Technical Bulletin

Suggested Grading Sequence with a Carbide-Tipped Blade

Version 1.0 1/25/05

Carbide–tipped blade systems offer several benefits for maintenance grading operations. These benefits are described in the Carbide-Tipped Blade System Informational Bulletin. The suggested grading sequence using a carbide-tipped blade system is:

1. Scratch the Road Surface
2. Cut the Road Material
3. Spread the Material
4. Groom the Road
5. Compact

Final grooming of the graded road can be accomplished with the grader rather than a rake saving an entire operation. More importantly, grooming with the carbide-tipped blade system eliminates the aggregate separation/segregation typically associated with raking.

1. Scratch the Road Surface

The first step in grading is to loosen the entire surface of the road. Scratching, or shallow scarifying, of the road surface is very effective in anchoring newly graded material to the road. The grooved surface created by a carbide-tipped blade enhances the adherence of the newly placed material. Failure to scratch the center of the road when attempting to rebuild/repair crown is a recipe for potholes and washboarding (see photo 1).

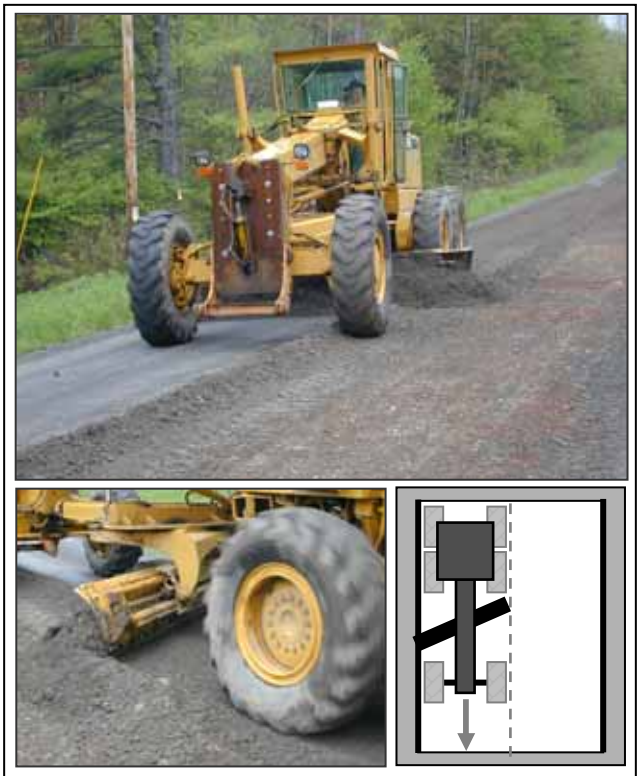

Figure 1.

Typically one pass in each direction is sufficient to loosen the material and prepare the center of the road to receive material. Use care not to disturb too much road material at a time, especially on days with full sunlight and low humidity; proper compaction requires moisture.

When scratching the surface, stay on one side of the crown and off the centerline (see figure 1). Scratch/loosen the road material to the depth of the deepest point in the road cross-section. It is particularly important to cut the road (cross-sectional profile) to the bottom of any washboards or shallow holes. Deep holes should be cut to the bottom with a grader-mounted scarifier or other equipment (backhoe) to destroy the shape of the hole and reduce the potential for the hole to recur.

The publishers of this publication gratefully acknowledge the financial support of the Pennsylvania State Conservation Commission. For additional information or assistance, contact: Center for Dirt & Gravel Roads Studies, Penn State University, 207 Research Unit D, University Park, PA 16802 (Toll-Free Phone: 1-866-668-6683, Fax: 814-863-6787, Email: dirtandgravel@psu.edu). Additional copies available on our website at: www.dirtandgravelroads.org

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2. Cut the Road Material

The accumulation of material along the outside edge of the road is a natural result of traffic. Pulling this material back into the center of the road is an important step in re-establishing the centerline crown and eliminating water following the wheel tracks. Evenly blending the material is critical. If the large segregated aggregate is brought back to the center of the road with out re-establishing a proper mixture of coarse and fine material, the road will unravel very quickly, generating dust and potholes.

During this second phase the blade should be in the cutting position with the carbide teeth pointed forward about 25 degrees (see figure 2). Having the blade rolled forward and the road center side of the blade tilted up slightly causes the material to roll up the blade and fall onto itself, which helps to mix the large material back into the fines.

If major rebuilding of the crown is required, it may be necessary to cut the road several times in each direction. These repetitive passes are part of the process of cutting the road deep enough to:

- Accumulate enough material to rebuild the crown.
- Cut the holes or washboards deeply enough to delay their return.
- Recover enough fine aggregate particles to replace fine particles lost to erosion, dust, and traffic action.

If the grading blade is kept at or slightly above the final elevation desired for the center of the road, each pass will rebuild the crown and mix the aggregate.

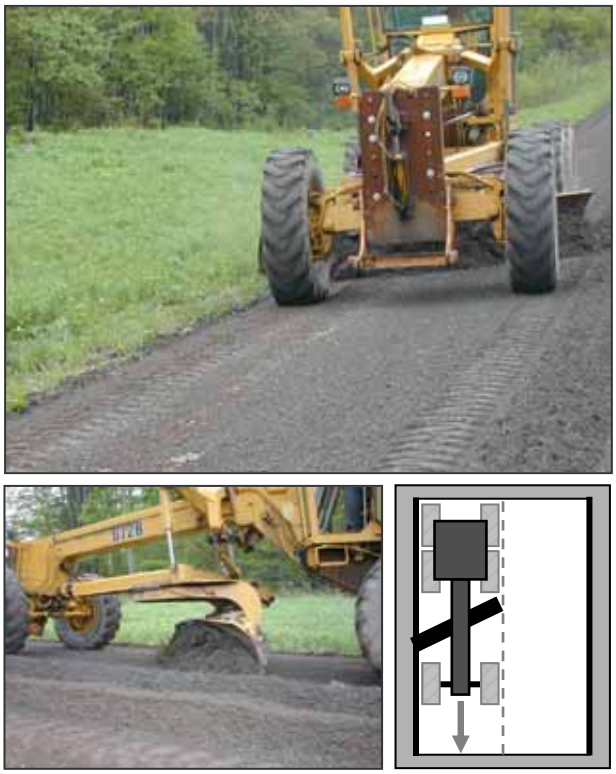

Figure 2. Large aggregate that has accumulated on the shoulder is pulled to the center of the road and mixed with fine aggregate particles as it rides up the blade. The blended aggregate is deposited in a windrow in the center of the road. Note the high moisture content of the graded material.

3. Spread the Material

Excess aggregate accumulated in the center of the road needs to be spread back out. Straddle the windrow of material with the blade straight and pitched forward slightly. Spread the material leaving the center of the road 1” or 2” higher than the elevation desired at completion (see figure 3). After this pass the road will have a slightly high flat center with a notch on both sides.

Figure 3. The material is knocked down (above) leaving the road with a high flat center (far left).

4. Groom the Road

The final passes with this blade system to groom the road are the most critical. Properly done, these two passes have the same effect as raking the road without separating the aggregate. On these passes, turn the grader blade the opposite direction from earlier scratching and cutting segments (as if plowing snow).

The grader stays in the lane and off the centerline. Pitch the blade forward sufficiently to see the material feeding out between the teeth. The road center side of the blade should be kept at the final elevation of the centerline and the road edge side of the blade kept at an elevation such that little if any material runs off the edge of the blade (see inset above right). A flat "A" shaped crown is desired. During these passes, the grader will not be carrying a lot of material (see figure 5). Any large rocks, roots, or chunks of vegetation should ride down the blade to the edge of the road. Avoid spreading the material too thin along the outside edge of the road. The replaced aggregate depth along the edge of the road should be no less than 1.5 times the thickness of the largest particle in the aggregate.

Figure 4.

5. Compact

The final stage of maintenance grading is compaction. Rolling should begin from the road edge and work toward the centerline. The center of the road should be rolled; however, take care to avoid straddling the crown with the roller. In normal grading operations, only a couple of inches of aggregate are shifted and a large roller or vibratory roller is unnecessary. It is more valuable to roll the road with the equipment available than to avoid rolling for lack of ideal equipment. A rubber tired roller or a loaded truck works well for this purpose (see figure 6).

Carbide-toothed blades perform best under moisture conditions that would be too wet for grading with a traditional blade. In order to achieve the maximum benefit from a carbide-blade system it is important to grade under high moisture conditions. Strategies for adding moisture to optimize compaction and minimize aggregate separation will be the subject of a future technical bulletin.

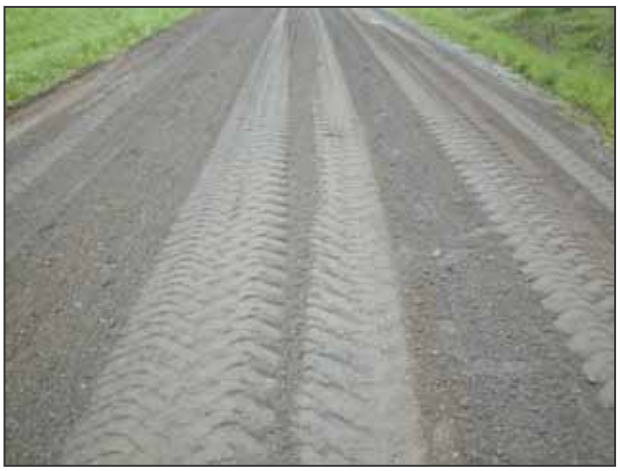

Figure 5. Here the grader was used to partially compact the groomed road. An articulating grader is particularly useful for this purpose allowing the operator to drive over more of the road with each pass.