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, or maintains a desired water surface elevation or measures water.

PURPOSE

This practice may be applied as management component to control the stage, discharge, distribution, 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, or canal, or pipeline 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: check, 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 screens.
- Control the direction of channel flow resulting from tides and high water or backflow from flooding. Typical structure: tide and drainage gates.
- Control the level of a water table, 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, 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.
- Modify water flow to provide habitat for fish, wildlife, and other aquatic animals. Typical structures: deflectors, chutes, cold water release structures, and flashboard risers.
- Provide silt management in ditches. Typical structure: sluice gate.
- Create, restore, or enhance wetland hydrology.

CRITERIA

General Criteria Applicable to All Purposes

Planned work shall comply with all federal, state, and local laws and regulations. Plans for water control structures may need to be permitted by the appropriate Water Management District (WMD) and comply with the appropriate WMD rules contained in Chapter 40-4 Florida Administrative Code (F.A.C.), Environmental Resource Permits: Surface Water Management

Systems; Chapter 40-40 F.A.C., Standard General Environmental Resource Permits: Regulation of Stormwater Management Systems; Chapter 40-41 F.A.C., Environmental Resource Permits: Surface Water Management Basin Criteria; Chapter 40-42 F.A.C., Environmental Resource Permits: Regulation of Stormwater Management Systems; Chapter 40-44 F.A.C., Environmental Resource Permits: Regulation of Agricultural Surface Water Management Systems.

Water control structures shall be designed and constructed in conformance with provisions contained in Part 650, Engineering Field Handbook for Conservation Practices, Chapter 6 - Structures, Chapter 14 - Drainage, and Chapter 15 - Irrigation. Detailed information and criteria about water control structures are contained in the National Engineering Handbook Part 623 - Irrigation, Chapter 3; and Part 624 - Drainage, Chapter 6 and Chapter 10. Structures shall be designed on an individual job basis to meet site conditions and functional requirements. They shall be part of an approved engineering plan for irrigation, drainage, wildlife, recreation, channel improvement, or similar purposes.

Structures must not create unstable conditions upstream or downstream. Water control structures installed in an open channel shall be designed to discharge the channel design flow at the designed channel hydraulic gradeline. Additional capacity needed under flood conditions shall be provided by "island" type installation. Provisions must be made for safe reentry of bypassed flow as necessary.

Where conduits are used, the diameter shall be based on design capacity but shall not be less than 6 inches in diameter. The length of the pipe shall be determined by the width and side slopes of the required embankment or roadway over the pipe and shall extend a minimum of two feet beyond the toe of the designed fill except where headwalls are used.

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

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

Flashboard Riser and Culvert Structures. These structures will be designed according to the hydraulic conditions under which they will function. Each condition will require a different design.

When this type structure is used for water stage control in a drainage ditch or irrigation canal and the flashboards will be removed to provide design discharge capacity, the pipe may be designed as a culvert with a riser width equal to or greater than the culvert diameter. If the boards are to remain in place during the design discharge, the structure will be designed to pass the design discharge with all the boards in place and will be designed as a drop inlet.

When used for reservoir or lake level control, this structure shall be designed as a drop inlet.

Structures used to protect grade shall meet the requirements of NRCS conservation practice standard Grade Stabilization Structure, Code 410. The portion of the flashboard riser opening below grade of the upstream channel bottom will be permanently closed with a headwall of steel across the bottom of the semi-circular riser.

Earth embankment. The minimum top width for an embankment shall be 6 feet. If the embankment top is to be used as a public road, the minimum width shall be 16 feet for one-way traffic and 26 feet for two-way traffic. Guardrails or other safety measures shall be used where necessary and shall meet the requirements of the responsible road authority.

Freeboard. The minimum elevation of the top of the settled embankment shall be 1 foot above the design water surface or natural ground, whichever is higher.

Side slopes. The combined side slopes of the settled embankment shall be not less than 5 horizontal to 1 vertical (5:1), and neither slope shall be steeper than 2 horizontal to 1 vertical (2:1). All slopes must be designed to be stable. Where embankments are to be mowed or used by the public for recreation; 3 horizontal to 1 vertical (3:1) or flatter slopes are recommended.

Compaction. The embankment fill material shall be compacted in accordance with the specified design requirements for compaction and moisture content. Maximum thickness of earthfill layers will be 9 inches. If for any reason the designer is of the opinion that more stringent compaction requirements are necessary, percent of standard proctor and moisture limits may be specified. The design height of the embankment shall be increased by the amount needed to ensure that after settlement has taken

place, the constructed height of embankment will equal or exceed the design height. This settlement shall not be less than 3 percent for rubber tired pans and scrapers and 5 percent for track type equipment such as bulldozers, except where detailed soil testing and laboratory analysis shows a lesser amount is adequate or field observations indicate a greater amount is needed to obtain the required level of compaction.

Materials. Structures installed under this standard shall be constructed of durable material with a life expectancy equal to the planned life of the structure.

Pipe conduits used shall meet the requirements as stated in NRCS Florida conservation practice standard for Pond, Code 378.

Polyethylene, Type III, Class C, Category 4 or 5 conforming to ASTM and D 3350 and AASHTO M 252 or M 294, Type S, may be used for water control structures with a hydraulic head of 10 feet or less. Pipe connections must be water tight.

Concrete appurtenances used shall be designed for the anticipated loading and shall meet the requirements of National Engineering Handbook, Part 642, Specifications for Construction Contracting, Structure Concrete.

Seepage control. Seepage control is to be included if (1) seepage will create unstable conditions downstream, (2) it is needed to ensure a stable embankment or (3) special circumstances require drainage for a stable structure. Seepage may be controlled by foundation, abutment or embankment drains.

Seepage along pipes extending through the embankment may be controlled by use of a filter and drainage diaphragm, unless it is determined that antiseep collars will adequately serve the purpose. Anti-seep collars and drainage diaphragms shall meet the requirements of NRCS Florida conservation practice standard for Pond, Code 378.

Antivortex devices. Closed conduit spillways designed for pressure flow must have adequate antivortex devices. Antivortex devices shall be designed in accordance with ARS-NC-33, Hydraulics of Closed Conduit Spillways, Part XIV.

Trash guard. Where necessary to prevent clogging of the conduit, an appropriate trash guard shall be installed at the inlet or riser. The trash guard shall be designed and constructed in such a manner that flow to the inlet will not be adversely affected.

Protection. A protective cover of vegetation shall be established on all disturbed earth surfaces. Where necessary, temporary vegetation will be used until permanent vegetation can be established. Vegetative measures including seedbed preparation, seeding, fertilizing, and mulching shall comply with NRCS conservation practice standard Critical Area Planting, Code 342.

Where needed to protect the outlet from erosion, it shall be protected with riprap or other means.

CONSIDERATIONS

When planning, designing, and installing this practice, the following items should be considered:

- Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.
- Potential for a change in the rate of plant growth and transpiration because of changes in the volume of soil water.
- Effects on downstream flows or aquifers that would affect other water uses or users.
- Effects on the field water table to ensure that it will provide a suitable rooting depth for the anticipated crop.
- Potential use for irrigation management to conserve water.
- Effect of construction on aquatic life.
- 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.
- Effects on the movement of dissolved substances below the root zone and to ground water.
- Effects of field water table on salt content in the root zone.
- Short term and construction-related effects of this practice on the quality of downstream water.

- Effects of water level control on the temperatures of downstream waters and their effects on aquatic and wildlife communities.
- Effects on wetlands or water-related wildlife habitats.
- Effects on the turbidity of downstream water resources.
- Existence of cultural resources in the project area and any project impacts on such resources.

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. Care must be used to protect the surrounding visual resources.

As a minimum, the plans and specifications shall include:

- Location of the structure(s),
- Typical cross section of structure(s) including grades, elevations, and dimensions of individual structure(s),
- Compaction requirements of all earth fills,
- Type and quality of materials,
- Hydraulic and structural requirements for individual structure(s), and
- Vegetative requirements.

OPERATION AND MAINTENANCE

Operation and maintenance shall be in accordance with the requirements of this standard and in keeping in conformance with all local, state, and federal laws and regulations. Structures for water control must be adequately maintained if their purposes are to be realized through the expected life. Special considerations shall be given for maintenance needs during the planning, design, and construction of the structure. An operation and maintenance plan shall be prepared for each structure site and provided to the landuser. The water control structure should be inspected periodically to ensure that the structure functions as planned.

Water level and timing shall be adequately described wherever applicable.

Vegetation on all earthfills shall be inspected regularly. Mow when vegetative growth becomes excessive. Damaged vegetation shall be replaced in accordance with NRCS FL conservation practice standard Critical Area Planting, Code 342.

Structures shall be inspected for deterioration and capacity. Any blockage of trash and debris that could affect flows through the structure shall be removed. Materials that have deteriorated, including rock used for outlet protection shall be replaced.

The structure shall be inspected for safety of people or animals using the area near the structure.

Periodically remove sediment that accumulates during the design life.

REFERENCES

AASHTO M 252 and M 294
ARS-NC-33, Hydraulics of Closed Conduit Spillways, Part XIV.
ASTM D 3350
WMD Chapters 40-4, 40-40, 40-41, 40-42, 40-44 F.A.C.
Florida Department of Transportation, Specifications for Road and Bridge Design
National Engineering Field Handbook, Part 650
Chapter 6, Structures
Chapter 14, Drainage
Chapter 15, Irrigation
National Engineering Handbook
Part 623, Irrigation
Part 624, Drainage
Part 642, Specifications for Construction Contracting, Structure Concrete
NRCS Florida Conservation Practice Standards:
Critical Area Planting, Code 342
Grade Stabilization Structure, Code 410
Pond, Code 378