Baystate Roads Program
Tech Notes

Maintaining Gravel Road Surfaces

Gravel

Gravels differ. Not all gravel is good for roads. Some soils may break into fine pieces under heavy traffic, swell when wet, or be so hard that they are difficult to work. Good gravel is hard enough so that it doesn't form dust, but loose enough to drain. It supports the weight of traffic and distributes traffic loads sufficiently so that it doesn't destroy the subgrade.

Blending

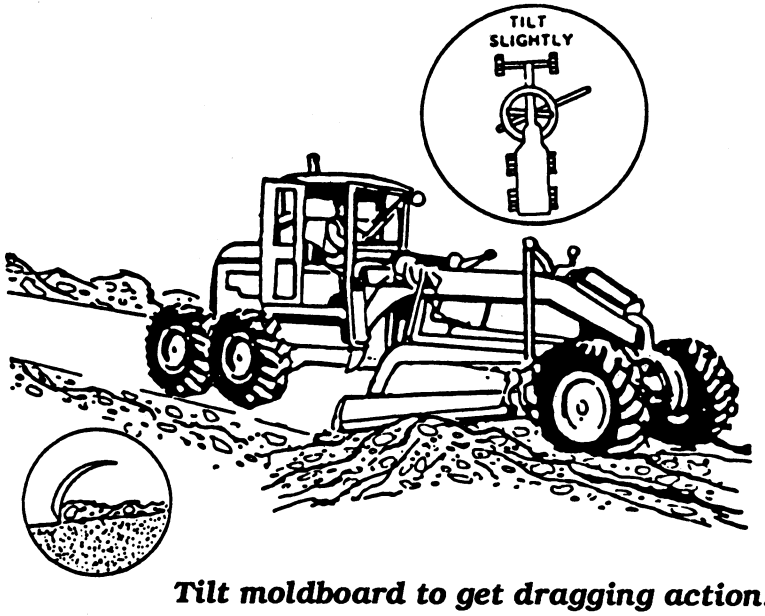
To build a road that can be used in all types of weather, it is essential to have a proper blend of different size materials. Good road gravel contains a uniform mixture of stones with a mixture of sand and fines. Blending different sizes allows the pieces to lock and pack (compact) together to make a strong, tight surface. Usually the size of materials for a wearing surface is three-fourth inch (3/4") and less.

Fines have the consistency of flour. The fines fill small spaces between the different size stones. It is an important part of the mixture because, with moisture, it acts as a cement to hold the larger materials together. Moist gravel will not dry to form a wearing surface without the proper amount of fines.

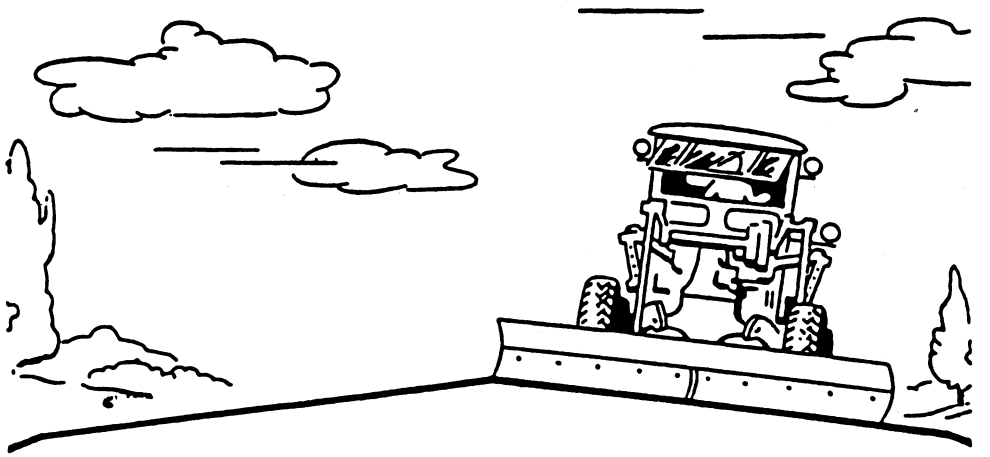
Maintaining Gravel Surfaces

To keep a road in good condition, the road surface and shoulders must be periodically smoothed and reshaped with a grader blade.

This should be done when the gravel is moist. The dragging operation also rolls the gravel and helps compact the road surface as it is blended.



Tilt moldboard to get dragging action.



Blade the road mat to a modified "A" cross-section. This eliminates water on flat central areas and prevents potholes.

Properly blended gravel and fines will dry to form a hard crust that provides a wearing surface. The crust carries the traffic load and sheds water until it is broken. Traffic and climatic conditions will completely break the crust over time. Reshaping will be necessary to rebuild the crust.

The speed at which a grader operates or can blade effectively will depend on the type of grader, its tire pressure, and the condition of the road surface. Going too fast will cause the grader blade to bounce, creating roughness in the road surface.

Reshaping

Reshaping is necessary when the surface cannot be smoothed to provide an acceptable riding surface. The gravel subbase, eight inches (8") or more in depth, may have to be reworked to eliminate large potholes, deep ruts, and a flattened crown. The grader blade should cut well below the potholes and below the washboards.

Reshaping involves remixing the soils to get a proper blend of fines and different size stones, then blading and compacting this blended material into a properly crowned road surface. When remixing, it may be necessary to add more gravel or fines. The art of proper blending is not a cut-and-dried proposition. Experience is the best guide to correct blending. The quality of the crust and its length of useful life depend on the skill used in blending coarse and fine materials and moisture to form the desired crust.

Crown

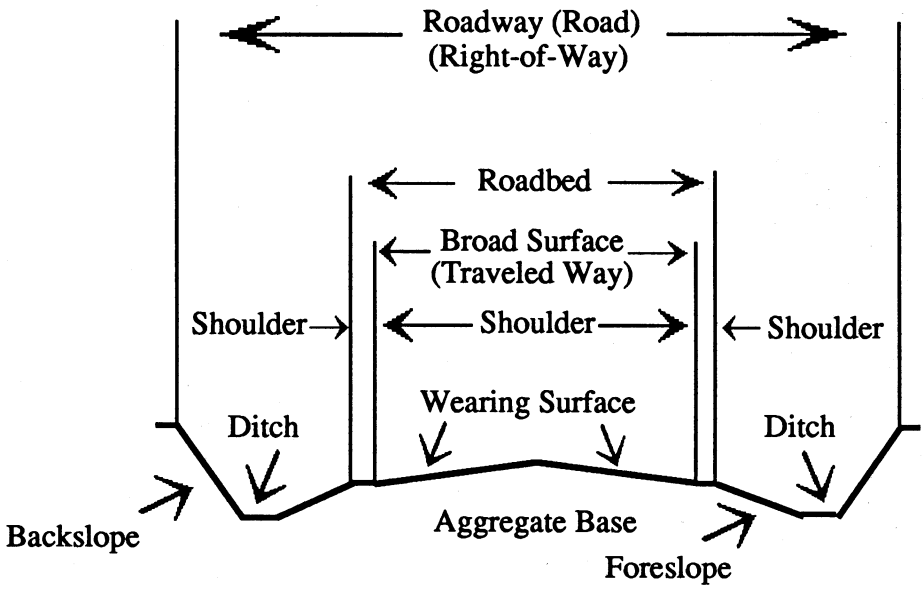
After the gravel is remixed, it is reshaped by blading to restore a proper crown and smooth surface. A proper crown has the center of the road higher than the shoulders and a straight, uniformly sloped line from the center of the road down to the shoulder edge on either side.

Keeping a crown on the road is probably the most important part of blading. Without a proper crown, water will stand and soak and soften the road surface.

The amount of crown or cross slope in the road should be one-third to one-half inch (1/3-1/2") for each foot of width measured from the center of the road to the outside edge or shoulder. This amount of crown should allow good drainage of surface water without washing off surface materials. This slope may vary in special cases.

Shoulders

The shoulders are the additional width along the outside edge of the road. These will be either gravel or grass covered on most roads. The slope of the shoulder from road edge to ditch foreslope must be equal or



Typical section of aggregate surfaced roadway.

slightly greater than the road surface cross slope. This will allow for good drainage of surface water from the road. When reshaping the road, the shoulders should also be worked in the same manner.

The shoulders should be an extension of the road surface in order to allow water to run in sheets from the center of the road, off the sides of the road and shoulder, and into the ditch. Be careful not to form a secondary ditch by leaving a ridge of materials between the road surface and the ditch.

Dust Control

When a gravel road has dust blowing from it, the dust is the fines and, therefore, the binder is being lost. The road is deteriorating. With an average daily amount of traffic, untreated gravel roads lose about one inch of surface per year. This is equal to about 500 tons of material in a year's time for each mile of unpaved road. To replace the lost gravel can cost from $1,000 to $1,500 per mile each year for just materials.

It is economical for a municipality to stabilize the gravel with calcium chloride, salt, cements, or other agents. In the long run, it may actually be more cost effective, while also keeping the roads in better condition. In addition to stabilizing the soil and reducing maintenance costs, a dust control program improves safety and reduces harmful effects to crops, the environment, and people.

Do not apply used motor oil for dust control. It is toxic and can enter the ground water.

Tips

- Work gravel surfaces when moist or after a rain.
- The best time to use a york rake for removal of cobbles is when traffic volume is low.
- Most washouts occur because of improper drainage.
- Avoid a double ditch. Leaving a farrow in the traveled way will keep water on the road. Smooth the surface to the ditch line. Grade from the outside to the center.
- Layers of gravel should be at least twice the thickness of the largest stone size. If you add a six-inch (6") gravel course, the largest stone should be three inches (3").

- A key to maintaining problem washboard areas and achieving a tight, strong surface is to use high-quality crushed gravel. Also check soil quality in the base as well as the need for under drainage.
- In mud season use quality gravel instead of sand to correct problem wet areas.
- Instead of disturbing the entire roadway to correct occasional potholes on an otherwise sound gravel surface, patch with a 50/50 mixture of crushed gravel and calcium chloride, sprinkle with water, and tamp.
- Establish a schedule for periodic inspection and resurfacing of all gravel roads.

Summary

A gravel surfaced road will provide a good all weather road when properly constructed and maintained. Quality road gravel will depend upon local availability and budget. The material used should be suitable for use as a base for future hardsurfacing. By putting down a good base in the beginning, the weak spots can be found over a period of years and corrected before applying the permanent hard surface. Resurfacing will be necessary from time to time to correct potholes, transverse corrugation or "washboard" effect, and rutting. The shoulder should also be maintained when reshaping. Dust control stabilizes gravel and prevents the binder material in the gravel from blowing away.

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