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ANALYSIS OF PEDESTRIAN LEVEL OF SERVICE ON FOOTPATH IN HYDERABAD

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ABSTRACT

In urban India version of transportation, the traffic planners mostly give stress on motorized mode of movement. All kinds of steps are taken for development of roads in terms of safety, speed or time interval at intersections in case of motorized vehicle. But in present traffic condition, the non-motorized mode of traffic is also increasing. The pedestrians and bicyclists are occupying the track of motorized vehicle as no separate grades are provided for them. It leads to traffic congestion as well as the safety factor of pedestrian is at stake. According to HCM 2010, for this heterogeneous traffic, we can't just increase the level of service by developing the quality of roads for vehicles. Steps have been taken to reclaim pavement for pedestrians by removing the encroachment on footpath. Study is carried out at random locations in Hyderabad city. The users were asked to answer the questions the quality of service provided by the system in terms of questionnaire formed .The format of questionnaire was based on the factors that user perceive. From the ratings, an analysis was carried out to find the level of service based on perception of the interviewers .The analysis consisted of five factors as safety, Comfort level vendors encroachment ,accessibility and side walk performance, climate condition. The analysis was done by Inverse variance method the area was categorized to a specific level of service out of 6 degrees of level of service (LOS).

It is difficult to have LOS value for an area based on perception as it varies from person to person. So the trail is made to its best possible value of LOS depending on majority of the majority of user's perception.

Keywords: Level of Service, Pedestrian, Road, Traffic, Vehicle-Pedestrian Interaction, Inverse Variance

I. INTRODUCTION

Since the pedestrian environment is multi-dimensional, the pedestrian in the road side environment is subjected to a set of several factors significantly affecting his or her perception of safety, comfort and convenience. Measurement of these factors is necessary to evaluate the pedestrian facilities and evaluation methods are

needed to understand how well a particular street accommodates pedestrian travel. In order to appropriately plan for more walk able environment methods are required that allow planners and decision makers to effectively identify and asses. The elements of the built environment that support or detract from walking. There are many factors which affect the pedestrian level of service but broadly they can be divided into two categories i.e. physical infrastructure and operational features. The physical infrastructure encompasses sidewalks, landscaped buffers, parking lane, street widths etc and the operational feature include traffic volume and speed limits. In India the traffic collision is highest which implies that more thrust should be given so that further deterioration can be curbed. For this reason the level of service concept was introduced so that qualitatively we could measure the level of safety of pedestrians, bicyclists, motorists etc on roads.

As stated by Litman (2007) an improved pedestrian safety and a safer walk able environment will help the community in achieving the following:

- For non drivers the accessibility would improve.
- Cost of transportation will sharply reduce.
- The parking efficiency in the area would be greatly enhanced.
- There would be improvement in aesthetics.
- Reduction in land needed for road construction.
- Reduction in the level of pollution and it acts as a support for transit

1.1 Statement of the problem

So the need of the hour is to provide a safe environment for pedestrians without any conflicts with other modes of transportation. With the burgeoning traffic the lives of pedestrians is highly endangered. In order to determine the pedestrian level of service a questionnaire was designed and the real time perception of people was recorded on the sheet of questionnaire. In this way we could tap their real time stimuli based on their perception of traffic conditions they faced. They were asked very basic questions pertaining to the traffic conditions which were encompassed within the sections namely footpath, road, barrier, buffer, transit area, safety. They were asked to rate or say yes/no according to their perception as answers. The perception of pedestrians will greatly be helpful in improving the walk able conditions for pedestrians in the area.

1.2 Objective and scopes

The objective of this study is to develop an instrument for determining factors affecting sidewalk performance based on pedestrian perception. A questionnaire with different items is developed to measure pedestrian perception in five different areas: (a) safety, (b) comfort (c) footpath (d) vendors presence, (e) movement easiness and accessibility, (f) environmental condition. It is believed that each item could potentially impact on sidewalk performance.

The main objectives are:

To provide higher safety to pedestrians without obstructing/hampering the inflow and outflow of traffic The study was aimed at improving the road conditions the result achieved by the research work will be helpful in designing roads in future which can guarantee enhanced safety for commuters.

The overall framework of the project is depicted

- Selecting study area and zero down upon the road whose PLOS is to be determined
- Selecting and studying the intersections, sidewalks, roads and getting a brief idea of vehicles traversing on the road.
- Data collection: Designing questionnaire and obtaining the perception of people
- Analyzing the data and finding the PLOS of the road, determining the boundary limits of PLOS A, B, C, D, E, F.
- To provide higher safety to pedestrians without obstructing/hampering the inflow and outflow of traffic.
- To device a yardstick for calming the traffic and to design the streets in such a way that it improves the pedestrian walking environment.
- Very little study has been carried out to perk up the pedestrian walking environment and the factors which define it.

II. CONCEPT OF LEVEL OF SERVICE FOR PEDESTRIANS

The level of service concept was first conceived for highways during the time of rapid expansion in the use and availability of the private motor car. The primary concern was congestion, and it was commonly thought that only the rapid expansion of the freeway network would curb congestion. The researchers proposed measurements of levels of service which would consider public transportation. Such systems would comprise of time to wait, frequency of service, time it consumes to pay fares, quality of the ride itself etc. To meet the requirements of modern traffic engineer HCM defines six PLOS levels namely LOS A, B, C, D, E, F. LOS can also be applied to surface streets, to portray foremost signalized intersections. A jam-packed four-way intersection where the major traffic movements are conflicting turns might have an LOS of D or E. At intersections, queuing time can be used as a yardstick to measure LOS.

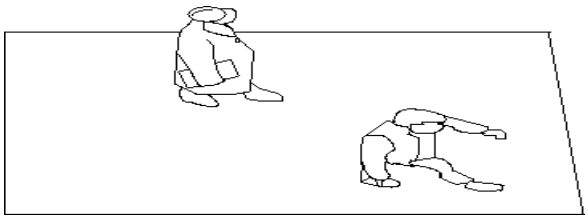

Fig 1 level of service LOS A

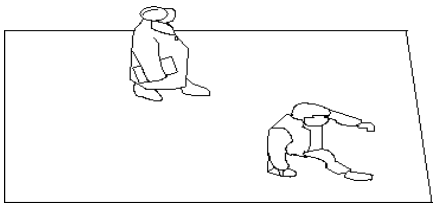

Fig 2 level of service LOS B

Pedestrian Space > 4.9 m^2/p. Flow Rate < 12-15 p/min/m

At a walkway **LOS A**, pedestrian moves in desired paths without altering their movements in response to other pedestrian. Walking speeds are freely selected, and conflicts between pedestrian are unlikely.

Pedestrian Space > 3.3- 4.9 m^2/p. Flow Rate < 12-15 p/min/m

At **LOS B**, there is sufficient area for pedestrian to select walking speeds freely, to bypass other pedestrian, and to avoid crossing conflicts. At this level, pedestrian begin to be aware of other pedestrian, and to respond to their presence when selecting a walking path.

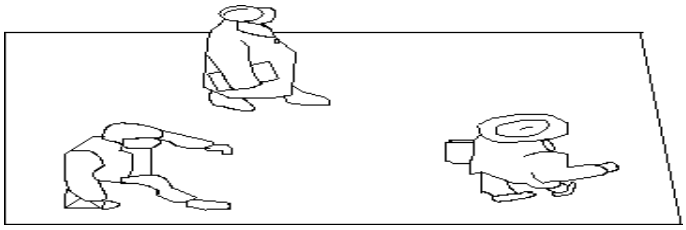

Fig 3 level of service LOS C

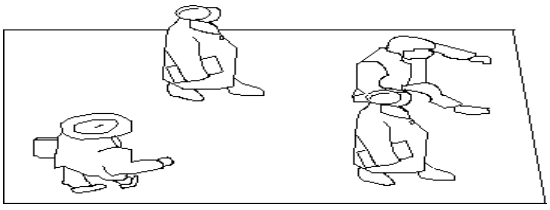

Fig 4 level of service LOS D

Pedestrian Space >1.9- 3.3 m^2/p. Flow Rate < 15-12 p/min/m At **LOS C**. space is sufficient for normal walking speeds and for bypassing other pedestrian in primarily unidirectional streams. Reverse-direction or crossing movements can cause minor conflicts, and speeds and flow rate are somewhat lower.

Pedestrian Space > 1.3-1.9 m^2/p. Flow Rate, **21-27** p/min/m

At **LOS D**. freedom to select individual walking speed ¡and to bypass other pedestrian is restricted. Crossing or reverse-flow movements face a high probability of conflict. requiring frequent changes in speed and position. The LOS provides reasonably fluid flow, but friction and interaction between pedestrian is likely.

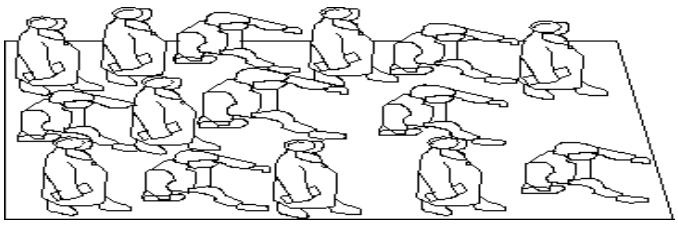

Fig 5 Level of Service LOS E

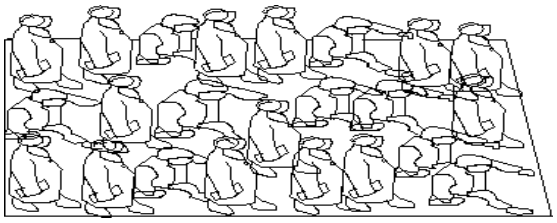

Fig 6 Level of Service LOS F

Pedestrian Space >0.6- 1.3 m^2/p. . Flow Rate < 27-45p/min/m

At LOS E, virtually all pedestrian restrict their normal walking speed, frequently adjusting their gate. At the lower range, forward movement is possible only by shuffling speed is not sufficient for passing slower pedestrian. Cross-or reverse-flow movements are possible only with extreme difficulty. Design volumes approach the limit of walking capacity, with stoppages and interruption to flow.

Pedestrian Space 5 0.6 m^2/p. Flow Rate varies

At LOS F. all walking speeds are severely restricted, and forward progress is made only by shuffling. There is frequent, unavoidable contact with other pedestrian. Cross- and reverse-flow movements are virtually impossible. Flow is sporadic and unstable. Space is more characteristic of queued pedestrian than of moving pedestrian streams.

2.1 Factors affecting Pedestrian Level of Service

The factors affecting level of service can be summarized as follows:

1. Traffic volume: We would observe that as the traffic volume increases the PLOS consequently tends to decrease. One can easily observe that during heavy traffic the pedestrians are more apprehensive of their safety than other time.

2. On street parking: this factor has a positive influence on PLOS as it acts as a buffer in between the traffic and the pedestrian thus providing a sense of security. As the people perceive they are safe, hence it results in higher LOS.

3. Sidewalk width: greater the width of sidewalk greater is the level of safety being perceived by pedestrians as they feel more comfortable which results in a higher PLOS.

4. Roadway width: with increase in width of road the pedestrian feels it more difficult to cross the road from one end to another thereby decreasing the PLOS. Normally now a days in order to accommodate the traffic we find carriage ways of large widths resulting in a lower PLOS.

5. Speed limits: The speed limit for the road surveyed was 40 km/hr. with increase in speed there is a drastic decrease in the pedestrian level of service. It is due to the fact that at higher speeds the pedestrians perceive higher threat levels to their life hence resulting in a decrease in PLOS.

6. Number of lanes: With increase in number of lanes there's a increase in the total width of the road hence there is greater probability of pedestrian-vehicle interaction which leads to lower safety levels and hence it leads to lower PLOS score.

III. LITERATURE REVIEW

Fruin et al (1971) stated that "pedestrian service standards should be based on the freedom to select normal locomotion speed, the ability to bypass slow-moving pedestrians, and the relative ease of cross- and reverse-flow movements at various pedestrian traffic concentrations. **Pushkarev and Zupan et al(1975)** found out that flow rate and speed are closely related. They found out that "people, or vehicles, are likely to move at a faster speed if the flow rate is low. **Gregory Benz et al (1986)** challenged the existing LOS calculations and found a method best suited for transportation terminals and other complex pedestrian spaces which could be applied to sidewalks, as well. According to **Young-In Kwon, Shigeru Morichi, and Tetsuo Yai et al (1989)** "the occupancy index could be applied for the design of planned streets and the evaluation of street, space improvements…considering not only traffic flow but also the physical size of traffic modes and the time needed to traverse the street.In his paper **Mozer et al (1994)** introduces a measurement called the "walk area width volume" (WWV) for pedestrians.

The most important concept in the **Milazzo (1999) *et al.*** article in terms of this study is the authors' suggestion that congregation in specific locations such as airport terminals is more common and thus more expected than it is on normal everyday walkways. They introduce the idea of "transportation terminals,

Venkata Chilukuri et al (2000) challenged the current equation used by the HCM to calculate pedestrian delay at signalized intersections. Chilukuri's statistical analysis of high and low flow rates on sidewalks between signalized intersections indicated that the arrival of pedestrians at those intersections had a significantly non-random pattern. **Serge P. Hoogendoorn et al (2003)** found that pedestrians are motivated by cost minimization. Pedestrians act according to predictions on other pedestrians' experience, but they have a limited predictive ability.

The Turner-Fairbank Highway Research Center report found out that while calculating walking speed for crosswalks, the report suggests, the speed should be expected to be lower where "large numbers of older pedestrians" are present. **Muraleetharan Thambiah, et al(2004)** proposed to re-configure the calculation of pedestrian levels of service using a statistical method.

IV. METHODOLOGY AND STUDY AREA

The key step by step procedures for applying methodology for determining performance measures and level of service for the study area are

- Selecting a tool for analysis.
- Facility segmentation.
- Gathering qualitative data by questionnaire
- To measure or forecast performance of pedestrians.
- Calculating pedestrian LOS.

A linear relationship was framed in between the PLOS and the data obtained from the questionnaire. The relationship was formulated as follows $y = aX1 + bX2 + cX3 + dX4 + eX5$

Here in the linear relationship the coefficients were determined by **inverse variance** method. The coefficient ***a*** stood for the sidewalk/pavement conditions, ***b*** represented road characteristics, ***c*** represented the interaction of

pedestrian mode with other mode of transportation at intersections, ***d*** considered the effect of buffer on PLOS, ***e*** represented the transit area and ***f*** represented the coefficient for safety.

The value of X_1, X2, X3, X4, X5, and X6 was determined by averaging the whole rating obtained for the respective cluster. In order to determine the limits of PLOS the best and worst conditions were chosen and the respective y_{max} & y_{min} was obtained. From this the difference between the y_{max} & y_{min} was determined and they were divided by the number of intervals to be obtained. Next starting from minimum by consecutively adding the interval we obtain the boundary limits of the respective LOS. By comparing the value found i.e. y, we can estimate the PLOS of the road.

4.1 Questionnaire Formation

A questionnaire with a total of 21 variables is developed to measure pedestrian perception in five different areas: (a) safety, (b) comfort (c) footpath (d) vendors obstruction (e) movement easiness and accessibility (f) environmental condition. It is believed that each variable could potentially impact on sidewalk performance. However, it is unsure which items would contribute the greatest impact and to what degree. In the present study all items are scored on a five-point Linker-type scale with "one" representing strongly disagree, and "five" representing strongly agree. To collect the data, onsite interviews were conducted in the study location. Some interviewers stopped the pedestrians and asked them for possibility to interview. The yes/no type questions were answered as 1(yes)/0(no).

4.2 Case of Study Area

For the research in Hyderabad city four areas are considered as study area. They are 1. BHEL 2. OU CAMPUS. 3. ABIDS 4. KOTI The presence of intersections and the higher traffic volume makes it an individual areas and challenging to cry out survey work. The questionarrires were distributed among the people at the areas and asked to fill out the forms immediately to collect the data.

Fig 7 Pedestrian Footpath at KOTI

Fig 8 Pedestrian footpath at ABIDS.

V. DATA COLLECTION

Traffic volume greatly affected the comfort level of pedestrians with low traffic volume the pedestrians perceived more relaxed and safe. With increase in number of vehicles the conflict between pedestrians and traffic greatly gets enhanced. The buffer between vehicular and pedestrian traffic improved pedestrian LOS. The on street parking also acts as a good barrier thus helping to improve the PLOS. On the basis of these principles the questionnaire was designed. About 120 people participated in the survey. The survey was carried out at different time of the day to observe the effect of traffic during rush hours and also during dull hours.. The data sheet is displayed below.

TABLE.1 Questionnaire data from the study area at Koti.

NAME	AGE	GENDER	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	4.2	4.3	5..1	5	5.3	6.1	6.2
Ramulu	35	Male	3	YES	1	NO	2	3	2	3	GROUP	YES	3	3	2	2	2	2	NO	2	2
Janaki	33	Female	2	NO	2	NO	3	4	1	4	SINGLE	NO	2	2	3	3	3	3	NO	3	3
Priya	25	Female	3	NO	2	NO	2	3	2	3	SINGLE	NO	3	2	4	2	2	2	NO	1	2
Madhu	29	Male	2	NO	1	NO	3	2	2	2	SINGLE	NO	1	3	3	3	3	3	NO	3	3
Subbu	32	Male	3	NO	2	NO	4	4	2	1	SINGLE	NO	2	1	2	4	1	4	NO	1	4
Rama	30	Male	4	NO	1	NO	3	3	3	3	SINGLE	NO	2	2	3	3	2	3	NO	2	3
Sri	21	Male	2	NO	2	YES	2	1	1	1	SINGLE	NO	1	1	2	2	3	2	YES	3	2
Krishna	19	Male	3	YES	1	NO	3	3	2	2	SINGLE	NO	2	2	3	3	4	3	YES	2	3
Laxmi	26	Female	2	YES	4	NO	2	2	3	1	SINGLE	YES	1	1	4	2	2	3	NO	1	3
Ganesh	28	Male	4	YES	3	YES	2	5	1	2	GROUP	YES	2	2	3	2	3	2	NO	3	2
Devi	30	Female	3	NO	1	YES	3	3	3	2	SINGLE	YES	1	1	4	2	1	3	YES	2	3
Sudha	25	Female	4	YES	2	NO	4	2	1	2	SINGLE	YES	4	2	3	2	2	4	NO	4	4
Sandeep	28	Male	2	NO	1	YES	3	2	2	3	SINGLE	YES	3		4	3	3	3	YES	2	3
Ranjeeth	19	Male	3	YES	2	YES	2	1	3	1	GROUP	YES	1	2	3	4	2	2	NO	3	2
Deepak	21	Male	2	NO	1	NO	3	2	2	2	SINGLE	NO	2	1	2	3	1	3	NO	2	3
Hari	20	Male	3	YES	2	NO	4	3	1	2	GROUP	NO	2	2	3	2	4	4	NO	3	4
Sameer	22	Male	4	NO	3	NO	3	1	3	2	SINGLE	NO	1	1	2	3	2	3	YES	1	3
Tarun	25	Male	3	YES	2	NO	2	3	2	3	GROUP	NO	2	2	3	4	1	2	NO	2	2

Renuka	28	Female	2	NO	3	YES	3	2	2	4	SINGLE	NO	1	3	4	3	4	1	YES	3	1
Kalpana	29	Female	4	YES	2	YES	4	5	3	2	SINGLE	NO	2	2	3	2	2	3	NO	2	3
Sathya	30	Female	2	NO	2	YES	3	3	2	1	SINGLE	NO	2	1	2	1	4	1	NO	1	1
Karthika	25	Male	3	YES	3	NO	2	2	1	2	SINGLE	NO	3	2	3	2	3	2	NO	2	2
Narishmulu	26	Male	4	NO	2	YES	3	4	3	3	SINGLE	NO	2	3	2	1	2	1	NO	3	1
Ravinder	27	Male	2	YES	3	YES	2	2	4	3	SINGLE	NO	3	2	2	2	3	2	NO	4	2
Varulu	29	Female	3	NO	2	YES	3	1	4	1	SINGLE	NO	2	1	3	1	1	2	NO	2	2
Prasad	30	Male	4	YES	3	YES	3	2	4	2	GROUP	YES	2	2	4	2	2	2	NO	3	2
Chand	32	Male	2	NO	2	NO	3	2	4	3	SINGLE	YES	3	3	3	2	2	3	NO	2	3
Prem	22	Male	3	NO	3	NO	2	3	4	2	GROUP	NO	2	2	2	2	3	1	NO	3	1
Hema	23	female	3	NO	3	NO	3	2	4	3	SINGLE	NO	3	1	3	3	2	2	NO	2	2
Charan	25	male	2	YES	1	NO	3	1	4	1	GROUP	YES	2	2	4	1	2	3	NO	4	3

5.1 Results and Analysis

Table 2 Analysis of the data collected

S.No	P	Q	R	S	T	U		S.No	P	Q	R	S	T	U
1	8	9	6	9	5	6		16	5	6	4	6	6	3
2	8	9	4	9	7	7		17	6	6	5	7	6	4
3	6	9	3	7	5	6		18	6	6	4	8	4	6
4	7	7	6	8	6	6		19	6	7	4	10	7	5
5	10	10	4	9	4	5		20	6	9	3	7	8	6
6	7	9	3	10	5	4		21	6	8	5	5	4	4
7	5	8	6	9	5	6		22	6	8	3	6	7	4
8	5	6	3	9	6	5		23	6	9	6	7	5	6
9	9	9	5	9	7	6		24	5	6	6	6	5	4
10	5	9	7	8	7	6		25	8	8	4	7	5	7
11	7	7	7	9	6	5		26	6	6	5	7	7	4
12	9	6	4	10	5	6		27	5	8	5	8	8	7
13	4	10	7	10	6	5		28	8	9	4	7	5	4
14	6	9	4	6	6	4		29	4	6	5	8	6	4
15	6	9	5	6	6	5		30	5	9	7	7	8	5

The level of service for the footpath in BHEL area is Y = ax1+bx2+cx3+dx4+ex5+fx6

=0.149x3.07+0.259x2.47+0.261x2.34+0.23x7.566+0.098x3.15+0.228x2.58 = 4.34502

The level of service for the footpath in KOTI area is Y = ax1+bx2+cx3+dx4+ex5+fx6

=0.248x2.37+0.2604x3.04+0.355x4.1+0.909x7.1+0.35x4.3+0.24x4.9=11.8697

The level of service for the footpath in ABIDS area is Y = ax1+bx2+cx3+dx4+ex5+fx6

=0.297x4.46+0.285x7+0.353x4.566+0.284x6.7+0.230x5.133+0.344x4.135 = 9.437248

The level of service for the footpath in O.U CAMPUS area is Y = ax1+bx2+cx3+dx4+ex5+fx6

=0.229x4.2333+0.222x4.866+0.234x5.066+0.377x6.033+0.221x5.166+0.465x3.83 = 8.381865

TABLE-2.1 LOS ANALYASIS OF TABLE 1

Constants	Parameter	Variance	Inverse Variance
a	Safety	6.68	0.149
b	Comfort	3.88	0.259
c	Footpath	3.82	0.261
d	Vendor	4.181	0.23
e	Movement	10.158	0.098
f	Transit area	4.378	0.228

TABLE-2.2 LOS ANALYSIS OF TABLE 1

Constants	Parameter	Variance	Inverse Variance
a	Safety	4.0309	0.248
b	Comfort	3.839	0.26
c	Footpath	2.816	0.355
d	Vendor	1.1	0.909
e	Movement	2.84	0.35
f	Transit area	4.07	0.24

TABLE.2.3 LOS ANALYSIS OF TABLE 1

Constants	Parameter	Variance	Inverse Variance
a	Safety	3.36	0.297
b	Comfort	3.508	0.285
c	Footpath	2.825	0.353
d	Vendor	3.52	0.284
e	Movement	4.34	0.23
f	Transit area	2.9	0.344

Table.2.4 Los Analysis of Table 1

Constants	Parameter	Variance	Inverse Variance
a	Safety	4.35	0.229
b	Comfort	4.5	0.222
c	Footpath	4.27	0.234
d	Vendor	2.65	0.377
e	Movement	4.517	0.221
f	Transit area	2.15	0.465

5.3 VALIDATION

The level of service for the above interval considers another area and calculates the level of service (LOS) and validates the results with the current table of LOS. Let us consider a footpath in SECUNDERABAD area.

Table 3 The Plos Score And Defining The Range Of Different Level Of Service, Result And Validation

The PLOS Score and defining the range of different level of service				Result		VALIDATION			
LOS	PLOS RANGE			Area	Level of Service (y)	a	0.23	X_1	2.5
A	4.34502	TO	5.64542	BHEL	4.34502	b	0.28	X_2	3.6
B	5.64542	TO	6.49512	KOTI	11.8697	c	0.31	X_3	3.9
C	6.49512	TO	7.79349	ABIDS	9.437248	d	0.81	X_4	6.8
D	7.79349	TO	9.09538	O.U CAMPUS	8.381865	e	0.31	X_5	4
E	9.09538	TO	10.39522	y_{min}	4.34502	f	0.22	X_6	4.2
F	10.39522	TO	11.8697	y_{max}	11.8697	Validation of Secunderabad Area			

By substituting the above values in the following equation of level of service

(LOS) $y = aX1 + bX2 + cX3 + dX4 + eX5 + fX6$ we get

y = (0.23 x 2.5)+(0.28 x 3.6)+(0.31 x 3.9)+(0.81 x 6.8)+(0.31 x 4.0)+(0.22 x 4.2) = 10.464.

The above value of y = 10.464, the level of service for the footpath in Sec-bad area is 'LOS E'

VI. CONCLUSION

After analyzing the data we arrive at following conclusions:

- The PLOS secured score by inverse variance method. which is in the range of LOS A in between 4.34502 and 5.6452 at BHEL. It shows that PLOS of the road area in the study location is provided good condition level of service to the pedestrians. Speed and ability to pass slower Pedestrians restricted. In this scenario the safety for pedestrians is overlooked in the quest to build more advanced transportation systems.
- The PLOS secured score by inverse variance method. which is in the range of LOS F in between 10.3952 and 11.8697 at KOTI. It shows that PLOS of the road area in the study location is provided is bad condition level of service to the pedestrians. Speed and ability to pass slower Pedestrians restricted. In this scenario the safety for pedestrians is overlooked in the quest to build more advanced transportation systems.
- The PLOS secured score by inverse variance method. which is in the range of LOS E in between 9.09538 and 10.3952 at ABIDS. It shows that PLOS of the road area in the study location is provided below average level of service to the pedestrians. Speed and ability to pass slower Pedestrians restricted. In this scenario the safety for pedestrians is overlooked in the quest to build more advanced transportation systems
- The PLOS secured score by inverse variance method .which is in the range of LOS D in between 7.79349 and 9.09538 at OU. It shows that PLOS of the road area in the study location is provided below average level of service to the pedestrians. Speed and ability to pass slower Pedestrians restricted. In this scenario the safety for pedestrians is overlooked in the quest to build more advanced transportation systems

- The area consists of lack of pedestrian effective foot path widths, irregular dimensions of heights of foot paths, uneven floorings of footpaths, obstacles in foot paths by poles, trees, transformers, bus stop shelters and untidy & unclean footpaths.
- In this survey women and elderly people are more distressed than middle aged men and students as our roads are inhospitable and unsafe for walking.

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