

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
SOUTH DAKOTA SUPPLEMENTS ITALICIZED**

IRRIGATION FIELD DITCH

(ft.)

CODE 388

DEFINITION

A permanent irrigation ditch constructed to convey water from the source of supply to a field or fields in a farm distribution system.

PURPOSE

To prevent erosion or loss of water quality or damage to the land, to make possible proper irrigation water use, and to efficiently convey water to minimize conveyance losses.

This standard applies to open channels and elevated ditches of 25 ft.³/s or less capacity formed in and with earth materials. It does not include canals and laterals or ditches constructed and removed during a season and ditches shaped or constructed for lining installations, irrigation canals, or laterals that deliver water to a farm.

CONDITIONS WHERE PRACTICE APPLIES

Field ditches shall serve an integral part of an irrigation water distribution system designed to facilitate the conservation use of soil and water resources.

Water supplies and irrigation deliveries for the area served shall be sufficient to make irrigation practical for the crops to be grown and the irrigation water application methods to be used.

Field ditches shall be constructed in earth material that contains enough fines to prevent excessive

seepage losses and where shrinkage cracks will not endanger the ditch. The sealing effect of sediment carried in the irrigation water may be considered.

CRITERIA

Capacity requirements. Field ditches shall have the capacity to deliver to the field a flow adequate to meet:

1. The design peak consumptive use of the crops to be grown in the field, with proper provisions for the expected field irrigation efficiency.
2. The largest irrigation stream required for the irrigation methods planned for the field.

The capacity shall be increased to provide for the additional flow required to compensate for the ditch seepage loss and to safely carry surface runoff from adjacent lands that must be transported to wasteways or overflow points. For capacity design, the value of "n" shall be selected according to the material in which the ditch is constructed, the alignment and hydraulic radius, and additional retardance because of weeds or moss.

Velocities. Field ditches shall be designed to develop velocities that are nonerosive for the soil materials through which they pass. Local information on the velocity limit for specific soils shall be used if available. If such information is not available, the maximum design velocity shall not exceed those shown in *Table A*.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

TABLE A

<i>Velocity after aging of canals carrying</i>			
<i>Original material excavated for canal</i>	<i>Clear water, no detritus</i>	<i>Water transporting colloidal silts</i>	<i>Water transporting colloidal silt, sands, gravel or rock fragment</i>
<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
	<i>Ft./Sec.</i>	<i>Ft./Sec.</i>	<i>Ft./Sec.</i>
<i>Fine sand (noncolloidal)</i>	<i>1.50</i>	<i>2.50</i>	<i>1.50</i>
<i>Sandy loam (noncolloidal)</i>	<i>1.75</i>	<i>2.50</i>	<i>2.00</i>
<i>Silt loam (noncolloidal)</i>	<i>2.00</i>	<i>3.00</i>	<i>2.00</i>
<i>Alluvial silts when noncolloidal</i>	<i>2.00</i>	<i>3.50</i>	<i>2.00</i>
<i>Ordinary firm loam</i>	<i>2.50</i>	<i>3.50</i>	<i>2.25</i>
<i>Fine gravel</i>	<i>2.50</i>	<i>5.00</i>	<i>3.75</i>
<i>Stiff clay (very colloidal)</i>	<i>3.75</i>	<i>5.00</i>	<i>3.00</i>
<i>Graded, loam to cobbles, when noncolloidal</i>	<i>3.75</i>	<i>5.00</i>	<i>5.00</i>
<i>Alluvial silts when colloidal</i>	<i>3.75</i>	<i>5.00</i>	<i>3.00</i>
<i>Graded, silt to cobbles, when colloidal</i>	<i>4.00</i>	<i>5.50</i>	<i>5.00</i>
<i>Coarse gravel (noncolloidal)</i>	<i>4.00</i>	<i>6.00</i>	<i>6.50</i>
<i>Cobbles and shingles</i>	<i>5.00</i>	<i>5.50</i>	<i>6.50</i>
<i>Shales and hardpans</i>	<i>6.00</i>	<i>6.00</i>	<i>5.00</i>

Field ditches shall be designed with enough capacity to carry the required flows at the velocities that will be developed under the maximum probable retardance conditions.

For checking designs to see that velocities do not exceed permissible values, a Manning’s “n” no greater than 0.025 shall be used, and applicable criteria in the *Natural Resources Conservation Service (NRCS) standard for Open Channels (582)* shall be followed.

Cross section. Freeboard in field ditches shall be not less than one-third of the maximum design depth of water. Side slopes shall be stable. The top width of banks as measured at the elevation providing the required freeboard shall be not less than 12 in. and shall equal or exceed the flow depth.

If a field ditch is to be constructed on an embankment, the side slopes of the embankment shall not be steeper than:

Height to water surface on centerline of fill	Steepest allowable side slope of fill
Less than 3 ft	1-1/2:1
3-6 ft	2:1
More than 6 ft	2-1/2:1

Water surface elevations. All field ditches shall be designed so that the water surface elevations at field takeout points are high enough to provide the

required flow onto the field surface. If ditch checks or other control structures are to be used to provide the necessary head, the backwater effect must be considered in computing freeboard requirements. The required elevation of the water surface above the field surface will vary with the type of takeout structure or device used and the amount of water to be delivered through each. A minimum head of four inches shall be provided.

Related structures. Erosion- or water-control structures, culverts, diversions, or other related structures needed to supplement the field ditch shall be designed and installed to meet NRCS standards for the particular structure and type of construction.

Vegetative Cover and Riprap. *All areas where vegetation has been disturbed during construction (e.g., waste borrow and/or equipment-parking areas) and all other earth construction (e.g., cut slopes, earth embankments) shall be seeded following completion of construction. Seeded areas shall be fenced where necessary to provide protection for the vegetation and for controlled grazing.*

The seedbed preparation, seeding, fertilizing, mulching, and fencing shall comply with South Dakota Technical Guide, Section IV-A, Critical Area Planting (342).

CONSIDERATIONS

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, and deep percolation.
2. Potential for a change in plant growth and transpiration because of changes in the volume or level of soil water.
3. Effects on downstream flows or aquifers that would affect other water uses or users.
4. Effect on the water table of the field in providing suitable rooting depth for anticipated land uses.

Water Quality

1. Effects on erosion and the movement of sediment, and the soluble and sediment attached substances carried by runoff.
2. Effects on the movement of dissolved substances to ground water.
3. Short-term and construction-related effects on the quality of downstream water courses.
4. Potential for uncovering or redistributing toxic material.
5. Effects on wetlands or water-related wildlife habitats.
6. Effects on the visual quality of water resources.
7. Effects of water level control on salinity of soils, soil water or downstream water.

Laws and Regulations

This practice must conform to all federal, state, and local laws and regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources and endangered species.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing irrigation field ditches shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purposes.

The following items must be included in the specifications for this practice:

Foundation preparation. The foundation area for all ditch embankments and ditch pads shall be cleared of all trees, weeds, sods, loose rock, or other material not suitable for the subgrade.

Placement of earthfill. Earthfill embankments shall be constructed to the neat lines and grades shown on the plans and established at the field location. Embankment materials shall be free of brush, roots, sod, large rocks, or other material not suitable for making compacted fills. The moisture content and methods of placing and compacting fill material shall be of such that a firm, stable embankment results. The fill material shall be placed in horizontal lifts of such thickness that proper compaction and prescribed densities are obtained.

Excavation. Excavation shall be to the neat lines and grades shown on the plans and established at the field location. Excavated materials shall be used in designated fill locations or spoil areas.

Over excavation in the channel area or overfill on the ditch banks shall be permissible if it does not interfere with the function of the ditch or the related structures and if the finished section generally is smooth.

Construction operations. Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The completed job shall be workmanlike and present a good appearance.

OPERATION AND MAINTENANCE

A plan of operation and maintenance shall be prepared for use by the owner or others responsible for the system to insure that each component functions properly.