

REVIEW OF THE EFFECT OF TEMPERATURE ON PAVEMENT ANALYSIS AND PERFORMANCE

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ABSTRACT

The discussion of the structural damage of a flexible pavement due to the combined influence of traffic loading and environmental considerations has been the thought that this knowledge, measured in terms of stress, strain and deflection, could be applied in some way to the pavement analysis, performance prediction, and design. Such application can not be realized, however without the ability to determine the state of stress that occurs within the pavement due to the effect of loading and environmental factors. In addition, mechanistic-empirical pavement design methods for flexible pavement are based on the assumption that the pavement performance and life are inversely proportional to the magnitude of the traffic-induced pavement strains. These strain vary with the stiffness of the asphalt layer, which in turn, varies with temperature. Because these relationships are nonlinear, the additional pavement life consumed at higher-than-average temperature is not offset by savings at lower-than-average conditions. As a result, whenever average pavement temperatures are used to determine the asphalt stiffness, pavement life is overestimated. There are two major failure mode of thermal cracking: low-temperature cracking and thermal fatigue cracking. Low-temperature cracking is caused by accumulated thermal stresses in the pavement layer during cold winters. Thermal fatigue cracking is caused by daily cyclic thermal loading. This paper presents a review of the effect of temperature on asphalt mixture stiffness and pavement performance and life.