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

- Reduce wind erosion
- Reduce dust emissions into the air
- Protect plants from abrasion by wind-blown particles.

CONDITIONS WHERE PRACTICE APPLIES

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 should not be used as a primary erosion control practice.

This practice applies on soils whose surface layer has a wind erodibility factor (I) value of 104 or less (see the National Agronomy Manual, Exhibit 502-2).

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

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

The random roughness (K_{rr}) value used to estimate wind erosion shall be determined from Table 1. Random roughness (K_{rr}) shall be equal to or less than 0.75. The shaded area shows the RR – "I" factor combinations that meet the 25% reduction criterion.

Table 1. K_{rr} from Random Roughness (RR) and "I" Factor Values[1]

RR (in)	I = 104	I = 86	I ≤ 56
0.2"	1.0	1.0	1.0
0.4"	0.95	0.86	0.70
0.6"	0.88	0.76	0.51
0.8"	0.82	0.68	0.40
1.0"	0.78	0.62	0.34
1.2"	0.74	0.57	0.30
1.4"	0.72	0.54	0.27
1.6"	0.69	0.51	0.24

[1]Note-I factor values >134 have a K_{rr} = 1.0, & the I of 134 soil will not reach a 25% reduction at any RR.

Random Roughness (RR) values shall be estimated from the field operation table for random roughness [see the National Agronomy Manual Part 502, Exhibit 502-7], or estimated using the roughness pictures in Agriculture Handbook 703 Appendix C, pages 339 to 347.

Criteria to Protect Plants from Abrasion by Wind Blown Soil Particles

Tillage operations for this purpose will produce random roughness sufficient to reduce or eliminate surface creep (roller phase) and saltation during crop emergence and early crop development.

Roughness created shall reduce the soil loss for the first growth period after planting the crop to the soil loss listed in National Agronomy Manual Table 502-4,

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 harvested 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

Plans and specifications for establishment of this practice shall be prepared for each field or treatment unit according to the conditions and criteria 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

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, Natural Resources Conservation Service, National Agronomy Manual, 3rd. Ed., October 2002. Part 502 Wind Erosion.