Volume : 1 | Issue : 5 | May 2012 ISSN - 2250-1991

Research Paper Engineering

Side Friction and Side Friction Factor (FARIC) In Ahmedabad Road Link

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ABSTRACT

Side friction factors are defined as all those actions related to the activities taking place by the sides of the road and sometimes within the road, which interfere with the traffic flow on the travelled way. They include but not limited to pedestrians, bicycles, non-motorised vehicles, parked and stopping vehicles. These factors are normally very frequent in densely populated areas in developing countries, while they are random and sparse in developed countries making it of less interest for research and consequently there is comparatively little literature about them. The objective of this thesis is to analyze the effect of these factors on traffic performance measures on urban roads.

Keywords :

I. INTRODUCTION

Side friction:

Side friction is defined as a composite variable describing the degree of interaction between the traffic flow and activities along the side(s) and sometimes across or within the traveled way (Bang etal. 1995). Activities likely to disrupt traffic flow include the following;

- Blockage of the traveled way (i.e. reduction of effective width) which include:

a) Public transport vehicles which may stop anywhere to pick up and set down passengers
b) Pedestrians crossing or moving along the traveled way
c) Non-Motorized vehicles and slow moving motor-vehicles

- Shoulder activities

a) Parking and un-parking activities
b) Pedestrians and non-motorized vehicles moving along shoulders

- Roadside activities

a) Roadside accessibility including vehicles entering and leaving roadside premises via gates and driveways
b) Trading activities (i.e. food stalls, vendors), and movement of vehicles and pedestrians depending on land use type.

II. METHODOLOGY

Data collection was focused to address the following components:

- Traffic flow variables: traffic flow, speed, free-flow speed, traffic composition and directional distribution.
- Geometric characteristics: road width, lane width, shoulder width and study segment lengths.
- Side friction factors: Number of pedestrians, bicycles, non-motorized vehicles and Parked/stopping vehicles.

Different methods were applied for different data types involved in the collection scheme. Video recording was chosen as the primary method of data capture of flow characteristics, which included traffic flow, traffic composition, and passage times or travel times of individual vehicles through the study segments. Side friction data were video recorded, but in principle they were manually recorded in the field using manual observers. Geometric characteristics were simply measured by using tape measures. Further explanation on the subject is provided below. It is however important to note that the use of video method had its own disadvantage. Video by itself is not 'data': the data 'collection' actually takes place from it in the laboratory. This has one major implication for manpower requirements. Data is obtained from the video film by repeatedly running, re-running and freezing the video, consequently the laboratory time becomes many times longer than the field time. One hour of field recording required approximately ten laboratory hours for data collection.

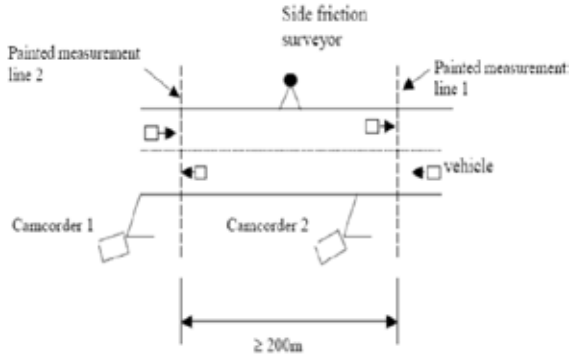

Figure 1: Method for road link surveys (2lane-2way roads)

III. SIDE FRICTION FACTER

Effective way of performing impact analysis of side friction was to combine the individual frictional components into one unit of measure. This had two advantages:

- To reduce the number of variables and consequently reduce the complexity of the analysis.
- To make it easier to judge whether friction was significant or insignificant on a given site in terms of one unit of measure instead of dealing with individual components

The procedure of combining these factors is described below.

Friction factors (determination of 'FRIC')

Based on the advantages mentioned above, it was decided to combine the individual friction factors into one unit of measure. A name for this unit was called 'FRIC'. The choice of the name was arbitrary to suit the theme of the study. 'FRIC' is

essentially a short version of 'friction'. 'FRIC' was determined by adding the weighted standardized coefficients of the negatively correlated individual factors to the criterion variable. It was thus important, first to establish these coefficients by performing regression analysis involving flow and the individual frictional items as independent variables and speed of the light vehicles as the criterion variable. The following equation was applied:

VLV= A+B1 (FLOW)+ B2 (PED) + B3 (BIC)+ B4 (NMV) + B5 (PSV)

Where:
VLV = Observed average speed of light vehicle
A = Regression constant which is the free-flow speed
B1, B2, B3, B4, B5 = Regression coefficients for explanatory variables.

SPSS computer program was used for the computation of the above equation and the results included the beta coefficients, which are standardized coefficients. These were weighted and summed up to determine the unit measure of 'FRIC' by applying the following equation:

FRIC = A*PED + B*BIC +C*PSV + D*NMV

Where,
PED= Pedestrians (No./200m/hr)
BIC=Bicycles (No./200m/hr)
PSV= Parking and stopping Vehicles (No./200m/hr)
NMV=Non-motorized Vehicles (No./200m/hr)
A, B, C, D= Weighted standardized coefficients

The results from the SPSS program and the computation of 'FRIC' for each site are depicted in table .1 below. In the table it is indicated that those factors, which showed positive correlation with the dependent variable, were excluded from the derivation of 'FRIC'. Negative correlation implied that the factors reduced speed while positive correlation implied the opposite, such that the presence of friction factors increased speed, which was considered as an anomaly and intuitively not expected, and hence excluded. It is important to note that factors with negative correlation were included in the analysis regardless of their significance levels. This was based on the assumption that despite showing low significance levels as individual factors, yet they could anyhow have a contribution when combined together.

2LANE-2WAY ROAD						FRIC EQUATION
SITE	Independent variables	Significance level	Regression coefficients	Beta coefficient	wigheted coefficient	FARIC=A(PED)+ B(BIC)+ C(NMV)+ D(PSV)
Sharkhej-	FLOW	0.001	0.014	0.379		
narol road	PED	0.012	-0.089	-0.282	1	FARIC= 1(PED)+0.05(PSV)+
	BIC	0.851	-0.001	-0.002	0.004	0.0004(BIC)
R2=0.388	NMV	0	0	0	0	
	PSV	0.901	-0.013	-0.013	0.05	
Jamalpra-	FLOW	0.000	-0.009	-0.686	0	
narol road	PED	0.300	-0.015	-0.083	0.65	FARIC=1(BIC)+0.65(PED)+
	BIC	0.599	-0.018	-0.128	1	0.22(NMV)+0.21(PSV)
R2=0.180	NMV	0.091	-0.004	-0.028	0.22	
	PSV	0.763	0.041	0.27	0.21	
Ahmedabad	FLOW	0.000	-0.007	-0.526		
chiloda road	PED	0.959	0.001	0.006		FARIC=1(PSV)+0.27(BIC)
	BIC	0.709	0.007	0.01	0.27	
R2=0.628	NMV	0.656	0.027	0.047		
	PSV	0.065	-0.055	-0.147	1	
Dehgam-	FLOW	0.000	-0.009	-0.692		
chiloda road	PED	0.352	0.012	0.094	1	FARIC=1(PED)+0.82(PSV)+
	BIC	0.627	-0.006	0.047		0.02(NMV)
R2=0.092	NMV	0.976	-0.002	-0.002	0.02	
	PSV	0.454	-0.019	-0.077	0.82	
4LANE-2WAY ROAD						
Baroda-	FLOW	0.000	-0.012	-0.705		
narol road	PED	0.601	0.003	0.047		FARIC=1(NMV)+0.96(BIC)+
	BIC	0.253	-0.016	-0.112	0.96	0.56(PSV)
R2=0.646	NMV	0.141	-0.112	-0.117	1	
	PSV	0.414	-0.042	-0.065	0.56	
naroda-	FLOW	0.000	-0.009	-0.754		
narol road	PED	0.997	0.000	0.000		FARIC=1(PSV)+0.55(BIC)+
	BIC	0.346	-0.009	-0.080	0.55	0.35(NMV)
R2=0.555	NMV	0.691	-0.015	-0.028	0.35	
	PSV	0.040	-0.050	-0.146	1	
Ghandhinag	FLOW	0.000	-0.016	-0.812		
chiloda road	PED	0.001	-0.020	-0.215	1	FARIC=1(PED)+0.2(PSV)+
	BIC	0.776	-0.003	-0.019	0.009	0.09(BIC)
R2=648	NMV	0.111	0.086	0.091		
	PSV	0.453	-0.038	-0.043	0.2	
Himatnagar	FLOW	0.000	-0.007	-0.522		
chiloda road	PED	0.105	-0.016	-0.151	0.54	FARIC=1(BIC) +0.54(PED)+
	BIC	0.002	-0.039	-0.280	1	0.21(NMV)
R2=0.591	NMV	0.452	-0.039	-0.059	0.21	
	PSV	0.767	0.007	0.024		

Table.1: Determination of 'FRIC'

IV. CONCLUSIONS:

This thesis has been concerned with the concepts, theories, and methods related to side friction impact on performance and capacity of urban road links, and were performed in Ahmedabad road link as a case study. A major part of this work has focused on issues related to identification of side friction factors and application of various measurement methods. "FARIC" is establish these coefficients by performing regression analysis involving flow and the individual frictional items as independent variables and speed of the light vehicles as the criterion variable.

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