

EFFECT OF OVER/UNDER DESIGN ON LIFE-CYCLE COST OF FLEXIBLE PAVEMENTS

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Abstract

The Mechanistic-Empirical (M-E) overlay design procedure incorporates many design factors. These factors include the expected future traffic, the structural capacity of the existing pavements, and the variation of pavement material properties due to seasonal environmental changes, especially the temperature of asphalt materials and moisture variations in unbound materials. Miscalculation of these factors produces over or under design cases. The effect of these blunders on the pavement Life-Cycle Cost (LCC) has major concern to pavement designers and decision makers. Therefore, this study addresses the effect of over/under design due to underestimation/overestimation of Seasonal Moduli Adjustment Factors (SAF) of unbound materials on the pavement LCC. Sensitivity analysis has been conducted on a pavement cross section located north of Egypt. The analysis was performed using M-E overlay design program based on Egyptian climatic zones, named OLFLEX. Analysis of the results indicated that variability of SAF of the base layer has more sound effect than of the subgrade layer on the designed overlay thickness and pavement LCC. For over design cases, every 1% increase in overlay thickness produces an average of 1.16% reduction in LCC due to underestimating the SAFs. For the under design cases, every 1% decrease in overlay thickness creates an average of 0.17% increase in LCC due to overestimating the SAFs. The outputs of this study are considered beneficial and vigorous in designing and/or rehabilitating the flexible pavements.

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