

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

SEDIMENT BASIN

(Each)

CODE 350

DEFINITION

A basin constructed to collect and store debris or sediment.

PURPOSE

To preserve the capacity of reservoirs, ditches, canals, diversion, 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.

DESIGN CRITERIA

General. The design of dams, spillways, and drainage facilities shall be according to NRCS standards for ponds (378) and grade stabilization structures (410) or according to the requirements in TR-60, as appropriate for the class and kind of structure being considered.

Compliance. The design and construction of sediment basins shall comply with all state and local laws, ordinances, rules and regulation.

Location. The sediment basin shall be located to obtain the maximum storage benefit from the terrain and for ease of clean out of trapped sediment.

Size of Basin. 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 capacity may be proportionately reduced. **The capacity of the sediment basin, as measured to the elevation of the crest of the auxiliary spillway or principle spillway, if there is no auxiliary spillway, shall be at least 67 cubic yards per acre of total drainage area or 0.5 watershed inches.**

For drainage areas of 5 acres or less and a total embankment height of 5 ft or less, temporary **sediment traps** may be used. The embankment shall have a minimum top width of 5 ft and side slopes of 2:1 or flatter. **The length to width ratio shall be 2 to 1 or greater. An outlet or overflow spillway shall be constructed using riprap, large stone or other non-erosive materials to slow the release of runoff and allow sediment to settle out. The sediment storage volume shall be 67 cubic yards per acre of total drainage area or 0.5 watershed inches. The sediment trap shall handle the 10-year-frequency discharge at the maximum design sediment elevation, without failure or significant erosion.**

Sediment basins shall be cleaned out when the volume as described above is reduced by sedimentation to 27 cubic yards per acre of drainage area or 0.2 watershed inches, except in no case shall the sediment level be permitted to build up higher than one foot below the principle spillway crest. The elevation corresponding to the maximum allowable sediment level shall be determined and shall be stated in the design data as a distance below the top of riser.

Spillway Design. Runoff shall be computed by the method outlined in:

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

1. Chapter 2 of the Engineering Field Handbook, "Estimating Runoff".
2. TR-55, "Urban Hydrology for Small Watersheds".
3. Other approved methods.

Runoff computations shall be based upon the soil-cover conditions expected to prevail in the contributing drainage area during the anticipated effective life of the structure. The combined capacity of the principle and auxiliary spillway shall be sufficient to pass the peak rate of runoff from a ten year frequency storm.

Principle Spillway. A spillway consisting of a vertical pipe or box type riser joined (water tight connection) to a pipe (barrel) which shall extend through the embankment and outlet beyond the downstream toe of fill. The minimum capacity of the principle spillway shall be 0.2 cfs per acre of drainage area when the water surface is at the auxiliary spillway crest. The principle spillway shall have the capacity to handle the peak flow from a ten-year frequency rainfall event. The minimum size barrel shall be eight inches in diameter. The riser will be perforated to provide gradual drawdown after each storm event.

When in combination with the auxiliary spillway, the crest elevation of the riser shall be one foot below the elevation of the control section of the emergency spillway. If no emergency spillway is provided, the crest elevation of the riser shall be a minimum of three feet below the crest elevation of the embankment.

The sediment pool shall be drained by using a perforated riser or by some other approved means. The riser shall be perforated with 1/2 inch diameter holes spaced eight inches vertically and 10 to 12 inches horizontally. Additional drainage of the sediment to facilitate periodic clean-out may be accomplished by installation of a drain in the bottom of the riser.

An anti-vortex device and trash rack shall be securely installed on top of the riser. An approved anti-vortex device is a rigid vertical plate firmly attached to the pipe and oriented normal to the centerline of dam. Plate dimensions shall be: Length = diameter of the riser plus 12 inches; Height = diameter of the barrel.

The riser shall have a base attached with a water-tight connection and shall have sufficient

weight to prevent flotation of the riser. Two approved bases for risers ten feet or less in height are:

- 1) A concrete base 18 inches thick with the riser imbedded 6 inches in the base.
- 2) A 1/4 inch minimum thickness steel plate with a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.0 feet of stone, gravel, or tamped earth placed on it to prevent flotation. In either case, each side of the square base shall be twice the riser diameter.

All conduits through earth embankments, foundation, and abutments are to be provided with anti-seep collars according to the following criteria:

- 1) Conduits 8 inches or less in diameter shall have at least two anti-seep collars. The collars shall be centered about the dam centerline and spaced approximately 15 feet apart.
- 2) With conduits larger than 8 inches in diameter, the maximum spacing of the anti-seep collars shall be approximately 14 times the minimum projection of the collar measured perpendicular to the conduit. The collar should be equally spaced throughout the saturated zone of the dam.

An outlet shall be provided including a means of conveying the discharge in an erosion-free manner to an existing stable stream or channel. Protection against scour at the discharge end of the pipe spillway shall be provided. Measures may include impact basins, riprap, revetments, excavated plunge pools, or other approved methods.

The riser shall be securely attached to the barrel and all connections shall be water tight. The barrel and riser shall be placed on a firm smooth soil foundation. The fill material around the pipe spillway shall be placed in four inch layers and compacted under the haunches and around the pipe to at least the same density as the adjacent embankment. A minimum of two feet of hand compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment.

Auxiliary Spillway. Auxiliary spillways shall not be constructed on fill. The auxiliary spillway cross section shall be trapezoidal with a minimum bottom width of eight feet.

The minimum capacity of the auxiliary spillway shall be that required to pass the peak rate of runoff from a 10 year frequency storm, less any reduction due to flow through the principle spillway.

The velocity of the flow in the exit channel of the auxiliary spillway shall not exceed 6 feet per second for vegetated channels. For channels with erosion protection other than vegetation, velocities shall be within the non-erosive range for the type of protection used.

Erosion protection shall be provided for by vegetation as prescribed in this publication or by other suitable means such as riprap, asphalt, or concrete.

Freeboard is the difference between the design high water elevation in the auxiliary spillway and the top of settled embankment. If no auxiliary spillway, it is the difference between the elevation required to pass the design flow through the pipe and the top of settled embankment. The freeboard shall be at least one foot.

The emergency spillway shall not be installed in fill. Elevations, design width, entrance and exit channel slopes are critical to the successful operation of the auxiliary spillway.

Embankment. For sediment basins with height of embankment 10 feet or less and a maximum drainage area of 150 acres, the minimum top width shall be eight feet and side slope shall be 2 to 1 or flatter. For sediment basin with an embankment height of 15 feet or less and a maximum drainage area of 150 acres, the minimum top width shall be ten feet and side slopes shall be 2.5 to 1 or flatter.

The fill material shall be taken from an approved borrow area. It shall be clean mineral soil free of roots, woody vegetation, over sized stones, rocks, or other objectionable material. Areas on which fill material is to be placed shall be scarified prior to placement. The fill material shall contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. Fill material shall be placed in six to eight inch thick continuous layers over the entire length of fill. Compaction shall be obtained by routing the hauling equipment over the fill so that the entire surface of each layer is traversed by at least one wheel or tread track of the equipment or by the use of a compactor.

The embankment shall be constructed to an elevation 10 percent higher than the design height to allow for settlement if compaction is obtained with hauling equipment. If compactors are used for compaction, the overbuild may be reduced to not less than 5 percent.

Cut-off Trench. A cut-off trench shall be excavated along the centerline of earthfill embankment. The minimum depth shall be two feet. The cut-off trench shall be extended up both abutments to the riser crest elevation. The minimum bottom width shall be four feet but wide enough to permit operation of equipment. The side slopes shall be no steeper than 1 to 1. Compaction requirements shall be the same as those required for the embankment. The trench shall be de-watered during backfilling and compaction operations.

Safety. Provisions shall be made for draining sediment pools if necessary for safety and vector control. Fencing, signs and other safety measures shall be installed as necessary to protect the public from floodwater and soft sediment. Due consideration shall be given to good visual resource management.

Site Preparation. Areas under the embankment and any structural works shall be cleared, grubbed, and stripped of topsoil; to remove trees, vegetation, roots or other objectionable material. In order to facilitate clean-out and restoration, the pool area (measured at the top of the pipe spillway) will be cleared of all brush and trees.

Erosion Control. Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized. Stabilize embankment and auxiliary spillway in accordance with the appropriate vegetative standards and specifications.

Points of entrance of surface runoff into excavated sediment basins shall be protected to prevent erosion. Diversions, grade stabilization structures, or other water control devices shall be installed as necessary to insure direction of runoff and protect points of entry into the basin. Points of entry should be located so as to insure maximum travel of entering runoff to point of exit from the basin.

Final Disposal. When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting

sediment deposits are to be leveled or otherwise disposed of in accordance with the sediment control plan.

applying the practice to achieve its intended purpose.

CONSIDERATIONS

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and groundwater recharge.
2. Effects on downstream flows and aquifers that would affect other water uses and users.
3. Effects on volume of discharge flow on the environmental, social, and economic conditions.
4. Effects on the water table downstream and the results of changes of vegetative growth.

Water Quality

1. Effects on erosion, movement of sediment, pathogens, and soluble and sediment-attached substances that could be carried by runoff.
2. Effects on the visual quality of onsite and downstream water resources.
3. Effects of construction and early establishment of protective vegetation on the surface and ground water.
4. Effects on wetlands and water-related wildlife habitats.

PLANS AND SPECIFICATIONS

Plans and specifications for installing sediment basins shall be in keeping with this standard and shall describe the requirements for

OPERATION AND MAINTENANCE

A maintenance program shall be established to maintain the sediment basin embankment, principle spillway, emergency spillway and other associated practices. All damages caused by soil erosion or construction equipment shall be repaired at or before the end of each working day. Barren areas and vegetation damaged by livestock, machinery, herbicides, or erosion must be repaired promptly. Sediment shall be removed from the basin and deposited in a suitable area when it reaches the specified distance below the top of riser.

An operation and maintenance (O&M) plan shall be prepared for the Sediment Basin and any other associated conservation practices. Prior to construction, sufficient copies of the O&M plan shall be provided to the owner/operator, designer, and approving agencies. The owner shall sign the O&M plan to indicate an understanding of the requirements and a commitment to operate and maintain the area as specified.

The O&M plan shall include the periodic mowing of vegetation around the basin and removal of trees, brush and other woody vegetation from the embankment and emergency spillway. The O&M plan shall also include the inspection and repair of the basin as needed, including re-vegetating of barren and damaged areas. The grazing on embankments shall be prohibited and grazing immediately around the pond shall be kept to a minimum.