

**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 while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue and plant crops.

**PURPOSE**

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- Improve soil organic matter content.
- Reduce CO<sub>2</sub> losses from the soil.
- Reduce soil particulate emissions.
- 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.

“No-till” refers to planting crops into a narrow slot or opening in the soil created by coulters, row openers, or other devices for the purpose

or inserting seed or transplants at the time of planting.

“Strip-till” refers to planting crops into a cultivated or tilled strip no wider than one-third of the row spacing. Strips may be tilled as part of the planting operation or in a separate earlier operation.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Residue shall not be burned.

All residues shall be uniformly distributed over the entire field. Combines or similar harvesting machines shall be equipped with spreaders capable of redistributing residues over at least 80 percent of the working width of the header.

No full-width tillage shall be performed regardless of the depth of the tillage operation. All operations will disturb less than 30% of the ground surface. 70% of the ground surface will remain undisturbed by field operations (strip-tilling, planting, manure injection, etc.)

The Soil Tillage Intensity Rating (STIR) value shall include all field operations that are performed during the crop interval between harvest of the previous crop and harvest or termination of the current crop (includes fallow periods). The STIR value shall be no greater than 30.

**Additional Criteria to Reduce Sheet and Rill Erosion**

The amount of randomly distributed surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the planned soil loss objective shall be determined using the Revised Universal Soil Loss

Equation, Version 2 (RUSLE 2). Calculations shall account for the effects of all management practices (crop rotation, tillage, residue removal, etc.) in the management system.

#### **Additional Criteria to Improve Soil**

##### **Condition**

An evaluation of the cropping system using the soil conditioning index generated by RUSLE 2 shall result in a positive trend.

#### **Additional Criteria to Reduce CO<sub>2</sub> Loss from the Soil**

The Soil Tillage Intensity Rating (STIR) value shall include all field operations that are performed during the crop interval between harvest of the previous crop and harvest or termination of the current crop and shall be no more than 20.

An evaluation of the cropping system using the soil conditioning index generated using RUSLE 2 shall result in a positive trend.

#### **Additional Criteria to Increase Plant-available Moisture**

##### **Reducing Evaporation from the Soil**

**Surface.** The annual Soil Tillage Intensity Rating (STIR) value for all soil-disturbing activities in the cropping system shall be no more than 20.

Crop stubble height during the time evaporation losses can be 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.

These stubble heights shall be present on at least 60% of the field.

#### **Additional Criteria to Provide Food and Cover for Wildlife**

The time that residue is present, the amount and orientation of residue and the height of stubble needed to provide adequate food and cover for the target species shall be determined using an approved habitat evaluation procedure.

#### **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 amounts of crop residues necessary to achieve the purposes of this practice can be enhanced by selection of high residue producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations 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, which provides additional resistance to sheet and rill erosion.
- sequestering more carbon in the soil.
- further reducing the amount of particulate matter generated by field operations.
- 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 CO<sub>2</sub> Loss***

CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> than operations done when the soil is warmer.

#### **Reducing Soil Particulate Emissions -**

Slower operating speeds generally produce fewer particulate emissions.

Dry soils will produce more particulates than moist soils.

#### **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.

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 be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

## **OPERATION AND MAINTENANCE**

No operation and maintenance requirements, statewide in scope, have been identified for this practice.

## **REFERENCES**

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