

Installation of Pedestrian Pelican Signals on Indian Roads - State of the Art

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Abstract—Every trip begins and ends on foot. In recent times developed countries have made colossal stride forward making their cities pedestrian and bicyclist friendly in order to encourage their citizens to travel short trips either by walking or by using bicycle. This also provides a healthier environment to the citizens due to less pollution and walking benefits. In order to encourage pedestrian use the non-motorised methods of transportation planners or designers have to provide them with an infrastructure which is more pedestrian friendly minimises their conflict with the vehicular traffic and enhancement of road user's safety. This concept has more significance in urban areas where the density of people as well as vehicle is quite high and conflicts of pedestrian and vehicles are frequent. Pedestrians are more vulnerable to road accidents than other road users. So this makes it more important to take special care of this healthier mode of transport. It has been observed by different organisations like the World Health Organisation, World Bank etc. that the number of deaths due to road accidents is higher in the developing countries than the developed countries. Therefore for developing country like India authorities have to be more concerned to provide their citizens with a healthier and safe environment for walking.

This paper reviews the concept of pedestrian pelican signals, their effect on the enhancement of pedestrian safety and various advancements regarding pedestrian safety with reference to India.

Keywords: pedestrian, pelican signals, safety, conflict, traffic, signalised signals.

1. INTRODUCTION

A pedestrian crossing or crosswalk is a place designated for pedestrians to cross a road. Crosswalks are designed to keep pedestrians together where they can be seen by motorists, and where they can cross most safely across the flow of vehicular traffic. Marked pedestrian crossings are often found at intersections, but may also be at other points on busy roads that would otherwise be too unsafe to cross without assistance due to vehicle numbers, speed or road widths. They are also commonly installed where large numbers of pedestrians are attempting to cross (such as in shopping areas) or where vulnerable road users (such as school children) regularly cross. Signalised pedestrian crossings clearly separate each type of traffic (pedestrians or road vehicles). Types of pedestrian

crossings typically used around the world are Zebra crossing, Pelican crossing, Puffin crossing, Toucan crossing and Pegasus crossing.

Signal-controlled crossings are used where vehicle speeds are high, and other options are thought unsuitable, there are normally a greater than average proportion of elderly or disabled pedestrians, vehicle flows are very high and pedestrians have difficulty in asserting precedence, specific need for a crossing for cyclists or equestrians, pedestrians could be confused by traffic management measures such as a contra-flow bus lane, there is a need to link with adjacent controlled junctions or crossings, pedestrian flows are high and delays to vehicular traffic would otherwise be excessive. Caution should be exercised where pedestrian flows are generally light or light for long periods of the day. Drivers who become accustomed to not being stopped at the crossing may begin to ignore its existence, with dangerous consequences. The problems are accentuated as vehicle speeds increase.

More than 270 000 pedestrians lose their lives on the world's roads. Many leave their homes as they would on any given day never to return. Globally, pedestrians constitute 22% of all road traffic fatalities, and in some countries this proportion is as high as two thirds of all road traffic deaths. Millions of pedestrians are non-fatally injured – some of whom are left with permanent disabilities. These incidents cause much suffering and grief as well as economic hardship^[1].

In India, more than one lakh people die every year due to road accidents. India accounts for about 5.4% of the road injuries in the world^[2]. Pedestrian collisions, like other road traffic crashes, should not be accepted as inevitable because they are both predictable and preventable. The key risks to pedestrians are well documented, and they include issues related to a broad range of factors which include driver behaviour particularly in terms of speeding and drinking and driving; infrastructure in terms of a lack of dedicated facilities for pedestrians such as sidewalks and raised crosswalks and medians.

2. NATIONAL AND INTERNATIONAL ADVANCEMENTS

^[3]According to Rastogi, Chandra & Mohan (2014) pedestrian facilities are provided to facilitate and encourage short distance travel. The Level of Service (LOS) criteria available in the literature for pedestrian facilities are more adaptable to the pedestrian scenarios in the US than in developing countries. They observed that the pedestrian space criterion is more uniform and stable than the pedestrian flow criterion in defining the LOS of a facility. ^[4]According to Kumar and Satheesh (2014) pedestrian is the most vulnerable road user among all categories of the road users. Incidentally, he is hapless victim of Road Traffic Accidents. Statistics also reveal that quite often, it is economically deprived, elderly citizen who fall a prey to accidents. Infrastructural facilities that patronize the pedestrian, available at important locations along the road environment, would encourage the pedestrian to use the same with confidence, reliability and safety. But, it is equally important that such facilities should promote and encourage the usage by end users. They suggested that some case studies do depict situations which many a times, work against the design safe passage and mobility of pedestrian. Their study aims at mapping the conditions at site and comparing it with standards. Their analysis aids at remedial measures that may ensure safety of the pedestrian. ^[5]According to Chandra, Rao & Dhamaniya pedestrian crossing a road at mid-block section reduce the traffic stream speed and thus the capacity of the road. These crossings may be designated places where pedestrian markings are made or at the undesignated places where no such markings are present. They suggested a mathematical relation for reduction in road capacity with volume of pedestrian cross-flow.

^[6]B Raghuram Kadali & P Vedagiri says that pedestrian road crossings have become a major issue in road traffic flow, especially in urban areas where there is no control for pedestrian road crossings. Pedestrian road crossing behaviour is a serious threat to pedestrians at uncontrolled midblock crossing locations in the mixed traffic conditions. Due to increase in motor vehicle growth there is an increase in the regulation of motor vehicles only and the regulation of pedestrian is completely neglected. This increases the uncontrolled road crossing behaviour of pedestrian. The main motivation of this study is to investigate the pedestrian road crossing behaviour at the uncontrolled midblock location in India under mixed traffic condition. The study concludes that the pedestrian behavioural characteristics like the rolling gap, driver yielding behaviour and frequency of attempt plays an important role in pedestrian uncontrolled road crossing. These inferences are helpful for pedestrian facility design and controlling pedestrian safety issues at uncontrolled crossings.

^[10]According to Japs B. Pelican, puffin and toucan crossings are three types of autonomous signal-controlled pedestrian crossings, which are used throughout the UK. The City of Edinburgh Council has been proactive in executing an action

plan to reduce the vehicle green time at all its independent signal-controlled pedestrian crossings, to ensure a minimal delay to the pedestrians using them. They carried out mathematical analysis to assess the average pedestrian delays and the total delay to pedestrians at specific examples of pedestrian crossings of all three types and signal-controlled junctions. It was found that pelican, puffin, and toucan crossings can be set to reduce pedestrian delays considerably compared with the delays at exclusive signalled junction crossings, during peak periods.

^[9]Warrant 3 of IRC: 93 (1985) recommends that the minimum pedestrian volume warrant is satisfied when for each of any 8 hours of an average day, the following traffic volume exists:

I. On the major street, 600 or more vehicles per hour enter the intersection (total on both approaches) or where there is a raised median island 1.5 meter or more in width, 1000 or more vehicles per hour (total on both approaches) enter the intersection on major street, and

II. During the same 8 hours, there are 150 or more pedestrians per hour on the highest volume cross walk crossing on the major street.

A signal installed under this warrant at an isolated intersection or mid-block, should be of the traffic actuated type with push buttons for pedestrian crossing the main street. If experience proves that it is being tampered with or misuse anticipated, they can be of usual fixed time cycle and phases. If such a signal is installed at an intersection, it should be equipped and operated with control devices and which provide proper coordination with other signals in the system.

Guidelines for installation of signal at proper distance from the intersection are provided in this code and various other aspects have been clearly stated under this code.

According to Hunt J. the safety of Zebra crossings, which are uncontrolled, and Pelican crossings, which are signal controlled is reviewed against a background of the development of each crossing type. The safety of Pelican and Zebra crossings has been compared in several studies over the past 20 years with few clear conclusions emerging.

^[11] Hunt and Griffiths give information about the pedestrian behaviour and they discussed the operation of zebra crossings and pelican signals. They found out that pedestrians delay are much more in pelican signals as compared to the zebra crossings and people tend to move in between the gaps provided by the vehicles thus increasing risk factor for major road accidents. In the absence of physical separation a surface crossing which gives preference to pedestrians is required.

The pelican signals have been installed in India in cities of Delhi and Chandigarh. Many cities are planning to have these signals like Bangalore. The idea is still in its initial stage. The major problem is due to unawareness of road users about the concept. Unless the education about these signals is not given to road users there is a danger of failing of this concept. In

Delhi the pelican signals have been converted into fixed time signals like other traffic signals giving fixed time to vehicles and pedestrian to cross the road. This defeats the concept of pelican signals which are designed to make city pedestrian friendly. In Chandigarh the pedestrian pelican signals have been installed at Madhya Marg (Sec.16-Sec.10) and Sukhna Lake. Many more locations have been identified in Chandigarh where these signals can be installed. The locations are identified on the basis of heavy pedestrian traffic present at these locations. The concept is still new in India and moreover it is in experimental stage and will take a long time to understand the concept of pelican signals. Text must be fully justified. A format sheet with the margins and placement guides is available in Word files as <format.doc>. It contains lines and boxes showing the margins and print areas. If you hold it and your printed page up to the light, you can easily check your margins to see if your print area fits within the space allowed.

3. PEDESTRIAN PELICAN SIGNAL

In India where a vehicle is owned per 1000 people (41/1000 persons) ^[12] is very less as compared to the developed countries and its huge population relies on their feet for their movement it is extremely important to develop a safe infrastructure for pedestrians. Pelican crossings they are essentially signal controlled crossing points where a pedestrian is able, through use of a button, to call a red signal to halt the traffic. Such crossings are generally perceived positively by the public (more so than the main alternative – unsignalised zebra crossings). A PELICAN (Pedestrian Light Control Activated crossing) signal incorporates a standard red-yellow-green signal light that rests in green for vehicular traffic until a pedestrian wishes to cross and presses the button. The signal then changes to yellow, then red, while Walk is shown to the pedestrian. The signal can be installed as either a one-stage or two-stage signal, depending on the characteristics of the street. In a two-stage crossing, the pedestrian crosses first to a median island and is then channelized along the median to a second signalized crossing point. At that point, the pedestrian then activates a second crossing button and another crossing signal changes to red for the traffic while the pedestrian is given a Walk signal. The two crossings only delay the pedestrian minimally and allow the signal operation to fit into the arterial synchronization, thus reducing the potential for stops, delays, accidents, and air quality issues. A Pelican crossing is quite effective in providing a pedestrian crossing at mid-block locations when the technique can be integrated into the roadway design. The pelican signals provide a segregation of pedestrian and vehicular traffic at surface level and thus minimise the conflict of vehicles and pedestrian crossing the road. The concept gives the pedestrian a right of way. The pelican signals are easy to use and easy to understand and thus provide a great mechanism to minimise the pedestrian accidents in urban areas.

The pelican signals are more useful in the roads where there are hospitals, schools and colleges in the adjoining area to the site of installation of these signals. These signals provide them with a safe movement along the road especially to the patients, persons with disabilities and smaller children.



Fig. 1: Installed PELICAN Signal at Madhya Marg Chandigarh

4. CONCLUSION

After studying the above literature, the findings reflect that the use of pelican signals has resulted in following:

- Increase in road capacity by streamlining the pedestrian traffic.
- Enhancement of pedestrian safety by removing the direct vehicle-pedestrian conflict.
- Reduction in uncertainty of pedestrian movement.
- More useful to vulnerable pedestrians like elders, children, physically challenged, blind etc.
- Flexibility as different durations can be set up during different time of day.
- Economical (as compared to foot-over bridge and under pass)
- Environmental friendly

The increase in population coupled with socio-economic growth has resulted in the increase of vehicular as well as pedestrian traffic. Hence the probability of their conflicts on road causing low and fatal accidents has increased considerably. So to deal with the situation use of the technology is the only solution. The pelican signals provide a simpler use of technology as it is simple to use and is user-friendly. The pelican signal along with other pedestrian safety measures like guard rails has resulted in enhancing the pedestrian safety. The only concern about using pelican signals is awareness among people as the concept is relatively new in India. These signals by minimising the vehicle-pedestrian conflict also attain the objective of green development of cities as they motivate road user to take short trips on foot.

REFERENCES

- [1] Briand, L. C., Daly, J., and Wüst, J., "A unified framework for coupling measurement in objectoriented systems", *IEEE Transactions on Software Engineering*, 25, 1, January 1999, pp. 91-121.
- [2] "Pedestrian safety: a road safety manual for decision-makers and practitioners" released by WHO in 2013.
- [3] "Legal Reforms to Combat Road Accidents" by the *Indian Law Commission*.
- [4] Rastogi R., Chandra S. and Mohan M.(2014), "Development of Level of Service Criteria for Pedestrians", *Journal of the Indian Roads Congress*, January-March 2014.
- [5] Er. Kumar V.D. and Er. Satheesh S. (2014), "Pedestrian Safety in Urban Areas", *Indian Highways*, November 2014, Vol. 42.
- [6] Chandra S., Rao G.S. & Dhamaniya A. (2014), "Effect of pedestrian cross-flow on Capacity of Urban Arterials", *Indian Highways*, January 2014, Vol. 42 No.1.
- [7] B Raghuram Kadali & Vedagiri P. (2013), "Modelling pedestrian road crossing behaviour under mixed traffic condition", *European Transport*, 2013, Issue 55.
- [8] IRC: 103 (1988), "Guidelines for Pedestrian Facilities", *Indian Road Congress*, New Delhi.
- [9] IRC: 70 (1977), "Guidelines on Regulation and Control of Mixed Traffic in Urban Areas", *Indian Road Congress*, New Delhi.
- [10] IRC: 93 (1985), "Guidelines on Design and Installation of Road Traffic Signals", *Indian Road Congress*, New Delhi.
- [11] Japs B. (2000) "Minimising Pedestrian Delays at Signal Controlled Crossings", *Traffic Engineering & Control*, May 2000, Vol. 41 No 5.
- [12] Hunt J. & Griffiths J. (1987), "Pedestrian Behaviour at Mid-Block Crossings In The United Kingdom --Road User Behaviour", *2nd international conference on road safety held in Groningen, Netherlands*.
- [13] "Indian official report on Motor Vehicles". *Indian Ministry of Statistics and Program Implementation*.