



Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

CONTOUR FARMING

CODE 330

(ac)

DEFINITION

Aligning ridges, furrows, and roughness formed by tillage, planting and other operations at a grade near the contour to alter velocity and/or direction of water flow.

PURPOSE

This practice is applied to achieve one or more of the following:

- Reduce sheet and rill erosion
- Reduce sediment transport to surface waters
- Reduce excess nutrients in surface waters
- Reduce pesticide transport to surface waters
- Improve the efficiency of moisture management

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on sloping land where crops are grown. For orchards, vineyards and nut crops use the national Field Office Technical Guide (FOTG) Standard (331) Contour Orchard and Other Fruit Areas.

CRITERIA

General Criteria Applicable to All Purposes

Use of this standard requires compliance with all applicable federal, state, and local laws and regulations.

Row grade is a measurement of the percent grade when looking down a crop row. The row grade is a measurement of how far the row itself is from perpendicular to a hillside. Zero percent row grade would be completely perpendicular to the slope of the hillside. Row grades must be aligned as closely as possible to the contour to achieve the greatest erosion reduction possible and be designed to be as near level as possible while allowing drainage. The maximum row grade must not exceed one-half of the up- and-down-hill slope percent used for conservation planning with a maximum 4-percent row grade.

When the row grade reaches the maximum allowable design grade, a new baseline must be established up or down slope from the last contour line and used for layout of the next contour pattern. Baseline is used to define the adjusted contour line when maximum row grade is exceeded.

Design the row grades with positive row drainage of not less than 0.2 percent on slopes where ponding is a concern. This includes sites with soils with slow to very slow infiltration rates (soil hydrologic groups C or D), or where crops are sensitive to ponded water.

Up to a 10 percent deviation from the design row grade is permitted within 50 feet of a stable outlet.

When the row grade reaches the maximum allowable design grade, a new baseline will be established up or down slope from the last contour line and used for layout of the next contour pattern.

Slope length starts at the point where downslope flow begins and ends where deposition or concentrated flow channels begin. Varying slope lengths and slope steepness may result in several different contour farming baseline patterns on a hillside. Contour farming layout shall not occur on a hill slope length that is longer than the maximum slope length identified in Table 1.

Table 1: Maximum Slope Length Limitations

Land Slope Percent	Maximum Length (feet)
1 to 2	400
3 to 5	300
6 to 8	200
9 to 12	120
13 to 16	80
17 to 20	60
21 to 25	50

Farming operations should begin on the contour baselines and proceed both up and down the slope in a parallel pattern until patterns meet. Where field operations begin to converge between two non-parallel contour baselines, establish a correction area (areas in the field where two different contour systems meet) that is permanently in sod or established to an annual close-grown crop.

Where contour row curvature becomes too sharp to keep machinery aligned with rows during field operations, establish sod turn strips on sharp ridge points or other odd areas as needed.

Ridge height is the surface condition during the of the year when rainfall and runoff are most erosive and soil is most susceptible to erosion. Very Low Ridge Height is defined as 2 inches or less where fields are rolled, pressed or dragged after planting conventionally drilled crops, no-till, smaller planters, and hand planted vegetables. Erosion prediction program operations databases contain the ridge height values for each field operation.

For row spacing's greater than 10 inches, the minimum ridge height will be 2 inches during the period of the rotation that is most vulnerable to sheet and rill erosion. Document ridge heights from the operations using the current approved water erosion prediction technology.

For row spacing 10 inches or less, the minimum ridge height will be 1 inch for close-grown crops, such as small grains. Document ridge heights from the operations using the current approved water erosion prediction technology.

The minimum ridge height criteria are not required when the Indiana (IN) Field Office Technical Guide (FOTG) Standard (329) Residue and Tillage Management – No Till is used on the contour and at least 50 percent surface residue cover is present between the rows after planting.

Concentrated flow from contoured fields must be delivered to stable outlets.

CONSIDERATIONS

Several factors influence the effectiveness of contour farming to reduce soil erosion. These factors include: 10-year, 24-hour rainfall in inches; ridge height; row grade; slope steepness; soil hydrologic group; cover and roughness; slope length; and soil infiltration rate. Cover and roughness, row grade, and ridge height can be influenced by management and provide benefit depending on design.

Where increased water infiltration is a conservation planning objective, the maximum row grade should not exceed 0.2 percent.

Contour farming is most effective on slopes between 2 and 10 percent. This practice will be less effective in achieving the stated purpose(s) on slopes exceeding 10 percent and in areas with 10-year, 24-hour rainfall of about 6.5 inches or greater. The practice is not well suited to rolling topography having a high degree of slope irregularity because of the difficulty meeting row grade criteria.

This practice is most effective on slopes between 100 and 400 feet long. On slopes longer than 400 feet, the volume and velocity of overland flow exceeds the capacity of the contour ridges to contain them. Increasing residue cover and roughness will change the vegetative cover-management conditions and decrease overland flow velocities, thus increasing the slope length at which this practice is effective. Increasing roughness alone is not sufficient to produce this effect.

The closer the row grade is to the true contour, the greater the erosion reduction and the greater the improvement in soil moisture use efficiency. "Absolute row grade" should be selected rather than "relative row grade" in the supporting practices step when designing contour strips in the latest erosion prediction program.

Prior to design and layout, obstruction removal and changes to field boundaries or shape should be considered, where feasible, to improve the effectiveness of the practice and the ease of performing farming operations.

When the intersection of crop rows with the field edge is not perpendicular, IN FOTG Standard (386) Field Border may be needed to allow farm implements room to turn and control erosion along the field border.

If using ridge till on the contour, avoid crossing over ridged rows at correction areas because this will destroy the effectiveness of the ridges. Sod turn strips may be established if correction areas are unavoidable.

The width of correction areas, and the distance between baselines, should be adjusted for equipment operation widths.

Ridge height is created by the operation of tillage and planting equipment. The greater the ridge height, the more effective the operation is in slowing overland flow. The ridge height value for each field operation can be viewed in the currently approved soil erosion tool.

Grassed waterways, water and sediment control basins, underground outlets, or other suitable practices should be used to protect areas of existing or potential concentrated flow erosion.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice will be prepared for each field according to the Criteria, Considerations, and Operation and Maintenance described in this standard. The plans will include, as a minimum:

- Percent land slope and slope length.
- Planning soil map unit.
- Planned contour row grade.
- Minimum ridge heights and row spacing.
- Minimum and maximum allowable row grades for the contour system.

OPERATION AND MAINTENANCE

Perform all tillage and planting operations parallel to contour baselines or terraces, diversions, or contour buffer strip boundaries where these practices are used, provided the applicable row grade criteria are met.

Where terraces, diversions, or contour buffer strips are not present, maintain contour markers on grades that, when followed during establishment of each crop, will maintain crop rows at designed grades.

Contour markers may be field boundaries, a crop row left untilled near or on an original contour baseline or other readily identifiable, continuous, lasting marker. All tillage and planting operations will be parallel to the established marker. If a marker is lost, re-establish a contour baseline within the applicable criteria set forth by this standard prior to seedbed preparation for the next crop.

REFERENCES

Flanagan, D.C., Nearing, M.A. USDA-Water Erosion Prediction Project, Hillslope Profile and Watershed Model Documentation, NSERL Report #10, July 1995.

Foster, G.R. Revised Universal Soil Loss Equation, Version 2 (RUSLE2) Science Documentation (In Draft). USDA-ARS, Washington, DC. 2005.

Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, coordinators. 1997. Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook 703.