

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

OPEN CHANNEL

(Ft.)

CODE 582

DEFINITION

Constructing or improving a channel, either natural or artificial, in which water flows with a free surface.

SCOPE

This standard covers the construction of open channels or improvement of existing streams or ditches having a drainage area in excess of one square mile. It does not apply to DIVERSIONS (362), SURFACE DRAINAGE FIELD DITCH (607), GRASSED WATERWAY or OUTLET (412), IRRIGATION CANAL or LATERAL (320), or IRRIGATION DITCH (388).

Functional requirements for DRAINAGE MAIN or LATERAL (608), FLOODWATER DIVERSION (400), or FLOODWAY (404) shall be in accord with the respective standard; but when the drainage area exceeds one square mile, design criteria regarding the channel stability and maintenance access shall be in accord with this standard for Open Channel.

PURPOSE

Open channels provide discharge capacity required for flood prevention, drainage, other authorized water management purposes, or any combination of these purposes.

CONDITIONS WHERE PRACTICE APPLIES

It applies: where water quality, fish and wildlife habitat, forest and woodlands, and the landscape will be enhanced; or subsequent measures to overcome any adverse effect are made part of the work. Where an adequate outlet is available or

can be developed. Where excavation and related work will not cause significant erosion, flooding or sedimentation gradient instability.

DESIGN CRITERIA

Plan

Channel construction or modification shall be in accordance with an approved plan developed for the site. Technical Release No. 25 shall be used for guidance in surveys, planning and site investigations. Those portions of TR 25 relating to detailed design procedures and design criteria shall be followed, using the procedure best adapted to site conditions.

In the location and design of channels careful consideration shall be given to the preservation of valuable fish and wildlife habitat and trees of significant value for wildlife food or shelter or for aesthetic purposes.

Where channel construction will adversely affect a significant fish or wildlife habitat, mitigation measures, acceptable to sponsors and concerned federal and state agencies, shall be included in the project.

Location

The alignment of established channels shall not be changed to the extent that the stability of the channel or laterals thereto is endangered.

Channel Capacity

The required capacity may be established by consideration of volume-duration removal rates, peak flow or a combination of the two as determined by the topography, purpose of the channel, desired level of protection, and economic

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feasibility. The water surface profile or hydraulic grade line for design flow shall be determined in accord with guidelines for hydraulic design in Technical Release 25. The "n" value for aged channels, assuming good maintenance, shall be used in this computation.

Hydraulic Requirements

Manning's formula shall be used to determine the velocities in the channels. The "n" values for use in this formula when designing channels to be constructed or improved shall be estimated using procedures referenced in Chapter 6 of Technical Release 25.

Channel Cross Section

The required channel cross section and grade are determined by the plan objectives, the design capacity, the materials in which the channel is to be constructed, and the requirements for operation and maintenance. A minimum depth may be required to provide adequate outlets for subsurface drains, tributary ditches, or streams. The design of the channel section should also take into consideration the value of the land through which it is to pass.

Channel Stability

The design will satisfy the following conditions:

1. It will neither aggrade nor degrade beyond tolerable limits.
2. do The channel banks will not erode to the extent that the channel cross section is changed appreciably.
3. Excessive sediment bars will not develop.
4. Excessive erosion will not occur around culverts and bridges or elsewhere.
5. Gullies will not form or enlarge due to the entry of uncontrolled surface flow to the channel.

The design shall result in a stable channel which can be maintained at reasonable cost.

Technical Release No. 25 shall be used in determining the stability of proposed channel design.

Dikes, which will restrict the overland inflow to either mechanical or natural inlets, should be considered in the design. Inlets should be designed so that they will not discharge silt into the channel and cause excessive maintenance.

Channels must be stable under conditions existing immediately after construction (as-built condition) and under conditions existing during effective design life (aged condition). Channel stability shall be determined for discharges under these conditions as follows:

1. As-built condition - Bankful flow, design discharge, or 10-year-frequency flow, whichever is smallest, but not less than 50 percent of design discharge.
2. Aged condition - Bankful flow or design discharge, whichever is larger, except that it is not necessary to check stability for discharges greater than the 100-year frequency.

Stability checks are not required if the velocity is 2 ft/s or less.

Baneful flow is the flow in a channel that creates a water surface at or near the normal ground elevation, or the tops of dikes or continuous spoil banks that confine the flow for a significant length of a channel reach.

Appurtenant Structures

The design of channels will include all structures required for the proper functioning of the channel and the laterals thereto and travelways for operation and maintenance. Inlets and structures needed for entry of surface and subsurface flow into channels without significant erosion or degradation shall be included in the design of channel improvements. The design also is to provide for necessary flood gates, water level control devices, bays used in connection with pumping plants and other appurtenances affecting the functioning of channels and the attainment of the purposes for which they are built. If the improved channel bottom elevation is below the elevation of the bottom of a lateral channel at their junction to the extent that a recessed inlet is not feasible, the lateral channel must be stabilized by a sound durable structure.

The effect of channel improvements on existing culverts, bridges, buried cables, pipelines, irrigation flumes and inlet structures shall be elevated.

Culverts and bridges which are modified or added as part of channel improvement projects shall meet standards for the type of structure, and shall have a minimum capacity equal to the design discharge or state agency design requirements, whichever is greater. When the design discharge is based on storms which occur frequently, i.e., storms of one- or two-year frequency, it may be desirable to increase the capacity of culverts and bridges above the design discharge. Design of culverts should be according to NEH 4, Chapter 14.

Disposition of Spoil

Spoil material resulting from clearing, grubbing and channel excavation shall be disposed of in a manner which will:

1. Minimize overbank wash.
2. Provide for the free flow of water between the channel and flood plain unless the valley routing and water surface profile are based on continuous dikes being installed.
3. Not hinder the development of travelways for maintenance.
4. Leave the right of way in the best condition feasible, consistent with the project purposes, for productive use by the owner.
5. Improve the aesthetic appearance of the site to the extent feasible.

Vegetation of Channel

Vegetation will be established on all channel slopes, berms, spoil and other disturbed areas except where the slopes are permanently covered with water or where bank material, land use, and climatic conditions are such that vegetation is impractical.

1. Annual species may be used for temporary seeding if necessary to provide a quick ground cover. Permanent vegetation is to include plants adapted to the area and should be seeded as soon as possible after

excavation. Technical guidance is provided in CRITICAL AREA PLANTING (342).

2. An anchored mulch or soil stabilizers are to be used if needed to achieve an adequate vegetative cover.

OPERATION AND MAINTENANCE

Operation and Maintenance Plan

An operation and maintenance plan must be developed for each channel system. Minimum requirements for operation, maintenance and replacement are to be established consistent with the design objectives.

Travelways for Maintenance

Travelways for maintenance shall be provided as a part of all channel improvement. A travelway shall be provided on each side of large channels if necessary for use of maintenance equipment. Travelways must be adequate for movement and operation of equipment required for maintenance of the channel. The travelway may be located adjacent to the channel on a berm or on the spread spoil. In some situations, the channel itself may be used as the travelway.

PLANS AND SPECIFICATIONS

Plans and specifications for construction of Open Channels shall be in keeping with this standard and shall describe the requirements for proper installation of the practice to achieve its intended purpose. Applicable Nebraska Construction and Materials specifications will be used.