

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**SURFACE ROUGHENING**

(Ac.)

CODE 609

**DEFINITION**

Performing tillage operations that create random roughness of the soil surface

**PURPOSE**

This practice is applied to support one or more of the following (resource concerns in parenthesis):

- Reduce soil erosion from wind/induce wind-borne sediment deposition. (SOIL EROSION – Sheet and Rill, and Wind)
- Protect growing crops from damage by wind-borne soil particles. (DEGRADED PLANT CONDITION – Undesirable plant productivity and health)
- Improve air quality by reducing the generation of airborne particulate matter. (AIR QUALITY IMPACTS - Emissions of Particulate Matter - PM - and PM Precursors)

**CONDITIONS WHERE PRACTICE APPLIES**

This is for emergency tillage on soils that have a surface layer suitable for clod formation and have a high potential for wind erosion due to lack of surface cover. This practice is not a primary erosion control practice.

**General Criteria applicable to all purposes**

Tillage operations will produce random roughness (RR) values (inches) large enough to achieve a 25% reduction in the potential erosion rate, OR reduce wind erosion during the management period by 25% as determined by the most current wind erosion technology.

**Additional Criteria to Protect Plants from Abrasion by Wind Blown Soil Particles**

Tillage operations for this purpose will produce random roughness sufficient to reduce erosion to the planned soil loss objective to protect the growing crop. See National Agronomy Manual Table 502-1, Crop Tolerances for Blowing Soil.

**CONSIDERATIONS**

This practice should be used when a well-planned and properly applied wind erosion control system fails for reasons beyond the control of the producer. These situations may exist when a low residue-producing crop is planted too late in a growing season to produce sufficient residue cover, or when the planned erosion control system fails to control erosion during a high wind event.

Wide spacing of chisel points or skip chiseling (alternate chiseled/non-chiseled strips) for the first operation may permit salvaging part of a growing crop of small grain and leave undisturbed soil for later operations, if needed.

Spacing and depth of chisel operation are important to obtain uniform distribution of clods on the surface. Close spacing at shallow depths generally pulverizes the soil, and does not produce enough random roughness to decrease the soil-blowing potential.

Proper tillage equipment matched to the crop being grown and soil is important. In general, chisels or narrow sweeps may reduce potential soil blowing on loamy or fine textured soils. Roughening the soil surface with a lister/bedder or wide shovels on chisel shanks is more effective on soils whose surface layer has a wind erodibility factor (I) value of 104 and 86.

Emergency tillage (surface roughening) can be done on soil that has an "I" factor greater than 104 using deep tillage, when soil moisture is adequate to create a stable aggregate (clod) and when finer soil material can be brought to the surface.

Perform the initial tillage operation as soon as erosion starts, or as soon as it is evident that the existing cover or surface roughness is inadequate to control erosion below an acceptable level.

Begin surface roughening operations on the windward (up wind) edge of the field.

Ridging associated with the tillage is very important to controlling wind erosion. Tillage that creates ridging is done perpendicular to the direction of damaging wind. See conservation practice standard Cross Wind Ridges 588 for criteria to use ridging.

Surface crusts generally reduce soil erodibility. However, certain smooth, crusted soils with loose grains (sand size particles) on the soil surface may cause crusts to abrade rapidly. These soils include loamy fine sands and sandy loams that have significant portions of sand on the surface when crusted. They also include certain calcareous loams, silt loams, and silty clay loams that tend to form sand sized aggregates in the surface when crusted.

## **PLANS AND SPECIFICATIONS**

Prepare plans and specifications for each field or treatment unit according to the Criteria and Operation and Maintenance requirements of this standard.

Specifications shall describe the application requirements to achieve the intended purpose.

Record practice specifications in an approved Colorado Surface Roughening 609, Implementation Requirements worksheet.

## **OPERATION AND MAINTENANCE**

This practice will be performed as soon as possible when there is inadequate cover to protect the soil from potential wind erosion events or when a crusted soil condition occurs as sensitive crop is emerging and inadequate crop residues are present.

## **REFERENCES**

USDA, NRCS. 2011. National Agronomy Manual, 4th Ed, Table 502-1. Crop tolerance to blowing soil. p. 502-2. Washington, DC.  
<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=29608.wba>

USDA, ARS, NRCS. 2014. Wind Erosion Prediction System. Manhattan, KS.  
<http://weru.ksu.edu/nrcs/wepsnrcs.html>  
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/tools/weps>