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Delay analysis due to Road side activities at Urban Arterial Road of Rajkot city

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Abstract - *India is one of the developing country with heterogeneous characteristics of traffic flow. One of them is road side activities causing side friction. The interference to smooth flow of traffic is known as "side friction". Road side activities itself has impact on the road performance. The present work aims at identify the impact of road side activities on traffic parameters of urban arterial road of Rajkot city. The field studies using videography techniques are carried out for traffic data collection. Data are extracted for one minute duration for vehicle composition, travel time delay and spot speed studies. Based on result the need to include road side activities on traffic related studies for proper planning of urban roads.*

Key Words: Road side activities, Travel time delay, Speed reduction

1. INTRODUCTION

Transportation plays major role in economic growth of county. Traffic performance is affected by many factors like surface of road, shoulder and roadway, driver skills, width, road side activities, terrain, road maintenance, etc. In developing countries like road side activities influences the traffic performance of roads to considerable extent. Road side activities include bus stop of all types, petrol pumps, entries and exits from major roads, on street parking, road side trading, Pedestrians crossing or moving along road side, Vehicles stopping for pick up & set down passengers etc. In this study road side activities are considered and an attempt has been made to find the effect of these road side activities on travel time and travel speed of urban arterials of Rajkot city. Road side activities itself has impact on road performance. An urban mid-block is selected for the data collection of travel time and speed data. With side friction data and without side friction data was collected and travel time delay and speed reduction due to road side activities was calculated. Based on the results it is need to include road side activities on traffic related studies.

1.1 Objectives of study

- To identify road side activities influencing performance of traffic parameter.
- Analysis of delay due to road side activities.

2. LITERATURE REVIEW

In urban cities are generally overcrowded which faces problems due to road side activities. Activities are often going on or along the carriageway of the urban road which interacts with ongoing traffic flow which affects traffic parameters. Therefore, a short discussion of the previous literature has been made.

Mayank Kanani, R.G. Motwani (2017) In this study they have concentrated on analysis of all factors which causes the side friction and to evaluate their impacts on the speed and road capacity. They have consider factor like pedestrians, slow moving vehicles, on road parked vehicles. They have obtain FRIC FACTOR from friction data which very low near residential area, medium in industrial area, high in commercial areas, and very high in commercial area with market areas. On road parked vehicles also affects the capacity of roads. They found that if 312 vehicles parked on road per km than there will be loss of 800 pcu per hour in capacity at speed of 25kmph.

Birva B Shah(2016) In this study she has selected C.G. Road of Ahmedabad city of Gujarat state. She determined traffic volume and speed relationship of peak hour for the study area. The capacity is determined and compared with the IRC guidelines. She has concluded that the observesd capacity is 16% higher than the specified in IRC guideline. Traffic composition and side friction also affects the capacity of road. She also used VISSIM software for capacity which is also more than suggested by IRC.

Iin Irawati(2015) In this paper he has selected Mrageen city of Indonesia as his study area In this study he has mainly concentrated road side activity and road side friction which causes delay. Delay is one of the most useful parameter for study. He has collected data of amount of vehicle, composition of vehicle, road geometry, and friction data. After data collection he has used VISSIM software for micro simulation of data. Main object of the research is to compare the delay with side friction and delay without side friction. At conclusion he found that delay with side friction is 128.88 unit time per vehicle and delay without side friction is 96.310 unit times per hour.

Chetan R Patel (2014) In this paper, they have carried out on six lane divided urban road in Pune and Patna city of

India. Videography is selected as primary source of data collection and data is extracted for one minute interval. Speed flow density relationships were developed for both the roads and parameter for mixed flow condition are derived and compared with IRC. They have taken Dynamic car unit instead of Passenger car unit. Due to side parking, effective lane width decreases from 10.5m to 7.0m which results into decrement of 57% in capacity in Patna city. Also due to presence of NMV 14% reduction in speed is observed in Patna city compares to Pune city.

Manraj Singh Bains,Balaji Ponnu (2012) In this study they have concluded that the micro simulation model VISSIM is suitable to simulating heterogeneous traffic in expressway. They have found that the estimated pcu values of the heterogeneous traffic are accurate at 5% level of significance and decreases with increases in volume capacity ratio. This is due to decreasing speed difference as volume increases from free flow to that at capacity. Due to the platooning effect of trucks the pcu value of vehicles decrease when raffic stream. It is found that due to the complex nature of interaction between vehicles under heterogeneous traffic condition, the pcu estimates made through simulation for different types of vehicles of heterogeneous traffic significally changes with change in traffic volume level.

2.1 Methodology

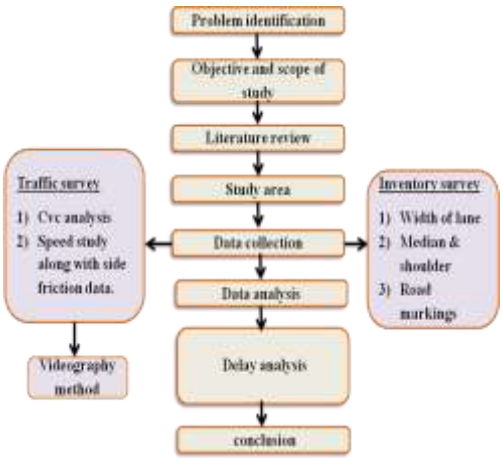


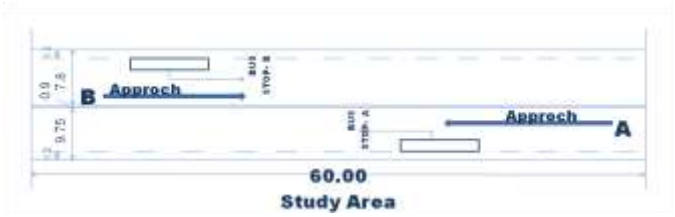
Fig -1: Flow chart of Methodology

3. DATA COLLECTION & EXTRACTION

3.1 Study Area

For this work urban arterial road of Rajkot city has been selected for data collection road containing stretches among which is having side frictional influence. Selected stretch on which there are two RMTS bus stop, on street parking and other road side activities.

Fig -2: Study Area



(all dimensions are in meter)

Fig -3: Road Inventory Drawing

3.2 Classified Volume Count (CVC)

To obtain speed reduction and travel time delay data of classified volume count and travel time of particular vehicles are collected on a urban mid-block. 60m stretch of a urban arterial road is selected for data collection. Classified volume count data is collected by using videography method and travel time of vehicles are collected by manual method from the top of 5 storey commercial building.Travel time data is collected at one minute interval for 8 hours in regular day from morning 9:00AM to 1:00PM and in evening 3:00PM to 7:00PM. As the road side activities present in the study area that particular minute will be noted as friction minute and further analysis is done.

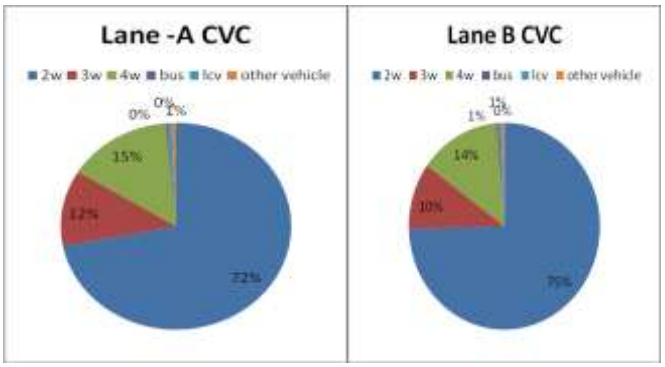


Chart -1: Vehicle Composition

3.3 Road Side Friction Data

Road side activities data were extracted from the recorded videos at urban arterial road over 60m length. The pedestrian movement, bus stopped at curb side bus stop, on street parking, shuttle are identified and frequency of each event type is noted. The data measured over study area is shown in Table.

Table -1: Side Friction Data-Lane A

SIDE FRICTION TYPES-LANE A				
Time Interval	Buses	Parked Vehicles	Shuttle	Pedestrian
9 AM TO 10 AM	18	104	120	190
10 AM TO 11 AM	19	142	125	210
11 AM TO 12 PM	20	93	97	196
12 PM TO 1 PM	19	101	134	240
3 PM TO 4 PM	19	82	92	186
4 PM TO 5 PM	20	121	115	228
5 PM TO 6 PM	22	114	104	254
6 PM TO 7 PM	21	96	128	235

`**Table -2:** Side Friction Data-Lane B

SIDE FRICTION TYPES-LANE B				
Time Interval	Buses	Parked Vehicles	Shuttle	Pedestrian
9 AM TO 10 AM	20	122	115	198
10 AM TO 11 AM	17	110	98	168
11 AM TO 12 PM	19	99	121	221
12 PM TO 1 PM	18	74	101	175
3 PM TO 4 PM	19	86	82	205
4 PM TO 5 PM	25	110	118	213
5 PM TO 6 PM	24	95	97	215
6 PM TO 7 PM	22	92	108	227

3.3 Travel time delay due to Road side Activities

Travel time survey is carried out manually at mid block of urban arterial road.

To calculate travel time delay due to road side activities on urban arterial road it is required to calculate the travel time of vehicle without side friction and travel time of vehicle with road side friction. Difference between those travel time given the travel time delay due to road side activities.

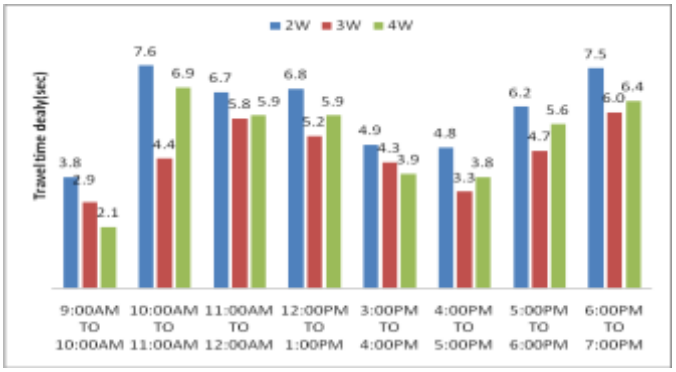


Chart -2: Average travel time delay(sec) lane A

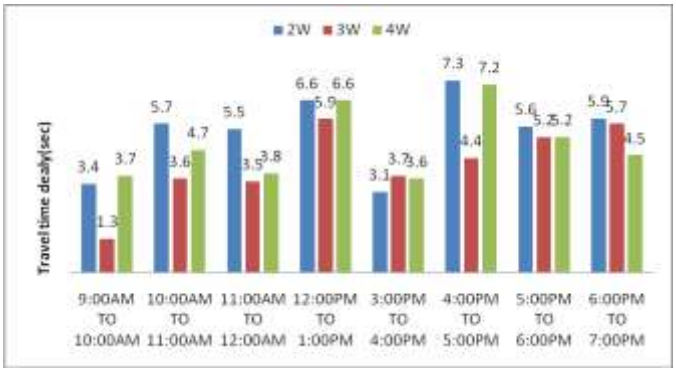


Chart -3: Average travel time delay(sec) lane B

Further travel time delay for a day is obtained by using the with side friction data and without side friction data as under:

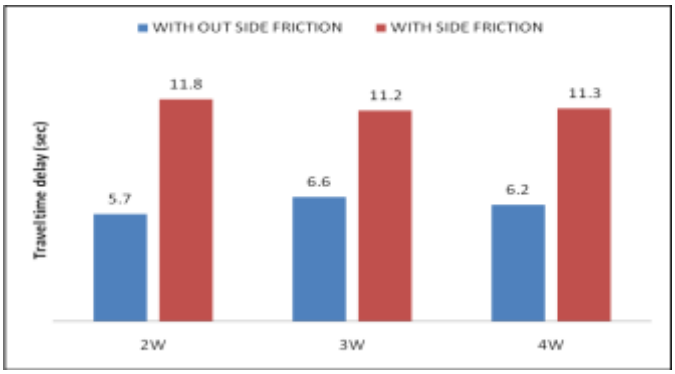


Chart -4: Travel time delay comparison (sec) lane A

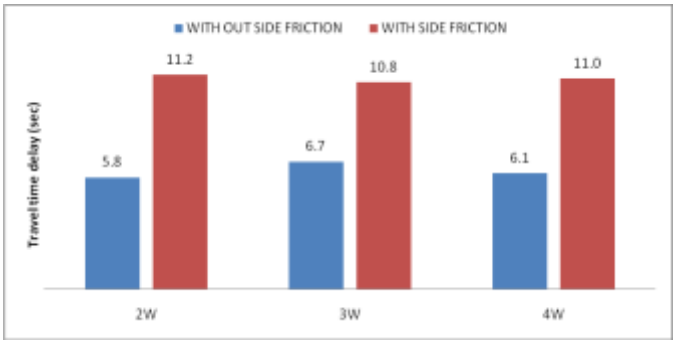


Chart -5: Travel time delay comparison (sec) lane B

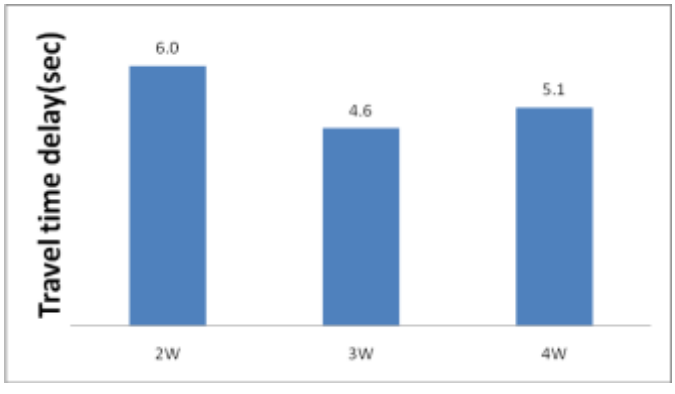


Chart -6: Travel time delay(sec) lane A

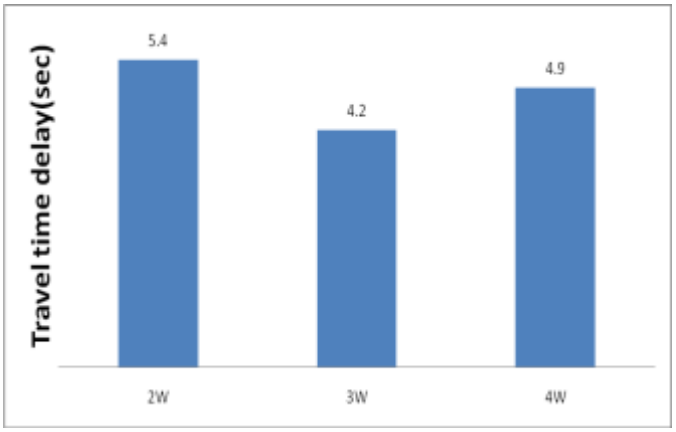


Chart -7: Travel time delay(sec) lane B

It is found that travel time delay for 2w, 3w and 4w is 6.0, 4.6, and 5.1 seconds for lane A and 5.4, 4.2, and 4.9 sec for lane B respectively.

3.4 Speed reduction due to Road side Activities

To calculate speed reduction due to road side activities on urban arterial road it is required to calculate the speed of vehicle without side friction and speed of vehicle with road side friction. Difference between those speed given the speed reduction due to road side activities.

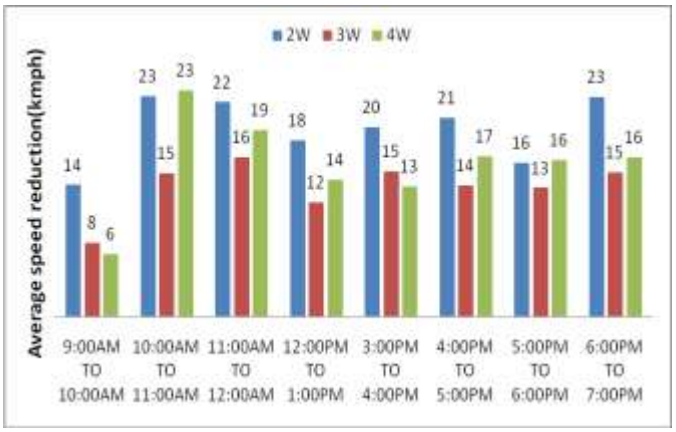


Chart -8: Average speed reduction(kmph) lane A

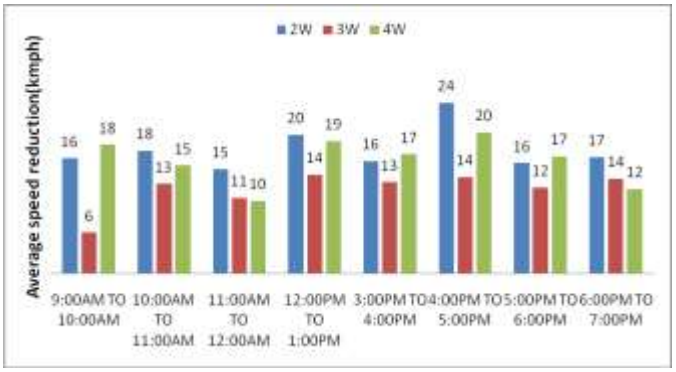


Chart -9: Average speed reduction(kmph) lane B

Further speed reduction for a day is obtained by using the with side friction data and without side friction data as under:

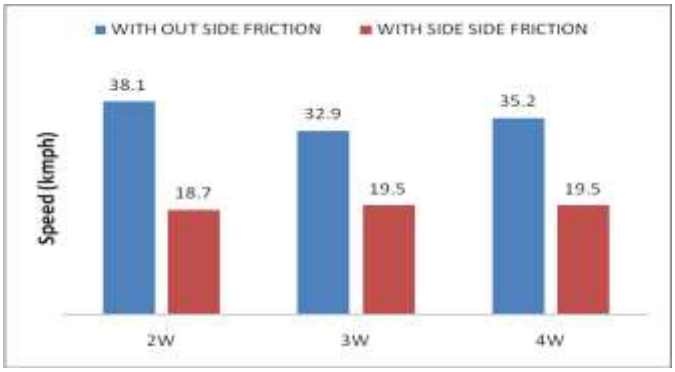


Chart -10: Speed reduction comparison (kmph) lane A

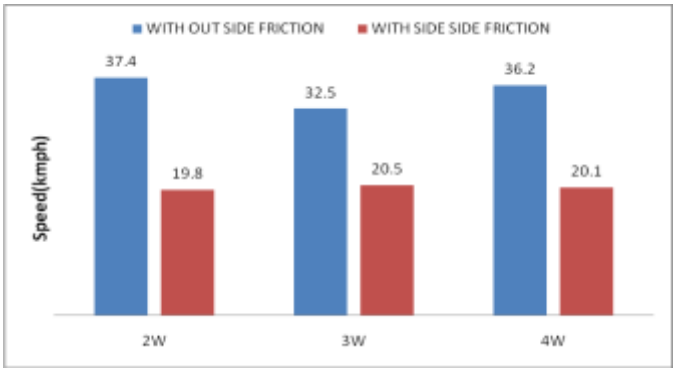


Chart -11: Speed reduction comparison (kmph) lane B

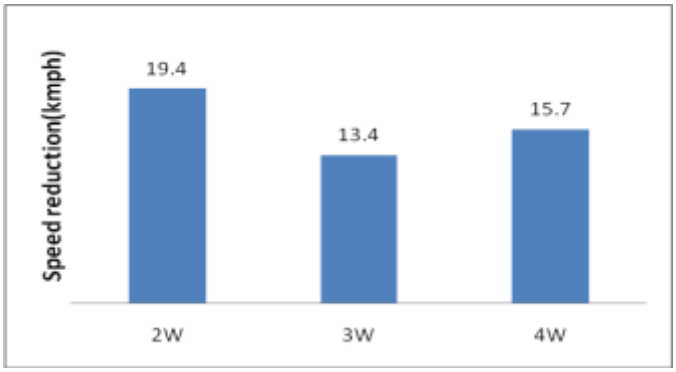


Chart -12: Speed reduction(kmph) lane A

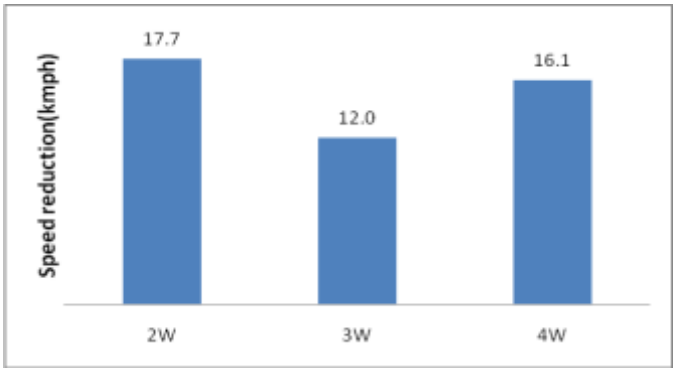


Chart -13: Speed reduction(kmph) lane B

It is found that speed reduction for 2w, 3w and 4w is 19.4, 13.4, and 15.7 kmph for lane A and 17.7, 12.0, and 16.1 kmph for lane B respectively.

4. CONCLUSIONS

From above study, it can be concluded that travel time delay and speed reduction in urban arterial road is depend on road side activities like on-street parking, curb side bus stop, pedestrian, pick up and drop of shuttle pedestrian.
It is found that travel time delay for 2w, 3w and 4w is 6.0, 4.6, and 5.1 seconds for lane A and 5.4, 4.2, and 4.9 sec for lane B respectively.

It is found that speed reduction for 2w, 3w and 4w is 19.4, 13.4, and 15.7 kmph for lane A and 17.7, 12.0, and 16.1 kmph for lane B respectively.

5. FUTURE SCOPE AND STUDY

As it seen from the current research work that road side activities play a vital role for the delay and speed reduction. So, it necessary to include side friction for the calculation of capacity and Level of Service(LOS).Influence of road side activities on traffic parameter at intersection & highway can also be done for future work.

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