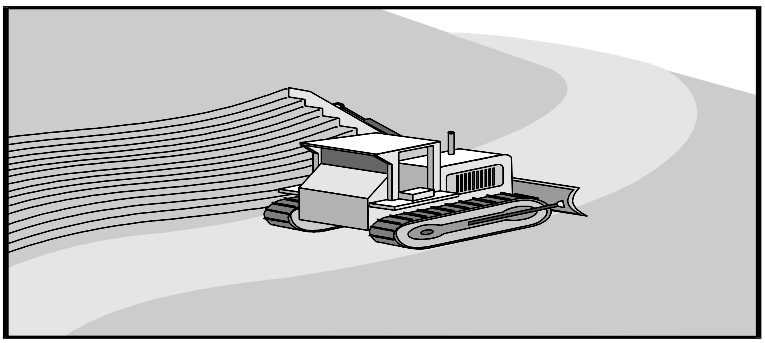
ACTIVITY: Surface Roughening

TCP – 06



Targeted Constituents				
● Significant Benefit	◗ Partial Benefit	○ Low or Unknown Benefit		
● Sediment	○ Heavy Metals	○ Floatable Materials	○ Oxygen Demanding Substances	
○ Nutrients	○ Toxic Materials	○ Oil & Grease	○ Bacteria & Viruses	○ Construction Wastes

Implementation Requirements				
● High	◗ Medium	○ Low		
○ Capital Costs	○ O & M Costs	○ Maintenance	● Suitability for Slopes >5%	○ Training

Description

Roughening, terracing and rounding are techniques used for creating unevenness on bare soil through the construction of furrows running across a slope, creation of intermediate benches in long slopes, or by utilization of construction equipment to track the soil surface. This management practice is likely to create a significant reduction in sediment.

The primary function of surface roughening (and/or terracing TCP-11) is to reduce erosion potential by decreasing runoff velocities, reducing the length of sheet flow, trapping sediment, and increasing infiltration of water into the soil. It should be used as a permanent measure, to prepare a slope to receive permanent vegetation.

Suitable Applications

- On all construction slopes.
- Where seeding, planting, and mulching to stabilize exposed soils will benefit from surface roughening.
- Graded areas with smooth, hard surfaces, and the potential for erosion of clay, silt or sand sized particles.
- Where the slope length needs to be shortened by terracing. Terracing is usually permanent and should be designed under the direction of and approved by a licensed professional civil engineer based on site conditions. Terraces must be designed with adequate drainage and stabilized outlets for the flow (See TCP-11).

Approach

Roughening methods include stair-step grading or furrowing, which must be done across the slope and along the contour. Tracking, by contrast, must be done up and down the slope. Factors to be considered in choosing a method are slope steepness, mowing requirements, soil type, and whether the slope is formed by cutting or filling.

Cut Slope Roughening

- Use stair-step grading or furrows (groove cuts) on slopes that are steeper than 3:1 (H:V).
- Use stair-step grading on erodible material which is soft enough to be ripped by a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the step in towards the slope.
- Do not make individual vertical cuts more than 600 mm (24 in.) high in soft materials or more than 1 m (3 ft.) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope and on the contour.

Fill Slope Roughening

- Place fill slopes with a gradient steeper than 3:1 (H:V) in lifts not to exceed 8 in. (200 mm), and make sure each lift is properly compacted.
- The face of the slope should consist of loose, uncompacted fill 4 in. (100 mm) to 6 in. (150 mm) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer and mulch then track or punch in the mulch. See Permanent Grass, Vines and Other Vegetation, Temporary Seeding, and Mulching BMPs.
- Do not blade or scrape the final slope face.

Cuts, Fills, and Graded Areas

- Slopes that will be maintained by mowing should be no steeper than 3:1 (H:V).
- To roughen these areas, create shallow grooves by normal tilling, disking, harrowing, or use a cultipacker-seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 10 in. (250 mm) apart and not less than 1 in. (25 mm) deep.
- Excessive roughness is undesirable where mowing is planned.

Roughening with Tracked Machinery

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.

- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not backblade during the final grading operation.
- Seed and mulch roughened areas to obtain optimum seed germination and growth.

Maintenance

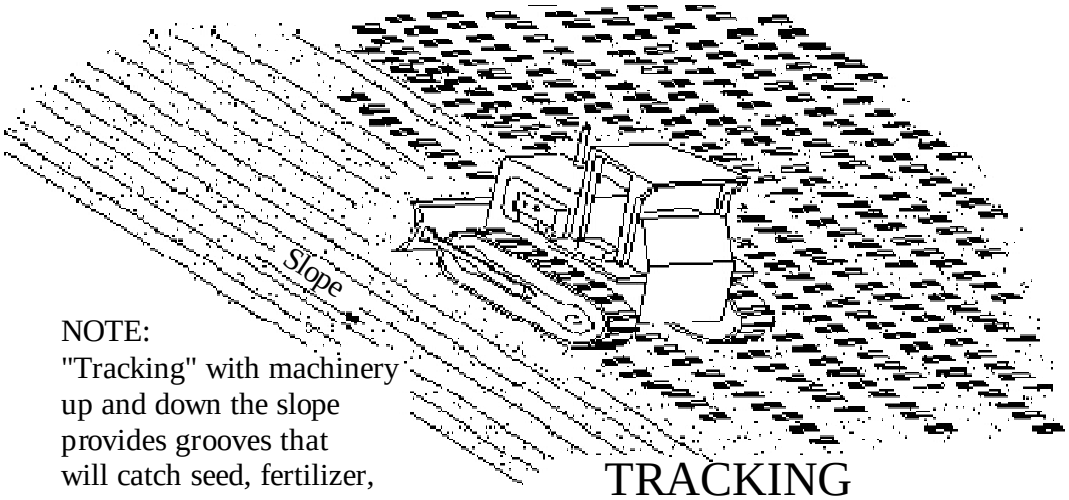
Periodically check the seeded or planted slopes for rills and washes, particularly after significant storm events, greater than 0.5 in. (1.2 mm). Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.

Limitations

- Roughening may increase grading costs and result in sloughing in certain soil types.
- Stair-step grading may not be practical for sandy, steep, or shallow soils.
- Roughening alone as a temporary erosion control or surface preparation measure is of limited effectiveness in intense rainfall events. If roughening effects are washed away in a heavy storm, the surface will have to be re-roughened and new seed and mulch applied.

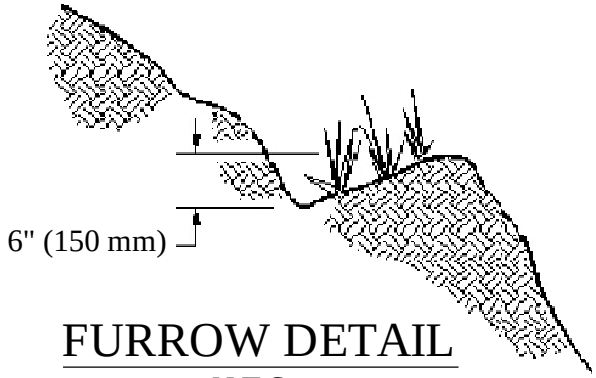
Primary References

Caltrans Storm Water Quality Handbooks, Planning and Design Staff Guide, CDM et.al. for the California Department of Transportation, September 1997.



NOTE:
"Tracking" with machinery up and down the slope provides grooves that will catch seed, fertilizer, rainfall, and reduce runoff.

TRACKING
N.T.S.



FURROW DETAIL
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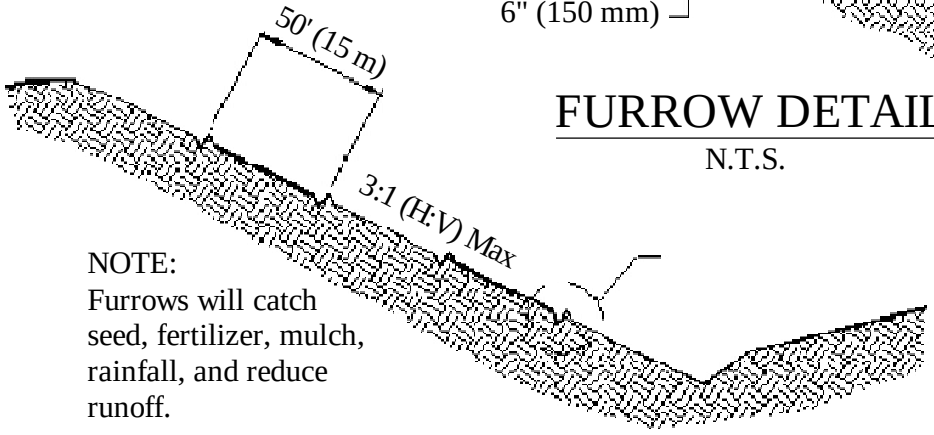

NOTE:
Furrows will catch seed, fertilizer, mulch, rainfall, and reduce runoff.

CONTOUR FURROWS
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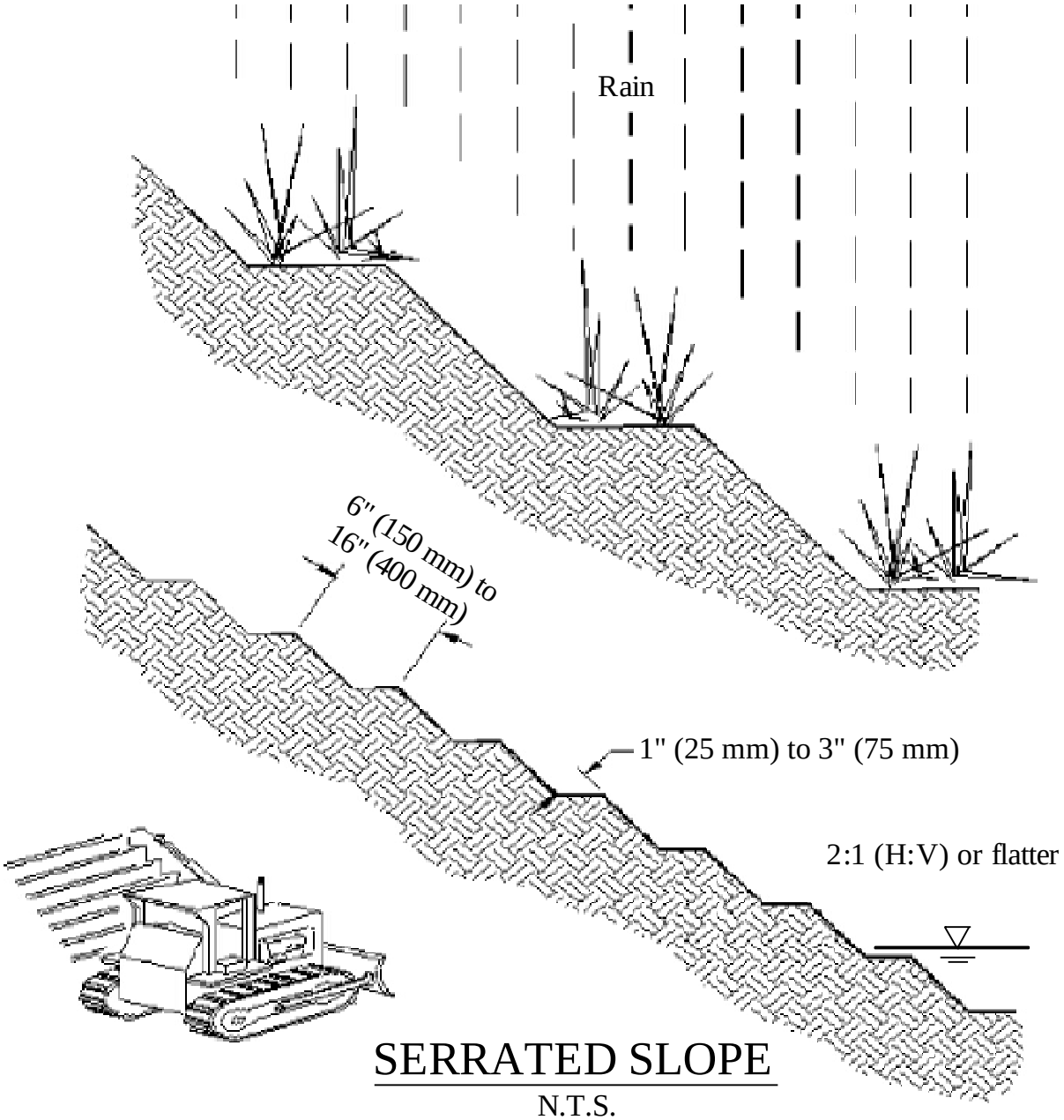
Figure TCP-06-1
Surface Roughening Techniques



SERRATED SLOPE

N.T.S.

NOTE:
Groove by cutting serrations along the contour. Irregularities in the soil surface catch rainwater, seed, mulch and fertilizer.

Figure TCP-06-2
Surface Roughening Techniques