A METHODOLOGY FOR ESTIMATING SEASONAL NONLINEAR MODULUS VALUES FOR DESIGN AND EVALUATION OF ASPHALT PAVEMENTS

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ABSTRACT:
This paper discusses the influence of traffic loads, the environment, and their interactions on aging, material degradation, and pavement deterioration. These factors cause temporal variations in asphalt temperature, moisture content in granular layers, nonlinear modulus values subject to the truck axle load, and pavement response calculations. It is shown that the coefficient of variability of asphalt pavement modulus value can be around 60 % in a typical year in temperate climate. Other granular base, subbase, and subgrade soils show 10-20 % variability in their modulus values. The least variability is shown by stabilized sublayers. The resulting mean values of surface deflection and vertical compressive strain in the subgrade are about 30 % higher using seasonal nonlinear modulus values compared to the results using modulus values backcalculated from deflection data. This may lead to reduced pavement life. This paper presents a comprehensive mechanistic design methodology for calculation of seasonal nonlinear modulus values using climatological data, asphalt pavement layer structure, and design traffic loads. Examples demonstrate that seasonal variations in pavement layer materials must be considered for meaningful pavement thickness design procedures and performance modeling studies.

KEY WORDS: Asphalt pavement, design, performance, modulus, variability