MONITORING AND ANALYSIS OF DATA OBTAINED FROM MOISTURE TEMPERATURE RECORDING STATIONS

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Executive Summary

The performance of asphalt concrete pavements is in part affected by the seasonal variations of the resilient modulus of the AC layer and of the subgrade soil. To determine the variation of these parameters throughout Ohio, seven moisture-temperature-rainfall recording stations, previously installed during an Ohio Department of Transportation-funded project, and two additional ones installed during this project, were monitored for an additional period of 2-1/2 years. These stations, located to include various climatic zones and the four most common soil types within the state, recorded air, asphalt concrete and subgrade soil temperature, rainfall and moisture content (or degree of saturation) of the subgrade soil on a two-hour basis.

Recorded data led to the development of polynomial equations to calculate the average asphalt concrete pavement temperature from the air temperature and to the division of the state into three temperature zones: Northern, Central and Southern.

Recorded depths of frost penetration indicated average depths of 45 to 61 cm. within the southern zone and of 70 to 82 cm. within the northern zone. Similarly, the northern and the southern zones experience an average of 7 to 12 and 4 to 5 freeze-thaw cycles, respectively.

The degree of saturation calculated from moisture and temperature sensor readings varied form about 90% to 100% throughout the monitoring period. The late spring to early summer consistently led to a higher degree of saturation at all depths.

Finally, a method to back calculate the resilient modulus of subgrade soils (Eri) at the break point from measured FWD deflections was developed. Seasonal averages of this modulus were obtained at each of six station locations where FWD testing was conducted. Seasons were ranked in terms of expected higher resilient modulus. The designated "fall" testing period (early fall) showed the highest followed by "summer", "winter" and "spring" in decreasing order. Determined monthly and seasonal variation of material properties will find immediate application as inputs in mechanistic-empirical pavement design procedures.

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