Axle Load Distribution Characterization for Mechanistic Pavement Design

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Abstract

As per the World Bank records of the year 2018, Sri Lanka had the highest road density among the South Asian countries with 173.9 km of roads per 100 square kilometres of land. Sri Lankan government reserves a considerable amount of finance in every year for developing and maintaining the existing road infrastructure, which is a well-recognized national priority. Currently, in local road designs, the Overseas Road Note 31 and AASHTO method are the most frequently used design references. However, in these methods, the consideration given for utilization of readily available in-situ materials and incorporating characteristics of substandard materials into the designs is not significant. Therefore, in most of the occasions, the economics of the construction processes are adversely affected due to overdesigns. The AASHTO Mechanistic-Empirical (M-E) method of pavement design combines the physical causes such as stresses, strains, and deflections within a pavement structure and the empirical mathematical models. It also allows the designer to utilize in-situ materials and allows to optimize the pavement design to suit the conditions at the site. Although attempts had been made to adopt M-E design method in Sri Lanka, since the M-E design process requires a lot of data input, the preference of local practitioners in using the M-E method is not satisfactory.

Out of the input parameters required for M-E design, traffic volume and axle load distribution data are crucial parameters. This study aimed at identifying trends in axle load group type distributions in different regions and to establish a classification for the pavement loading in regions throughout the island. It has been found that there are similar patterns in the distribution of axle group types throughout the island. Accordingly, on average the total axle counts in different regions constitutes of 57% single axles with single tires, 38% single axles with dual tires, 5% tandem axles with dual tires, and 0.1% tri axles with dual tires. Further, in this study, hierarchical clustering techniques have been utilized to identify geographical regions with similarities in pavement loading conditions. An attempt for zoning traffic load distributions for selected geographic areas has been presented in this study. Comparative for the resource utilization in obtaining axle load distributions, obtaining manual classified counts for a road is convenient. With the aid of the identified traffic load zones, this study will be useful for determining the traffic data input for M-E design, with a degree of accuracy level 2 as defined in the M-E design method.

Keywords: *Axle load distribution, Traffic load zoning, Mechanistic-Empirical pavement design*

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