NATURAL RESOURCES CONSERVATION SERVICE
ENGINEERING STANDARD

GRASSED WATERWAY

(No.)

CODE 412

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- To convey runoff from water concentrations without causing erosion or flooding.
- To reduce gully erosion.
- To protect/improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices.

This practice is not applicable where construction would destroy important woody wildlife cover or the present watercourse is not seriously eroding.

CRITERIA

General Criteria Applicable to All Purposes

Grassed waterways shall be planned, designed and constructed to comply with all Federal, State, and local laws and regulations.

Capacity. The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration obtained by using the procedure in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 2.

Out-of-bank flow will be permitted in short sections of a reach to facilitate alignment or to minimize grade changes, as long as positive drainage to the waterway is maintained, flow will continue along the watercourse re-entering the waterway prior to reaching the outlet and no crops are damaged.

When the waterway grade is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum capacity in such cases shall be the discharge obtained from the "B" drainage curve procedure in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 14.

Exhibit OH7-2, "Alternative Grassed Waterway Design Procedure" may be used to design grassed waterways with small drainage areas. Exhibit OH 7-2 is located in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7.

Velocity. Design velocities shall not exceed those obtained by using the procedures, "n" values and recommendations in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7 or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-lined Open Channels.

Design velocities greater than 5 feet per second or less than 2 feet per second should not be used unless special precautions are taken to prevent excessive erosion or sedimentation.

Width. The bottom width of trapezoidal waterways shall not exceed 50 feet, unless multiple or divided waterways or other means are provided to control meandering of low flows.

Side Slopes. Side slopes shall not be steeper than a ratio of two horizontal to one vertical. They shall be designed to accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway.

Depth. The minimum depth of a waterway that receives water from tributary channels shall be that required to keep the design water surface elevation at, or below the design water surface elevation in the tributary channel, at their junction when both are flowing at design depth.

Drainage. Designs for sites having prolonged flows, a high water table, or seepage problems shall include Subsurface Drains (NRCS Practice Code 606), Underground Outlets (NRCS Practice Code 620), Stone Center Waterways or other suitable measures to avoid saturated conditions.

Offset subsurface drains at least ¼ of the designed top width from the centerline of the waterway. The drain's flowline should be at least 1 foot below the centerline grade and maintain at least 2 feet of cover. Subsurface drains should be installed on both sides of the waterway if a high water table or other site conditions will create wetness on both sides.

Where French drains are used, limit the width of the rock to the center 2/3 of the waterway and extend downstream as far as necessary to collect the required flow. Collector pipes at the base of the French drain shall be of adequate length and have openings necessary to handle the required flow. Orifice plates or other acceptable means should be used to prevent pressure flow in the outlet drain as necessary.

Outlets. All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earthen ditch, a grade-stabilization structure, filter strip, or other suitable outlet.

Vegetative Establishment. Grassed waterways shall be vegetated according to the appropriate Conservation Practice Standard.

Seedbed preparation is detailed in NRCS Conservation Practice Standard Critical Area Planting, Code 342. See NRCS Field Office Technical Guide (FOTG) Section IV-Appendix A for the application of lime, fertilizer, species selection and seeding rates.

Grassed waterways shall be mulched according to Conservation Practice Standard, Mulching, Code 484.

Waterways designed using OH Exhibit 7-2, "Alternative Grassed Waterway Design Procedure" should be seeded with the Turf-Type Tall Fescue and Kentucky Bluegrass mixture.

Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, rock, straw or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established.

CONSIDERATIONS

Important wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways, so they do not interfere with hydraulic functions. Mid- or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g. riparian areas, wooded tracts and wetlands.

Water-tolerant vegetation may be an alternative on some wet sites.

Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Establish filter strips on each side of the waterway to improve water quality.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

The soil loss from the watershed draining into the waterway should be evaluated when the sedimentation from upland erosion on land not controlled by the landowner/user will impair the proper functioning of the waterway.

The waterway should not be constructed until a suitable stable outlet is in place, consideration of upstream erosion control is in place or appropriate land use and/or management changes have been made to reduce the erosion to an acceptable level.

PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

In addition to the waterway, the plans and specifications must fully describe open inlets, French drains, subsurface drains, outlets and any other required appurtence.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.

Seeding shall be protected from concentrated flow and grazing until vegetation is established.

Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods.

Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be filled, compacted, and seeded immediately. Remove sediment deposits to maintain capacity of grassed waterway.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.

Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition.

Control noxious seeds.

Do not use as a field road. Avoid crossing with heavy equipment when wet.

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION

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Site Preparation

All trees, brush stumps, rubbish, and other unsuitable material shall be removed from the site. Disposal method and site(s) will be shown on the plans.

Earth Fill

After the site preparation has been completed, all depressions, ditches and low areas within the waterway section that are below the design grade will be filled. Unless otherwise specified, all fill material will be obtained from within the waterway cross section and shall be free from brush, roots, sod, frozen soil, and rocks in excess of 6 inches. Fill will be placed in approximately uniform layers of not more than 9 inches in thickness and each layer will be compacted using the treads and tracks of the construction equipment. The fill material shall have adequate moisture so that when kneaded in the hand, it will form a ball that does not readily separate.

Excavation

The waterway shall be excavated to the dimensions shown on the plans, unless otherwise specified, all excavated material will be disposed of adjacent to the waterway and spread in such a manner so as to maintain positive drainage into the waterway.

Topsoil

When specified on the plan, stockpiling will preserve topsoil from the construction area. After all excavation is completed, topsoil shall be uniformly spread over the waterway to a uniform depth as specified on the plan.

Vegetative Treatment

A seedbed shall be prepared by loosening and smoothing the soil as required to meet the design cross section. Unsuitable material that will interfere with seeding or maintenance shall be removed and disposed of. Seed, fertilizer, lime, mulch, and other requirements will be in accordance with the appropriate Conservation Practice Standards for Critical Area Planting, Code 342 and Mulching, Code 484, and the type and rates specified on the plans and specifications.