International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

IMPROVING PEDESTRIAN FACILITY IN CONGESTED URBAN AREA (PEDESTRIAN SIMULATION)

[1] Vaka venkata ramireddy, [2] K.Sreekar chand

[1]M.Tech Student, Transportation Engineering, AM REDDY MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY, (Approved by AICTE, NewDelhi, Affiliated to JNTUK, Kakinada) Vinukonda Road, Petlurivaripalem (V), Narasaraopet (M), Guntur (Dt.), Andhra Pradesh - 522601.

[2] Associate Professor, Department of Civil Engineering, AM REDDY MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY, (Approved by AICTE, NewDelhi, Affiliated to JNTUK, Kakinada) Vinukonda Road, Petlurivaripalem (V), Narasaraopet (M), Guntur (Dt.), Andhra Pradesh - 522601.

Abstract:

Pedestrians are extremely vulnerable in crashes with the faster moving and much more massive motor vehicles. Circulation of pedestrian is of vital importance to the modern metropolis, but the paradox here is that though meant for human travel, these roads hardly provide any quality space for those who are without vehicles (well known as pedestrian). Due to the ambiguous position of non-motorized travel in an urban transportation system, the transportation conditions for non-motorized travel are getting worse in cities, which illustrate the urgent need for the improvement for same consequently pedestrian are at greater risk for their safety more especially in the commercial zones of large cities. A change in perspective spotlight will create a sense of awareness that the pedestrian traffic is also vital as the vehicular traffic. Soothing the traffic would moderately cut the driving expediency but the pedestrians will get a much safer and peaceful route to their terminuses. Safety and comfort are the two pans of a balance while considering the pedestrian traffic. Considering these aspects, this study deals a study in improving pedestrian facilities by analyzing the existing skeleton of the selected locations. The adequacy of facility is checked based on IRC latest guidelines and counteractive measures are postulated.

Keywords: pedestrian, vehicular traffic, Safety and comfort

INTRODUCTION

Since the 1960s, skyway systems (also known as skywalk systems) have become a vital feature in many cities around the world. Ahmedabad is the largest city and former capital of the Indian state of Gujarat. With growing population,

congestion, pollution and related issues, that are facing mobility accessibility problems, and the governments have become more supply oriented and thus preoccupied in building more roads, flyovers that they have completely neglected the most ancient mode of transport. Walking is a universal phenomenon but generally not considered as a transport mode because it does not employ vehicles as modes. The term ―Pedestrian is used to recognize the fact that the approach to pedestrian pathway development must be as scientific and systematic as the techniques which are applied to highway design and development. Hence safety of pedestrian is a basic step to create safer city. In metro cities, more than one mode of public transport is available now-a-days. Due to expansion of city boundary and urban sprawls, the single mode of transport is neither viable nor efficient as the spatial separation between commuters and work places has increased. Hence, public transport has become multi modal which combines two or more modes to provide comfort, rapid and environmentally compatible movement of the commuters. Hence, pedestrian safety is an integral part of overall transport system. Most central business districts are characterized by high intensity development within a small area with resultant congestion and conflicting pedestrian-vehicle movements, especially at signalized intersections. The downtown areas experience highest concentration of day-time population and diverse activities causing vehicle delays, air pollution, and accident hazards. In some cases the conflicting movements of vehicles and pedestrians have been segregated by implementing horizontal, and vertical separation like sidewalks, auto-restricted zones, partial and full malls, underground tunnels, and other innovative approaches. A few cities have diluted the complexity of the problem to some extent by the construction and operation of skywalk systems. A skywalk provides vertical separation of pedestrian and vehicular movements and, along with street level sidewalks, represents a unified system of pedestrian facilities in the central business districts. Pedestrian skywalk is, in practice, very much a transportation system management technique. Pedestrian modelling is a complex behavioural and engineering issue. Of interest to urban transport planners is both the behavioural side i.e., how pedestrians move in relation to other pedestrians, how they decide to cross the road, how they make route choice decisions and the engineering side, i.e., how traffic control measures affect

pedestrian travel times Various modelling approaches have attempted to take into account these aspects, mostly independent of each other. Pedestrian specific micro-simulation techniques have been steadily improving over the last decade and have been increasingly applied to crowd movements and building evacuation scenarios with highly sophisticated behavioural algorithms. With Pedestrian issues considering primarily from the safety point of view rather than Level of Service, amenity At traffic signals, pedestrians are often accommodated in which least amount of interruption to motorised traffic, and signal cycle times can be long, leading to excessive pedestrian waiting times.

Pedestrian movement model

In this study, a pedestrian is represented by a point and is assumed to move towards his desired direction when he is away from the road When he reaches the curb side, he has to decide whether to cross immediately or wait for the oncoming vehicle to pass. The criterion for safe crossing is based on the widely used gap acceptance formulation Every pedestrian is assumed to have an accepted critical gap which is defined as the time between the crossing pedestrian and the nearest oncoming vehicle. If the time left for the oncoming vehicle to reach the position of the pedestrian with its current speed is larger than a critical value tcg , the gap will be accepted and the pedestrian continues crossing. Otherwise the gap will be rejected; the pedestrian will stop and wait.

Problem statement:

The problem of this thesis can be broadly stated as "understanding vehicular, pedestrian flow interactions in varied situations." In some situations, pedestrian motion is observed empirically. This describes the following

- Crossing time for pedestrian will be measured to evaluate the maximum pedestrian flow, crossing speed, density, and the adequacy of the geometry and location of signalized crosswalk. The signal timing for pedestrian and motorists will also be examined.
- To analyze and study the effect of various factors related to vehicle, pedestrian interactions like pedestrian characteristics, pedestrian movements, traffic conditions, road conditions.
- The signalized crosswalk performance will be examined if

it can handle the pedestrians safely and efficiently.

- Heavy congestion effect the lane user every day.
- Vehicle pedestrian interaction is such that pedestrian suffer anxiety.
- Conceiving all this situation there must be some providence of Pedestrian facility.

Objectives:

Here the main objective of this is to ensure that pedestrian activity occurs in a safe, comfort, convenient manner, to represent real life situation and then simulating it in a proper way to minimize pedestrian delay and congestion.

- To carry out the feasibility study for Pedestrian Facilities in urban area.
- To collect data on traffic and pedestrians for real time study.
- To collect data that provides delay to the pedestrians in the main traffic stream.
- To show the real life situation of vehicles and Pedestrians interaction and suggest
- The Remedial measure for reducing the obstruction to the pedestrians.
- To simulate the pedestrians with use of Microscopic simulation mode

LITERATURE REVIEW

[1] Kadali. BR, Vedagiri. P,(2015) The major characteristics of Indian cities are very high densities and a variety of land use. Pedestrians and vehicles are the two main inhabitants of the urban roads. Earlier, there was much focus on the development of urban roads, focusing only on solving the issues faced by the vehicular traffic. The result of this is that nowadays vehicular traffic occupies a larger number of roads in cities, leading to a number of conflicts arising for pedestrians and other non-vehicular users. The most basic step to creating a safer city is by providing proper amenities to pedestrians. This research paper focuses on identifying the problems faced by the pedestrians in congested urban cities like Chennai. A management technique for the pedestrians is the skywalk. Therefore, the safety of pedestrians has become a very integral part of any transport planning. Many urban areas focus on development at a very small scale because of which results in congestion and leads to pedestrian-vehicular conflicts especially at Signalized Intersections. Two behavioral sides of pedestrians are of

interest to planners, i.e. how pedestrians move relative to the others, their choice of route, and their decision whether to cross the road or not etc. and how pedestrian travel times are affected by the signal control measures.

[2] Shekari. ZA, Moeinaddini. M, Shah. MZ (2013) Map the conditions at the site and comparing it with standards. Pedestrian's proneness to accidents is the most considered factor in determining the dearth of facilities. Various road users include commuter, shopper, Disabled person and child. Differing priorities such as safety versus directness, based on different requirements are considered. Factors such as reliability, safety, greenery environment are the major contributors to a sustained skeleton. This is objectively measured but to an extensive scale. The existing features or the road furniture's related to the pedestrians such as pedestrian facilities, Hazards to pedestrians were noted. The analysis provided remedial measure that ensures safety of the pedestrian. The template of the data collection, analysis of the existing condition, was generalized as a model for any situation that could predict the pedestrian proneness to accidents. States that delay is the key feature for designing or improving the existing facilities. Various intersection requirements such as bus stop, signalized systems and regular bus service routes are necessary to find the delay. Data regarding opinion of the pedestrians, Road inventory data and data related to speed of vehicle and the pedestrian are the foremost components to be considered

[3] M, Willis. A, Stradling. S, (2003) Traffic congestion and lack of public pedestrian space are some problems faced by most urban metropolises. Conventionally walking has been a mode of transportation in Indian cities. The percentage of pedestrians may vary from 16 to 57 depending upon the city. Encounters between vehicular traffic and pedestrian traffic are at its rise currently. Rapid industrialization and urbanization in India has resulted in neglecting of pedestrian facilities. Consequently pedestrian are at greater risk for their safety more especially in the commercial zones of large cities. A change in perspective spotlight will create a sense of awareness that the pedestrian traffic is also vital as the vehicular traffic. Soothing the traffic would moderately cut the driving expediency but the pedestrians will get a much safer and peaceful route to their terminuses. Safety and comfort are the two pans of a balance while

considering the pedestrian traffic. Considering these aspects, this study deals a study in improving pedestrian facilities by analyzing the existing skeleton of the selected locations.

[4] Lee. JYS, Lam. WHK (2008), The yielding behavior is affected by various aspects of the roadway and driving environment, including vehicle dynamics, pedestrian's behavior, roadway function and design. The driver yield behavior is rarely observed (those pedestrian waiting at curb location) at un-signalized intersection under mixed traffic conditions. The non-complaint behavior of pedestrian and non- driver yield behaviour the interaction between pedestrian-vehicle increases at un-signalized mid-block crosswalk locations. Interaction between the pedestrian and vehicular driver at un-signalized mid-block locations when pedestrian is waiting at curb and stepping off the curb. From the results, it was concluded that, the driver yield behaviour is more when the pedestrian steps off from the curb and it is more during morning peak hours. Safety at mid-block crosswalks depends on the ability of drivers and pedestrians to recognize potential conflicts. Some of the researchers explored pedestrian safety at mid-block crosswalk location and they concluded that pedestrian safety is governed by driver

[5] J, Wang. J, Lu. J, "Pedestrians' (2009) In the urban transportation system at some locations (school zone and residential areas) the effect of vehicular traffic is reduced by implementing raised pedestrian crosswalks. Some research studies were carried on effect of raised pedestrian crosswalks on urban vehicular traffic speed However, the improper midblock crosswalk location was deliberates the pedestrian crossing behaviour. Moreover this crossing behaviour leaves a deleterious impact on traffic stream. Few research studies address the effect of pedestrian crosswalk on capacity of urban arterials at unprotected mid-block locations under mixed traffic condition. However, very few studies have employed effect of pedestrian crossing on vehicle speed at unprotected mid-block locations under mixed traffic condition. In this background, the objective of the study is to find out the vehicular speed with considerations of vehicle flow characteristics at two different locations with and without pedestrian crossings.

METHODOLOGY

With the approach presented in this project local administrations have a way

to work with the existing city structure, by creating accessibility plans for all neighborhood-level facilities. This way building, renewing or closing down actions may be based not only on economic or opportunistic principles, such as funds that need to be spent in a short timeframe on a certain type of activity (like creating new green areas). Building authorizations for new private facilities (like kindergartens) may be issued after a discussion on several placement options according to the service area of existing ones. Street networks proposed by new zonal plans may be tested before final authorization if they improve or diminish access between neighboring points of interest. Some facts that affect the pedestrian movement are the interactions of the other pedestrian motion, geometry of the road facilities, and alternate ways of the pedestrian has to choose their trip in a multiple ways. The pedestrian flow may take place in a unidirectional, bidirectional, or multi-directional. They do not prefer travel in extreme clear path/lanes although they may do sometimes under heavy traffic. To do that recorded data or experimental/field data is to be taken to extract the pedestrian speed, density and several parameters which are very useful for the study. There are several experiments were conducted at intersections and midblock. The first experiment was conducted at Hyderabad on disturbed pedestrian movement intended to study the impact of motorized vehicles on the pedestrian. From daily market undisturbed pedestrian movement was recorded to compare with the disturbed data set. The yield of this study is to show the fundamental difference between speed and density of the pedestrians.

Distance headway- Speed relationship:

Data was collected here to compare the disturbed and undisturbed pedestrian movement, by using the hypothesis, testing it is concluded that the two data sets are different each other. That is impact of motorized vehicles is affects the pedestrian movement at the signalized intersections. Speed-distance headway relationship is crucial to know the space required for a pedestrian from two different locations. Here we can observe the difference of distance headway-speed relationship for disturbed and undisturbed pedestrian movement. Hypothesis test was done to determine the differences within the two different groups of people (experiments), disturbed and undisturbed pedestrian movement and impact of motorized vehicles in traffic flow. Depends upon the sample size hypothesis tests are

conducted. If the sample size is less than or equal to 30 t-test is preferred otherwise we will go for z-test. To show the differences between the disturbed and undisturbed pedestrian movement z-test was conducted. The t- test was conducted for the disturbed pedestrian crosswalk to the motorized vehicular flow

RESULTS AND DISCUSSIONS

Study area:

The activities in urban areas are pedestrian oriented like the major shopping, recreation, bus stops and medical facilities. This increases the concentration of pedestrian rapidly. It carries the mixed traffic volume there by it causes.

- The Pedestrian Green Time in Traffic signals on all legs is very less. (Only 30 Sec. against 165 Sec. of cycle length at this intersection) Therefore the pedestrians are getting very less time to traverse the intersection while crossing the road.

- The enforcement of Stop sign is not observed properly, due to which, it is very difficult for pedestrian to cross the road even if the traffic is stopped due to Stop Signal.

- The Zebra Crossing on all the legs is placed at central part of road so that pedestrian has to cross for long distance. The parking space provided is not marked or paved; most of the vehicles occupy the space of the footpath. So, that I have selected income tax intersections at Hyderabad show the figure 1 because the pedestrian flow is very high and also traffic flow is continuous.

Figure: zebra crossing in Hyderabad

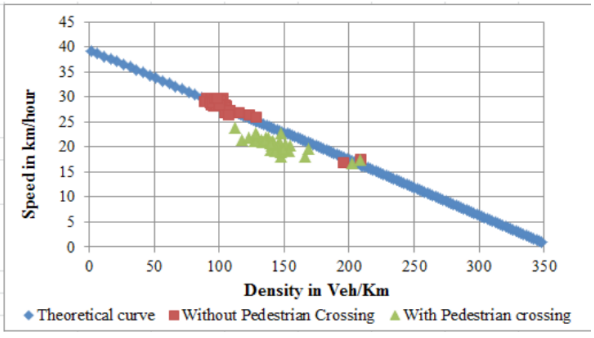
Data Collection:

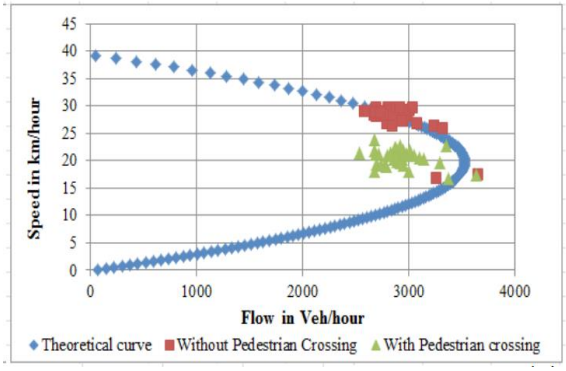
Videotaping survey was conducted at both locations during a normal weather working day condition in Hyderabad, Telangana India. The survey was conducted during two peak flow conditions morning (8:00-10:00 AM) and evening (4:00-6:00 PM). The video camera was located on top of a building. The total road section was divided into 20 m sections of white cello tape to find out the speed of the vehicle and also

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

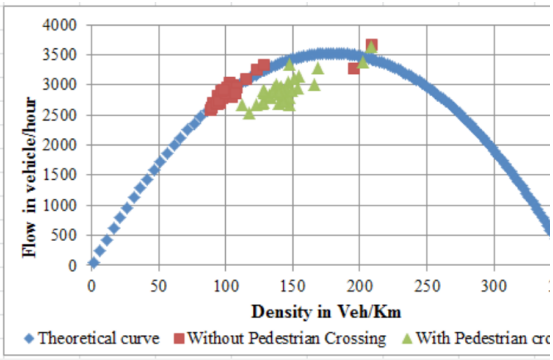
vehicular flow values. The video was played in Corel studio software in order to stop and view the time frame and data was extracted at an accuracy of 1 in 33 sec. From each time step (5 min), data were collected which includes pedestrian and traffic characteristics. In particular, to study the individual vehicular effect by pedestrian crossing, data was collected every 5 min and it is approximated to hourly traffic in order to get the each hour traffic flow characteristics. The collected data include a number of pedestrians, type of vehicle, vehicular flow, and vehicle speed.

The data such as vehicular flow, speed and density were computed at pedestrian crossing and pedestrian crossing restricted location. In order to study the effect of pedestrian crossing on vehicular f low characteristics the total combined traffic was considered and relationship were plotted between speed and density, speed and flow, flow and density and are presented in Fig. 2. The scattered plot of data points recommended a straight line relation between vehicle speed and density; quadratic relationship between vehicular speed and flow, and vehicular flow and density. In order to study the effect of pedestrian crossing on individual vehicle; individual vehicular flow, speed and density (each type of vehicle separately treated) were also measured from the field data and relationships were also developed. From these individual vehicular characteristics, the driver's yield behaviour at pedestrian crossings can be studied. If the particular vehicular flow characteristics change drastically, it implies that vehicular drivers give more space to the crossing pedestrian. The relationships were developed for combined data (see in Table and Fig) and also for individual mode; the calculated relationships from the analysis of data at two study locations, are presented in Table . The correlation coefficient R2 varies from 0.11 to 0.94 at various conditions.





International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362



Traffic Flow Fundamental Diagrams with and without Pedestrian Crossing: (a) Speed and Density Relationship, (b) Speed and Flow Relationship, (c) Flow and Density Relationship Vehicular Flow Characteristics Relationships with Pedestrian and without Pedestrian Crossing Conditions

Variation in Vehicle Flow Characteristics with Type of Vehicle Considering Effect of Pedestrian Crossings

The effects of pedestrian crossing on individual vehicles were studied by considering the variation of individual vehicle flow characteristics. From the field survey, it is observed that vehicles such as car, two wheeler and auto rickshaw (three wheeler) were more compared to heavy vehicles (bus and trucks) at the selected site. So, the individual variation was carried for only car, two wheeler and auto rickshaw. From this study, the individual driver behaviour with effect of pedestrian crossing can be observed. The variation of car vehicle flow characteristics is shown in Fig.

In particular, the average car speed (theoretical speed which indicates that k = 0 from the Table) was observed at pedestrian crossing is 21.83 kmph and at pedestrian crossing restricted location observed as 29.89 kmph. Due to interference the car drivers are more affected due to pedestrian crossings and interaction between pedestrian-car is also high. The variation of two wheeler characteristics with and without pedestrian crossing is shown in Fig 4. The two wheeler speed was found as 42.43 kmph without pedestrian crossing and 40.1 kmph with pedestrian crossing (theoretical speed which indicates that k = 0 for two-wheelers from the Table). It is clearly indicated that there is no significant effect of pedestrian crossing on two wheelers when compared to the car. It is also observed from the field survey, the two wheeler drivers change their vehicular path instead of change in speed to yield to pedestrians at crosswalk locations. the of vehicle speed and flow relationship, the theoretical capacity value is higher for the case of two wheelers when compared to the cars because there is no change in two wheeler

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

speed. It is the indirect indication of the effect of pedestrian crossing on two wheelers.

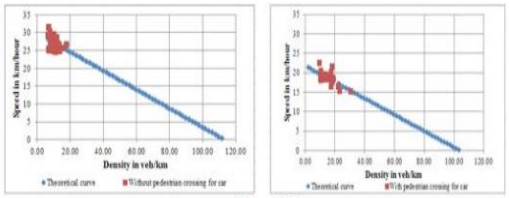


Figure 3(a)

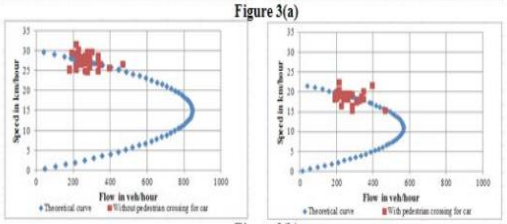
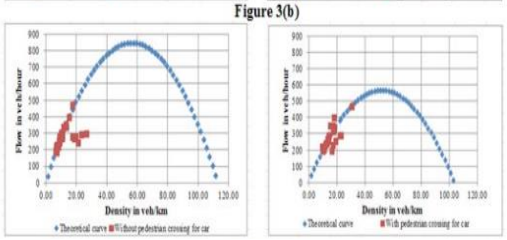


Figure 3(b)



Traffic Flow Fundamental Diagrams with and without Pedestrian Crossing for Car: (a) Speed and Density Relationship, (b) Speed and Flow Relationship, (c) Flow and Density Relationship

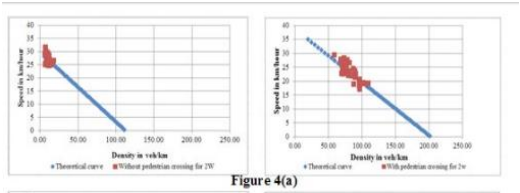


Figure 4(a)

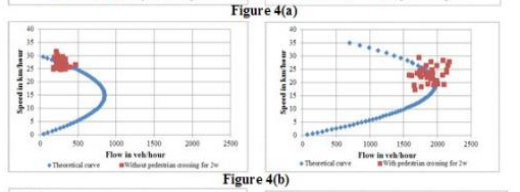


Figure 4(b)

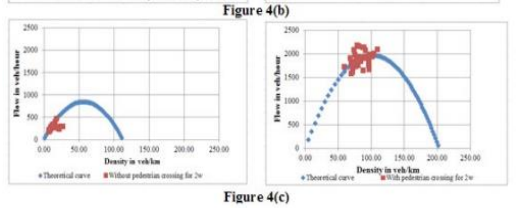


Figure 4(c)

Traffic Flow Fundamental Diagrams with and without Pedestrian Crossing for Two Wheeler: (a) Speed and Density Relationship, (b) Speed and Flow Relationship, (c) Flow and Density Relationship

The variation of auto rickshaw characteristics with and without pedestrian crossings is shown in Fig. The average speed of auto rickshaw was observed as 34.92 kmph when the pedestrian crossing restricted and 27.47 kmph with pedestrian crossing (theoretical speed which indicates that k = 0 for auto rickshaw (three wheeler) from the Table). There is a significant change in auto rickshaw speed with effect of pedestrian crossing. From these results, it inference that car and auto rickshaw has significantly changed their vehicular speed while yielding to pedestrians who are already in crosswalk location under mixed traffic conditions.

CONCLUSION

The vehicular f low characteristics were studied at un- signalized m id-block pedestrian crossing and pedestrian restricted crossing in hyderabad, India. The vehicular speeds were implicitly affected with pedestrian crossing when compared to without pedestrian crossing location under mixed traffic conditions. Pedestrian facilities are mainly consist of

the basic infrastructure facilities required for the pedestrian to walk safely and comfortably on the footpath, such as streetlights along the footpath, street furniture and traffic-calming measures like zebra crossings, and pedestrian-accentuated signals. The main objective of study is to recommend the appropriate pedestrian facilities for safe, comfort, reliable and efficient movement of pedestrian Approach as needs of pedestrian's having changed over the course of time. Nowadays, more stress has been laid on the importance of new measures of effectiveness such as safety, comfort, convenience etc. for evaluating the LOS of pedestrian facilities. The literature has also emphasized the need for designing the facilities for all kind of pedestrian users (elderly people, persons with disabilities, visually-impaired persons and persons using any kind of assistive devices) using new modeling techniques which in turn depends on the factors that influence the service quality.

REFERENCE

[1] Kadali. BR, Vedagiri. P,(2015) "Evaluation of pedestrian crosswalk level of service (LOS) in perspective of type of land-use", Transportation Research Part A: Policy and Practice 73:113–124

[2] Shekari. ZA, Moeinaddini. M, Shah. MZ, "Disabled Pedestrian Level of Service Method for Evaluating and Promoting Inclusive Walking Facilities on Urban Streets", Journal of Transportation Engineering, ASCE 2013; 139(2):181-192.

[3] M, Willis. A, Stradling. S, "Quality of Service for Pedestrians: Closing the Gaps in Knowledge", In Proceedings Traffic and Transportation Studies, Guilin, Guangxi, China, 2002, pp. 326- 333.

[4] Lee. JYS, Lam. WHK (2008), "Simulating Pedestrian Movements at Signalized Crosswalks in Hong Kong", Transportation Research Part A: Policy and Practice 2008; 42(10):1314–1325.

[5] J, Wang. J, Lu. J, "Pedestrians' Level of Service at Signalized Intersections in China", Transportation Research Record: Journal of the Transportation Research Board 2009; 2114:83- 89.

[6] J, Jiang. G, Yan. X, "Modeling Pedestrian Level of Service at Signalized Intersection Crosswalks under Mixed Traffic Conditions", Transportation Research Record: Journal of the Transportation Research Board 2015; 2512:46-55.

[7] V, Rokade. S, "Identification of Factors Affecting Pedestrian Level of Service of Crosswalks at Roundabouts", International Research Journal of Engineering and Technology 2017; 4(6):342–346.

[8] Zhao. L, Bian. Y, Lu. J, Rong. J, "Method to Determine Pedestrian Level of Service for the Overall Unsignalized Midblock Crossings of Road Segments", Advances in Mechanical Engineering 2014; 6:1- 9

[9] Rathi. N, Perumal. V (2014) , "Evaluation of pedestrian mid-block road crossing behaviour using artificial neural network", Journal of Traffic and Transportation Engineering 2014; 1(2):111-119

[10] Z, Moeinaddini. M, Shah. MZ, "A Disabled Pedestrian Level of Service Method for Evaluating and Promoting Inclusive Walking Facilities on Urban Streets", Journal of Transportation Engineering ASCE 2013; 139(2):181–192.