DEVELOPMENT OF LOCAL SAFETY PERFORMANCE FUNCTIONS FOR EGYPTIAN MULTI-LANE RURAL DIVIDED HIGHWAYS BASED ON HIGHWAY SAFETY MANUAL PROCEDURE

By

Hend Ibrahim Mohamed Saad Asal

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
CIVIL ENGINEERING - PUBLIC WORKS

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

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Title of Thesis:
Development of Local Safety Performance Functions for Egyptian Multi-Lane Rural Divided Highways Based on Highway Safety Manual Procedure

Key Words:
Road traffic crashes in Egypt; Highway Safety Manual; Calibration Factor; Crash Modification Factors CMF's; Safety Performance Functions.

Summary:
The Highway Safety Manual (HSM) provides several safety performance functions (SPFs), which are used to predict the expected average crash frequency on a roadway network given the geometric features, section length, and traffic volume. The HSM was developed in the US using road and crash data specific to the environment in the US. Every state was encouraged to develop locally derived models suitable for the local characteristics of roads and crashes. The objective of this research is to assess the opportunity of adopting the HSM on rural multi-lane divided highways in Egypt. This thesis calibrated SPFs considering Egyptian road factors. The SPFs were first calibrated using the default Crash Modification Factors (CMFs), and the results were compared with the actual crash events. The results showed the need for a further step to develop locally derived SFPs using the Poisson-Gamma regression technique. The developed models describe the mean crash frequency as a function of natural logarithm of the annual average daily traffic and segment length. Several factors were investigated including curve radii, percentage of heavy vehicles, curve length, median width, shoulder width, and curve density. However, it was found that the curve density was the main geometric feature affecting crash occurrence on rural multi-lane divided roads. The results would help designers in regions of driver behavior different than the US to benefit from the HSM procedure and better select countermeasures to provide improved safety countermeasures. In addition, the thesis proposed a methodology for selecting proper countermeasures and conducting an economic appraisal and safety effectiveness evaluation for Cairo Alexandria Agriculture Road as a case study.

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