IOSR Journal of Engineering
Apr. 2012, Vol. 2(4) pp: 750-754

PEDESTRIAN STUDY ON ROAD LINKS IN MAJOR URBAN CENTRE

T.Subramani
Professor & Dean, Department of Civil Engineering, VMKV Engg College,
Vinayaka Missions University, Salem, India

Abstract
Walking is an important mode of transport. In urban areas a significant proportion of trips up to 1-2Kms in length are performed on foot. Moreover every journey necessarily starts and ends as a walk trip. Since pedestrian are more vulnerable to being involved in accidents, it is imperative that adequate consideration should be given to their safety through provision of facilities like guard rails, secured crossing areas, footpath and grade separations. Pedestrian facilities should be planned in an integrated manner so as to ensure a continuous pedestrian flow. It should be useful therefore to look at pedestrian needs for an area as a whole and prepare an overall strategic plan. The basic aim should be to reduce pedestrian conflicts with vehicular traffic to the minimum. Efforts should be made to create such conditions that pedestrian are not forced to walk in unsafe circumstances and that the motorist respects the position of pedestrian. While planning the convenient of pedestrian should be paramount consideration. Otherwise the facilities provided will not be fully used. Suggestions formulated as traffic management schemes to provide safety to the pedestrians by reducing conflict in between vehicle movement and pedestrians.

Keywords: *Footpath, Major Urban Centre, Pedestrian, Road links, Survey*

1. General
Pedestrian facilities should be planned in an integrated manner so as to ensure a continuous pedestrian flow. It should be useful therefore to locate pedestrian needs for an area s a whole and prepare an overall strategic plan. The basic aim should be to reduce pedestrian conflicts with vehicular traffic to the minimum efforts should be made to create such conditions that pedestrians are not forced to walk in unsafe circumstances and that the motorists respect the position of pedestrians. While planning, the convenience of pedestrians should be a paramount consideration. Otherwise the facilities provided will not be fully used.

2. OBJECTIVES
1. To carry out pedestrian studies
2. To formulate strategies for better management for pedestrian movements.

3. LIMITATIONS
The survey has been carried out only on the working day in the middle of the week. A detailed pedestrian surveys spread over longer duration of time would have yielded more reliable results. More of parking problems is especially due to unauthorized construction of the shopping complexes in the basement especially in CBD areas; a detailed survey is not carried out. During evenings, especially when pedestrian moment is too high, video shooting of the same and the count taken with on slow motion would have yielded more reliable results. In this survey the count is taken manually.

4. Scope
For the safer moment of pedestrian is required to carry out survey and then with decision in the CBD to locate/allot places on the roads and vendors so that the pedestrian do not keep crossing the roads and hence all the pedestrian will have safer movement. His could be a major study that can be carried out by local government.

5. Study of present conditions in salem city

5.1 Salem – General
Salem is the fifth largest city in Tamil Nadu over an area of 91.34 Sq.kms. Salem city is located at distance of 350 kms from a Chennai on the west, and 160 kms from Coimbatore and it got the fifth largest population of 7.54 lakhs as per 2011 census in Tamil Nadu.. It is situated at the trijunction of Bangalore, Trichirappalli and Chennai roads. The City is located at 11 40’ North and 78 10’ on the East. The general topography is plain The city is surrounded by the hills viz. the shervarous and Nagarmalai on the North, The Kanjamalai on the west, the Goodamalai on the East.

5.2 Population Growth
The population in Salem has grown at a rate of 23 percent per decade between 1951 and 1971, the rate has been lower for the decade 1971 – 1981 at 17 percent and 14 percent per decade between 1991 and 2011. TABLE.1 gives the growth of population within the Salem town.

Table 1. Population growth of salem city corporation

Year	Salem town / corporation* population	Decade variation	% of decade variation
1901	70621	-	-
1911	59153	(-) 11468	(-) 16.24
1921	52244	(-) 6909	(-) 11.68
1931	102149	(-) 49935	95.58
1941	129702	27523	26.94
1951	202335	72633	56
1961	249145	46810	23.13
1971	308716	59571	23.9
1981	361394	52678	17.06
1991*	579951	218557	60.47
2001*	672330	92379	15.92
2011*	754000	81670	12.15

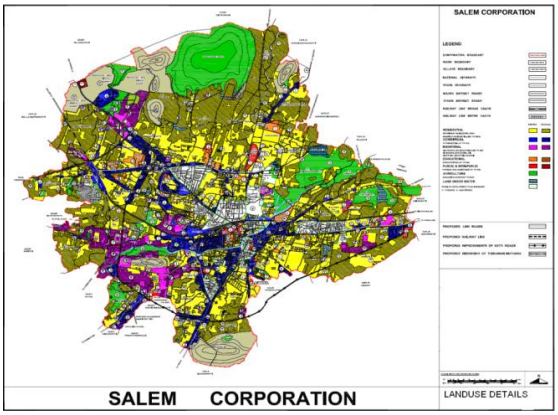

Figure.1. Existing land-use details of salem city corporation

5.3 Existing Land-Use Structures

The extent of Salem town is 91.34 Sq.km of this the developed area is 4648 Hectares i.e. 48.71 percent of the total area and undeveloped area is 4894 hectares i.e. 51.29 per cent of the total area. Fig.1. is showing the existing land use details of Salem City Corporation area.

5.4. Existing Traffic Situation

The traffic in Salem town is heterogeneous in nature comprising of slow moving vehicles such as hand carts, animal drawn vehicles, bicycle and fast moving vehicles such as mini cargo vans, Passenger vans Lorries, buses etc. In the absence of separate lanes for slow moving vehicles and cyclists all the vehicles are found to use the available narrow carriageway. The pedestrian side walks have been provided only near Collectorate. In almost all the main roads vendors occupy the road margins and side walks. Hence the pedestrians are deprived of the use of road margins and side walks and use the carriage way, causing hindrance to the free vehicle movement. This may be noticed more in the central area of the old town comprising of Collectorate and Bus stand complex the main private companies.

6. Salem city corporation road network

Salem district as a whole has only 10,133.7 km. of road, out of which 214.6 km are cement concrete roads, 5098.1 kms. are bituminous surfaced road and the remaining 4821 kms. are water Bound Macadam roads. The unsurfaced road of 2352.7 kms. also exist in the district.

Salem Corporation has about 748.13kms. of surfaced roads under its control and maintenance as detailed below. The width of road ranges from 3.5 m to 14.0m in the major road network excluding the lanes and small roads. The details of the various categories of roads with their lengths in the town is show in TABLE. 2

Table.2 Types Of Roads With Their Length In Salem Corporation

Sl. No	Category	Road length (km)
1	Cement Concrete Super Roads	54.47
2	Black Topped Roads	628.17
3	Wbm Roads	17.04
4	Earthern Road	23.46
5	Others	24.66
	Total Length of Municipal Roads	748.13

The arterial road network of Salem Chosen for the study consists of four major radial corridors originating from the city bus stand. These roads are Attur road in the east, Trichy road and Coimbatore road in the South and Omalur road in the North west. In addition to these, there are a few secondary radial roads. One orbital corridor is identified and it consists of Shandipet road, pallapatti main road and court road. Fig.2. shows the identified road network selected for the present study.

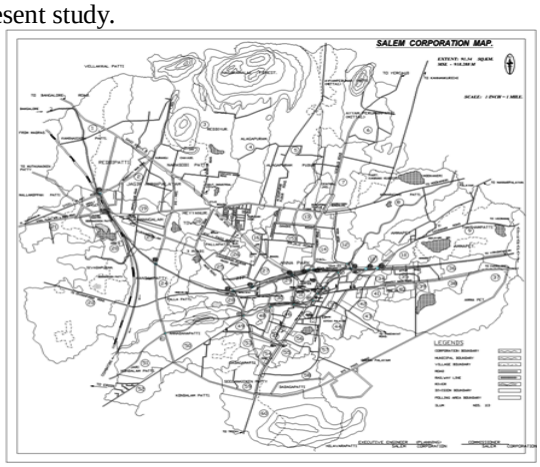

Figure.2. Salem city corporation road network

7. PEDESTRIAN STUDIES

Pedestrian's accidents are common on the roads. Walking is significant mode of transport and all human beings are pedestrians. For varying time periods on roads, even though motorization is increasing at a rapid pace. Right from the early day- till the person is unable to move, walking remain an important mode of travel. Even people, who use cars and motor cycles, depending upon their needs, walk for shorter or longer distances. Walking is indeed found to be healthy as it helps in prevention and control of some non communicable diseases like diabetes, obesity, hypertension, cardiac problems and others. In a country with large populations it is common to see more people walking on roads in both cities and rural areas. Large number of people including children, elderly, disabled, pregnant mothers and others use roads regularly. When large number of such people uses roads, the environment and operating vehicles need to be safe, so that pedestrians are not injured and killed. In recent years, pedestrian's safety has assumed greater importance as reports indicate that pedestrians are the single largest category of those injured and killed in road crashes in India. Walking is an important mode of transport. In urban areas, a significant proportion of trips up to 1-2Km in length are performed on foot. Moreover every journey necessarily starts and ends as walk trip. Since pedestrian are more vulnerable to being involved in accidents, it is imperative that adequate consideration should be given to the safety through provision of facilities like guard-rails, secured crossing areas, footpaths and grade separations.

8. FOOTPATH (SIDE – WALK)

In order to be effective, the side walks should be provided on both sides of the road and above the level of the carriageway separated by non-mountable kerbs. Height of the kerb at the edge should, however, not exceed the height of non-mountable kerbs, as this might otherwise detract pedestrians from getting on to the side-walks. The width of the side-walks depends upon the expected pedestrian flows and could be fixed with the help of guidelines given in TABLE.3, subject to a minimum width of 1.5m Most of the footpath were occupied by the merchants (Fig.3.)

Figure.3. Footpath & carriageway occupied by the merchants in cbd area

Table3. Capacity of sidewalks

Width of side walk (meter)	Capacity in numbers of persons per hour	
	All in one direction	In both direction
1.50	1200	800
2.00	2400	1600
2.50	3600	2400
3.00	4800	3200
4.00	6000	4000

For side walks in shopping areas, the width should be increased by 1m which is treated as the "dead width". In other situations where side-walks pass adjacent to buildings and fences the dead width can be taken as 0.5m. For areas of heavy pedestrian activity such as bus stops, railway stations and recreational area, the width of side-walk should be suitably increased to account for accumulation of pedestrian. In purely residential areas, and special cases like shopping centers and industrial office complexes, different principles will apply to side-walk design than the capacity considerations given in TABLE.3. Enhancement of environmental values and safety are the governing criteria in pedestrian sensitive situations such as these, and layouts need to be carefully planned keeping these points in view.

9. pedestrian guard - rail

Pedestrian guard- rails are an important design element to prevent indiscriminate crossing and spilling over of pedestrians on to the carriageway. Their judicious use can help to ensure that pedestrians cross the streets at predetermined and safe locations. As the guard rails would confine the movement of pedestrians to the footpath, it is obligatory that sufficient width of footpath be made available for the use of pedestrians

10. Pedestrian crossings

Where complete segregation of pedestrians from vehicular traffic is not possible, some form of planned road sharing principle must be applied. Being the most vulnerable road user, pedestrian should increasingly be given the place and time to legally claim the right to cross the road. Pedestriancrossings are to be provided where they will be well used. Hence, it is necessary to follow certain criteria for extablishing the right pedestrian crossing at a particular location.

11.Pedestrian safety

A large number of road accidents involve pedestrians. In Delhi, the pedestrians contribute 46 percent of the fatalities from road accidents. These figures indicate the seriousness of the pedestrian safety problem.

12. Trends in pedestrian accident pattern.

12.1 Age

Age has significant effect on the accident pattern involving pedestrians. Most of the research findings have concluded that children and the very old are more likely to be in a greater risk than the other age groups. This is easy to understand: the active adults are able to cross the road safely, whereas the very young and very old are not. Children are frequently involved in crossing the road on their way to or from the school. They also get involved in accidents when playing in the streets or nearby. The old people get involved in accidents due to impaired hearing and vision and decreased perception and reaction.

12.2 Sex

The influence of the sex of a person on the accident has been investigated by many. The general conclusion is that women are more careful pedestrian than men

12.3 Social conditions

Social status influences pedestrian behaviour instance, it has been noticed that under-privileged and low income groups figures prominently in pedestrian casualties. General environmental and living condition also have an influence on the accident rate.(Fig.4.)

Figure.4. Pedestrians moving across and along the road without any traffic awareness.

13. Survey and analysis of data

Pedestrian survey conducted in 10 main locations of the city from morning 8.0am to night 8.0pm. From that survey we understand the existing pedestrian traffic condition in all the places and identify peak hour pedestrian strength. We have collected the existing pedestrian traffic facilities available in the locations. The details are as follows.

13.1 Four road

We observe that the peak hour pedestrian movement is 729. Footpath available on both side of the road. There is no pedestrian guard rail is provided for safety. Also zebra crossing is to be provided.

13.2 Five road

We observed that the peak hour pedestrian flow is 916, Footpath available on both side of the road. No guard rail is existed. Safety kerb guard rail is not available along both side of the road.

13.3. New bus stand

We observed that the peak hour pedestrian flow is 1493. No pedestrian guard rail is available along the road.Footpath is available on bothsides. But, it is fully occupied by the merchants.

13.4 Old bus stand

Peak pedestrian hour moment is 1422. There is no railing and zebra crossing along the road. Footpath is not available on both sides.

13.5 State bank colony

The peak hour pedestrian movement is along the road in both direction is 726. There is no guard rail available.

13.6 Bangalore bye-pass road

We observe that the peak hour pedestrian flow is 751 along one side of the road. No proper footway is available..

13.7 Saradha college road

The peak hour pedestrian movement is along the road in both direction is 728. The existing footway is of 2.8meters & no guard rail is available on both side of the road.

13.8 Railway station

It is observed that the peak hour pedestrian flow is 1171.There is no footway available on both sides of the road. No pedestrian guard rail is provided.

13.9 Cherry road

Peak pedestrian hour movement is 724. There is no footway available on both sides of the road. No pedestrian guard rail is provided.

13.10 Kondalampatti Bye-pass

The existing footway is 2.3meters each on both side of the road. Safety kerb is provided along the road. The pedestrian peak hour movement is 845.

14. Conclusions

From the pedestrian study and survey we observed that there is no proper required footpath available in most of the Salem City road links. Even if it is available, it is not maintained properly. So, the pedestrians are not properly using the available footpath because of social conditions. Even most of the available footpaths are fully occupied by the small merchants and in some places shop keepers are keeping their generators over the footpath. So, the Local

body has to take necessary action over their illegal occupanancy and make clear footpath for pedestrian movements. Educate the public in the form of advertisement regarding the usage of footpath and follow necessary traffic rules and regulation to prevent road accidents.

From the pedestrian study different suggestions were formulated as follows.

1) According to IRC-1988 provision of safe walking places in the city with walkable footpaths must be provided. Elevated and visible designated areas for crossing of roads in all possible places.
2) Separation of pedestrian movement from heavy moving traffic in all possible places.
3) Design of safer highways with separation of pedestrians and slow moving vehicles.
4) Speed control by road design, traffic claiming and enforcement on highways, in residential areas and near traffic generators like educational institutions, business places, hospitals etc.
5) Prohibition of drinking and driving among vehicle users.
6) Recognizing heavy pedestrian movement areas and appropriate traffic management schemes.

15. References

[1]. DTCP (1986), 'Short term improvement program ME – Traffic and Transportation study for Coimbatore, Madurai, Trichy and Salem', DTCP, Tamil Nadu
[2]. Hanspeter Georgi (1973),`Cost- Benefit Analysis and Public Investments in Transport: A Survey', First Edition, Butter Worths (Publishers),London.
[3]. Kadiyali.L.R.(2007),`Traffic Engineering and Transport Planning', 7th edition, Khanna publishers, Delhi.
[4]. Khanna S.K – Justo C.E.G (2010),` Highway Engineering',9th edition, Nem Chand and Bros. publishers, Roorkee(U.P)
[5]. Lindsay R. Peat (1982),`Practical Guide to DBMS selection', Walter de Grawyter, New York.
[6]. Meyer M.d.Miller E.J (1984),`Urban Transportation Planning', Mcgraw – Hill series, New Delhi.
[7]. Subramanian P. (1990) ,`Capacity restrained trip assignment model for Madras City', ME Urban Engineering Thesis, Madras – 600025.
[8]. V.N.Vazirani & S.P.Chandola, `Transportation Engineering Vol.I ', 5th edition, Khanna Publishers, New Delhi
[9]. Dr.L.R.Kadyali & Dr.N.B.Lal,` Principles and Practices of Highway Engineering, 5th edition, Khanna Publishers, New Delhi
[10]. B.L.Gupta & Amit Gupta `Highway and bridge Engineering'3rd edition Standard Publishers Distributers, New Delhi
[11]. C.Jotin Khisty & B.Kent Lall,` Transportation Engineering' 3rd edition, PHI Learning Private Limited, New Delhi
[12]. Gurcharan Singh, `Highway Engineering'5rd edition Standard Publishers Distributers, New Delhi
[13]. R.K. Khitoliya, `Principles of Highway Engineering' 1st edition , Dhanpat Rai Publishing Company, New Delhi.
[14]. DTCP (1999), 'Comprehensive Traffic and Transportation Study for Salem`, Pallavan Transport Consultancy Services Ltd., Chennai, Tamil Nadu.
[15]. Guidelines on regulation and control mixed traffic in urban areas, IRC: 70-1977.
[16]. Guidelines for pedestrian facilities, IRC:103-1988ITPI Journal (Institute of town planner India) 2004, 43-46 and 2005, 62-65.
[17]. Sarna, A.C.,et al, Road accidents on rural highways in India, International seminar on Road safety, Indian Road Congress, New Delhi,1986