REVIEW PAPER ON STUDY OF PEDESTRIAN FLOW ON GRADE SEPARATED CROSSING

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Abstract – Walking is not usually considered a transportation mode. This is because it does not employ vehicles or it is a fundamental means of movement. But walking is the most efficient and effective mode of transportation for the short trips. People walk for many purpose i.e. work, shopping and recreation etc. Moreover every journey necessarily starts and ends as a walk trip. All trips in urban areas, be it by bus, car or train begin and end as a pedestrian movement. In India, the proportion of pedestrian movement is very large. Pedestrians are the most vulnerable among road users and the most affected in urban traffic accident. Complete segregation from vehicle through space may solve the problem of pedestrian’s causality in road traffic accidents especially at cross walk. These can be achieved by using pedestrian bridges and subways i.e. foot over bridge and foot under bridge which is defined as pedestrian movement in vertical direction or at gradients.

Keywords: Pedestrian, pedestrian flows, grade-separated intersections, reduce vehicular delays, foot over-bridges

1. INTRODUCTION
Walking is one of the most important travel modes in every country. However, pedestrians are always neglected in transportation planning and management. With the development of environment-friendly and resource-saving society, pedestrians are getting more and more attention. A pedestrian can be termed as a person who travels on foot. Any person walking, running, standing or sitting on a road or, a pram or in a mobility device or person on a toy vehicle not capable of exceeding 10 Km/h is called pedestrian. It also includes dismounted cyclists. Walking is recommended for a healthy lifestyle. It is also considered to be clear example of sustainable mode of transport especially suitable for urban use and/or relatively shorter distances. Pedestrian spaces are becoming increasingly rare nowadays. With the importance imparted to vehicular modes of travel, pedestrians are not included in planning and design of traffic. What is frequently overlooked is the fact that at some point or the other, every person is a pedestrian. So, serious thought should be given to the various issues relevant to pedestrians such as pedestrian safety, convenience and amenities. Pedestrian spaces have a long history. Most of the older towns in India as well as abroad, display a degree of respect towards the pedestrian which is higher than modern day cities. One of the obvious reasons is that the pedestrian was a significant mode of traffic in those days. The Industrial era and the advent of the automobile signaled the decline of walking and its associated spaces. Indian cities have not yet reached the level of Western cities in terms of vehicular volume, but they are growing very rapidly. With a major percentage of trips performed by walking, logic dictates that pedestrians deserve more respect in the overall urban scheme.

Various studies have demonstrated the benefits that could accrue to a city by the creation of proper pedestrian spaces - improvement in circulation of people, better areas for shopping, attraction for tourists, higher rental values, increased opportunities for leisure, better environment for residential areas, helps in environmental protection, increased scope for conservation, helps in promoting intellectual social relations and in projecting a better image of the town and its administration. The movement of pedestrians in the urban environment is vital for sustaining the social and economic relationships essential to city life. Walking enable individual to have direct contact with the environment and other people, enable the passage of people from place to place, and makes possible due to safety or ecological reasons. To enable and encourage walking for different purposes, the physical facilities must be designed to satisfy the physiological, psychological, and social needs of pedestrians and accidents. Planning and implementing such facilities require an understanding of the characteristics of pedestrian traffic.

2. FACTORS AFFECTING PEDESTRIAN DEMAND:-
The demand for pedestrian facilities is influenced by a number of factors of which some of the most important are:-

• The nature of the local community: - Walking is more likely to occur in a community that has a high proportion of young people.

Car ownership: - Due to increase in private cars pedestrians cannot move

• easily, even for short journey.

• Local land use activities: - Walking primarily used for short distance trips. Consequently the distance between local origins and destinations (e.g. homes and school, homes and shops) is an important factor influencing the level of demand, particularly for the young and elderly.

• Quality of provision: - Due to increase in good quality facilities, demand will always increase.

• Safety and security: - Facilities should be provided for safety and security of pedestrians. So, that they cannot conflict with motors. For pedestrians this means freedom from motor as
well as minimal threat from personal attack.

3. PEDESTRIAN PROBLEMS:
Accidents Circumstances: Pedestrian accidents occurs in a variety of ways the most Common type involves pedestrian crossing or entering the street at or between intersections.
- DARTING is the sudden appearance of a pedestrian from behind a vehicle or other sight obstruction.
- DASHING is the running pedestrians.

Special Problems:
- Age: The largest group of pedestrian victims and have the highest injury rate per population are children under 15 years of age group, because of the lower probability of recovery from injuries the elderly has the highest fatality rate. Intoxication and Intoxication and Drug effects: Alcohol and drugs impair the behaviour of pedestrians to the extent that they may be a primary cause of accident.
- Drug effects: Alcohol and drugs impair the behaviour of pedestrians to the extent that they may be a primary cause of accident.
- Dusk and Darkness: During the hours of dusk and darkness, special pedestrian safety problems arise when it is most difficult for motorists to see pedestrians.

4. PEDESTRIAN ACCIDENT SCENARIO
In the urban traffic accidents, pedestrians are observed to be a major component. In a very well-developed country like the United State of America and Germany and developing country like India, pedestrian deaths and injuries are the major issues. Some of the noteworthy points are:
- In 1998 total 5220 pedestrians died from traffic related injuries and another 69,000 pedestrians sustained non-fatal injuries in the USA.
- On an average one pedestrian is killed in a traffic crash every 101 minutes.

In India, pedestrian related fatalities accounted for about 8.4% of all motor vehicle related deaths in the year 2006 and around 8906 pedestrians died in accidents. 72% of all pedestrian fatalities in 2003 occurred in urban areas (National Highway Traffic Safety Administration, 2004). In New Delhi, there were 2088 deaths due to road accidents in 2008 and the number of pedestrians among them was 1075 which is 51.48% of the total fatalities.

Compared to those in USA and Japan, in India pedestrians, bicyclists and MTW(Motorized-Two-Wheeler) riders constitute a large proportion of road victim accidents. Bicyclists and MTW riders, who constitute the vulnerable road users, constitute 60-80% of all traffic fatalities in India (Mohan-2004). The data show that pedestrians are major victims in road accidents. In year 2014, 5% of traffic deaths as pedestrian’s. They constitute about 32% of the total road accidents. The total percentage of pedestrian Killed during road accident is 9.5%(Road accident in India 2015)

5. LITERATURE REVIEW:
Dr’az, 2002; Male pedestrians are more willing to violate regulations and make unsafe crossing decisions. They are also less likely to perceive risk when crossing a roadway in the presence of motor vehicles.

Holland and Hill (2010) collected adult pedestrian accident data which demonstrated that the risk of being killed or seriously injured varies with age and gender. A range of factors affecting road crossing choices of 218 adults aged 17-90+ were examined in a simulation study using filmed real traffic. With increasing age, women were shown to make more unsafe crossing decisions, to leave small safety margins and to become poorer at estimating their walking speed. However, the age effects on all of these were ameliorated by driving experience. Men differed from women in that age was not a major factor in predicting unsafe crossing decisions.

Zhuang and Wu (2011) studied that pedestrian’s crossing out of crosswalks (unmarked roadway) contributed many traffic accidents, but existing pedestrian studies mainly focus on crosswalk crossing in developed countries specifically. Field observation of 254 pedestrians at unmarked roadway in China showed that 65.7% of them did not look for vehicles after arriving at the curb. Those who did look and pay attention to the traffic did so for duration of time that
followed an exponential distribution. Pedestrians preferred crossing actively in tentative ways rather than waiting passively. The waiting time at the curb, at the median, and at the roadway all followed exponential distributions. During crossing, all pedestrians looked at the oncoming vehicles. When interacting with these vehicles, 31.9% of them ran and 11.4% stepped backwards. Running pedestrians usually began running at the borderline rather than within the lanes. Pedestrians preferred safe to short paths and they crossed second half of the road with significantly higher speed.

Guo et al., 2012 Dependent behavioral variables chosen for this study include pedestrian delay time, utilization of available crossing treatments, and conflicts between pedestrians and motor vehicles. Pedestrian delay is an important variable to study because pedestrians frequently become impatient while waiting to cross the street.

Khatoon, Tiwari and Chatterjee (2013) observed that pedestrians on Delhi roads are often exposed to high risks. This is because the basic needs of pedestrians are not recognized as a part of the urban transport infrastructure improvement projects in Delhi. Rather, an ever increasing number of cars and motorized two-wheelers encourage the construction of large numbers of flyovers/grade separators to facilitate signal free movement for motorized vehicles, exposing pedestrians to greater risk. This paper describes the statistical analysis of pedestrian risk taking behaviour while crossing the road, before and after the construction of a grade separator at an intersection of Delhi. A significant number of pedestrians are willing to take risks in both before and after situations. The results indicate that absence of signals make pedestrians behave independently, leading to increased variability in their risk taking behaviour. Variability in the speeds of all categories of vehicles has increased after the construction of grade separators. After the construction of the grade separator, the waiting time of pedestrians at the starting point of crossing has increased and the correlation between waiting times and gaps accepted by pedestrians show that after certain time of waiting, pedestrians become impatient and accepts smaller gap size to cross the road. A Logistic regression model is fitted by assuming that the probability of road crossing by pedestrians depends on the gap size between pedestrian and conflicting vehicles, sex, age, type of pedestrians (single or in a group) and type of conflicting vehicles. The results of Logistic regression explained that before the construction of the grade separator the probability of road crossing by the pedestrian depends on only the gap size parameter; however after the construction of the grade separator, other parameters become significant in determining pedestrian risk taking behavior.

Dulaski and Liu (2013) the 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 yield behaviour.

Granie, M.A., Brenac., et al., 2014 pedestrian behavior being strongly dependent on biological gender, as shown in past researches, it has also been found to depend on the psychological masculinity of an individual. Pedestrian speeds are also significantly related to pedestrian age, and the speeds of pedestrians are slower as they get older.

Satish Chandra, Rajat Rastogi et al (2014) studied that three types of crossings were observed in field; single stage, two stages and rolling gap. Single stage gap acceptance was found to have less deviation from critical gap. Two stage crossings were less in number and people preferred rolling gap crossing as compared to the other two types of crossing. The average gap accepted was found to be the lowest for Young and the highest for Old pedestrians. It was found that the older pedestrians exhibit a higher level of deviation in their accepted gap from critical gap than the other two categories. Based on age, it was found that young pedestrians take higher risk while crossing the roads. The critical gap at four locations was between 5.90 and 7.60 s and it decreases with increasing road width. It suggests that crossing speed of pedestrian increases with road width. Considering the safety aspect, a general value of 8 s is recommended for design of crossing facilities (like signal) and a higher value of 12 s are recommended at locations where female or old pedestrians are substantial

6 NEED FOR STUDY:-
A detailed study should be conducted which could highlight factors, such as attractiveness, safety, security, comfort and convenience etc. These environmental factors can greatly influence the pedestrians’ perceptions of the overall quality of facility. These factors can be analyzed in finer detail and an evaluation and grading method can be devised to assess the street.
Indian cities were built for walking and cycling. However, rapid motorization combined with limited attention to pedestrian facilities has inadvertently resulted in a decrease in the overall mode share for non-motorized transport. In order for people to reclaim the urban environment overrun by motor vehicles, strategies must be incorporated. Policies and investments provide an impetus to transform Indian cities, encourage pedestrianization and allow people to enjoy better mobility and quality of life

7 CONCLUSION
In this project information is gathered for pedestrian facilities. We could establish a methodology to deal with pedestrian optimization problems. The various pedestrians’ behavior at both intersections (Ambala Railway Station and Chandigarh Bus stand) on different time has been carried out in present study.
These two urban areas that generate large pedestrian movements were examined for the efficacy of movements within them. These are a railway station and a bus stand. A railway station and bus stand attracts large people communicate the different area on daily basis. A bus stand and railway station also attracts diverse groups of people for business and employment opportunities. Thus large groups of people traverse the different directions and these movements
need to be understood for effective facilities and safe movement. The list of architectural features is extensive and includes public conveniences, signboards, shoe-shine stands, traffic control booths, time tables, dust bins, litter bins, road signs, information kiosks, town map boards, loudspeaker systems, clocks, letter boxes, telephone booths, etc

REFERENCES