

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

IRRIGATION LAND LEVELING

(acre)
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 water-logging 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

Field grades. 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.

Slope to control erosion caused by rainfall. Design field grades shall be of such that erosion caused by rainfall can be controlled to permissible soil loss limits.

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 feet.

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

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Slope for graded irrigation methods. The steepest slope in the direction of irrigation shall be as follows:

1. Furrows - 0.5 percent. Furrow grade shall range from 0.1 to 0.5 percent except that on flatland areas such as the claypan prairie area, grades up to 1.0 percent will be permitted providing lengths of run are shortened and good management is practiced in order to minimize erosion to permissible soil loss limits. The preferable range of furrow grade is 0.15 to 0.3 percent.
2. Corrugations - 8 percent.
3. Borders for non-sodforming crops, such as alfalfa or grain--0.5 percent
4. Borders for erosion-resistant grass or grass-legume crops or for nonsod-forming crops on sites where water application by the border method will not be required until after good crop stands have been established--2 percent.

Slopes may be uniform in the direction of irrigation or may increase or decrease. On slopes of more than 0.5 percent where leveling designs provide for increasing or decreasing slopes, the maximum grade in an irrigation run shall be no more than twice the minimum. Short, level sections are permissible at the upper or lower ends of irrigation runs to facilitate water control or to reduce runoff.

The maximum cross-slope for borders shall be 0.1 foot per border strip width. The allowable cross-slope for furrows and corrugations 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 of such that "breakthroughs" from both irrigation water and runoff from rainfall are held to a minimum.

Furrow cross slope shall be within the limits specified below:

Furrow Grade In Percent	Maximum Cross Slope In Percent
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0.1	0.3
0.2	0.3
0.3	0.3
0.4	0.4
0.5	0.5

Exceptions to the above are that cross slopes of 0.5 to 3.0 percent are permissible on a field having very uniform slopes providing (1) that the field is properly terraced, (2) that land leveling is performed between the terraces so that each furrow will drain toward the terrace outlet, and (3) that each furrow is short enough and has sufficient cross section so that it has the capacity to carry the flow of irrigation water as well as runoff from a normal rainfall without a "breakthrough."

Rice Irrigation. The field shall be smoothed to the extent that after the contour levees are built, water will not be ponded more than 0.2 foot in depth and the high area will not be more than 0.2 foot above the adjacent land surface within the contour levee area. Ponded areas (lows) within a given contour levee area should not exceed 5 percent of that area so that reasonable uniform distribution of irrigation water and suitable drainage can be obtained. High areas within a given contour levee area shall not exceed 10 percent of that area so that decreased yields will be kept to a minimum due to drying out of these high areas.

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 plane having no slope.

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.

Surface drainage ditches, a series of structures, or other means of controlling the surface runoff without causing an erosion problem shall be used to provide proper drainage at the lower end of the field. An adequate outlet will be provided downstream from these installations so that backwater will not be a hazard to the field that has been leveled.

Maximum field elevation. All leveling work shall be designed so that the highest point in the field is far enough below the elevation of the water source to permit delivery of needed irrigating streams onto the field surface. The field elevation shall be at least 4 inches below the water surface elevation at the point of delivery.

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.

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 purpose.

OPERATION AND MAINTENANCE

Graded fields shall be re-planned as necessary. "Breakthroughs" shall be repaired as they occur. End rows shall be checked for erosion on a periodic basis.

NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI CONSTRUCTION SPECIFICATION

FOR
IRRIGATION LAND LEVELING
(464)

Site preparation

The land to be leveled shall be cleared of brush, crop residue, trash, and vegetative material that can materially reduce the effectiveness of leveling operations.

could cause excessive damage to the soil structure, resulting in poor crop growth or detrimental settlement.

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits.

Borrow location

Soil shall be obtained from the designated cut areas in the field or from other designated borrow areas as specified in the plan.

After cuts and fills are completed, the land shall be smoothed to remove minor irregularities.

Leveling operations

The land shall be leveled to the grades shown on the cut sheets or survey stakes. Fills of more than 6 inches shall be placed by spreading the soil in successive layers. Land leveling operations shall not be performed when the ground is frozen or if soil moisture conditions are such that they

Deep chiseling is recommended on areas where the soil has been compacted by the equipment.

Finished grades

All land leveling work shall be finished according to the design. No reverse grades shall be permitted. The completed job shall be workmanlike and present a good appearance.

Additional details: _____

