

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RESIDUE AND TILLAGE MANAGEMENT
NO TILL/STRIP TILL/DIRECT SEED**

(Ac.)

CODE 329

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year round, limiting soil-disturbing activities to those necessary to place nutrients, condition residue, and plant crops.

PURPOSE

- Reduce sheet/rill erosion.
- Reduce wind erosion.
- Improve soil organic matter content.
- Reduce CO₂ losses from the soil.
- Reduce energy use.
- Increase plant-available moisture.
- Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland and other land where crops are planted.

This practice includes planting methods commonly referred to as no-till, strip till, direct seed, zero till, slot till, or zone till. Approved implements are: no-till and strip-till planters; certain drills and air seeders; strip-type fertilizer and manure injectors and applicators; in-row chisels; and similar implements that only disturb strips and slots. All others are considered to be full-width or capable of full disturbance and therefore not compatible.

CRITERIA

General Criteria Applicable to All Purposes

Residue shall not be burned.

All residues shall be uniformly distributed over the entire field.

No full-width tillage shall be performed regardless of the depth of the tillage operation.

The Revised Universal Soil Loss Equation (RUSLE2) Field Operation database shall be used to determine if an implement is considered Full Width.

The Soil Tillage Intensity Rating (STIR) value shall include all field operations that are performed during each crop interval in the planned rotation.

Crop Interval is the time period following harvest, senescence, or termination of a crop through the harvest, senescence, or termination of a current crop)

The STIR value for each crop interval in the planned crop rotation shall be no greater than 30.

Additional Criteria to Reduce Sheet/Rill Erosion and/or Wind Erosion

The amount and orientation of surface residue and the amount of surface soil disturbance needed to reduce erosion to the planned soil loss objective shall be determined using current NRCS approved erosion prediction technology.

Calculations shall account for the effects of other conservation practices in the management system.

The RUSLE2 is the current South Dakota (SD) NRCS approved erosion prediction technology for sheet and rill erosion.

http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#), or visit the [electronic Field Office Technical Guide](#).

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Section IV
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The Wind Erosion Prediction System (WEPS) is the current SD NRCS approved erosion prediction technology for wind erosion.

<http://www.weru.ksu.edu/nrcs/wepsnrcs.html>

Additional Criteria to Improve Soil Organic Matter Content

The residue management system shall maintain:

- A positive Soil Conditioning Index (SCI) for the planned rotation.
- A crop interval STIR values of no greater than 20 for each crop in rotation.

Additional Criteria to Reduce Energy Use

The average annual STIR value for the planned crop rotation shall be no greater than 80 percent of the average annual STIR for the Benchmark crop rotation.

The sum of diesel fuel equivalent use for the planned crop rotation shall be no greater than 80 percent of the diesel fuel equivalent for the benchmark crop rotation.

The RUSLE2 Field Operation database shall be used to document diesel fuel equivalent values for all field operations.

Additional Criteria to Reduce CO₂ Loss from the Soil

The residue and tillage management system shall:

- maintain a SCI value for the planned rotation of no less than 0.2
- maintain STIR values during each crop interval in the planned rotation of no greater than 20.

Additional Criteria to Increase Plant-available Moisture and Reducing Evaporation from the Soil Surface.

The crop interval STIR values during the planned crop rotation shall be no greater than 20.

Crop stubble height for reducing evaporation losses during the time period of expected evaporation losses shall be:

- at least 10 inches for crops with a row spacing of less than 15 inches;
- at least 15 inches for crops with a row spacing of 15 inches or greater; and
- present on at least 60 percent of the field.

Crop stubble height for trapping snow during the time period when significant snowfall is expected to occur shall be:

- at least 10 inches for crops with a row spacing of less than 15 inches;
- at least 15 inches for crops with a row spacing of 15 inches or greater; and
- present over at least 50 percent of the field.

Fall field operations that disturb residue shall be done as close to perpendicular as possible to the direction of prevailing winds during the time that significant snowfall is expected to occur.

Additional Criteria to Provide Food and Cover for Wildlife

Determine residue duration, amount, orientation, and stubble height needed to provide adequate food and cover for target species using an approved habitat evaluation procedure.

Use SD-CPA-19, Wildlife Habitat Quality Rating Worksheet.

CONSIDERATIONS

General - Removing of crop residue, such as by baling or grazing, can have a negative impact on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant, and air resources.

Production of adequate crop residues to achieve the purpose of this practice can be enhanced through the use of high residue crops and crop varieties, the use of cover crops, and adjustment of plant populations through seeding rates and row spacing.

Using no till/strip till/direct seed for all crops in the rotation or cropping system can enhance the positive effects of this practice by:

- increasing the rate of soil organic matter accumulation;
- keeping soil in a consolidated condition provides additional resistance to sheet and rill erosion;
- sequestering additional carbon in the soil;
- further reducing the amount of particulate matter generated by field operations;
- reduce energy inputs to establish crops;
- forming root channels and other near-surface voids that increase infiltration.

A field border planted to permanent vegetation can:

- allow unobstructed turning for equipment;
- eliminate unproductive end rows;
- provide food and escape cover for wildlife;
- provide travel lanes for farming operations.

Increasing Soil Organic Matter Level and Reducing CO₂ Loss - CO₂ loss is directly

related to the volume of soil disturbed, the intensity of the disturbance and the soil moisture content and soil temperature at the time the disturbance occurs. The following guidelines can make this practice more effective:

- Shallow soil disturbance (1-3 inches) releases less CO₂ than deeper operations;
- When deep soil disturbance is performed, such as by subsoiling or fertilizer injection, make sure the vertical slot created by these implements is closed at the surface;
- Planting with a single disk opener no-till drill will release less CO₂ than planting with a wide-point hoe/chisel opener air seeder drill;
- Soil disturbance that occurs when soil temperatures are below 50°F will release less CO₂ than operations done when the soil is warmer.

Managing Soil Moisture and Protecting

Crops from Freeze Damage - The type, timing, and depth of soil-disturbing activities all influence moisture loss. Shallow operations (1-2 inches) or operations that do not invert the soil will reduce moisture loss compared to

deeper operations or those that invert and mix the soil.

Soil-disturbing operations performed when the soil surface is moist will result in greater moisture loss than operations done when the top two to three inches of soil have dried.

Leaving stubble taller than the minimum required will increase the relative humidity close to the soil surface, which reduces the rate of evaporative loss from the soil.

Leaving stubble taller than the 10-inch minimum will trap more snow and provide better protection to plants from freezing or desiccation.

Variable-height stubble patterns may be created to further increase snow storage.

Performing all field operations on the contour will slow overland flow and allow more opportunity for infiltration.

Wildlife Food and Cover - Leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover will enhance the value of residues for wildlife food and cover. Leaving unharvested crop rows for two growing seasons will further enhance the value of these areas for wildlife.

Leave crop residues undisturbed after harvest (do not shred or roll) to maximize their cover and food source benefits

Avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria and Considerations described in this standard.

Specifications shall include:

Planned crops and yields for the crop rotation;

Management record of the sequence and description of planned field operations;

Crop interval STIR values during the rotation;

Soil erosion estimates and soil Conditioning Index values for the crop rotation.

Specify the planned residue amounts for:

- (1) after harvest of the prior crop; and
- (2) after seeding of the planned crop.
- Plan specifications shall be recorded using approved practice specification sheets and additional documents listed as documentation requirements for this conservation practice (SD-DR-329).

OPERATION AND MAINTENANCE

Evaluate the crop residue amounts and orientation following each crop interval to ensure the planned level of resource protection is maintained.

Adjust the planned residue and tillage management for the crop system as needed to ensure the practice purposes, criteria and plan objectives are maintained.

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Skidmore, E.L. and N.P. Woodruff. 1968. Wind erosion forces in the United States and their use in predicting soil loss. U.S. Department of Agriculture. Agriculture Handbook No. 346.

USDA-NRCS, National Agronomy Manual, M_190_NAM_500 - Fourth Edition - March 2011.

USDA-NRCS, National Planning Procedures Handbook, H_180_600_TOC - Amend. 5 - February 2010.