ROAD METER CORRELATIONS: IOWA STATE HIGHWAY COMMISSION

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In April of 1967, Phil Brua of the Portland Cement Association (PCA) demonstrated the use of the PCA road meter to the Iowa State Highway Commission. The apparatus showed real promise for road inventory, so a unit was constructed and by July was installed in a 1967 Chevelle station wagon (because it was the only passenger vehicle with coil-type rear springs available). This unit was functional, but it was believed that a standard-sized automobile with coil-type rear springs would yield better results. The purchasing department obtained a poorly equipped 1967 Ford Custom with very weak suspension. This vehicle was unsatisfactory as a road meter vehicle. In the spring of 1968, 3 units were mounted in fully equipped 1968 Ford Customs with very good results.

It was apparent from the beginning that the road meters would have to be correlated against a more stable and exacting standard to make the values meaningful from one agency to another. The 3 identical Fords, all having identical road meter units, exhibited enough variation in count to prove the need for individual correlation of each car.

We have used some rating panels in Iowa but have not been completely satisfied with these. The BPR roughometer and the CHLOE profilometer were available and were considered. The CHLOE profilometer was selected as a standard because, if it is operated on roadways having uniform surface textures, it yields very accurate and repeatable results. It also is not dependent on a suspension system, and if the electrical calibration checks out it yields reliable results. Because it checks a line profile, its repeatability varies with the transverse undulations of the various roadways but is generally very good.

The correlation test sections should be carefully selected. Sections should have uniform ridability with no extreme profile in or just prior to the test section. Surface texture of all test sections used for the correlation must be uniform because open textures will yield erroneous CHLOE results. In early correlations, both asphaltic concrete and portland cement concrete sections were used. A greater surface variation and a winter change were soon evident in the asphaltic concrete sections. This did not seem to be true on portland cement concrete, which had a relatively uniform burlap drag finish; therefore, all correlation sections were selected on portland cement roadways. One case has been enountered where dogs had played on the slab prior to hardening of the portland cement, and the uniform texture was destroyed. One-half mile long correlation sections have served satisfactorily. They are short enough for the CHLOE (3 mph) and long enough for the road meter (50 mph). The sections should include a wide range of present serviceability ratings. We have a range of 2.7 to 4.6. A greater range is available, but we choose to limit our sections to relatively new, more stable sections, thus making it difficult to find roads below 2.7. Usually these are quite old, very broken, and not as uniform as desired.

In the actual correlation operation, the CHLOE is operated in both the inside and outside wheelpaths. The reason for this is that the road meter is influenced by both wheelpaths, and from experience there is no definite relation between the CHLOE slope variance of the inside and the outside. The values obtained are averaged to determine the CHLOE slope variance of a section.

The CHLOE slope variance and the road meter summation of counts are determined for all correlation sections (we currently have 54). In 1968, we assumed a straight-line relation between CHLOE slope variance and summation of count. The data, however, continually exhibited a certain amount of curvature (Fig. 1). This curvature varies with the vehicle, and in general we have decided that stiffer suspensions yield straighter correlation lines and that softer suspensions yield more curvature. There are many factors that influence this, however. The data are submitted to the data processing center by way of a computer terminal, and a parabolic fit is determined by the method of least squares. If a straight line is the best fit, the X^2 term will be zero, and a linear relation will result. In all cases the correlation coefficient has been better for the parabolic fit than for a linear fit.

We determine a correlation annually in May and then make weekly checks on 6 convenient correlation sections to verify the original correlation. The resulting correlation equation is combined with both the flexible and rigid equations as determined at the AASHO Road Test, and the result is plotted on a semilogarithmic graph.

An inventory of Iowa's 10,000 miles of primary highway including a cracking and patching survey has been conducted and stored on magnetic tape in the data processing center to be used in the determination of maintenance and construction priorities.

Figure 1. Relation between CHLOE slope variance and road meter summation of counts.