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## Traffic Speed-Flow Model for the Mix Traffic Flow on Surat Urban Arterial Road

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### ABSTRACT

*In India, the traffic in mixed flow can be classified as fast moving and slow moving vehicles or motorized and non motorized vehicles. The vehicle also varies in size maneuverability, control, static and dynamic characteristics.*

*The present study is carried out the effect of curve on speed. Under the mix traffic condition. The speed flow model was development by considering the straight road section. The model is developed using stream speed and flow rate. Also the effect of the vehicles composition is carried out to understand the speed flow characteristic. For the study Ring Road Fly over Surat is taken as case study. The development model with help the traffic engineering to plan and managed the future demand and supply using capacity.*

**Keywords :** Speed-flow model, straight road section

### 1.1 INTRODUCTION:

The urban traffic congestion has become a global phenomenon. Rapid urbanization and industrialization have caused drastically growth of vehicles all over the world. Several cities in developing countries have been suffering from a high degree of the congestion problem, which is mostly caused by two-wheel vehicles. Indian context the heterogeneity of traffic on the roads entails indigenous study to understand the stream flow behavior so that effective planning, design and operation of road network can be accomplished.

The speed-flow relationship is probably one of the most well-known and important relationships in the field of traffic engineering. The relationship finds important application in the Highway Capacity Manual (TRB, 2000). The speed-flow relationship provides an excellent overall or macroscopic description of the traffic stream. Study of heterogeneous traffic flow necessitates for the fundamental characteristics of traffic flow and derivation of Speed-Flow relationships for different categories of roads in India as one of the most important components of traffic flow behavior. These curves will be useful, in addition to estimate the capacity of the roads, to predict the traffic speed on divided roads for a given traffic volume over a wide range, which is an important input for planning of road networks and road traffic operations.

1.2 Data Collection: Videography survey the selected time durations of peak and off-peak hours in a day.

Periods	Time
MPH	09.00 AM TO 11.00 AM
NOP	12.00 PM TO 03.00 PM
EPH	05.00 PM TO 07.00 PM

Table no .1 selected study hours for Ring Road (fly over)

### 1.3 METHODOLOGY:

Properly chalked out methodology for the study is essential to complete task according to objectives of the thesis. Fig. 1 shows various stages of the methodology adopted for the present study. The methodology adopted in the present study is illustrated step by step below. The first step is the collect data for speed and volume by using of 10 hours vehicles count and Inventory study. The problem of traffic characterization and flow behaviour for urban road is identified and defined considering two arterial and sub arterial roads midblock sections. Then the develop methodology in three way it space means

speed flow relationship and speed flow curve. The next step data analysis the speed and volume. Subsequently, Analysis of traffic data is carried out to study the vehicular speed profile, peak-off peak effects, and composition and flow rate variations. Based on this, vehicle equivalent factors are derived by considering 2-wheelers (2w) as well as 4-wheelers (4w) as reference vehicles. Also, regression models are developed for vehicular speed as well as stream speed based on correlation analysis. The traffic behaviour is captured by developing speed flow models for selected road stretches. Analysis of the traffic characteristics and their behaviour models is carried out with reference to the roadway and traffic conditions observed on the study stretches. Finally the summary of the study carried out and the inferences drawn with respect to the study objectives are contained in the conclusions. To implement this methodology on a small network, a flow chart of detailed procedure is prepared and shown in figure 1 Site selection and data collection.

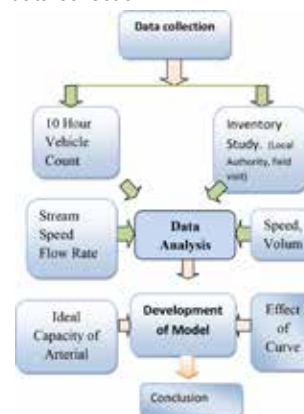


Fig no: 1 Flow Chart of Procedure.

### 1.4 Study Area:

The study is carried out on Ring Road (fly over) urban arterial road Surat city is selected. It Starts from Man Darvaja to textile. The Curve and straight portion selection for the vedio-graphic survey for both direction.

Types of road: Arterial road (four lane divided road)

Carriageway: 7.50 m, (one direction) Divider 0.4m

Length: 1870m

**1.5 Traffic Surveys:**

The traffic survey was carried out for 10 hours classified volume count. Based on 10 hour volume the peaks and off-peaks are identified for the study stretch and Videography survey for peak and off-peak duration is carried out. From the Videography survey 5 minutes interval data were extracted for speed and volume. The stream speed is calculated

1.5.1 Spot Speed: Spot speed study carried out Ring Road Surat. Spot Speed study is selected time durations of peak and off-peak hours. It has been observed during MPH 9.00 am to 11.00 am, NOH 12.00 pm to 3.00 pm and EPH 5.00 pm to 7.00 pm

**Speed criteria towards Railway Station straight portion:**

two wheeler minimum speeds vary between 39.49 kmph to 43.47 kmph and maximum speeds vary between 43.35kmph to 48.38 kmph during peak hour and off peak hour. Three wheeler speeds vary 28.38 kmph minimum in peak hour and 33.01 kmph maximum in off peak hour. Four wheel speeds vary between 49.29 kmph to 51.41 kmph. LCV speed ranges from 29.49 kmph to 52.17 kmph. Truck maximum speed and bus maximum speed closely 55.00 kmph. Standard deviation for all vehicles categories range from 0.54 to 7.2. Maximum space means speed 46.06 kmph for four wheelers and minimum 29.84 kmph for three wheelers.

Speed criteria towards Collage Road Straight portion:

two wheeler minimum speeds vary between 39.20 kmph to 51.74 kmph and maximum speeds vary between 42.55 kmph to 58.59 kmph during peak hour and off peak hour. Three wheeler speeds vary 29.02 kmph minimum in peak hour and 51.43 kmph maximum in off peak hour. Four wheel speeds vary between 38.51 kmph to 65.06 kmph. LCV speed ranges from 28.48 kmph to 63.90 kmph. Truck maximum speed 61.08 kmph and bus maximum speed 51.19 kmph. Standard deviation for all vehicles categories range from 0.61 to 6.33. Maximum space means speed 59.23 kmph for four wheelers and minimum 30.14 kmph for three wheelers.

**1.6 Speed flow model:**

The speed flow curve is developed from the data sets obtained from the survey during peak and off peak periods of working day. Equation is developed for speed-flow model with excellent co-efficient of determination that effectively explains the behavior stream traffic in the free flow and force flow regime.

**College road straight portion model:**

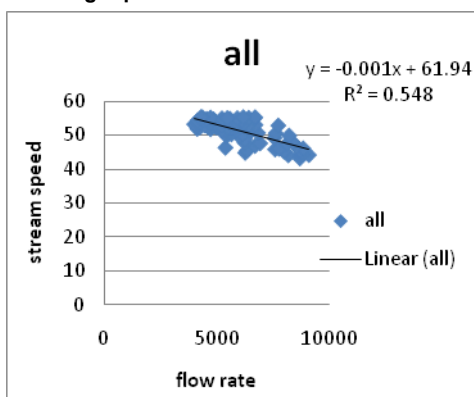


Fig no:2 College road straight portion model

As show in fig:2 the observed traffic speed vs flow model is developed through traffic characteristics using Excel curve fitting technique and quadratic equation is derived with high value of co-efficient of determination (R2) . flow rate increases steam speed decreases up to certain level . As shown in figure some points are at jam condition which is prevailing on the road. Flow rate is found by following equation shown below.

$y = -0.001x + 61.94, R^2 = 0.548$

**Railway station straight portion model:**

As show in fig: 3 flow rate increases and steam speed decreases up to certain level. Some points are at jam condition which is prevailing on the road. Flow rate is found by following equation shown below.

$y = -0.000x + 45.54, R^2 = 0.65$

The speed flow relationships that gives good co-efficient of determination that indicates traffic flow behaviour is well explained by the model.

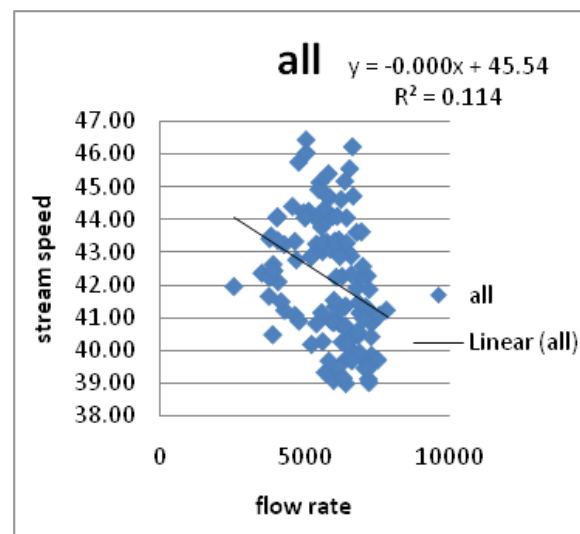


Fig no: 3 Ring Road straight portion model

**1.7 Conclusion:**

The study is carried out to analyze the traffic characteristics and flow behavior on mid block section of divided urban ring roads in Indian context. Speed flow models are developed in the study are able to explain the behavior of traffic stream precisely with good value of R2 under heterogeneous traffic environment. Speed-flow models are linear in nature. This model decided the level of service so transpot planner and engineers can planning and design of such urban roads.

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