

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**STRUCTURE FOR WATER CONTROL**

**(No.)**

**CODE 587**

**DEFINITION**

A structure in an irrigation, drainage, or other water management system that conveys water, controls the direction or rate of flow, or maintains a desired water surface elevation.

**SCOPE**

This standard applies to the structures normally installed in a well-planned irrigation or drainage system, wildlife facility or other water management systems for the conveyance, flow control, or level regulation of water. It covers the planning and functional design of such water-control structures but not the detailed design criteria or construction specifications for specific structures. It does not apply to structural components of irrigation pipelines or to subsurface drains or grade stabilization structures.

**PURPOSE**

To control the stage, discharge, distribution, delivery, or direction of flow of water in open channels or water use areas. Also used for water quality control, such as sediment reduction or temperature regulation. These structures are also used to create or protect fish and wildlife habitat and other natural resources.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies wherever a permanent structure is needed as an integral part of an irrigation, drainage, or other water-control system to serve one or more of the following functions:

1. To conduct water from one elevation to a lower elevation within, to, or from a ditch, channel, or canal. Typical structures: drops, chutes, turnouts, surface water inlets, head gates, pump boxes and stilling basins.
2. To control the elevation of water in drainage or irrigation ditches. Typical structure: checks.
3. To control the division or measurement of irrigation water. Typical structures: division boxes and water measurement devices.
4. To keep trash, debris, or weed seeds from entering pipelines. Typical structure: debris screens.
5. To control the direction of channel flow resulting from tides and high water or backflow from flooding. Typical structure: tide and drainage gates.
6. To control the level of a water table or to remove surface or subsurface water from adjoining land, to flood land for frost protection or to manage water levels for wildlife or recreation. Typical structures: water level control structures, pipe drop inlets, and box inlets.
7. To provide water control for recreation or wetland restoration, enhancement or creation.

8. To convey water over, under, or along a ditch, canal, road, railroad, or other barriers. Typical structures: deflectors, chutes, cold water release, or structures to make pools and riffles.
9. To modify water flow to improve or provide habitat for fish, wildlife, and other aquatic animals. Typical structures: deflectors, chutes, cold water releases or structures to make pools and riffles.

**DESIGN CRITERIA**

Structures for water control are part of a water management system. The capacity of the water control structure(s) shall be consistent with the level of protection desired and equal to or more than the capacity of other related components of the overall plan. Related components such as dikes, diversions, irrigation canals, etc., shall meet the criteria of the applicable standard.

Structures shall be designed on an individual job basis, or applicable NRCS standard drawings shall be adapted to meet site conditions and functional requirements. They shall be part of an approved and overall engineering plan for irrigation, drainage, wildlife, recreation, channel improvement, or similar purposes.

The plan shall specify the location, grades, dimensions, materials, and hydraulic and structural requirements for the individual structure. Provisions must be made for necessary maintenance. Care must be used to ensure that the area's visual resources are not damaged. If watercourse fisheries are important, special precautions or design features may be needed to ensure continuation of fish migration, passage or movement.

Legal Requirements

Structures shall conform to all Federal, State, and Local laws and regulations.

Wildlife Wetlands Development

For minimum spillway capacity for wildlife wetland development water control structures, see Table 1.

TABLE 1

Minimum Spillway Capacity Wildlife Wetlands Development 1/

Eff. Height Of Dam <u>2/</u> (feet)	Drainage Area (acres)	Principal Spillway <u>3/</u>	Emergency Spillway <u>4/</u>	Freeboard (feet) <u>5/</u>
0-3	0 – 10	None	Q10	0.5
	10 – 30	Q2	Q10	0.5
	30 – 100	Q2	Q10	1.0
3-6	0 – 10	None	Q10	0.5
	10 – 30	Q2	Q10	1.0
	30 – 100	Q2	Q25	1.0
OVER 6' OR OVER 100 ac - Submit proposed criteria to the Area Engineer for approval.				

It would be possible to deviate from Table 1 if inundation of the structure could be proven. Inundation shall be defined as when backwater reaches the crest of the emergency spillway.

**1/** This table applies only to those wildlife wetlands development structures whose:

- a. Hazard classification is class "a" (low hazard embankments).
- b. Product of the effective height times storage is less than 50.
- c. Wetland management is planned under the criteria as set forth in Standard 644, Wildlife Wetland Habitat Management.

For structures associated with urban or other high property value areas, spillway capacities and freeboard allowances shall comply with the requirements of Standard 378, Ponds.

**2/** Effective height of the embankment shall be defined as the difference in elevation from the crest of the earth spillway to the original low point on the centerline of the dam. Any embankment over (6) six-foot effective height shall meet the requirements of Standard 378, Ponds.

**3/** Trickle tubes or underground outlets (standard 620) shall be included in the design if there is a continuous flow from springs or other sources. It is recommended that a principal spillway be included in all designs. The principal spillway capacity may include temporary storage. The minimum size for trickle tubes shall be (6) six inches.

**4/** The emergency spillway routing may include the principal spillway discharge and temporary storage at design flow in the emergency. The discharge that goes through the earth spillway must be handled at safe velocities to the level of the outlet below the structure.

**5/** Freeboard for structures shall be measured between the water level at maximum design discharge and the top of the settled embankment.

#### Earth Embankments

The height of the dam shall be increased not less than 10 percent for impervious fills and not less than 40 percent for organic fills to accommodate for settlement. No embankment side slope shall be steeper than 3:1 for mineral soils or 6:1 for organic soils. Minimum top width shall be 4 feet.

If the water level in the wetland is managed to be seasonal, a foundation cut-off is not required. If the water level is managed as a permanent pool enough soils information should be gathered to evaluate the need of a foundation cut-off or sealing the pool area. Foundation preparation shall require stripping of the topsoil and vegetation, prior to the placement of fill, for all conditions.

If a suitable borrow area is not reasonably available, organic soils may be used in the embankment for effective heights less than 3 feet. Organic soils shall be covered with 4 to 6 inches of mineral soil, whenever possible, to protect against fire and decomposition. Organic soils may leak, so a fluctuating water level should be anticipated.

### Principal Spillway

Acceptable pipe materials are cast iron, steel, corrugated steel, corrugated aluminum, concrete and plastic. Steel pipe shall be a minimum 16 gauge and aluminum pipe shall have a minimum wall thickness of 0.06 inches (0.15 cm) up to 30 inches (0.75m) diameter. PVC shall meet the requirements of ASTM D1785, D2241 or D3034 being a minimum schedule 40 or SDR 35. Corrugated plastic tubing shall be used as an underground outlet only and shall meet the requirement of ASTM F445 or F667. Solid steel, aluminum or PVC outlets are required. Use aluminum or steel in areas subject to burning for weed or brush control. Antivortex devices shall be required for closed conduit spillways designed for pressure flow. Trash protectors shall be required for all inlets. Variable crest spillways (such as stop log risers) may be included in the design whenever practical to permit manipulation of water levels for cropping and wildlife management.

### Subsurface Drain Blocks

Existing subsurface drains may be blocked or controlled to restore wetland conditions to previously drained lands. Blocks and control structures shall be adequate to meet all hydraulic, structural, and other functional requirements. Where the drain lines serve as outlets to other drained areas where drainage is still desired, appropriate measures shall be included in the designs to keep the upstream drainage systems functional. Such measures may include using sealed conduits through the restored wetland areas, rerouting drain lines around the restored areas, or, where topography permits, setting water control levels so that upstream areas are unaffected. When sealed conduits are used under restored areas, the conduits shall be checked and modified if necessary to prevent flotation.

Where the wetland restoration will not be permanent, existing drain lines and intakes should be protected from damage. Blocks and control structures should be protected from damage. Blocks and control structures should be adequately marked and/or location recorded so that the block or structure can be easily found when the drain system is restored.

### Seeding and Mulching

Seedbed preparation, seeding, fertilizing and mulching shall comply with the instructions in Standard 644, Wildlife Wetland Habitat Management. The structure can be fenced, if necessary, to protect the vegetation.

### Operation and Maintenance

An operation and maintenance plan shall be developed and implemented so that the structure accomplishes its intended purpose. The plan is to be discussed with the landowner or operator who is responsible for operating and maintaining the structure. The structure should be inspected periodically and repairs made promptly as needed.

### Plans and Specifications

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

NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION

**GRASSED WATERWAY**

**CODE 587**

**Foundation Preparation**

The foundation area shall be stripped a minimum of six (6) inches (0.15 m) to remove organic or unsuitable materials in the foundation unless an organic fill or foundation are the only alternative. If a foundation cut-off is required, it shall be deep enough to backfill against a suitable impervious layer, have minimum slopes of 1:1 or flatter and have a minimum bottom width suitable for equipment used for placing and compacting backfill. The most impervious backfill shall be used in the cut-off, center and upstream portion of the embankment.

**Earth Embankment**

Earthfill material shall be free of sod, roots, organics and stones larger than six (6) inches (0.15 m) or other materials that cause a non-homogenous fill except for those circumstances when organic soils are permitted. Compaction of earthfill shall be accomplished by controlling the layer depth prior to compaction and the number of passes over the earthfill by heavy equipment. The uncompacted layer shall be placed in horizontal lifts not to exceed eight (8) inches (0.20m) for heavy equipment compaction. The number of passes over the entire surface of each layer shall be one. The moisture content shall be such that a ball can be molded by hand that can hold its shape without crumbling. Earthfill around pipes, underground outlets or diaphragms shall be hand compacted or consolidated by means to prevent piping. Equipment shall not travel over pipes, underground outlets or diaphragms until a minimum of two (2) feet (0.60m) of compacted fill has been established.

**Pipe Materials**

The type and quality of materials for the principal spillway shall be as designated in the plans. Unless otherwise specified in the plans, anti-seep collars, connecting bands and other appurtenances, shall be of the same material as the pipe conduit. Surface inlets or water level control devices may be fabricated from materials of the quality stated above or commercially fabricated units installed as per manufacturer's recommendations.