

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**IRRIGATION LAND LEVELING**

(Ac.)  
Code 464

**DEFINITION**

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

**PURPOSE**

To facilitate the efficient use of water on irrigated land.

**CONDITIONS WHERE PRACTICE APPLIES**

This standard applies to leveling of land irrigated by surface or subsurface irrigation systems. The leveling is based on a detailed engineering survey, design, and layout. This standard does not apply to Precision Land Forming (462) or Land Smoothing (466).

**CRITERIA**

Land to be leveled shall be suitable for irrigation and for the proposed methods of water application. Soils shall be deep enough so that after leveling, an adequate 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 an improved field alignment. The finished leveling work must not result in exposed areas of highly permeable materials that would 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 enhance the conservation of soil and water resources. The boundaries, elevations, and direction of irrigation of individual field leveling jobs shall be such that the requirements of all adjacent areas in the farm unit can be met.

**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

removal of excess surface water, and to control erosion caused by rainfall. Reverse grades in the direction of irrigation shall not be permitted.

**Slope for level irrigation methods.** The maximum fall in the direction of irrigation 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 0.1-feet.

**Slope for graded irrigation methods.** The design slope for graded irrigation methods should be equal to or less than the maximum recommended irrigation grade for the particular soil as shown in the "Soils Interpretations for Irrigation" section of the New Mexico Irrigation Guide.

At no time shall the maximum slope exceed the following:

In the direction of irrigation if rainfall erosion is not a significant problem-

- Borders for non-sod-forming crops, such as alfalfa or grain - 2 percent,
- Borders for erosion-resistant grass or grass-legume crops or for non-sod-forming crops on sites where water application by the border method will not be required until after good crop stands have been established - 4 percent.
- Furrows - 3 percent,
- Corrugations - 8 percent.

Where potential for rainfall erosion is great-

- Furrows - 0.5 percent,
- Borders with sod-forming grasses – 2 percent,
- Other crops - 0.5 percent.

On slopes in the direction of irrigation of more than 0.5 percent, where leveling designs provide for increasing or decreasing slopes the following limits shall apply:

- The maximum permissible slope in an irrigation run shall be no more than twice the minimum slope designed for the field.
- The change in slope in any 100-foot reach shall not exceed one-half the maximum permissible change along the length of run. However, short level sections are permissible at the upper or lower ends of irrigation runs to facilitate water control or to reduce runoff. (The maximum permissible slope change is the difference between the flattest and steepest design slope along the length of run.)

**Cross slope.** The maximum cross slope for borders shall be 0.1-foot per border.

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 such that "breakthroughs" from both irrigation water and runoff from rainfall are held to a minimum. However, at no time shall the cross slope exceed 80 percent of the slope in direction of irrigation at the point where the cross slope is being evaluated.

**Slope for subsurface irrigation methods.** In areas where irrigation is practiced through ground water level control, the field surface shall be shaped to parallel the expected subsurface water elevations. The design shall consider the desired depth from the soil surface to the elevation ground water.

**Surface drainage.** Farm irrigation systems shall include plans for removing or otherwise controlling excess irrigation and storm water. Leveling designs must provide field elevations and field grades that will permit proper functioning of the planned drainage system facilities. The minimum recommended grade for tail water ditches is 0.2 percent.

**Maximum field elevation.** All leveling work shall be designed to permit delivery of needed irrigating streams onto the highest point on the field surface. Maximum field elevation shall be at least 0.5 foot lower than the design water surface in the water delivery system at the point of delivery.

**Survey.** The survey method used for design purposes shall meet the level of accuracy needed for the project. Approved methods include but are not limited to:

- Staking out and surveying points on a 100 foot by 100 foot grid.
- Surveying multiple random shots at regular intervals and important locations such as grade breaks to develop electronic surface models.

**Earthwork quantities.** Earthwork quantity calculations used for cost-share certifications shall be computed using the grid method (also known as the four-point method) unless an alternative method is approved by the Area Engineer.

Excavation and fill materials required for or obtained from such structures as ditches, ditch pads, and roadways shall be planned as a part of the overall leveling job and the appropriate yardage included when balancing cuts and fills and determining borrow requirements. The cut/fill ratio shall not exceed 1.38:1.

## CONSIDERATIONS

Consider crops, method of irrigation, soil intake rates, field slope, irrigation stream size and resulting deep percolation, runoff, and evapotranspiration when determining or evaluating length of irrigation runs.

Consider the depths of cuts and the resulting plant rooting depths to saline soil and to shallow water tables.

In areas with sediment-laden irrigation water, consider increasing the required height of the water surface at the point of delivery.

Consider effects on water flows, aquifers and the affect on other water uses and water users.

Consider the effects on adjacent wetlands.

Consider the effects of uncovering or distributing unhealthy materials such as saline soil.

Depth of cuts shall not cause sterile soil material to be exposed over more than 5 percent of the area being leveled unless adequate reclamation measures are planned.

Increasing slopes in the direction of irrigation shall not be permitted; however, decreasing slopes in the direction of irrigation are encouraged where needed to increase irrigation uniformity.

## PLANS AND SPECIFICATIONS

Plans and specifications for irrigation land leveling shall be site specific and shall show the

requirements for installing the practice to achieve its intended purpose. Site specifics typically include field boundaries, planned cuts and fills, plant rooting depth, planned usable root zone depth, earthwork volumes, cut/fill ratio, direction of irrigation, design run slope and cross slope, required water surface and location of irrigation water delivery, tail water disposal, and appurtenant structures. Refer to NM-ENG-125 sheet for detailed requirements.

#### **OPERATION AND MAINTENANCE**

The maintenance on leveled fields includes the periodic removal or grading of mounds and/or depressions. Land grading, such as with a laser leveler may periodically be needed to restore the design gradient.