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An Investigation of the Washboard Road

This research project was conducted to study the washboard road phenomenon that I live with every day in Morgan County, Colorado. I wanted to determine why rippling occurs, and how it could be curtailed. My hypothesis was that both the velocity and mass of wheels traveling on gravel roads would affect washboarding.

To study washboarding, I designed around 40 cm diameter metal table mounted on a wooden pedestal. I placed a cardboard lip around the perimeter of the metal circle. I also placed a cardboard lip in an 18 cm diameter circle in the center of the metal circle. In this manner, an 11 cm “roadbed” was formed around the metal table. The roadbed was filled with salt, 3 cm deep. The table was placed on a phonograph that would turn it at either 33, 45, or 78 RPMs. A 3 inch John’s BSR racing tire was mounted onto a ring stand with a clamp. The tire was placed in contact with the salt in the roadbed. The phonograph was then run at the three different speeds, for 200 seconds. Data was taken on the distance between ripples and the height of the peaks and troughs. I also inserted a straw onto the roadbed to determine the effect of irregularities in the road surface.

My data showed that as the turntable speed increased, both the amplitude of the ripples and the wavelength increased. In other words, as the velocity increases, the washboarding gets larger and spaced farther apart. My data also showed that the build-up of an incompressible material, (the straw placed in the roadbed) causes a vertical oscillation of the wheel that induces the formation of rippling. I also found that the mass of the wheel did affect how fast rippling occurred.

My conclusion is that the washboarding of gravel roads is inevitable even when tires only move over roads at 1.2 miles per hour. Morgan County will have to continue to spend money grading gravel roads to keep them safe for drivers. One way to save money in the long run would be to pave the more traveled roads.