INFLUENCE OF LANE DISCIPLINE ON TRAFFIC FLOW CHARACTERISTICS AT MANINAGAR LEVEL CROSSING

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Abstract—Traffic flow in mixed conditions can be classified as fast moving and slow moving vehicles or motorized and non motorized vehicles. The vehicle also varies in size maneuverability, organize, static and dynamic characteristics. This heterogeneity will generate difficult mix traffic characteristic on road. Lane discipline causes Delay and consequent change in Approach speed, lateral movement and other traffic flow characteristics at major city road network, intersections, level crossing. For safe and efficient movement of large volumes of traffic on city road network, intersections, crossings, the lane discipline is important. The proposed capacity and operation of traffic significantly depend on driver behavior, lane discipline, traffic flow characteristics, etc. The lane discipline not followed on urban roads in India leads to heterogeneous motorized traffic, slow-moving traffic. It is therefore required to consider suitably traffic flow parameter speed, volume, and dispersion time influence by lane discipline for mixed traffic situation to estimate at Maninagar level crossing. This paper represents the traffic volume check the time to reach the target in off-peak and peak timings and estimating traffic flow characteristics, volume-dispersion time and speed variation at Maninagar level crossing and coming up with both methodical and realistic solution.

Index Terms— Lane Discipline, Dispersion Time, Traffic Flow Characteristics

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1. INTRODUCTION

India is a developing country and its cities are undergoing immediate urbanization and development as a result there is speedy development in the road traffic. Traffic development in India is very difficult due to the heterogeneous traffic stream allotment the same carriageway. Also in spite of having lane markings, mainly the lane discipline is not followed mostly at intersections, city road network, level crossing etc. Railway traffic as well as road traffic is increasing quickly in urban and suburban areas. Railway and road infrastructure share in areas the public space with other transport modes. However the railway and the road infrastructure are usually spatially separated from other transport modes. They are also typically situated on the same high level as other transport infrastructures. This situation unavoidably leads to common areas, where these two infrastructures exist at the same time, but where the interests of different transport modes divergence.

The rapid increase in vehicle possession in India in demanding has increased the traffic attentiveness that has created various serious problems such as congestion and growth of long queues eventually causing heavy delays and increase in the number of accidents at a range of locations on roadways. Traffic signals are maybe the most substantial traffic control devices for at grade intersection in the urban traffic individual. Appropriate setting up of traffic signals can decrease the number of accidents and reduce delays and increase speed of vehicles at level crossing but there are no controlling devices at level crossing for safe and efficient movement of traffic to cross a level crossing for without any delay occurring, lane discipline is the solution to accommodate at level crossing for better movement of traffic.

Lane discipline means choosing the correct lane at the suitable time and – to a certain amount – staying in that lane. If road markings or road signs designate which lanes to use to head off in convinced directions and wait until the last moment to change then it is guilty of poor lane discipline. If bestride lanes or wander out of lane then it is moreover guilty. It could also be striking for poor planning, normal driving position, observation/safety, and response to traffic signs/markings, and so on. At traffic lights regularly find that the road splits into two lanes, and then merges back into one immediately after. This happens where there is a junction and level crossing, and its purpose is to prevent people being held up by those who are turning. It is effectively an overtaking lane meant to keep traffic flowing at selected crossings. In some places, lanes are marked on the road to help guide traffic and to make best use of the road space. Lane discipline means using the correct lane for where we're going and subsequent the lane markings. This helps to avoid congestion and keeps traffic flowing safely, particularly where traffic is heavy.

Make sure move into the exact lane in good time. If vehicle in the wrong lane and don't have time to change lane safely, embrace on in our lane and find another way back to its route. Poor lane discipline at intersections and level crossing is very common in learner drivers. A good accomplished driver will approach a level crossing based on what they see and if they have any previous experience of this crossing. The key to good lane discipline at level crossing is to establish the level crossing at the earliest opportunity. Approaching a roundabout too fast is extremely possible to result in poor lane discipline.

Highway Capacity Manual and other works suppose homogeneous and lane based traffic for exploration, which exists in developed countries. On the other hand, in developing countries like India, road traffic in ordinary and urban roads traffic in demanding is extremely heterogeneous comprising vehicles of generally varying static and dynamic uniqueness and the vehicles share the same road space without any separation.

The railway road crossing is called the place where the railway and road infrastructures are crossing on the equal level. These places work correspondingly as an intersection of two roads where direction change is not allowable and only vehicles on the same road could move generously from side to side. At railway level crossing, road vehicle drivers have to give way trains. It is due to technical provision of railway vehicles. The railway operation between block sections is forbidden by signals, which adequately in advance inform about the option to continue in a next block section. Road transport with high coefficient of adhesion is operated in line-of-sight distance mode and in proper lane discipline

of vehicles. At the railway level crossing road and rail traffic contribute to the same infrastructure. Because it is not possible to use the infrastructure by both transport modes at the same time, the railway has a priority.

Traffic police will extract the lane discipline rule although protests from private bus operators and motorists' protest. It is true that the performance of the regulations had slowed down traffic flow, but motorists were awareness to be disciplined while most private bus and three-wheel drivers now avoid zigzagging from lane to lane at signalized intersections and level crossing.

In mixed traffic situation lane discipline is not observed and the vehicles tend to occupy any lateral position available on the road space. The vehicles stirring in such stream interacts in lateral directions. Due to non-lane discipline, the lateral position of vehicles in such mixed traffic will differ significantly when compared to lane discipline and homogeneous traffic. The lateral movements of vehicles are considerably higher in mixed traffic conditions. These complex lateral movements are supplementary increased in case of undivided roads mostly on urban areas.

Due to lack of lane separation, the vehicles in ongoing direction occupy the opposing lane which increases the lateral interactions between vehicles. These lateral interactions are influenced by various parameters such as vehicle types, driver behavior and vehicular speeds. These lateral movement effects can be reduced by to follow a lane discipline at intersections, level crossing, etc. if drivers have knowledge about lane discipline then it will also decrease movement of vehicles and as per traffic rules traffic police will be able to extract a lane discipline through a drivers so that both ongoing and opposing vehicles have less freedom to move laterally in other directions.

2. LITERATURE REVIEW

The lateral movement of the vehicles is very high due to lane discipline. Lateral acceleration is one of the most important vehicle dynamic variables. To study the lateral movement of the vehicle in case of straight road section to know the vehicles are following lane discipline or not. They observe the lateral acceleration; speed values in the moderate traffic conditions and to investigate the relationship between the vehicles longitude speeds with the lateral characteristics. (Geetimukta et al., 2013)

To quantify the unaccounted parameters of heterogeneity for Indian traffic into the existing car-following models to form a modified car-following model. A simulation model has been developed as a software program to study the performance of the modified car-following model and they carried out for roadway traffic characteristics, distribution of vehicles along roadway width and speed distribution of vehicles. (Mahendrakumar et al. , 2016)

Vehicular traffic is heterogeneous and do not follow lane discipline and can move anyplace on the available free space of the road. Lateral gaps maintained by the vehicles play major role in the passing/overtaking behavior of the following vehicles. Detailed understanding of the lateral gap maintains behavior huge data, covering various traffic scenarios. Speed of the subject vehicle and type of the adjacent vehicle, and road width, were found to be significantly influencing the lane discipline. (Budde et al., 2013)

Speed-density relations play a main role in dynamic macroscopic modeling and these relations are also used for estimating the other important macroscopic relations. Appropriate speed-density data with respect to heterogeneous traffic stream are using the field observations. Green shields linear speed-density model has been utilized for understanding the issues related to the parameter estimation. (syed et al., 2016)

Lane-changing behavior, as one of the most challenging driving maneuvers to understand the lane discipline, and a major source of collisions, can benefit from this additional information. Lane-changing model based on a calibration approach based on the method of simulated moments is presented and a simplified version of the proposed framework is calibrated against NGSIM software data. The prediction capability of the simplified model is validated and concluded the presented framework is capable of predicting lane-changing behavior. (Alireza et al., 2015)

Free-flow speed (FFS) is the speed of vehicles under low volume conditions, when the drivers are liable to drive at their desired speed without being affected by control delay and it is only possible to follow lane discipline. Estimation of FFS is important in several applications. FFS varies extensively across various road facilities as they are influenced by driver behavior, lane discipline, vehicle characteristics, road factors, land use, geometric features, control factors, etc. (Srijith et al., 2015)

The lane utilization is affected by several factors such as vehicle composition, traffic flow rate and vehicular speeds and lane discipline eight hours of video graphic data was collected from a road stretch incorporating both peak and off peak hours. The lane discipline behavior is studied for five different vehicle categories. SPSS software is used for multivariate analysis in connection with lane utilization factor over a wider range of traffic flow rates and structural equation model has been established for all the four lanes separately and the influence of the vehicles on lane discipline. The form of lane utilization and lane discipline behavior by different vehicle types may help in differentiating the characteristics of traffic on expressways. It may be helpful to refine the microscopic simulation models and its parameters in to validate. (Shriniwas et al., 2010)

Rail-road crossings create a range of transport, economic, social and environmental impacts. They have focused on elected effects such as safety; small deliberation has been given to higher impacts to consequently develop a holistic understanding of the impacts of rail-road crossings and to recognize delay time in this field. They reviewed an international separation of rail -road crossing impacts were urbanized through a detailed literature review, which discovered a total of 18 different types of impacts associated with rail-road crossings. The review found that most research has focused on quantifying transport and economic impacts, particularly safety and road vehicle delay, with deliberation given to social and environmental impacts. They had been estimated delay as per modified Webster's delay model at rail-road crossing and include the use of observed confirmation to support impact assessment, and need to better recognize the impacts of delay at rail-road crossings in terms of safety, travel time variability, rail vehicle delay, traffic flow, land use, crime, and disability access.(Jianfeng et. Al, 2011)

SUMMARY OF LITERATURE REVIEW

Many methods have been used to estimate the average delay, speed and density relationship using Greenshied model, lateral Movement, lateral gap, and lateral acceleration at different parameters influencing the flow with lane discipline it can be complex but most have used software simulation techniques and it is uncomplicated and convenient. Most of the studies conducted are for homogeneous traffic situation which concern with lane discipline. Urban Indian circumstances are moreover represented by Heterogeneous traffic flow conditions and different road conditions making it more difficult to correctly estimate the traffic Characteristics at major city road network on behalf of influence by lane discipline. Moreover lane discipline accommodate with Software like VISSIM, IRFANVIEW, ETC. for better understanding of lane discipline at signalized intersection, crossing and Major city road network should be precious in urban traffic area.

3. METHODOLOGY AND DATA COLLECTION

The primary steps in the study are selecting site and we selected Maninagar crossing and then after problem identification and objectives of the study area. The data collection of existing condition of surrounding roads, different types of traffic volume count survey and based upon survey analysis of data are carried out and to follow a lane discipline by traffic police at rail-road crossing. Based on the data collection comparative study of various traffic flow characteristics influence by with or without lane discipline are found out. Based on comparative study it will be suggested how lane discipline influences on speed, volume, vehicle composition, dispersion time etc.

Since it will need two or more observers to collect the essential data physically, it was determined to use a Video Recording technique for data collection. This technique had several advantages. Information on vehicle types, movements of vehicles, approach distance, dispersion time interruptions to traffic streams at rail-road crossing and traffic volumes could all be gathered concurrently by one observer and analyzed by a single observer on a television screen.

The traffic data is collecting by observing the traffic flow at level crossing. The traffic flow is recorded using a video camera; mount on tripods along the roadside which enabled recording of all the traffic flow characteristics (volume composition and speed) at the same time. The video data will be transferred to a computer for further processing. A total number of vehicles will observe (moving in one direction) to pass through the level crossing according to train schedules time for every incident when crossing is closed.

In order to find out the traffic volume, a video camera is placed on a location so that rail-road crossing is focused clearly. The data will be collected for about peak and off-peak period on each camera on a typical clear weekday. The recorded video will later played on a computer and the desired information will extracted.

4. DATA ANALYSIS

4.1 Volume-Dispersion Time Relationship

Volume –Dispersion Time relationship showed as total observed volume with dispersion time for arrival volume rate disperse at both Maninagar Level crossing for with and without lane discipline.

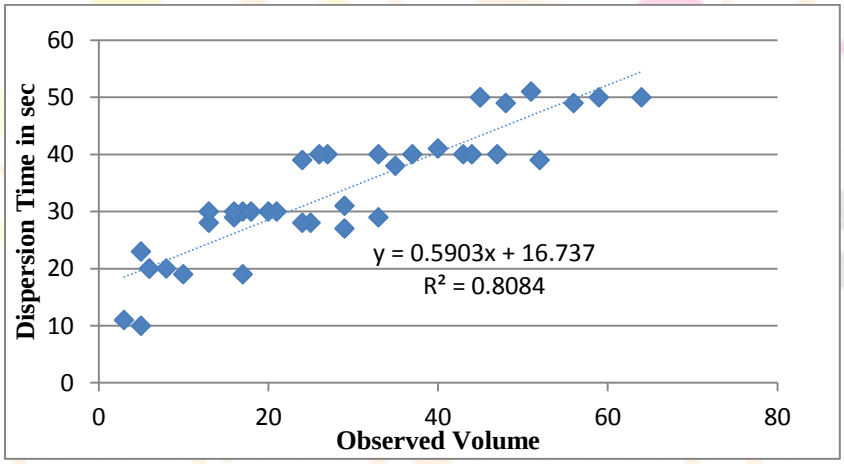

Figure.1: Volume– Dispersion time Relationship for with lane discipline at Maninagar level crossing

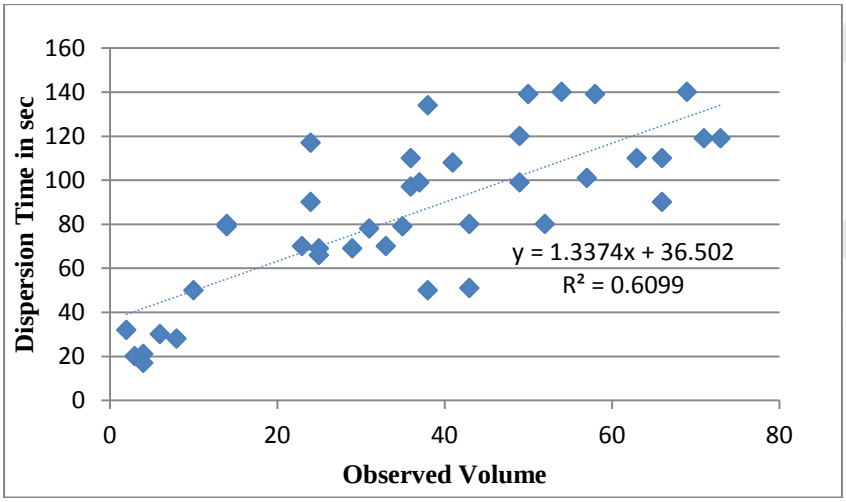

Figure.2: Volume– Dispersion time Relationship for without lane discipline at Maninagar level crossing

4.2 Average Speed Variation

Average speed variation at both level crossings can be counted as distance covered per unit time for every vehicle according to stretch, estimating for every incident and conducting to get average values. Average Speed Variation showed by observed volume with average speed of all vehicles as per every incident for with and without lane discipline at Maninagar Level crossings.

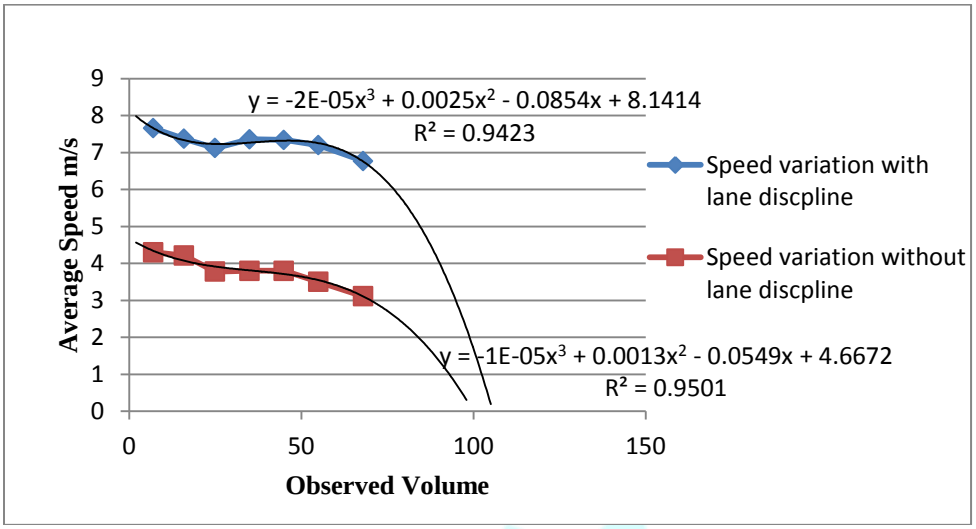

Figure.3: Average speed variations for with & without lane discipline at Maninagar level crossing

4.3 Time-space Graphs

Time is drawn on the horizontal axis and distance from a reference spot on the vertical axis. Diagrams that show the position of every vehicle in time and in space are very useful for understanding traffic flow behavior with following lane discipline for movement of vehicles on spots.

Time-space diagrams are formed by plotting the position of each vehicle, given as a distance from a reference point, against time. The first vehicle or queue with lane discipline will probably start at the origin, while the other vehicles that follow won't reach the reference point until slightly shortly times.

Time-space Graphs data analysis and calculations at Maninagar level crossings for with and without lane discipline for various traffic compositions (40 vehicles) from north to south and south to north direction as under:

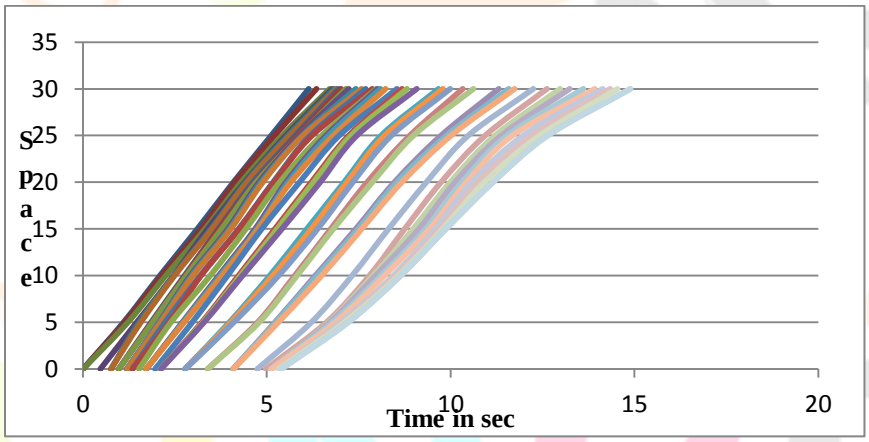

Figure.4: Time-Space Graph for with lane discipline at Maninagar Level Crossing
(For 40 vehicles composition from north to south direction)

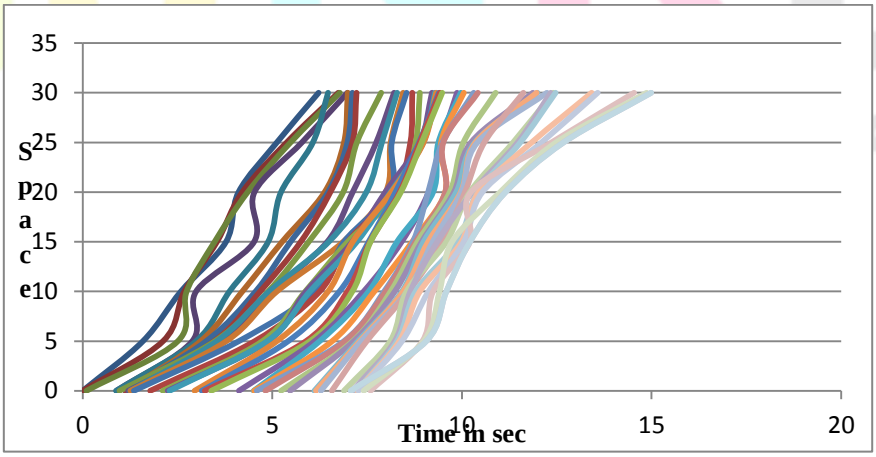

Figure.5: Time-Space Graph for without lane discipline at Maninagar Level Crossing
(For 40 vehicles composition from north to south direction

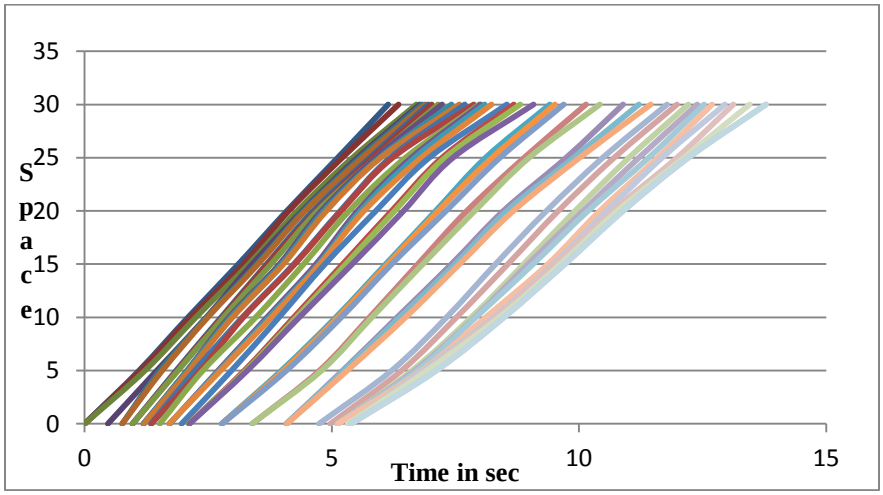

Figure.6: Time-Space Graph for with lane discipline at Maninagar Level Crossing
(For 40 vehicles composition from south to north direction)

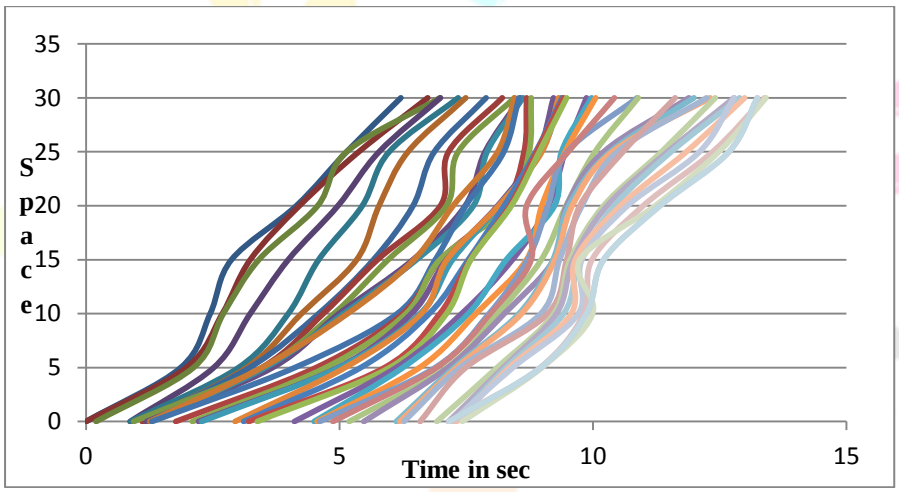

Figure.7: Time-Space Graph for without lane discipline at Maninagar Level Crossing
(For 40 vehicles composition from south to north direction)

Average approach speed for arrival volume at Maninagar level crossings can be counted as distance covered per unit time for every vehicle according to stretch, estimating for every incident and conducting to get average values.

Observed Average Delay values obtain from the field is quiet equal to the value proposed by Modified Webster's Delay model at level crossing for with and without lane discipline.

By following Lane Discipline tends to increase in approach speed for dispersing traffic and less dispersion time for arrival volume to disperse at level crossing rather than without lane discipline.

Approach speed and dispersion time for arrival volume of all vehicles as per every incident for with and without lane discipline at Maninagar and Punitnagar Level crossings as showed as under:

Sr. No.	Conditions of level crossing	Observed Average Delay/ day in sec	Modified Webster's Average Delay/ day in sec	Average Dispersion Time in sec	Average Speed for Dispersing traffic in m/s
1	With lane discipline at Maninagar level crossing	272.27	270.09	33	7.26
2	Without lane discipline at Maninagar level crossing	574.28	573.94	84	3.78
3	With lane discipline at Punitnagar level crossing	286.33	285.31	32	5.52
4	Without lane discipline at Punitnagar level crossing	485.19	485.67	68	3.65

Table.1 Comparison of Observed and Modified Webster's Average Delay, Average Dispersion Time and Average Speed for Dispersing Traffic

5. SUGGESTION FOR IMPROVEMENT AND CONCLUSION

Observed Average Delay, Speed and other traffic flow values obtain from the field is quiet equal to the value proposed by Modified Webster's Delay model at level crossing for with and without lane discipline. Calculated Delay and Modified Webster's Delay values for lane discipline is much lesser than the traffic volume those are not following lane discipline at intersections, level crossing. By following Lane Discipline tends to increase in approach speed for dispersing traffic and less dispersion time for arrival volume to disperse at level crossing rather than without lane discipline. Suggest the barriers, lane markings should be clearly vision for all drivers, traffic signs to follow lane discipline should be provided on the lane, so learners and drivers are get better understanding to follow a lane discipline. To prevent this critical situation of without lane discipline at level crossing, intersections using different types of barriers between road lanes so it must be all vehicles follow proper lane. Traffic police will also be extracting to follow a lane discipline at road networks so it may safety operations for all vehicles at level crossing.

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