سامية محمد مصطفى

شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية

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التوثيق الإلكتروني والميكروفيلم

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بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

STRESS AND DEFLECTION ANALYSIS IN RIGID PAVEMENTS DUE TO MOVING AXLE LOADS

A Thesis
Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science
in Civil Engineering

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وقل رب زدني علماً

صدق الله العظيم

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ABSTRACT

Since the beginning of this century, many procedures have been used in the analysis of rigid pavement subject to wheel loads and environmental effects. Among these methods is the finite element approach which has become the most commonly used. In this study, the Finite Element Method (FEM) was utilized to analyze rigid highway pavement subject to static and moving axle loads. This was done by developing two computer programs, one for static axle loads and the other for moving axles. In these programs, every possible effort was made to ensure the program efficiency in handling matrices and storage requirements. The model considers several parameters that represent pavement and loading properties including axle load, axle speed, load position, tire pressure, slab dimensions, modulus of subgrade reaction, and condition of load transfer at transversal joints. Slabs are idealized into rectangular plate elements connected at their corners and subject to bending stresses. The Winkler model was used to simulate the subgrade as individual elastic and massless springs.

By assigning values to the named parameters, the proper model can be used to determine the resulting deflections and stresses throughout the slab area. The model then searches the results for maximum deflection and stress that correspond to assigned pavement and load properties. Over 200 computer runs were made to provide enough results to help investigate the effect of individual parameters on the trends as well as the absolute values of the maximum deflection and stress. The

analysis of results showed that the maximum stress and deflection occur at the transversal joint when the axle load is located near to that joint. This may call for special attention to the design and load handling at slab transversal joints. Further analysis of the results indicated that maximum deflection depends on the axle load, modulus of subgrade reaction, and load transfer condition at the transversal joint, while maximum stress depends on the axle load and slab thickness. The dynamic effect on deflection was found to be higher for pavements with high relative stiffness and deflection in this case may reach 140% of its static value. Interestingly, the axle speed had no significant effect on the maximum stress.

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