

# STANDARD AND SPECIFICATIONS FOR DEBRIS BASIN



## Definition

A barrier or dam constructed across a waterway or at other suitable locations to form a basin for catching and storing sediment and other waterborne debris.

## Scope

This standard covers the installation of debris basins on sites where: (1) failure of the structure would not result in loss of life or interruption of use or service of public utilities; (2) the drainage area does not exceed 200 acres; and (3) the water surface area at the crest of the auxiliary spillway does not exceed 5 acres. For this purpose of this standard, debris basins are classified according to the following table:

Class	Maximum Drainage Area (Ac)	Maximum Height <sup>1</sup> of Dam (ft)	Auxiliary Spillway Required	Design Storm Frequency
1 <sup>2</sup>	20	5	No	—
2	20	10	Yes	50 yrs.
3	200	20	Yes	100 yrs.

<sup>1</sup> Height is measured from the low point of original ground at the downstream toe to the top of dam.

<sup>2</sup> Class 1 basins are to be used only where site conditions are such that it is impractical to construct an auxiliary spillway in undisturbed ground.

## Purpose

To provide a permanent or temporary means of trapping and storing sediment from eroding areas in order to protect properties or stream channels below the installation from damage by excessive sedimentation and debris.

## Conditions Where Practice Applies

Where physical conditions or land ownership preclude the treatment of the sediment source by the installation of erosion control measures to reduce runoff and erosion. It may also be used as a permanent or temporary measure during grading and development of areas above. If a debris basin is used as a temporary structure, it may be removed once the development is complete and the area is permanently protected against erosion by vegetative or mechanical means.

## Design Criteria

The capacity of the debris basin to the elevation of the crest of the service spillway is to equal the volume of the expected sediment yield from the unprotected portions of the drainage area during the planned useful life of the structure. The minimum volume of sediment in acre feet per year can be determined for various drainage areas under construction from curves on Figure 5B.21 on page 5B.44.

**NOTE:** All Debris Basins will be designed and constructed in accordance with the New York State Department of Environmental Conservation Dam Safety Section, "Guidelines for Design of Dams," and all applicable permits must be obtained.

## Spillway Design

Runoff will be computed by the USDA-NRCS, TR-55, or other appropriate method. Runoff computations should be based upon the soil cover conditions expected to prevail during the construction period of the development.

For Class 2 basins, the combined capacities of the service and auxiliary spillways will be sufficient to pass the peak rate of runoff from a 50-year frequency storm after adjusting for flood routing.

For Class 3 basins, the combined capacities of the service and auxiliary spillways will be sufficient to pass the peak rate of runoff from a 100-year frequency storm.

## Pipe Spillway

The pipe spillway will consist of a vertical pipe box type riser jointed to a conduit, which will extend through the embankment and outlet beyond the downstream toe of the fill. The minimum diameter of the conduit will be 8 inches.

The service spillway system will be perforated to provide for a gradual drawdown after each storm event. The minimum average capacity of the service spillway will be sufficient to discharge 5 inches of runoff from the drainage area in 24 hours (0.21 cfs per acre of drainage area). The riser of the service spillway shall be a cross-sectional area at least 1.3 times that of the barrel.

1. **Crest Elevation:** The crest elevation of the riser shall be at least 3 feet below the crest elevation of the embankment.
2. **Perforated:** Metal pipe risers shall be perforated with 1-1/2 inch diameter holes spaced 8 inches vertically and 10-12 inches horizontally around the pipe. Box type risers shall be ported or have some means for complete drainage of the sediment pool within a 5 day period following storm inflows.
3. **Anti-vortex device:** An anti-vortex device shall be installed on the top of the riser.
4. **Base:** The riser shall have a base attached with a watertight connection. The base shall have sufficient weight to prevent flotation of the riser.
5. **Trash rack:** An approved trash rack shall be firmly attached to the top of the riser if the pipe spillway conveys 25 percent or more of the peak rate of runoff from the design storm.
6. **Anti-seepage measures:** Anti-seep collars, or seepage diaphragms, shall be installed around the pipe conduit within the normal saturation zone when any of the following conditions exist:
  - A. The settled height of dam exceeds 15 ft.
  - B. The conduit is of smooth pipe 8 inches, or larger, in diameter.
  - C. The conduit is of corrugated metal pipe 12 inches in diameter, or larger.  
The anti-seep collars and their connections to the pipe shall be watertight. The maximum spacing shall be approximately 14 times the minimum projection of the collar measured perpendicular to the pipe. In lieu of anti-seep collars, a seepage diaphragm can be used whose projections are three times the diameter of the pipe in all directions.

7. **Outlet protection:** Protection against scour at the discharge end of the pipe spillway shall be provided. Protective measures may include structures of the impact basin type, rock riprap, paving, revetment, excavation of plunge pool or use of other approved methods.

## Auxiliary Spillway

Class 2 and 3 basins: An auxiliary spillway shall be excavated in undisturbed ground whenever site conditions permit. The auxiliary spillway cross section shall be trapezoidal with a minimum bottom width of 8 feet.

Class 1 basins: The embankment may be used as an auxiliary spillway. In these cases, the downstream slope of the embankment shall be 5:1 or flatter and the embankment must be immediately protected against erosion by means such as sodding, rock riprap, asphalt coating, or other approved methods.

1. **Capacity:** The minimum capacity of the auxiliary spillway shall be that required to pass the peak rate of runoff from the design storm, less any reduction due to flow in the pipe spillway.
2. **Velocities:** The maximum allowable velocity of flow in the exit channel shall be 6 feet per second for vegetated channels. For channels with erosion protection other than vegetation, velocities shall be in the safe range for the type of protection used.
3. **Erosion protection:** Provide for erosion protection by vegetation or by other suitable means such as rock riprap, asphalt, concrete, etc.
4. **Freeboard:** Freeboard is the difference between the design flow elevation in the auxiliary spillway and the top of the settled embankment. The minimum freeboard for Class 2 and Class 3 basins shall be 1 foot.

## Embankment (Earth Fill)

Class 1 basins: The minimum top width shall be 10 feet. The upstream slope shall be no steeper than 3:1. The downstream slope shall be no steeper than 5:1.

Class 2 basins: The minimum top width shall be 8 feet. The combined upstream and downstream side slopes shall not be less than 5:1 with neither slope steeper than 2½:1.

Class 3 basins: The minimum top width shall be 10 feet. Side slopes shall be no steeper than 3:1.

## Embankment (other than Earth Fill)

Class 1 basins only: The embankment may be constructed

of the following materials:

1. Pressure treated timber crib – rock filled
2. Precast reinforced concrete crib – rock filled
3. Gabions

When the above material is used for the embankment, a principal spillway is not required; however, the dam shall be pervious to allow for drainage during time of low inflow. Basins constructed of the above materials should be used only when the sediment to be trapped is coarse-grained material such as well graded gravel (GW) or poorly graded gravel (GP) material (Unified Soil Classification System).

## **Construction Specifications**

### **Site Preparation**

Areas under the embankment and any structural works shall be cleared, grubbed, and the topsoil stripped to remove trees, vegetation, roots, and other objectionable material. In order to facilitate cleanout and restoration, the pool area will be cleared of all brush and excess trees.

### **Cutoff Trench**

A cutoff trench shall be excavated along the centerline of dam on earth fill embankments to a depth of at least 1.0 foot into a layer of slowly permeable material. The minimum depth shall be 2 feet. The cutoff trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be 4 feet, but wide enough to permit operation of compaction equipment. The side slopes shall be the same as those for embankment. The trench shall be kept free from standing water during the backfilling operations.

### **Embankment**

The fill material shall be taken from approved designated borrow areas. It shall be free of roots, woody vegetation, oversized stones, rocks, or other objectionable material. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material should contain sufficient moisture so that it can be formed into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction.

Fill material will be placed in 6 to 9 inch layers and shall be continuous over the entire length of the fill. Compaction will be obtained by routing the hauling equipment over the fill so that the entire surface of the fill is traversed by at least one track width of the equipment, or compaction shall be achieved 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 5 percent.

### **Pipe Spillway**

The riser shall be solidly attached to the barrel and all connections shall be watertight. The barrel and riser shall be placed on a firm foundation. The fill material around the pipe spillway will be placed in 4-inch layers and compacted to at least the same density as the adjacent embankment.

### **Auxiliary Spillway (Class 2 and 3 basins)**

The auxiliary spillway shall be installed in undisturbed earth unless otherwise specified in the plan. The lines and grades must conform to those shown on the plans as nearly as skillful operation of the excavating equipment will permit.

### **Embankment (other than Earth Fill)**

The rock used to fill cribbing or gabions will be hard and durable and of an approved size and gradation.

### **Erosion and Pollution Control**

Construction operations will be carried out in such a manner that erosion and water pollution will be minimized. State and local laws concerning pollution abatement shall be complied with.

### **Safety**

State requirements shall be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.

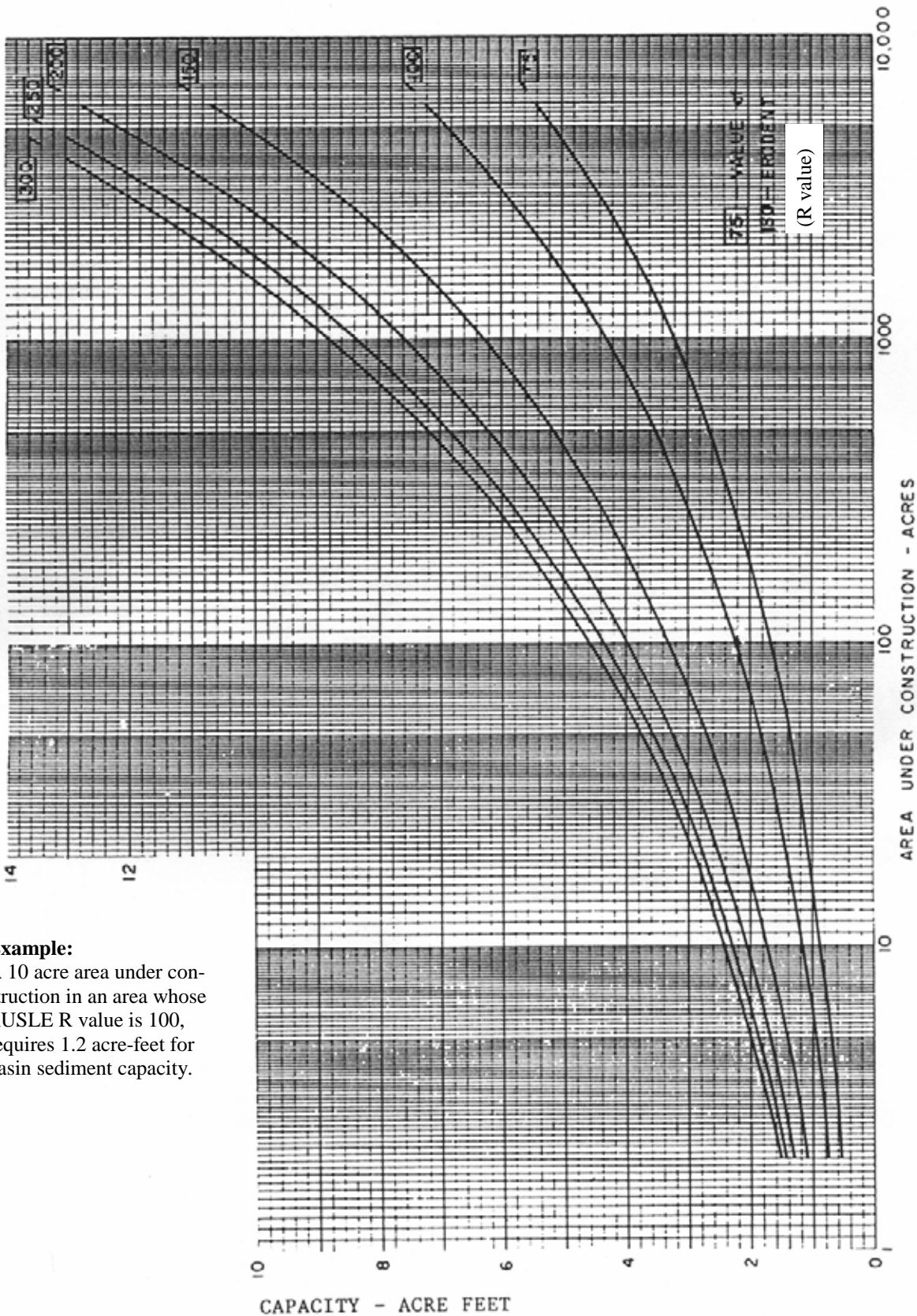
### **Seeding**

Seeding, fertilizing, and mulching shall conform to the recommendations in Section 5, Vegetative Measures for Erosion and Sediment Control, of this manual.

### **Final Disposal**

In the case of temporary structures, when the intended purpose has been accomplished and the drainage area properly stabilized, the embankment and resulting silt deposits are to be leveled, or otherwise disposed of in accordance with the plan.

**Figure 5B.21**  
**One-Year Debris Basin Sediment Capacity (USDA - NRCS)**



**Example:**  
 A 10 acre area under construction in an area whose RUSLE R value is 100, requires 1.2 acre-feet for basin sediment capacity.