coarse soils (3)
Water flow rate (gal/min/sq ft at 50 mm constant head)	(5)	10
Ultraviolet radiation	ASTM D 4355	90

- (1) All numerical values represent minimum average roll values (i.e., the average of test results on any roll in a lot should meet or exceed the minimum values in the table).
- (2) Fine soil refers to soils with more than 50 pct by weight passing the No. 200 sieve.
- (3) Coarse soil refers to soils with less than 50 pct by weight passing the No. 200 sieve.
- (4) ASTM D 1682, Grab Test, Method 16, using a 4-in by 8-in sample, 3-in gauge length, clamped in a 1-in long grip, tested at a strain rate of 12-in/min.
- (5) Water flow rate in gal/min/sq ft shall be determined by multiplying permittivity in l/sec as determined by ASTM D 4491 by a conversion factor of 74.

Geotextile fabric with support netting shall be reinforced with an industrial polypropylene netting with a maximum mesh spacing of three-quarter (3/4) in or equal. A heavy duty nylon top support cord or equivalent shall be required. Posts shall be installed at a spacing of 8 ft or less.

A wire support fence may be installed to which the geotextile fabric is attached where it is desired to increase the spacing between the posts. The wire support fence shall be a minimum of 1/4-in gage woven wire with a maximum mesh spacing of 6 in.

The top of the geotextile fabric shall be secured to the top of the fence with staples or wire rings spaced at 12 in center to center. The geotextile fabric shall be folded a minimum of 3 in over the top of the wire fence. Posts shall be installed at a spacing of 10 ft or less.

Posts shall be either wooden or steel with a minimum length of four (4) ft. Wooden posts shall be a minimum dimension of 2" x 2" (nominal). Steel posts shall be studded "Tee" or "U" type with a minimum weight of 1.3 lb per lineal ft. Anchors sufficient to resist post movement are required. All posts shall be driven at least 2 ft into the ground.

The bottom edge of the silt fence fabric must be anchored by burying in a trench 6 in deep by 4 in 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.

Geotextile fabric attached directly to wooden posts shall be secured with wire staples or with wooden lath and nails.

#### Storm drain inlet protection

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 large storm flows could overtop the barrier, the top of the barrier needs to be level and uniform for at least 4 times the perimeter length of the storm drain inlet. 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 stormwater will not cause excessive inconvenience or damage to adjacent areas or structures. Barriers shall encircle the storm drain inlets or prevent bypass by some other means.

#### **Seeding**

All embankments and other disturbed areas, excluding the permanent storage pond, shall be seeded in accordance with SCS standard 342, critical area planting and mulched in accordance with SCS standard 484, mulching.

#### **Operation and maintenance**

All sediment basins should be inspected immediately after a storm event. Temporary sediment barriers

should be inspected after each rainfall event and at least daily during prolonged rainfall.

Any required repairs shall be made immediately. Any part of a sediment basin or barrier that decomposes or becomes ineffective while it is still needed shall be replaced promptly.

Sediment deposits 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.

All sediment removed from temporary or permanent structures shall be deposited in a suitable area and in such a manner that it will not cause pollution.

Temporary sediment basins or barriers shall be removed when the sediment source has been permanently stabilized and the area reshaped to conform to the existing grade and seeded.

### **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.

### **Design documentation requirements**

Location map, applicable soil investigation logs, hydrology data and/or computer printouts, sediment and/or water storage volumes, sediment yield, discharge rate, orifice dimensions, if applicable; principal and emergency spillway dimensions, elevations, and materials; embankment dimensions, seeding requirements.

### **Construction (as-built) and/or certification documentation requirements**

Weir or orifice dimensions, principal and emergency spillway

dimensions, elevations, and materials; profile and cross section of embankments, quantity and quality of materials used in temporary sediment barriers; seeding adequacy.

## SEDIMENT BASIN SPECIFICATIONS

### General

Construction of sediment basins within the scope of the SCS standard for ponds (378) shall have, as a minimum, specifications commensurate with that standard. Those within the scope of SCS TR-60 shall be in accordance with the guide specifications contained in the SCS National Engineering Handbook, Section 20.

Other construction specifications which may apply are:

<u>Number</u>	<u>Title</u>
1	Clearing
2	Excavation
3	Earthfill
4	Concrete
6	Corrugated Metal Pipe Conduits
8	Drain Fill
9	Loose Rock Riprap
13	Geotextiles
14	Timber Fabrication and Installation

### Foundation preparation

The foundation area shall be cleared of trees, logs, stumps, roots, brush, boulders, sod, and rubbish. If needed to establish vegetation, the topsoil and sod shall be stockpiled and spread on the completed dam and spillways. Foundation surfaces shall be sloped no steeper than 1:1. The foundation area shall be thoroughly scarified before placement of any fill material.

Required excavation shall be made to the lines and grades shown on the plans or as staked in the field. If they are suitable, excavated materials shall be used in the permanent fill.

Foundation areas shall be kept free of standing water when fill is being placed in them.

### Fill placement

Materials used in fills shall be free of detrimental amounts of sod, roots, frozen soil, stones more than 6 inches in diameter (except for rock fills), and other objectionable material.

Selected backfill material shall be placed around structures, pipe conduits, and antiseep collars at about the same rate on all sides to prevent damage from unequal loading.

The placing and spreading of fill material shall be started at the lowest point of the foundation and the fill brought up in horizontal layers of such thickness that the required compaction can be obtained. The fill shall be constructed in continuous horizontal layers except where openings or sectionalized fills are required. In those cases, the slope of the bonding surfaces between the embankment in place and the embankment to be placed shall not be steeper than 3 horizontal to 1 vertical. The bonding surface shall be treated the same as that specified for the foundation so as to insure a good bond with the new fill.

The distribution and gradation of materials, shall be such that no lenses, pockets, streaks, or layers of material that differ substantially in texture or gradation from the surrounding material. If it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the center and upstream parts of the fill. If zoned fills of substantially differing materials are specified, the zones shall be placed according to lines and grades shown on the drawings. The completed work shall conform to the lines, grades, and elevations shown on the drawings or as staked in the field.

### Moisture control

The moisture content of the fill material shall be adequate for obtaining the required compaction. Material that is too wet shall be dried to meet this requirement, and material that is too dry shall have water added and mixed until the requirement is met.

### Compaction

Construction equipment shall be operated over the areas of each layer of fill to insure that the required compaction is obtained. Special equipment shall be used if needed to obtain the required compaction.

If a minimum required density is specified, each layer of fill shall be compacted as necessary to obtain that density. Fill adjacent to structures, pipe conduits, and antiseep collars shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators. Fill adjacent to concrete structures shall not be compacted until the concrete is strong enough to support the load.

## Protection

A protective cover of vegetation shall be established on all exposed surfaces of the embankment, spillway, borrow area and other disturbed areas if soil and climatic conditions permit.

If soil or climatic conditions preclude the use of vegetation and protection is needed, nonvegetative means, such as mulches or gravel, may be used. In some places, temporary vegetation may be used until conditions permit establishment of permanent vegetation. The embankment and spillway shall be fenced if necessary to protect the vegetation.

## Pipe spillways

Corrugated metal pipe shall conform to the requirements of Federal Specifications WW-P-402 or WW-P-405, as appropriate. Other pipe materials shall conform to specifications suitable for the intended purpose. Antiseep collars shall be of materials compatible with that of the pipe and shall be installed so that they are watertight. The pipe shall be installed according to the manufacturer's instructions. The pipe shall be firmly and uniformly bedded throughout its length and shall be installed to the line and grade shown on the drawings.

## Straw bale sediment trap

Straw bales shall be placed on the contour to the extent practicable. The ends of the straw bale fence should be turned upslope 1 to 2 ft in elevation to prevent flanking by runoff.

Straw bale fences shall be constructed by tightly abutting ends of adjacent bales. Gaps between bales shall be filled with straw.

All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent degradation of the bindings.

Each straw bale shall be securely anchored by at least two stakes driven through the bale and at least 8 in into the ground. The first stake shall be driven towards the previously anchored bale to help create a tight fit. Stake spacing, size and materials shall be as shown on the construction drawings.

## Silt fence

Geotextile fabric fences shall be placed on the contour to the extent practicable. The ends of the geotextile fence should be turned upslope 1 to 2 ft in elevation to prevent flanking by runoff.

Materials for geotextile fabric, support posts, and attachments; support post spacing and fabric anchoring details shall be as shown on the construction drawings.