

Questions 'N' Answers

From Cornell Local Roads Program - April 1990

QUESTION:

We built a one-inch hot-mix overlay on a road that showed moderately deep, narrow ruts in the wheelpaths. After a few months of summer traffic the ruts came right back again. What causes this to happen?

ANSWER:

There are a variety of factors that could contribute to wheelpath rutting, but the ruts came so quickly, I would say it was because you did not put down a leveling course to begin with.

A leveling course (also called a T&L course or a scratch coat) is a thin layer of sand-asphalt mix which is placed on top of the old road surface just deep enough to fill the ruts. It is compacted immediately, using a pneumatic rubber tired roller (a steel drum roller will bridge across the ruts and not properly compact the mix). Because the leveling course is so thin, you must place it on a very hot day in the middle of the summer, and get the roller on it quickly, if you hope to compact it well. It is usually a good idea to let traffic run on it for a few days to help compact it, before placing the overlay on top.

The leveling course helps to eliminate the return of the wheel path ruts. An overlay that is placed above the leveling course will be of uniform thickness across the lane (Figure 1). When it is compacted (typically by a steel drum roller) the density is uniform. If good density is achieved, traffic will not have much effect on it. If the leveling course is omitted, then when the overlay is placed it is thicker in the wheelpaths by the amount of the rut depth (Figure 2). When the overlay is compacted, the material between the wheelpaths gets more compaction effort because it is thinner than the material in the wheelpaths. Traffic gradually compacts the material in the wheelpaths, and the ruts reappear.

There are several other possible, but less likely, causes. The overlay material or the old road surface could be unstable. Low stability is usually caused by having too much asphalt in the mix. This condition will

sometimes be accompanied by flushing of excess liquid asphalt to the surface, initially just in the wheelpaths and later across the entire surface. Often materials of low stability will exhibit transverse ripples (corrugations) as well as wheelpath ruts.

Another possible cause could be a weak base course or subgrade. Ruts due to base failure are usually wider and deeper than ruts due to surface failure. Ruts due to subgrade failure are usually very wide, each being perhaps half a lane or more in width. Since you describe your ruts as being narrow, this is not likely to be applicable in your situation.

In recent years wheelpath ruts have become an increasing problem on roads that serve large trucks. Although axle loads and gross vehicle weights are regulated according to law, tire pressures are not. This posed no problem when trucks were using tire pressures of 65 to 85 pounds per square inch (psi). But today truck tire pressures commonly run from 100 to 125 psi, which

often leads to rutting on hot summer days. If you have a large number of trucks on the road in question, they could be aggravating the problem.

Overlay of uniform thickness on top of leveling course.

With both tire pressures and the number of trucks using the roads steadily increasing, it is more important today than ever before to use a leveling course to fill in the ruts as part of the construction of an overlay. To get better performance in the future, specify a high stability hot-mix. And be sure to construct when the weather is very hot, to help you get good compaction of the new layer.

Overlay of non-uniform thickness on top of the old road surface. Material in the wheelpaths does not compact properly. Ruts reappear due to compaction under traffic. ■

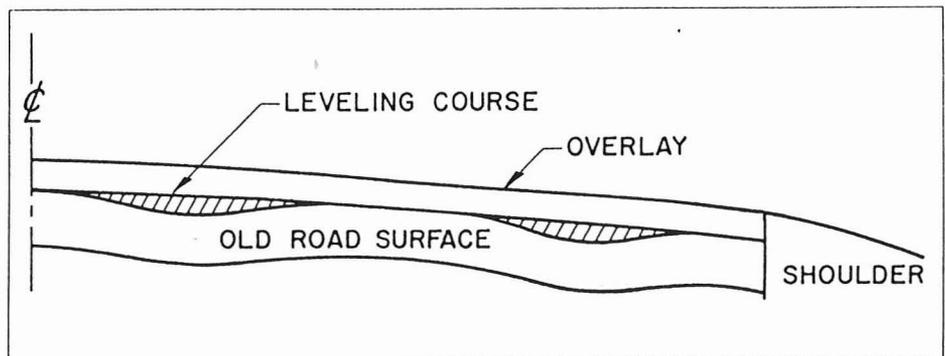


Figure 1. Overlay of uniform thickness on top of leveling course

Figure 2. Overlay of non-uniform thickness on top of old road surface. Material in the wheelpaths does not compact properly. Ruts reappear due to compaction under traffic.

