

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

**DIKE
(Feet)
Code 356**

DESIGN CRITERIA – CLASS II DIKES

HEIGHT

The design height of an earth dike shall be the design water depth plus an allowance for freeboard.

The minimum freeboard for dikes having a surface exposure (fetch) for 1000 feet or less shall be not less than 1.0 foot for fill heights of 4 feet and less, 1.5 feet for fill heights of 4 to 8 feet, and 2.0 feet for greater fill heights.

Additional freeboard shall be provided, to contain waves, for dikes having longer surface exposure (fetch) by addition of the following amounts to the applicable freeboard given above:

<u>FETCH</u> (feet)	<u>FREEBOARD</u> (feet)
1001 – 1250	0.2
1251 – 1500	0.4
1501 – 1750	0.6
1751 – 2000	0.8
over 2000	increase proportionally

In areas where dikes will be exposed to wave action for extended periods of time, additional protection will be required. (see Pond 378, Standard)

ALLOWANCE FOR SETTLEMENT

The minimum allowance to be added to the design height for settlement shall be as follows:

<u>DIKES CONSTRUCTED WITH</u> <u>PERCENT</u>	<u>ALLOWANCE IN</u> <u>PERCENT</u>
Bulldozer and Scrapers	10
Dragline	20

The use of draglines alone is not recommended for dikes with maximum fill heights exceeding 10 feet.

DESIGN CRITERIA – CLASS III DIKES

(For the Purpose of Protecting Agricultural Land of Relatively Low Capability or Improvements of Low Value)

Class III dikes are usually built where the spoil from excavated drainage channels is available. The maximum design water height permitted in this class dike shall be 4 feet above normal ground level for organic soils and 6 feet for mineral soils. This height is exclusive for crossing at channels, sloughs, and gullies. Damages which are likely to occur from a dike failure are low.

The design and installation shall be based on engineering surveys and investigations as provided for:

1. Mineral soils – Sec. 16, Chapter 2, NEH
2. Organic soils – Sec. 16, Chapter 8, NEH

The stage and duration of high water for which protection is to be provided shall be determined from this investigation. Dikes of this class shall provide protection for at least a 10-year frequency flood, except for areas to be devoted to range. Protection for these areas may be provided only for annual high water or annual high tide.

HEIGHT

The height of Class III dikes are determined in the same manner outlined under "Height" for Class II dikes except where no wave action is anticipated a minimum freeboard of 1 foot may be used.

ALLOWANCE FOR SETTLEMENT

The minimum allowance for settlement shall be as required under Class II dikes. In cases where dikes are constructed in slush and mud typical of marshes, at least 50 percent shall be allowed for settlement.

CROSS SECTION

The minimum requirements for the cross section of the dike shall be as follows:

(MINERAL SOILS)

<u>DESIGN WATER HEIGHT</u> FEET	<u>MIN. TOP WIDTH</u> FEET	<u>STEEPEST DESIGN</u> ^{1/} SIDE SLOPE
0 - 2	4	1½:1
2 - 4	6	1½:1
4 - 6	8	1½:1

(ORGANIC SOILS)

<u>DESIGN WATER HEIGHT</u> FEET	<u>MIN. TOP WIDTH</u> FEET	<u>STEEPEST DESIGN</u> ^{1/} SIDE SLOPE
0 - 2	4	2½:1
2 - 4	6	2½:1

1/ Where water is likely to remain against dike for extended periods of time (approximately one month or longer) steepest design side slope is to be 2:1 and the minimum top width for organic soil shall be 10 feet.

BERMS

Minimum berm widths between the toe of the dike and the edge of the excavated channel or borrow, shall be:

<u>FILL HEIGHT</u>	<u>MINIMUM BERM WIDTH</u> ^{1/}
Under 6 feet	10 feet
Over 6 feet	15 feet

1/ A berm is not required for dikes constructed on mineral soil with bulldozers or motor graders if the slope of the upstream borrow is not steeper than the front slope of the dike.

STRUCTURES

All structures through a dike, below the design high waterline, shall be equipped with antiseep collars designed to increase the distance of the seepage line along the structure by at least 15%.

The dike shall be protected from scour at each pump intake and discharge by use of appropriate structural measures.

All structures shall meet the standards and specifications for "STRUCTURES FOR WATER CONTROL", 587.

CORE TRENCH

A cutoff trench will be installed if prescribed by the engineer.

VEGETATIVE COVER

Dikes should be protected from erosion by the use of vegetation, or suitable mulch material until natural vegetation is adequate.

MAINTENANCE

All dikes must be adequately maintained to the required shape and height. Vegetation to control erosion shall be established on dikes as required by climatic conditions and the need for protection against wave action. The maintenance of dikes must include periodic removal of woody vegetation which may become established on the embankment. Design of the project shall include provisions for maintenance access.

DESIGN CRITERIA – CLASS III DIKES

(For the Purpose of Creating New or Developing Existing Wildlife Wetlands)

HEIGHT

The maximum design dike height shall be 4 feet above normal ground level for organic soils and 6 feet for mineral soils. This height is exclusive of crossing at channels, sloughs, and gullies.

The stage and duration of high water for which protection is to be provided shall be that necessary to allow good management and meet the objectives of the wildlife development.

SOILS

The dike shall be constructed on soil suitable for embankment construction, and for structure and embankment foundation.

If the dike is to be constructed in a primary organic material, soil borings will be taken to determine the depth of the organic material. Ordinarily, embankments cannot be constructed in one lift where organic material exceeds 2 feet in depth.

If it becomes necessary to construct a dike with organic material deeper than 2 feet, then (a) suitable mineral earth materials shall be hauled in and used to construct the dike across the area, or (b) the landowner shall be advised of and shall agree to construction period of several months, or years, during which the dike can be constructed in several stages.

EMBANKMENT

The minimum requirements for the embankments shall be as follows:

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

DESIGN WATER HEIGHT FEET	MIN. TOP WIDTH FEET	MIN. DESIGN SIDE SLOPE	MIN. 1/ FREEBOARD FEET	MIN. 2/ BERM FEET
0 - 1	0	3:1	0.4	0
1 - 3	4	1 ½:1	0.8	4
3 - 6	6	2:1	1.0	6

ORGANIC SOILS

DESIGN WATER HEIGHT FEET	MIN. TOP WIDTH FEET	MIN. DESIGN SIDE SLOPE	MIN. 1/ FREEBOARD FEET	MIN. 2/ BERM FEET
0 - 2	4	2 ½:1	0.8	10
2 - 4	6	2 ½:1	1.0	15

- 1/ Where there is no contributing drainage area outside the impoundment, the freeboard shall be added to the normal water surface elevation in the impoundment when it is flooded.

Where there is contributing drainage area outside the impoundment, the freeboard shall be added to the water surface elevation for the emergency spillway when it is flowing at design depth.

- 2/ A berm is not required for dikes constructed on a mineral soil with bull dozers or motor graders if the slope of the upstream borrow is not steeper than the front slope of the dike.
- 3/ Where water is likely to remain against dike for extended periods of time (approximately one month or longer) the minimum top width shall be 10 feet.

Additional freeboard shall be provided, to contain waves, for dikes having longer surface exposure (fetch) by addition of the following amounts to the applicable freeboard given above:

<u>FETCH</u> (feet)	<u>FREEBOARD</u> (feet)
1001 - 1250	0.2
1251 - 1500	0.4
1501 - 1750	0.6
1751 - 2000	0.8
over 2000	increase proportionally

In areas where dikes will be exposed to wave action for extended periods of time, additional protection will be required (see Pond 378, Standard).

ALLOWABLE FOR SETTLEMENT

DRAGLINE CONSTRUCTED

The allowance for settlement shall not be less than 30 percent for clays and silty soils, 20 percent for sandy soils, and 50 percent for organic soils.

BLADE CONSTRUCTED (BULLDOZERS, MOTOR GRADERS AND SCRAPERS)

The allowance for settlement shall not be less than 20 percent for clays and silty soils, and 10 percent for sandy soils.

CORE TRENCH

A cutoff trench will be installed if prescribed by the engineer.

EMERGENCY SPILLWAY

When the impoundment is entirely surrounded by a dike, and has no runoff discharging into it, an emergency spillway is not required.

Where there is a contributing drainage area outside the impoundment, emergency spillway capacity shall be sufficient to carry the maximum outflow expected for a rainfall frequency of one in ten years. Reduction of spillway size due to temporary detention may be considered.

The emergency spillway shall consist of (1) a concrete or earthen spillway, (2) conduit (pipe), or (3) a combination of a concrete or earthen spillway and a conduit.

If an earthen spillway is used, the crest of the spillway shall be at least 0.2 foot above the normal reservoir water elevation.

DRAINAGE

Provisions shall be made to drain water stored in the impoundment area as follows:

<u>FOOD CROP</u>	<u>AVERAGE REMOVAL RATE</u>
Corn, Browntop Millet, Rice	1.5" in 24 hours
Chufas, Japanese Millet	1.0" in 24 hours
Native wetland plants, Bottomland hardwoods	0.5" in 24 hours

Adequate surface drains shall be provided to remove surface water from approximately seventy-five percent (75%) or more of the impoundment area. However, a lesser degree of drainage may be used when recommended by a biologist.

STRUCTURES

One or more structures shall be provided which will automatically draw water down after rains to the planned surface elevation in the impoundment where there is a contributing drainage area outside the impoundment. Structures shall be sized by the use of the Cypress Creek Formula, with the appropriate "C" value and safety factor.

These structures shall consist of one of the following: (1) a weir type drop structure equipped with removable flashboards; (2) a pipe provided with an elbow and riser; (3) a pipe provided with a riser and a gate or plug at the pipe entrance; or (4) a structure of treated timber or concrete approved by the engineer.

Antiseep collars designed to increase the distance of seepage line along the structure by at least 15 percent shall be used when the design water height exceeds 3 feet.

Structures to automatically draw water down are not required where there is no contributing drainage area from outside the impoundment, but are recommended.

All structures shall meet Service Standards and Specifications for "Structure for Water Control", 587.

VEGETATIVE COVER

Dikes should be protected from erosion by the use of vegetation, or suitable mulch material until natural vegetation is adequate.

MAINTENANCE

All dikes must be adequately maintained to the required shape and height. Vegetation to control erosion shall be established on dikes as required by climatic conditions and the need for protection against wave action. The maintenance of dikes must include periodic removal of woody vegetation which may become established on the embankment. Design of the project shall include provisions for maintenance access.