CORRELATIONS OF WISCONSIN ROAD METERS

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The first Wisconsin road meter was purchased by the Wisconsin Division of Highways in September 1968 to supplement the use of the CHLOE profilometer as a means of evaluating pavement serviceability. It was evident by this time that the CHLOE was not suited for the continued use necessary for a full evaluation program. Because the present serviceability index (PSI) rating system had been adopted for pavement evaluation and because the CHLOE profilometer was the original instrument involved in this system, it was decided to correlate the output of the road meter to the output of the profilometer. This eliminated the need for a panel rating program and provided a relatively time-stable rating standard.

ORIGINAL CORRELATION

In the original correlation, the summation of the squared deviations of the road meter was related to the slope variance output of the CHLOE. The correlation was accomplished by operating both instruments over selected pavement sections to obtain raw data. The profilometer was run in the outer wheelpath in at least three 0.1-mile long sections within a selected 1-mile section of pavement. The slope variance values obtained from these 3 runs were averaged, and this average was compared to the average of several summations of counts obtained by the road meter traversing the entire 1-mile long section.

The pavements were divided into 2 types, rigid and flexible, and the test sections were selected primarily on the basis of their level of ridability, with the objective of yielding a broad distribution of values for comparative purposes. However, this particular objective was not satisfactorily achieved because there was a considerable grouping of points rather than a good distribution among all values.

The odometers of vehicles were used to lay out the sections and to situate them near prominent landmarks. Before the completion of this original correlation, it was evident that this method of location left much to be desired because of variances from one odometer to another and interpretation of the readings.

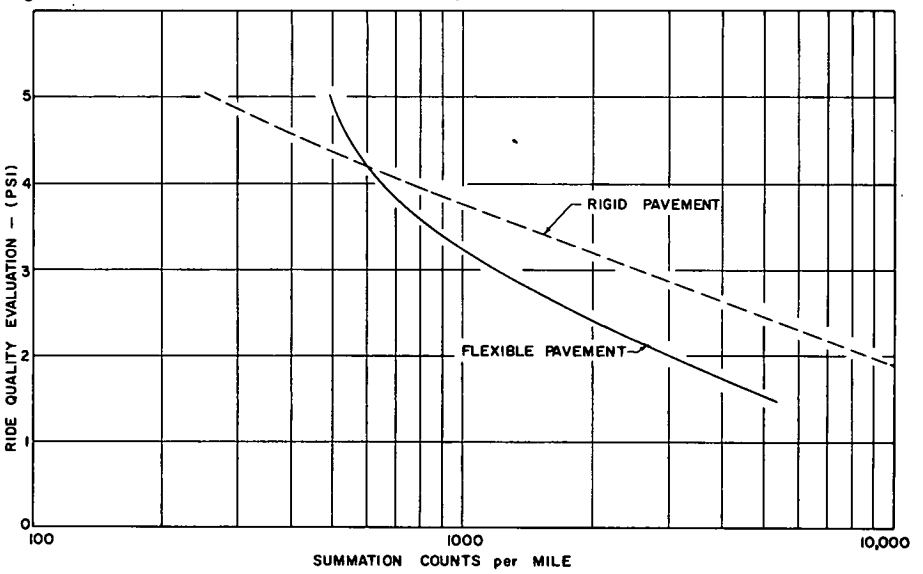
The end result of this first correlation is shown in Figure 1. Note that both correlation lines are curves. This is due to the fact that the correlation was based on a linear relation between the summation of counts and the CHLOE slope variance rather than on a linear relation between summation of counts and PSI. These curves have been used since 1969.

1971 CORRELATION

By the summer of 1971, the 1968 Ford that housed the road meter had traveled about 85,000 miles, so an order was placed for a new automobile, which was delivered in the fall of 1971. Several drastic changes were incorporated in the 1971 road meter, so a new correlation was required. In addition to the new automobile, changes were made to the meter, including faster counters and an automatic nulling device.

Profiting from experience with the initial correlation, we tried to obtain data points for the full scale of the PSI (2.0 to 5.0) for the new correlation. This required careful

Figure 1. Wisconsin road meter conversion chart.



screening of test sections by conducting preliminary testing with the CHLOE profilometer. Information previously obtained using the CHLOE and the 1968 road meter was used in selecting sections of pavement for correlation, but new sections were included. The test sections were located from highway network data information (HNDI) reference markers and prominent landmarks. These HNDI markers are part of a system that has been recently instituted in Wisconsin. The markers are located along state trunk highways at structures, town roads, and property lines and are generally located one per mile. They provide a convenient and permanent reference and a means to identify locations in the computer program.

The pavement types were divided into 4 categories rather than the 2 used for the original correlation. The 4 types were rigid, flexible, flexible overlay over a rigid pavement, and a flexible mat over a portland cement concrete stabilized base course. This was done to determine if the type of pavement might influence the relation between the outputs of the road meter and the CHLOE. Wind direction, velocity, and temperature were recorded to document the conditions existing during the correlation surveys.

The test sections were 2,530 ft in length; the road meter surveyed the total length, and the CHLOE surveyed two 1,000-ft lengths plus one 500-ft length. Fifteen-foot gaps were provided between these 3 lengths so that the limitation of the numerical accumulations of the CHLOE computer would not be exceeded on rough pavements. The test sections were located primarily on tangent lengths of pavements and included cut and fill cross sections.

A typical survey consisted of operating the CHLOE profilometer in the outer wheelpath of the travel lane of each test section in each direction followed immediately by a run with the road meter. These runs were repeated in each direction of each test section to obtain replicate sampling. The data obtained will eventually be entered into a 5-step computer program that should produce a calibration curve relating the output of the road meter to the CHLOE output, a conversion chart relating road meter output directly to PSI, and information concerning the variability of the 2 instruments. The computer program had not been started at the time of the preparation of this paper, so it is not possible to present results of the correlation; however, it is believed that the results will provide a reliable basis for relating road meter output to PSI values for pavements.