Natural Resources Conservation Service
Conservation Practice Standard

IRRIGATION LAND LEVELING
(Ac.)
CODE 464

DEFINITION

Reshaping the surface of land to be irrigated to planned grades.

PURPOSE

To permit uniform and efficient application of irrigation water without causing erosion, loss of water quality, or damage to land by waterlogging and at the same time to provide for adequate surface drainage.

CONDITIONS WHERE PRACTICE APPLIES

All land to be leveled shall be suitable for irrigation and for the proposed methods of water application.

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

Soils shall be deep enough so that after leveling work is done an adequate, usable root zone remains that will permit satisfactory crop production with proper conservation measures. Limited areas of shallower soils may be leveled to provide adequate irrigation grades or a better field arrangement. The finished leveling work must not result in exposed areas of highly permeable materials that can inhibit proper distribution of water over the field.

All leveling work shall be planned as an integral part of an overall farm irrigation system to facilitate the conservation use of soil and water resources. The boundaries, elevations, and direction of irrigation of individual field leveling jobs shall be of such that the requirements of all adjacent areas in the farm unit can be met.

CRITERIA

General

If more than one method of water application or more than one kind of crop is planned, the land must be leveled to meet the requirements of the most restrictive method and crop.

All leveling work must be designed within the slope limits required for the methods of water application to be used, to provide for the removal of excess surface water, and to control erosion caused by rainfall. Reverse grades in the direction of irrigation shall not be permitted.

Survey techniques, design methods, earthwork computations, and construction methods shall be in keeping with the National Engineering Handbook, Section 15, chapter 12. Earthwork computations shall be based on the four-point method as discussed in Chapter 12, page 12-29 through 12-32, Section 15 of the National Engineering Handbook.

Design

Slope to control erosion caused by rainfall. Design field grades shall be such that erosion caused by rainfall can be controlled within the limits permissible for conservation farming.

Slope for level irrigation methods. The maximum fall in the length of run shall not exceed one-half the design depth of application for a normal irrigation.

The difference in elevation across an individual border strip shall not exceed 0.10-ft (0.03 m).

Slope for graded irrigation methods. The maximum slope in the direction of irrigation is 0.3 percent. The minimum slope in the direction of irrigation shall be 0.05 percent. Short, level sections are permissible at the upper or lower ends of irrigation runs to facilitate water control or to reduce runoff.

The allowable cross slope for furrows depends on the stability of the soil, the size of furrows that are to be used, and the rainfall pattern in the area. Cross slopes must be such that "breakthroughs" from both irrigation water and runoff from rainfall are held to a minimum. The maximum cross slope shall not exceed the irrigation slope.

Slope for subsurface irrigation methods. In areas where irrigation is practiced through ground-water level control, it may be desirable to grade the surface to a level plane.

Surface drainage. Farm irrigation systems shall include plans for removing or otherwise providing for control of excess irrigation and storm water. Leveling designs must provide field elevations and field grades that will permit proper functioning of the planned drainage facilities.

Borrow computations. Excavation and fill material required for or obtained from such structures as ditches, ditch pads, and roadways shall be considered part of the overall leveling design, and the appropriate yardage shall be included when balancing cuts and fills and determining borrow requirements.

CONSIDERATIONS

Water quantity

- Effects on the water budget, especially on volumes and rates of runoff, infiltration evaporation, transpiration, and deep percolation.
- Potential for a change in plant growth and transpiration because of changes in the volume of soil water.
- Potential to manage irrigation water through root zone management.

Water quality

- Effects on erosion and the movement of sediment and soluble and sediment-attached substances carried by runoff.
- Effects of nutrients and pesticides on surface and ground water quality.
- Effects on the movement of dissolved substances below the root zone or to ground water.
- Effects of water level control on the salinity of soils, soil water or downstream water.
- Short-term and construction-related effects on the quality of downstream water courses.
- Potential of uncovering or redistributing such toxic material as saline soil.
- Effects on the visual quality of downstream water.

PLANS AND SPECIFICATIONS

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

OPERATION AND MAINTENANCE

An operation and maintenance plan and program will be established. Timely maintenance is essential for continued adequate performance of a water conveyance system. Maintenance operations must be planned with the landuser when the system is designed. Inspections should be made following heavy rains and at least once each year. Tillage operations should be planned to retain the shape of field surfaces as was initially constructed.

REFERENCE

Engineering Manual for Conservation Practices

National Engineering Handbook, Section 15 – Irrigation

Natural Resources Conservation Service
Construction Specification

IRRIGATION LAND LEVELING

1. SCOPE

This specification covers the minimum requirements for site preparation, grading and materials for irrigation land leveling.

2. MATERIALS AND INSTALLATION

Site preparation. The land to be leveled shall be free of brush, crop residue, trash, and vegetative material that can materially reduce the effectiveness of leveling operations. The land should be smoothed or floated to firm the soil to permit an accurate design survey.

Leveling operations. The land shall be leveled to the designed grade or grades. Fills of more than 6 in. (152 mm) shall be constructed by placing the soil in successive layers. Leveling operations shall not be performed when soil moisture conditions will result in excessive damage to soil structure.

After cuts and fills are completed, the land shall be plowed or disked and the surface smoothed with land levelers, graders, or similar earthmoving equipment to remove minor irregularities.

Finished grade. All leveling work shall be finished according to the design specifications given in the plan. Permissible variation of the finished grade from the planned grade or a plane paralleling the planned plane shall be 0.1 foot, plus or minus, provided such variations will not affect water distribution or cause drainage problems.

Materials. Soil for the leveling operations shall be obtained from designated cut areas in the field or other designated areas as specified in the plan.