TEMPERATURE AND VEHICLE SUSPENSION EFFECTS

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The first winter survey conducted with a road meter in Wisconsin occurred during the winter of 1968-1969. This survey was conducted over the entire rural Interstate system in Wisconsin. Following this original survey, the entire system was surveyed in the summer of 1969, winter of 1969-1970, summer of 1970, and winter of 1970-1971.

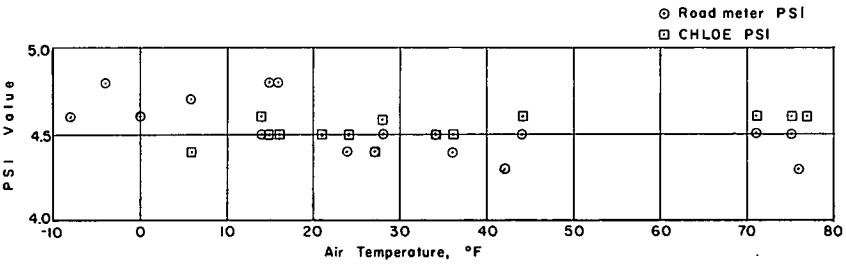
It was noted in these early surveys that winter present serviceability index (PSI) values typically were higher than summer values; however, because the differences were slight and inconsistent, they were viewed as reflecting normal variation that is caused by repeated use of the instrument and effects such as wind velocity and direction. However, by the summer of 1971, when 3 comparisons between winter and summer surveys were available, it was evident that the winter values were generally slightly higher than the summer values for those pavements that had relatively good longitudinal profiles (3.5 to 4.5 PSI). This was contrary to what would normally be expected; that is, pavements normally are expected to be slightly rougher in the winter. There were many pavements, however, that became significantly rougher during the winter months, and the road meter values did reflect this increased roughness. Thus, it was suspected that the road meter was being affected by low temperatures during winter surveys, but the effect was not sufficient to override extreme roughness.

In an attempt to evaluate the influence of temperature on the road meter, a study was initiated in the fall of 1971 to conduct continuing surveys through the fall, winter, and spring. Because temperature could also be expected to influence the pavement (and therefore ride quality), the CHLOE profilometer was used throughout the evaluation. It was our opinion that the CHLOE would not be influenced mechanically or electronically by low temperatures, so any change in slope variance (or PSI) would be due to change in the pavement profile. Thus, a comparison of changes in road meter values and CHLOE values with variations of air temperature at the time of testing should provide an indication of the influence of temperature on the road meter.

The pavement selected for the continuing surveys was a 2-lane portland cement concrete pavement near Madison. The pavement is a 9-in. jointed concrete slab, 24 ft wide (with joints at about 80 ft cc), on 9 in. of gravel base and 9 in. of granular subbase. The 1970 average 2-way daily traffic was 2,645 vehicles. This particular section of pavement had been used for numerous tests with a road meter, so considerable information on its general performance was available.

The comparison was started in December 1971, and the resultant values are shown in Figure 1. The values shown are averages for 2 tests conducted by each instrument in the northbound lane of the test pavement. Note that the values obtained with the CHLOE profilometer have remained relatively constant at 4.5 PSI, with occasional deviations above or below this value but well within the range of accuracy of the CHLOE. In contrast, the road meter results were consistently above 4.5 PSI when the air temperatures were below 20 F (down to -10 F) but fell to values generally below 4.5 when temperatures were above 20 F. Note also that the values obtained when air temperatures were between 70 and 80 F were about the same as those obtained between 30 and 50 F. As a means of checking the road meter values, the road meter was used to also

Figure 1. Relation between temperature and output of road meter versus CHLOE profilometer.



survey the southbound lane. The values were very similar to those shown for the northbound lane.

It is apparent from the results obtained that the road meter is affected by extremely low temperatures, perhaps because of a stiffened vehicle suspension system. In view of this limitation of the road meter, several alternatives are being considered for future observation, including (a) suspension of operations when air temperatures are below 25 F or (b) determining if a correction factor could be applied if operations were continued during cold weather.