

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**IRRIGATION SYSTEM, SURFACE AND SUBSURFACE**

(No and Ac)

CODE 443

**DEFINITION**

A planned irrigation system in which all necessary water-control structures have been installed for the efficient distribution of irrigation water by surface means, such as furrows, borders, contour levees, or contour ditches, or by subsurface means.

**SCOPE**

This standard covers the planning and design of the overall irrigation water distribution and waste water disposal system for a farm or farming unit. It does not include detailed design criteria and construction specifications for individual structures or components of the system, or for the methods of irrigation water application to be used.

**PURPOSE**

To efficiently convey and distribute irrigation water to the point of application without excessive erosion, water losses, or reduction in water quality.

**CONDITIONS WHERE PRACTICE APPLIES**

Irrigation systems shall be planned and installed to serve only lands that are suitable for use as irrigated land. Water supplies must be sufficient in quantity and quality to make irrigation practical for the crops to be grown and also must be adequate for the water application methods to be used.

Each irrigation system shall be designed as an integral part of an overall plan of conservation land use and treatment for the farm that is based

on the capabilities of the land and the needs of the farm enterprise.

**DESIGN CRITERIA**

**Land Treatment Units**

All conservation farm irrigation systems shall be designed to meet the particular needs of the various land treatment units to be served in accordance with the Nebraska Irrigation Guide.

**Conservation Irrigation Methods**

All farm irrigation system designs shall be based on the use of conservation water application methods that are adapted for the site conditions (combination of soil and slope) and the crops to be grown. Adapted methods are those methods that will provide for efficient use of water within acceptable erosion limits.

**Capacity of System**

The capacity of the system and its component parts shall be adequate to meet the design use requirements of the crops to be grown and the required rate of water delivery for the irrigation methods to be used.

Where various irrigation methods will be used on the same field, the system capacity must be adequate for the method requiring the highest rate of water delivery. Likewise, where crops with different peak use requirements are to be grown, the system capacity must be based on the crop having the highest use rate.

All ditches and other structures shall be of sufficient size to permit the delivery of required quantities of water without over-topping. All structures shall be designed for the maximum

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flow conditions to be expected, and shall provide for a freeboard consistent with their size and construction and in accordance with appropriate Service standards.

### **Water Surface Elevations**

All systems for irrigation by surface methods shall be designed so the water surface elevation at field takeout points is sufficient to provide the required flow onto the field surface. A head of at least 4 inches shall be provided.

### **Location of Head Ditches or Pipelines**

Head ditches, or pipelines used for surface irrigation shall be located so that irrigation water can be applied uniformly over the entire field without erosion. Ditch or pipeline spacing shall be such that irrigation runs will not be longer than the maximums specified in the National Irrigation Guide or that determined by adequate field evaluations. Where more than one kind of crop is to be grown or more than one method of irrigation is to be used, the ditch or pipeline spacing should not exceed the allowable length of run as determined for the limiting crop or method.

Feeder ditches or conduits for subsurface irrigation shall be spaced so that the variation in depth from the land surface to the water table will not be greater than is permissible for adequate irrigation of the limiting crop to be grown.

### **Erosion Control**

The design of farm irrigation systems must provide for the conveyance and distribution of irrigation water without causing damaging or increasing soil erosion. All unlined ditches shall be located on nonerosive gradients. Where water must be conveyed down slopes that are steep enough to cause erosive velocities, the irrigation system design shall provide for the installation of erosion control structures such as drops, chutes, buried pipe lines, or erosion resistant ditch linings.

### **Water Control**

Farm irrigation systems shall include such structures as measuring devices, division boxes,

checks, turnouts, pipelines, lined ditches, valves, and gates as needed to control and regulate the water for efficient application.

### **Seepage Control**

Seepage from irrigation system ditches can damage land and waste water resources. Therefore, except where seepage is specifically desired for subsurface irrigation, designs shall provide for minimizing these losses.

For surface irrigation systems, ditches preferably should be located so they do not cross areas of highly permeable soils. Where site conditions require the conveyance of water across gravelly, sandy, or other excessively permeable areas, the irrigation system design shall provide for the use of pipe lines, flumes, or lined ditches as needed to prevent excessive losses of water seepage into the soil.

### **Waste Water Disposal**

Irrigation system designs shall include facilities of adequate capacity for the safe removal of excess irrigation and storm water from the field surface. Pickup or waste water ditches constructed for this purpose must be on nonerosive gradients or must be stabilized by lining or structural measures where erosion hazards exist. Where field elevations do not permit the disposal of waste water by gravity flow, the design shall provide for the installation of pumping units and other needed appurtenant structures.

Waste water ditches must be protected against bank erosion by the use of structures for the entry of waste water, or by the establishment of a vegetative cover on gently-sloping banks.

Where excess water will be reused as irrigation water, the irrigation system design shall provide for pickup ditches so that water does not flow directly from furrows or borders into irrigation head ditches. Storage facilities may be needed as a regulating device in the wastewater system.

## **PLANS AND SPECIFICATIONS**

Plans and specifications for Surface and Subsurface Irrigation Systems shall be in keeping with the preceding standard.

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Component parts of the system will be designed in accordance with applicable standards and specifications.

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

Plans, specification and maintenance for Flow Meters and Surge Valves (component parts) can be found in Engineering Field Manual Appendix 1 and 2.