

Impact of Changing Environmental Parameters on Flexible Pavements Performance

By

Sameh A. Galal and Mostafa A.H. Abo-Hashema

ABSTRACT

The objective of this paper is to investigate the impact of changing the environmental parameters on performance of flexible pavements. There are many input parameters to the Mechanistic-Empirical (M-E) design procedure such as traffic loading, structural capacity, and variation of pavement material properties due to seasonal environmental changes, especially the temperature for asphalt materials and moisture variations for unbound materials. The variation of the unbound material properties due to environmental effects is incorporated in the M-E design procedure via a series of Seasonal Adjustment Factors (SAF) that adjust the unbound layer moduli from one season to another. Error in estimating SAFs of unbound layers leads to variability in the designed asphalt thickness and consequently in the pavement performance. To achieve the objective of this paper, a sensitivity analysis has been performed on a selected pavement cross section located in the northern of Egypt. The analysis was conducted using M-E overlay design program based on Egyptian climatic zones, named OLFLEX. In this analysis the errors in estimating SAFs were changed from $\pm 10\%$ to $\pm 50\%$ creating 121 runs or design cases. For each run, the designed thickness and corresponding pavement responses, number of repetitions to failure (due to fatigue cracking and rutting distress), and year of failure have been calculated. The results indicated that changing the environmental parameters, represented by SAFs for unbound layers, has a significant effect on pavement performance.