

Evaluation of PCU Factors for Two Lane Sub-urban Roads

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Abstract

Passenger Car Unit (PCU) or Passenger Car Equivalent (PCE) is defined as the number of passenger cars displaced in the traffic flow by any other vehicle mode under the existing roadway and traffic conditions. PCU value used to convert all non-uniformity of vehicle modes into a common unit and is used to define the capacity of the road. The nature of the traffic on developing countries like Sri Lanka is heterogeneous with wide variation in physical dimensions, weight and dynamic characteristics. Furthermore, the operating characteristics of the road users and the roadway environment also vary.

PCU factors used at present in Sri Lanka have not been reviewed to reflect the present vehicle characteristics and composition, road geometric and surface conditions.

Traffic data were collected using video filming technique to record vehicles in both directions for 2-3 hours during different phases of weekdays on sub-urban two-way two-lane road segments. Study locations are selected based on uniformity of road characteristics and non-obstruction sections to traffic due to bus stops, intersections etc.

In this study, PCU factors were derived using the method proposed by Chandra et al (1995). According to Chandra, PCU factors for different vehicles under mixed traffic condition is directly proportional to the speed ratio and inversely proportional to the space occupancy ratio with respect to the standard design vehicle i.e. a car.

$$PCU_i = \frac{V_c/V_i}{A_c/A_i}$$

V_c – Speed of car

A_c – Projected rectangular area of a car

V_i - Speed of i^{th} type vehicle

A_i - Projected rectangular area of i^{th} type vehicle

The main findings of the study give the PCU factors for 10 vehicle categories. PCU values are similar in the current study and existing literature for ‘Van’ and ‘Medium Commercial Vehicle’ categories. PCU values for above two types are 1.1 and 2.0 respectively. But other categories show a significant variation. The new PCU value for ‘Motorcycle’ and ‘Three-wheeler’ are 0.2 and 0.53 respectively while the existing values for those two categories are 0.5 and 0.75

respectively. This study gives PCU 2.06 for 'Medium Bus' and 3.41 for 'Large Bus'. But the existing values for above two classifications are 1.6 and 2.4 respectively. The new PCU value for 'Small Commercial Vehicles' and 'Large Commercial Vehicles' are 0.97 and 3.36 respectively while the existing values for those two categories are 1.5 and 3.8 respectively. PCU value for the new vehicle category called 'Passenger Car (Small)' is 0.75.

Derived PCU factors can be used for the planning and design purposes of two-way two-lane roads in Sri Lanka. Further research could be carried out to determine PCU factors for Expressways, Multilane highways and Intersections.

Key Words: PCU, PCE, Heterogeneous traffic flow, Highway capacity

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