NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

STRUCTURE FOR WATER CONTROL

(No.)

Code 587

DEFINITION

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

PURPOSE(S)

The practice may be applied as a management component of a water management system to control the stage, discharge, distribution, delivery or direction of water flow.

CONDITIONS WHERE PRACTICE APPLIES

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

- Convey water from one elevation to a lower elevation within, to or from a water conveyance system such as a ditch, channel, canal or pipeline designed to operate under open channel conditions. Typical structures: drops, chutes, turnouts, surface water inlets, head gates, pump boxes and stilling basins.
- Control the elevation of water in drainage or irrigation ditches. Typical structures: checks, flashboard risers and check dams.
- Control the division or measurement of irrigation water. Typical structures: division boxes and water measurement devices.
- Keep trash, debris or weed seeds from entering pipelines. Typical structure: debris screen.
- Control the direction of channel flow resulting from tides and high water or back-flow from flooding. Typical structures: tide and water management gates.
- Control the water table level, remove surface or subsurface water from adjoining land, flood land for frost protection or manage water levels for wildlife or recreation. Typical structures: water level control structures, flashboard risers, pipe drop inlets and box inlets.
- Convey water over, under or along a ditch, canal, road, railroad or other barriers. Typical structures: bridges, culverts, flumes, inverted siphons and long span pipes.
- Modify water flow to provide habitat for fish, wildlife and other aquatic animals. Typical structures: chutes, cold water release structures and flashboard risers.
- Provide silt management in ditches or canals. Typical structure: sluice.

Conservation practice standards are reviewed and updated periodically. To obtain a current version of this standard, contact the Natural Resources Conservation Service or the NRCS web site (www.oh.nrcs.usda.gov).

- Supplement a resource management system on land where organic waste or commercial fertilizer is applied.
- Create, restore or enhance wetland hydrology.

CRITERIA

Criteria Applicable to All Purposes:

1. Vegetation complying with Critical Area Planting standard (code 342) shall be established on all disturbed earth surfaces. Where soil, climate or site specific conditions preclude establishing permanent vegetation, other protective means such as mulches or gravels, shall be used.

2. The structure shall be fenced, if necessary, to protect the vegetation.

3. Structures shall not be installed that have an adverse effect on septic filter fields.

4. The water level upstream of water control structures shall not be raised on adjacent landowners without their written permission.

5. All water impoundment structures built under this practice standard shall meet the requirements of NRCS Practice Standard Dike (code 356) or Pond (code 378) as applicable.

6. The landowner is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

7. The landowner shall obtain all necessary permissions from regulatory agencies, including the Ohio Department of Agriculture, US Army Corps of Engineers, US Environmental Protection Agency, Ohio Environmental Protection Agency and Ohio Department of Natural Resources – Division of Soil and Water Resources, or document that no permits are required.

8. Release of water from control structures shall not allow flow velocities in surface drainage system components to exceed acceptable velocities prescribed by NRCS Conservation Practice Standard, Surface Drainage, Main or Lateral (608).

9. Release of water from flow control structures shall not cause flow velocities in subsurface drains to exceed velocities prescribed by NRCS Conservation Practice Standard, Subsurface Drain (606).

Additional Criteria for Drainage Water Management

1. The drainage water management system shall be designed in accordance with a drainage water management plan per NRCS Practice Standard 554 or an approved Conservation Activity Plan (CAP) -130, Drainage Water Management plan.

2. The rate of outflow and the level of the water table shall be controlled by structures or pumps. Structures or pumps shall be located where they are accessible and subject to convenient control. Designs of critical components shall be in accordance with pertinent NRCS Practice Standards.

3. Control structures will be protected from damage, or located away from farming operations. The location of all buried drainage control structures will be clearly referenced on as-built construction drawings for future maintenance access.
4. Water level control structures shall be sized to provide adequate drainage flow and not to restrict drainage capacity when operated in free drainage mode. The water level control structure shall be designed to allow the water table to rise to satisfy the intended purpose.
5. All valves, controlled drainage structures, storage structures, and fittings shall be sufficiently watertight so the structure performs its intended function. The design must account for the head requirements necessary for buried (automatic float operated) control structures to function under all flow conditions.
6. Design documentation will include water surface profiles when control structures are installed in series on the same main or connecting sub-mains.
7. For subsurface systems, connect at least 10 ft of solid pipe with an anti-seep collar to the control structure. In lieu of an anti-seep collar, 10 additional feet of solid pipe may be installed. In either case, piping will be prevented
8. Structures shall be sized such that design flows over the flashboard or through the control structure can be maintained with a maximum head of 0.5 feet during normal operation. Structures shall be designed so that the control can be removed to return to the drainage mode when desired. Water tables should be dropped slowly to prevent high exit gradients, which may draw sediment or other pollutants into the drains. Ease of management and operation of the control structures shall be considered. Automatic devices should be considered to lower the flashboard or control the position of the outlet structure during sudden or high peak flows following infrequent storms. Pumping may be needed to achieve the objective in some sites.
9. Critical dates and target elevations will be determined on a site-specific basis in accordance with the purpose, crop and crop rotation, climate and growing season, topography and soils, crop management schedule and machinery/equipment, and related factors.
10. When the primary function of the structure is to prohibit the discharge of land applied liquid manure, a storage sump with access for a pump located upslope of the drainage control structure may be necessary to remove liquid manure from the system prior to lowering the drain outlet. Base flow in the system during times of anticipated manure application needs evaluated during project planning to evaluate the need for a sump.

CONSIDERATIONS

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge.
2. Potential for a change in the rate of plant growth and transpiration because of changes in the volume of soil water.
3. Effects on downstream flows or aquifers that would affect other water uses or users.
4. Effects on the field water table to ensure that it will provide a suitable rooting depth for the anticipated crop.
5. Potential use for irrigation management to conserve water.
6. Effect of construction on aquatic life.

7. Effects on stream system channel morphology and stability as it relates to erosion and the movement of sediment, solutes and sediment-attached substances carried by runoff.
8. Effects on the movement of dissolved substances below the root zone and to ground water.
9. Effects of field water table on salt content in the root zone.
10. Short term and construction-related effects of this practice on the quality of downstream water.
11. Effects of water level control on the temperatures of downstream waters and their effects on aquatic and wildlife communities.
12. Effects on wetlands or water-related wildlife habitats.
13. Effects on the turbidity of downstream water resources.
14. Existence of cultural resources in the project area and any project impacts on such resources.
15. Conservation and stabilization of archeological, historic, structural and traditional cultural properties when appropriate.

Design alternatives presented to the client should address economics, ecological concerns and acceptable level of risk for design criteria as it relates to hazards to life or property.

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.

Drainage management zones will be shown in plan view, and drawings will include a profile of the drainage main when drainage control structures are installed in series.

The plan shall specify the location, grades, quantities, dimensions, materials, and hydraulic and structural requirements for the individual structure. Provisions must be made for necessary maintenance. Care must be used to protect the surrounding visual resources. If watercourse fisheries are important, special precautions or design features may be needed to facilitate continuation of fish migrations.

OPERATION AND MAINTENANCE

An operation and management plan shall be provided to and reviewed with the land manager. The plan shall be site specific and include but not be limited to the following: Structures will be checked and necessary maintenance, including removal of debris, shall be performed after major storms and at least semi-annually.

Water level management and timing shall be adequately described wherever applicable.

Structures installed for the purpose of drainage water management are to be managed in conformance with Conservation Practice Standard 554, Drainage Water Management

Structures installed for the purpose of maintaining water levels in wildlife wetlands are to be managed in conformance with Conservation Practice Standard 644, Wildlife Wetland Habitat Management

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

STRUCTURE FOR WATER CONTROL – 587

Scope

The work shall consist of furnishing and installing flash board structure, conduits and appurtenances for the water control structure system as shown on the drawings and specified herein.

Utilities

The landowner and/or contractor shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

General

Construction operations shall be carried out in a manner and sequence that erosion and air and water pollution are minimized and held within legal limits.

The completed job shall present a workmanlike appearance and shall conform to the line, grades, and elevations shown on the drawings or as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used. Contractor shall be assured that all state laws concerning buried utilities have been met.

Documentation of materials used (rock or concrete delivery tickets, geotextile tags, seed tags, photographs of pipe labeling, etc) shall be saved and provided to NRCS.

All trees, stumps, roots, brush, weeds, and other objectionable materials shall be removed from designated work area.

The foundation must be firm so that installed structures will not settle

Materials

Materials for the structure for water control, conduit and appurtenances shall meet the requirements as shown in the plans and specifications. Materials shall be carefully inspected before installation. Materials with physical imperfections shall not be installed.

The following reference specifications pertain to conduit products currently acceptable for use in the water control structure system:

REFERENCE SPECIFICATIONS FOR CONDUIT MATERIALS	
Description	**ASTM**
Plastic	
Corrugated Polyethylene (PE) Pipe and Fittings	F405, F667
Poly Vinyl Chloride (PVC) Pipe and Fittings	F949, D1785, D2241
Styrene-Rubber (SR) Plastic Drain Pipe and Fittings	D2852
Dual Wall Polyethylene Pipe	
Corrugated Polyethylene (PE) Pipe and Fittings	F2306, F2648, F405 F667
Elastomeric Seals and Joints (Gaskets)	F477, D3212
Clay	
Clay Drain Tile and Pipe	C4, C700, C301
Concrete	
Concrete Drain Tile and Pipe	C412, C118, C14, C76, C444
Test Methods for Concrete Pipe	C497
Portland Cement	C150
Metal	
Corrugated Aluminum Pipe	B745
Corrugated Steel Pipe	A760

Manufacturer information requirements for Drainage Water Management control structures:

- Hydraulic flow capacity and head requirements for the conditions applicable to the installation
- Assurance of acceptable watertightness applicable to the installation
- Installation instructions
- Equipment for water level control adjustment and provisions for locking access to the structure
- Provisions for pumping access when the structure is used for the purpose of preventing liquid manure discharge from a subsurface drainage outlet

Placement

The structure for water control shall be installed to the line and grade shown on the drawings. Excavations below grade shall be corrected by backfilling and compacting by hand-operated or power equipment as specified by NRCS.

Equipment shall not be operated within 2 feet of any structure or pipe. Fill adjacent to structures, pipe conduits, and anti-seep collars shall be placed in 4 inch layers and compacted to a density equivalent to that of the surrounding fill by means of hand tamping or manually directed power tampers. Care should be taken that compaction around the pipe does not cause uplift on the pipe with a resulting void beneath the pipe. Hand tamping, only, should be used to compact the fill under the bottom half of the pipe.

Conduits installed in a trench shall be bedded and backfilled throughout the width of the embankment. Broken pieces of clay tile shall be kept away from the conduit. Friable soil shall be placed in 4-inch lifts and hand tamped to a depth of 2 feet above the conduit. The sides of the remaining trench under the embankment shall be sloped no steeper than 3 horizontal to 1 vertical and backfilled meeting embankment requirements.

Conduit and Structure Earthfill

The moisture content of the fill material being placed around a structure and conduit must be maintained within the limits required to permit satisfactory compaction. The lower moisture content limit is the amount of moisture required to produce a hand-molded ball that holds its shape. The upper moisture content limit is the amount of moisture required to disable operation of compaction equipment. If borrow material is dry, water must be added by irrigating the borrow area or by sprinkling each fill layer prior to compaction. After adding water, the fill material must be mixed to obtain uniform moisture content prior to compaction. Material that is too wet when placed on the fill shall be removed or dried by disking prior to compaction. The maximum rock size shall be 4 inches. Earthfill material shall be placed in uniform horizontal layers not to exceed 6 inches prior to compaction. Compaction of the fill shall be done by exerting pressure over the entire upper surface of each lift with a mechanical hand-operated compactor. Plate compactors shall not be used. No construction equipment shall be operated within two feet of any conduit or structure. The alignment and grade of flexible pipe conduits shall be maintained during compaction to prevent displacement.

Outlet

Where the construction plans call for a free outlet, a continuous section of non-perforated conduit shall be used at the outlet, unless a headwall is used. All outlets shall have an animal guard, hinged to allow passage of debris.

The continuous section of non-perforated conduit shall be long enough to satisfy all requirements of Conservation Practice Standard 606 – Subsurface Drain:

- At least two-thirds of the pipe shall be buried in the ditch bank.
- The cantilever section must extend to the toe of the ditch side slope or to the side slope protected from erosion.
- The continuous section must be at least 10 feet long.

Acceptable materials for use at the outlet include the following:

- Corrugated metal pipe, galvanized or aluminum, 16-gauge, minimum thickness,
- Smooth steel pipe with 3/16 of an inch minimum thickness,
- Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 35 or less or schedule 40 or heavier, and
- Dual wall corrugated polyethylene pipe.

All plastic and polyethylene pipe outlets shall include an ultra-violet stabilizer. Conduit ends shall be protected from sun damage during installation.