

**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 and Particulate matter less than 10 micrometers in diameter - PM 10.
- Reduce tillage-induced particulate emissions
- 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 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/Rill Erosion; Reduce Wind Erosion and Particulate matter less than 10 micrometers in diameter - PM 10

The amount and orientation of 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 current approved water and/or wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Reduce Tillage-Induced Particulate Emissions

Reduce or modify tillage operations that create dust, especially during critical air quality periods.

Adopt tillage practices that reduce trips across the field. Utilize tillage equipment that has proven to reduce particulate matter emissions.

Other operations to reduce dust shall be performed when specified on the Practice Requirement Sheet.

Additional Criteria to Improve Soil Organic Matter Content

An evaluation of the cropping system using the current approved soil conditioning index procedure shall result in a positive trend.

Additional Criteria to Reduce CO₂ 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 current approved soil conditioning index procedure shall result in a positive trend.

Additional Criteria to Increase Plant-available Moisture and 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 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.

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

Trapping Snow. Crop stubble height during the time 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.

These heights shall be present over at least 50% 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.

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

Document in the plans and specifications:

- Planned crop(s)
- Specify the type of equipment for No Till/Strip Till/Direct Seed for each crop
- Specify the planned residue amounts for: (1) after harvest of the prior crop and (2) the planned residue cover after seeding the planned crop.

OPERATION AND MAINTENANCE

Evaluate/measure the crop residues cover and orientation after each crop to ensure the planned amounts and orientation are being achieved. Adjust management as needed to either plan a new residue amount and orientation or adjust the planting and/or harvesting equipment.

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