

Precision Land Forming (acre)

Definition

Reshaping the surface of land to planned grades.

Scope

This standard applies to all precision land-forming operations for drainage and erosion control as well as other purposes such as moisture conservation, leaching, and improving water quality. All land-forming operations under this standard will be on the basis of a detailed engineering survey and layout. It does not include land smoothing (466), or recreation land grading and shaping (566), and irrigation land leveling (464).

Purpose

To improve surface drainage, provide land-forming operations for drainage and erosion control as well as other purposes such as moisture conservation, leaching, and improving water quality. All land-forming operations under this standard will be on the basis of a detailed engineering survey and layout. It does not include land smoothing (466), or recreation land grading and shaping (566), and irrigation land leveling (464).

Conditions where practice applies

On all land that is suitable for the purpose required and where precision land forming is practical. Soils shall be of sufficient depth and of suitable textures so that after precision land forming is completed an adequate root zone remains to permit the planned use of the land and application of proper conservation measure, soil amendments, and fertilizer.

All precision land forming shall be planned as an integral part of an overall system to facilitate the conservative use of soil and water resources.

Planning considerations

Water Quantity

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration, deep percolation and evaporation.
2. Potential for changes in plant growth and transpiration resulting from the changes in the volume of soil water.

Water Quality

1. Effects on erosion and the movement of sediment and soluble and sediment-attached substances carried by runoff.
2. Effects from the use and management of nutrients and pesticides on surface and ground water quality.
3. Short-term and construction effects of installation on downstream water resources.
4. Potential for earth moving to uncover or redistribute toxic materials, such as saline soils, and make them available to water or plants.
5. Downstream temperature changes.
6. Effects on the visual quality of downstream water resources.

Design criteria

Design and installation shall be based on adequate engineering surveys and investigation. If the land is to be formed for more than one purpose, it must be formed to meet the requirements of the most restrictive purpose and crop.

All forming work must be designed within the slope limits required for the proposed use and provide for the removal of excess surface water. If other conservation practices such as grassed waterways, drainage field ditches, and filter strips are needed to accomplish the stated purpose, they shall be included in the plans for improvement.

Slope requirements. Slope may be uniform in the direction of flow or may increase or decrease.

Reverse grades in the direction of planned water flow shall not be permitted. Short level sections are permissible to meet field conditions. Cross slopes must be designed so that "breakthroughs" from rainfall runoff are held to a minimum.

Slope to control erosion caused by runoff from rainfall. Design field grades shall be such that erosion caused by runoff from rainfall can be controlled within the limits permissible for conservation farming. When benching between land-formed plots exceeds 1 ft (304 mm) a permanent grassed area or border ridge must be left between the plots to reduce the possibility of gully erosion.

Surface drainage. All precision land-forming systems shall include plans for removing or otherwise providing for control of excess water.

Designs must provide field elevation 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 precision land-forming design, and the appropriate yardage shall be included when balancing cuts and fills and determining borrow requirements.

Plans and specifications

Plans and specifications for precision land forming shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Precision Land-forming Specifications

Site Preparation

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

Borrow location

Soil for land-forming operations shall be obtained from the designated cut areas in the field or from other designated borrow areas as specified in the plan.

Land-forming Operations

The land shall be formed to the designed grade or grades. Fills of more than 6 in. (152 mm) shall be placed by spreading the soil in successive layers. Land-forming operations shall not be performed when the ground is frozen or if soil ~~moisture conditions are such that they could~~ cause excessive damage to the soil structure, resulting in poor crop growth or detrimental settlement.

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

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

Finished grades

All land-forming work shall be finished according to the design and to the tolerances specified. The completed job shall be workmanlike and present a good appearance.

NORTH CAROLINA SUPPLEMENT - 462-1

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service

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PRECISION LAND FORMING (Acre)

Design Criteria

Design and installation shall be based on adequate engineering investigations. Laser equipment may be used for making necessary surveys.

Designed grade and distance limitations shall be suitable for the particular site, conservation system, and land use. Consideration shall be given to erosion hazards when determining slope length and grade. Slopes in the direction of flow may be uniform, increase, or decrease. Uniform grades are preferable. ~~Short level sections not exceeding 200' may be~~ used but reverse grades are not permitted.

The planned row grade shall not exceed 0.5 foot per 100 feet. A range of 0.1 to 0.3 foot per 100 feet is usually recommended, depending upon the soil conditions and the crops to be grown. On easily eroded soils, row grades above 0.3 foot should not be used.

Cross grades or grades approximately perpendicular to the row grade should not exceed 0.5 foot per 100 feet. The allowable cross grade depends largely upon the type and stability of the soil, the size of furrows to be used, and the planned row lengths. Cross grades must be such that "break-throughs" from rainfall are held to a minimum.

Row lengths may vary but, where the minimum grade is planned, the following maximum lengths should be used as a guide: 660 feet for soils in Group 5 (Drainage Guide), up to 1,320 feet for better drained soils in Group 1. Where the row grade is 0.2 to 0.5 foot per 100 feet, the length of rows can be 1,320 feet for any of the soil groups.

Slope To Control Erosion Caused By Runoff From Rainfall

Where rows carry runoff directly into drainage channels over 2.0' deep, special erosion control measures, such as pipe drops, shall be considered.

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PRECISION LAND FORMING ENGINEERING NOTEKEEPING

Design Survey, Design and Layout

- A. Record the following minimum information in a field notebook or on approved forms:
 - 1. Soil investigation to determine kind of soil and depth of topsoil.
 - 2. Topographic survey. Laser equipment may be used for all surveys.
- B. Make quantity computations, if needed.
- C. Prepare cut sheet, showing planned cuts and fills and/or field layout showing design elevations, row grades and cross slope grades, if laser controlled equipment is used for installation.

Construction Check

- A. Record rod readings along selected lines showing constructed elevations and grades. (Check a minimum of 2 lines in each field.)
- B. Record recheck notes, if parts of field had to be reworked after first check.
- C. Record statement as to adequacy of outlet for surface drainage.
- D. Record, date and sign statement concerning adequacy of practice to meet plans and specifications. Note all exceptions.
- E. A signed narrative statement showing dates, survey party, control elevations used, checks made of row grade and cross slope grade, correction of deficiencies, if any, and certification statement will serve as adequate documentation when laser equipment is used in surveys.

Recording Data

Record all field notes in standard engineering field book or approved forms. Cross reference to appropriate field books all drawings and plans.