Clear Form

SURFACE ROUGHENING (609) CONSERVATION PRACTICE DOCUMENTATION WORKSHEET

CLIENT/OPERATING UNIT: LOCATION:

FARM NO.: TRACT: LAND USE/CMU: JOB CLASS:

NRCS TECHNICIAN: DATE:

Surface Roughening is the performance of tillage operations that create random roughness of the soil surface. Random roughness is the non-oriented surface roughness often referred to as "cloddiness". Such roughness is usually created by the action of tillage implements. The primary effects of random roughness on wind erosion are to raise the threshold wind speed at which erosion begins and to provide sheltered areas among soil clods where moving soil particles can be trapped.

This practice applies on soils that have a surface layer suitable for clod formation and that have a high potential for wind erosion due to lack of surface cover (soils whose surface layer has a WEQ ("I") value of 104 or less). This practice should not be used as a primary erosion control practice.

Requirements for reporting application of the Surface Roughening conservation practice are that tillage operations produce random roughness values 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. Random roughness (K_{rr}) shall be equal to or less than 0.75.

PURPOSE:

- ☐ Reduce wind erosion
- ☐ Reduce dust emissions into the air
- ☐ Reduce deposition of soil into surface water
- ☐ Protect plants from abrasion by wind blown particles.

Random roughness (K_{rr}) values used to estimate wind erosion are determined referencing to Table 1. Table 1 converts random roughness (RR) height (*sd* in inches) to WEQ "K" subfactors (K_{rr}) for random roughness. Note that K_{rr} values vary by "I" factors assigned to soil Wind Erodibility Groups.

TABLE 1. K_{rr} from Random Roughness and "I" Factor Values[1,2]

RR VALUE *(inches)*	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**	**0.52**	**0.23**
1.8"	**0.67**	**0.50**	**0.23**
2.0"	**0.66**	**0.48**	**0.22**

The shaded area in Table 1 shows the K_{rr}– "I" factor combinations that meet the 25% reduction criterion.

See Table 2 for 'RR' values assigned to various field operations.

[1]Note: "I" factor values >134 have a K_{rr} = 1.0, and the "I" of a 134 soil will not reach a 25% reduction at any K_{rr}.
[2]From NRCS National Agronomy Handbook (pg 502-47)

Random roughness values from field tillage operations can be used to determine random roughness (Table 2). Random roughness can also be determined by comparing a field's surface to random roughness photos (Figures 1 through 9).

Table 2. *Core* value Random Roughness (*sd*) values for common tillage operations [1,2]

FIELD OPERATION	RANDOM ROUGHNESS 'RR Value' *(standard deviation in inches)*	FIELD OPERATION	RANDOM ROUGHNESS 'RR Value' *(standard deviation in inches*
Chisel, sweeps	1.20	Fertilizer applicator, anhyd knife	0.60
Chisel, straight point	1.50	Harrow, spike	0.40
Chisel, twisted shovels	1.90	Harrow, tine	0.40
Cultivator, field	0.70	Lister	0.80
Cultivator, row	0.70	Manure injector	1.50
Cultivator, ridge till	0.70	Moldboard plow	1.90
Disk, 1-way	1.20	Mulch treader	0.40
Disk, heavy plowing	1.90	Planter, no-till	0.40
Disk, tandem	0.80	Planter, row	0.40
Drill, double disk	0.40	Rodweeder	0.40
Drill, deep furrow	0.50	Rotary hoe	0.40
Drill, no-till	0.40	Vee ripper	1.20
Drill, no-till into sod	0.30		

[1]These values are typical and representative for operations in *medium textured soils* tilled at *optimum* moisture conditions. Many of the implements may differ by cropping region, farming practice, soil texture, or other conditions. ***Refer to the random roughness photos in Figures 1-9, and adjust to values that seem most appropriate.***
[2] From NRCS National Agronomy Handbook (pg 502-48)

Field	WEQ "I" Factor for Dominant Soil in Field	Tillage Implement	Tillage Implement 'RR' Value[a]	Figure No. Referenced for 'RR' Value[b]	WEQ "K_{rr}" Factor Following Field Tillage Operation[c]	Ridge Height *inches*	Ridge Spacing *inches*

[a] From Table 2. [b] Refer to the random roughness photos in Figures 1-9 (page 3) [c] From Table 1.

OPERATION AND MAINTENANCE (O&M)

This practice will be performed as soon as possible when there is inadequate cover or crop residues present to protect the soil from potential wind erosion events. 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. Spacing and depth of tillage 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. Surface Roughening will comply with all federal, state, and local laws and regulations.

Practice specifications have been reviewed and practice application as planned above is *agreed to:*

Cooperator Signature and Date

NRCS Planner Signature and Date

I certify that the above practice has been applied and meets NRCS Practice Standards and Specifications.

NRCS Planner Signature and Date

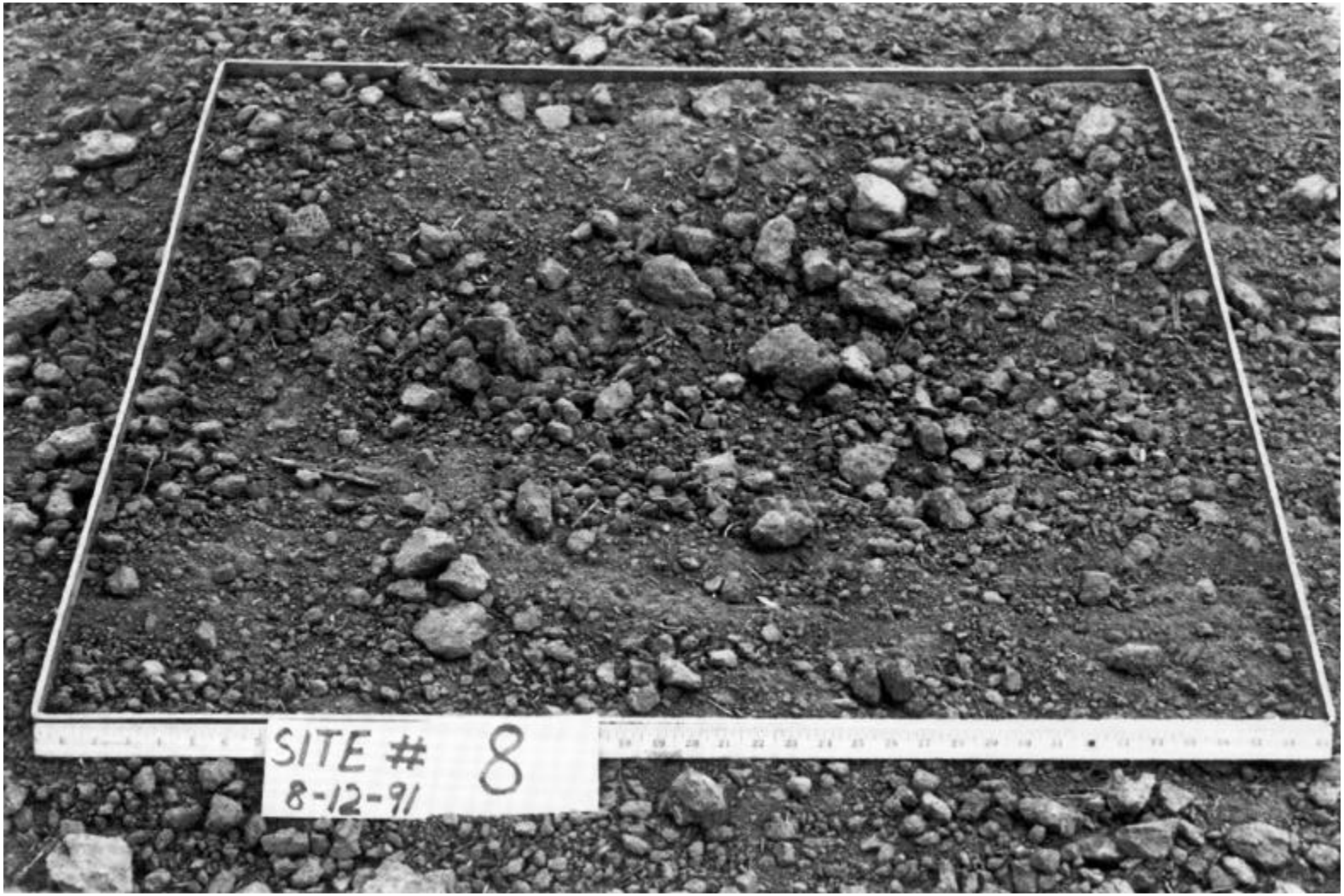
Print Form

Random Roughness, R_t, of 0.25 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 339

FIGURE 1

Random Roughness, R_t, of 0.40 inches



Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 340

FIGURE 2

Random Roughness, R_t, of 0.65 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 341

FIGURE 3

Random Roughness, R_t, of 0.75 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 342

FIGURE 4

Random Roughness, R_t, of 0.85 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 343

FIGURE 5

Random Roughness, R_t, of 1.05 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 344

FIGURE 6

Random Roughness, R_t, of 1.60 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 345

FIGURE 7

Random Roughness, R_t, of 1.70 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 346

FIGURE 8

Random Roughness, R_t, of 2.15 inches

Source: Agriculture Handbook Number 703, USDA-ARS, *Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, page 347

FIGURE 9