NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

IRRIGATION FIELD DITCH

(Ft.)

CODE 388

DEFINITION

A permanent irrigation ditch constructed in or with earth materials, to convey water from the source of supply to a field or fields in an irrigation system.

PURPOSE

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

- Improve distribution uniformity of water applied on irrigated land.
- Improve irrigation efficiency of water applied on irrigated land.

CONDITIONS WHERE PRACTICE APPLIES

This standard is limited to open channels and elevated ditches of 25 cubic feet per second or less in capacity and constructed of earth materials.

This standard applies where field ditches are needed as an integral part of an irrigation water distribution system designed to facilitate the conservation use of soil and water resources.

CRITERIA APPLICABLE TO ALL PURPOSES

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 sufficient fines to prevent excessive seepage losses and where shrinkage cracks will not endanger the ditch, or cause down gradient water quality problems. The sealing effect of sediment carried in the irrigation water may be considered.

Capacity requirements. Field ditches shall have adequate capacity to deliver:

1. The design peak consumptive use of the crop(s) to be grown in the field, with proper provisions for the expected field irrigation efficiency.
2. The largest irrigation stream required for the irrigation method(s) planned for the field.

The design capacity shall include additional flow required to compensate for losses due to ditch seepage losses and to safely carry surface runoff from adjacent lands that must be transported to waterways or overflow points.

For capacity design, the value of Manning's roughness coefficient "n" shall be selected according to the materials in which the ditch is constructed, the alignment, the hydraulic radius, and the additional retardance due to vegetation.

Velocities. Field ditches shall be designed for flows that are non-erosive for the soil materials in which they are constructed. 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 NRCS National Engineering Handbook, Part 654, Figure 8-4, or other equivalent method, unless protective measures are implemented.

A maximum Manning's roughness coefficient "n" of no greater than 0.025 shall be used. Field ditches shall meet the applicable design criteria in NRCS Conservation Practice Standard, Open Channel (582).

Cross section. Freeboard in field ditches shall be one-third of the maximum design depth of water, or 6 inches, whichever is less. Side slopes shall be stable against slope failure. The top width of banks, as measured at the elevation providing the required freeboard, shall be not less than 12 inches and shall equal or exceed one-half the flow depth.

If a field ditch is to be constructed on a fill section, side slopes of the fill shall not be steeper than the values shown in Table 1.

Table 1

Height of fill to water surface on centerline of fill (feet)	Steepest allowable side-slope of fill (horizontal to vertical)
< 3	1½ :1
3 – 6	2 :1
> 6	2½ :1

Water surface elevations. All field ditches shall be designed such that 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 water surface elevations above the field surfaces 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 4 inches shall be provided.

Related structures. Erosion control or water control structures, culverts, diversions, or other related structures needed to supplement the field ditch shall be designed and constructed to meet the applicable NRCS Conservation Practice Standards for the particular structure and type of construction.

CONSIDERATIONS

When planning this practice, the following items should be considered, where applicable:

- Potential impacts on downstream flows or aquifers, which would affect other water uses, other water users, or aquatic life.
- Potential water quality impacts for soluble pollutants and attached sediment pollutants.
- Potential for uncovering or redistributing toxic material.
- Impacts on cultural resources.
- Effects on wetlands or water-related wildlife habitats.
- Scheduling regular maintenance (mowing or other disturbance of vegetative cover on side slopes or in ditches) outside of the primary nesting season for grass-nesting species.
- Effects of water level control on the salinity of soils, groundwater, or downstream waters.
- Excavation safety during design and construction.
- Existence or non-existence of underground utilities prior to construction.
- Reduction of energy use and potential improvements to energy use efficiency.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing irrigation field ditches shall describe the requirements for applying the practice to achieve its intended purposes.

Plans and specifications shall include cross-section details, embankment requirements, channel grades, and appurtenant structural details. The location of the field ditch will be shown on the plan map.

If applicable, information will be provided on recommended species of vegetative cover, establishment, and maintenance.

OPERATION AND MAINTENANCE

An Operation and Maintenance plan shall be prepared for use by the landowner or operator. The plan shall provide specific instructions for operating and maintaining the field ditch to insure proper function as designed.

The plan shall include the following provisions:

1. Perform prompt repair or replacement of damaged components.
2. Remove debris or foreign material from field ditches and other components, which could obstruct or hinder system operation.
3. Maintain recommended vegetative cover on side slopes and in watercourses.

REFERENCES

USDA-NRCS, National Engineering Handbook, Part 654, Stream Restoration Design, Chapter 8, Threshold Channel Design.

Natural Resources Conservation Service
Construction Specification

IRRIGATION FIELD DITCH

1. SCOPE

This specification covers the minimum requirements for foundation preparation, excavation, and backfill.

2. 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.

3. 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.

4. 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.

Overexcavation 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.

5. 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.