Contemporary Study On Road Safety In Urban Areas- A Case Study From Bwssb Office To Ms Palya

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Abstract

Bangalore is the capital of Karnataka. Bangalore is frequently alluded to as 'The Silicon City' of Karnataka, because of its high centralization of structures and vehicular traffic. Bangalore is a very Porsche area of our country where 10 million people live there. It is a very developed city as it as many industries, many technical institute research centers and with many talented people present there. It is a nation-leading city in IT. Bangalore is a major metropolitan city.

In a short period of time there is an impressive growth in all the sectors, thus creating employment opportunities and improved education facilities causing people from all over the world to come here. As a result of this there are also many means of transport facilities in Bangalore, because of this there are many traffic problems in the city.

India has the second biggest street organize on the planet with more than 3 million km of streets of which 60% are cleared. These streets make a crucial commitment to the India's economy. All in all, the offices for the street clients are not sufficient, prompting a high cost of the demise casualties. As of late, there is a developing worry over the street crash issue.

The road selected for this particular study fall under the similar issues faced by areas of Bangalore city like Silk board junction, Hebbal junction, and KR Puram junction. The selected road stretch has no traffic signals, even with the presents of too many junctions in frequent intervals. More number of Educational Institutions, International Airport Commuters and many other in Yelahanka cause dense traffic congestion in the selected path. To ensure the complete safety of the road users the provided road inventories such as median, pedestrians' path, carriageway, curbs and other road inventories should be in standard measurements as per the government regulations. The speed breakers, barricades, signal systems, road margins, cross slopes and the shoulders which are the integral part of the road should be given attention in order to prevent unforeseen incidents. The potholes, absence of sign boards in turnings and marking on speed breakers would raise the chances of accidents.

1. Introduction

Road safety refers that the method and prevention measure that uses to reduce road user's accident kills and injuries. The road safety prevention measure is necessary to control and to reduce the road accidents.
Road safety in India

Transportation by street in India is extremely mainstream for different reasons, however the state of Indian streets needs generous improvement. The pace of street mishaps and casualty in the nation is high. Weight on streets has been on increment and the quantity of vehicles is expanding a wide margin. Absence of street sense has additionally confounded the issues. Driving licenses are affirmed to be given without appropriate testing and traffic rules and guidelines are tossed to the breezes. Over-burdening is another main consideration of street mishaps and passing's.

The Global Status Report 2013, distributed by the World Health Organization (WHO), uncovers that 1.24 million individuals were executed worldwide every year in street mishaps. India represents 0.39 million street fatalities for every annum (in year 2012), which is about 30% of the world's absolute street fatalities. The information discharged by the Ministry of Road Transport and Highways has featured street mishaps to be perhaps the greatest reason for un-characteristic passing's happening in India.

Street transportation is the foundation of our country and transport administrations are considered as development motor of the economy. It is said that more the length of streets, more the success of the country. The flourishing units of a country ordinarily involve intellectuals, hard work, framework accessibility and in conclusion the smooth more secure streets. Be that as it may, transportation organize if not utilized appropriately may cause contamination and mishaps. According to information enlisted by the World Health association, (WHO 2004) almost 12 lakhs individuals are known to kick the bucket every year in street mishaps internationally out of which in excess of 83,000 individuals are killed around multiple times of this number (around 4 lakhs) are genuinely harmed in India. That is to say, we kill around 230 individuals and harm around 1100 consistently on Indian streets. Out of this, around 25-30% are people on foot and 15-20% kids under 15 years old. In India, the absolute expense of misfortunes because of street mishaps are in the scope of Rs. 400-500 crores every day (Desai, 2011). The assessed cost incorporates pay, resource misfortune, time and vitality spent on police, medical clinic and legal disputes and so forth. In any case, it is hard to quantify these sufferings as far as cash. The misfortune to the country because of street mishaps is untold, eating into the financial aspects of the country.

1.1 Objectives

1) Improving design standards of the road and periodic maintenance.
2) To check the traffic flow characteristics at selected stretch.
3) To ensure the safety on urban road provide traffic control devices at proper places.
4) To reduce congestion and delays caused due to traffic maneouvers.

1.2 Study Area Selected
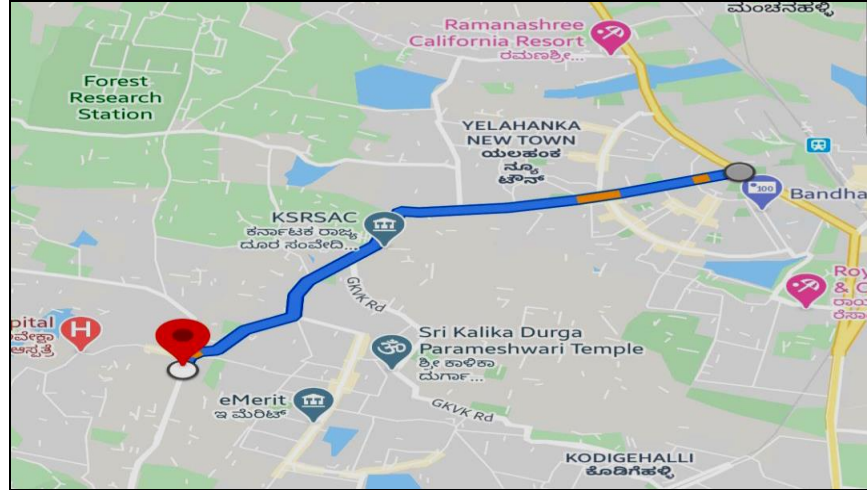
Figure 1: Study Location Map

2. Methodology
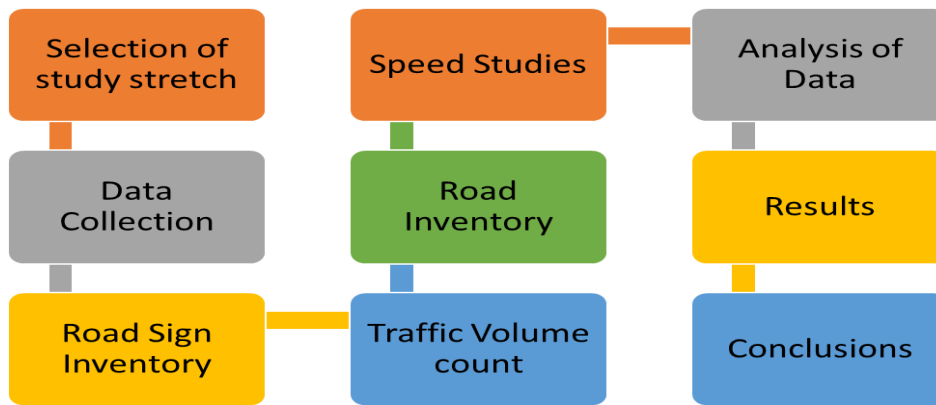
Figure 2: Flowchart

2.1 Surveys carried out

1) Road Inventory survey: Data collection of the parts of road such as median, carriageway, pedestrian's path and shoulders.
2) Road Conditioning survey: Data collection of the nature of the pavement and the surrounding.
3) Traffic volume study: Data collection of the traffic density.
4) Spot speed study: Analysing the speed of the vehicles at specific point.
5) Parking study: Study carried at different parking and no-parking zones.
6) Speed and Delay study: Study carried at plane road for the speed of the vehicles and near to the potholes for the delay of the vehicle at the same selected stretch of the road

3. Data Analysis

Table 1: Geometric data recorded as per on field observations

From (km)	To (km)	Terrain (plain/rolling/Hilly)	Land use (Built Up/Forest/Industrial/Barren)	Name of the village/town/city	Formation Width (m)	Cracking %			Embankment	Details of Cross Roads			REMARKS
						Type (BT/CC/GR/EM)	Width (m)	Condition (G/F/P/VP)	Height(m)	Location(KM)	Road No. (km)	Carriageway width(m)	
0	0.5	Plain	Built UP	SUK	22.5	BT	15.5	Good	1				Poor median
0.5	1	Plain	Built UP	4th phase	22.1	BT	15.3	Good	11				
1	1.5	Plain	Built UP	Dairy circle	25.2	BT	15.1	Fair	0.9				Under const.
1.5	2	Plain	Built UP	Attur Layout	24.4	BT	15.1	Fair	12				
2	2.5	Plain	Built UP	Tirumala Dhaba	21.4	BT	15.2	Good	0.9				
2.5	3	Plain	Built UP	Bettahalli	22.1	BT	15	Fair	1	GK VK 2.8	4	13.8	Narrow road
3	3.5	Plain	Built UP	Jelly Machine	24.2	BT	18.4	Fair	1				
3.5	4	Plain	Built UP		15.6	BT	12.5	Poor	11				
4	4.5	Plain	Built UP	Ms Palya	17.1	BT	`13.2	Fair	11				
4.5	5	Plain	Built UP	Ms Palya Signal	17.1	BT	15	Good	11				Improper sight distance

Table 2: Pavement condition data survey sheets

Road Name	Sandeep Unni Krishnan Road	Sheet-1		Road No. :	
Section (FROM)	Dairy Circle			Date of Survey:	26.02.2020
District(FROM)	Bengaluru North			Weather:	
Chainage	Pavement	Riding		Pavement Condition	

		Composition		Quality									
From (km)	To (km)	Composition	Type	Speed (km/hr)	Quality (G/F/P/VP)	Cracking %	Ravelling %	Potholing (No. and %100m)	Rut (None/Moderate/Severe)	Patching(No. and %100 m)	Pavement edge drop (mm)	Embankment Condition (Good/Fair/Poor)	Road Side Drain (NE/PF/F)
0	0.5	Surface	BC										
		Binder	DBM	60km/h	G	-	-	4	Moderate	10	-	GOOD	F
		Base	GB										
		Sub-Base	GSB										
		Subgrade											
		Surface	BC										
0.5	1	Surface											
		Binder	DBM	50km/h	F	3	-	28	Severe	21	-	FAIR	PF
		Base	GB										
		Sub-Base	GSB										
		Subgrade											

Road Name	Sandeep Unni Krishnan Road		Road No. :	
Section (FROM)	Dairy Circle	Sheet - 2	Date of Survey:	26.02.2020
District (FROM)	Bengaluru North		Weather:	

Chainage		Pavement Composition		Riding Quality		Pavement Condition							
From (km)	To (km)	Composition	Type	Speed (km/hr)	Quality (G/F/P/VP)	Cracking %	Ravelling %	Potholing (No. and %100m)	Rut (None/Moderate/Severe)	Patching (No. and %100 m)	Pavement edge drop (mm)	Embankment Condition (Good/Fair/Poor)	Road Side Drain (NE/PF/F)

Chainage		Pavement Composition		Riding Quality		Pavement Condition							
From	To	Composition	Type	Speed	Quality	Cracking %	Ravelling %	Potholing	Rut	Patching	Pavement edge drop	Embankment Condition	Road Side Drain
												)	
1	1.5	Surface	BC										
		Binder	DBM	60km/h	F	-	3	4	Moderate	13	-	GOOD	F
		Base	GB										
		Sub-Base	GSB										
		Subgrade											
		Surface	BC										
1.5	2	Surface											
		Binder	DBM	60km/h	F	2	4	2	Moderate	20	5	GOOD	F
		Base	GB										
		Sub-Base	GSB										
		Subgrade											

Road Name	**Sandeep Unni Krishnan Road**		**Sheet - 3**			**Road No. :**		
Section (FROM)	**Dairy Circle**					**Date of Survey:**		**26.02.2020**
District(FROM)	**Bengaluru North**					**Weather:**		
Chainage		**Pavement Composition**		**Riding Quality**		**Pavement Condition**							
From (km)	To (km)	Composition	Type	Speed (km/hr)	Quality (G/F/P/VP)	Cracking %	Ravelling %	Potholing (No. and %100m)	Rut (None/Moderate/Severe)	Patching (No. and %100m)	Pavement edge drop (mm)	Embankment Condition (Good/Fair/Poor)	Road Side Drain (NE/PF/F)
2	2.5	Surface	BC										
		Binder	DBM	50km/h	F	-	2	8	None	10	-	FAIR	F
		Base	GB										

Chainage		Pavement Composition		Riding Quality		Pavement Condition								
From (km)	To (km)	Composition	Type	Speed (km/hr)	Quality (G/F/P/VP)	Cracking %	Ravelling %	Potholing (No. and %100m)	Rut (None/Moderate/Severe)	Patching (No. and %100m)	Pavement edge drop (mm)	Embankment Condition (Good/Fair/Poor)	Road Side Drain (NE/PF/F)	
		Sub-Base	GSB											
		Subgrade												
		Surface	BC											
2.5	3	Surface												
		Binder	DBM	60km/h	G	4	2	7	Severe	21	-	FAIR	PF	
		Base	GB											
		Sub-Base	GSB											
		Subgrade												

Road Name	Sandeep Unni Krishnan Road	Sheet - 4		Road No. :	
Section (FROM)	Dairy Circle			Date of Survey:	26.02.2020
District (FROM)	Bengaluru North			Weather:	

Chainage		Pavement Composition		Riding Quality		Pavement Condition								
From (km)	To (km)	Composition	Type	Speed (km/hr)	Quality (G/F/P/VP)	Cracking %	Ravelling %	Potholing (No. and %100m)	Rut (None/Moderate/Severe)	Patching (No. and %100m)	Pavement edge drop (mm)	Embankment Condition (Good/Fair/Poor)	Road Side Drain (NE/PF/F)	
3	3.5	Surface	BC											
		Binder	DBM	60km/h	F	8	1	10	Moderate	20	-	FAIR	F	
		Base	GB											
		Sub-Base	GSB											
		Subgrade												
		Surface	BC											
3.5	4	Surface												

		Binder	DBM	60k m/h	F	7	2	8	Moder ate	12	-	FAI R	F
		Base	GB										
		Sub-Base	GSB										
		Subgra de											

| Road Name	Sandeep Unni Krishnan Road	She et - 5				Road No. :							
Section (FROM)	Dairy Circle					Date of Survey:		26.02.2020					
District(F ROM)	Bengaluru North					Weather:							
Chainage		Pavement Composition		Riding Quality		Pavement Condition							
From (km)	To (km)	Comp osition	Type	Spee d (km/ hr)	Qualit y (G/ F/P /VP)	Cra cki ng %	Rave lling %	Poth oling (No. and %10 0m)	Rut (None/ Moder ate/ Severe)	Pat chi ng(No. and %1 00 m)	Pav em ent edg e dro p (m m)	Emb ankm ent Cond ition (Goo d/Fai r /Poor)	Road Side Drai n (NE/ PF/F)
4	4.5	Surfac e	BC										
		Binder	DB M	60k m/h	F	9	-	13	None	6	5	FAI R	F
		Base	GB										
		Sub-Base	GSB										
		Subgra de											
		Surfac e	BC										
4.5	5	Surfac e											
		Binder	DB M	50k m/h	P	18	3	20	Moder ate	21	-	FAI R	PF
		Base	GB										
		Sub-Base	GSB										
		Subgra de											

Figure 3: Photos of Slight pavement edge drop and Formation of Ruts
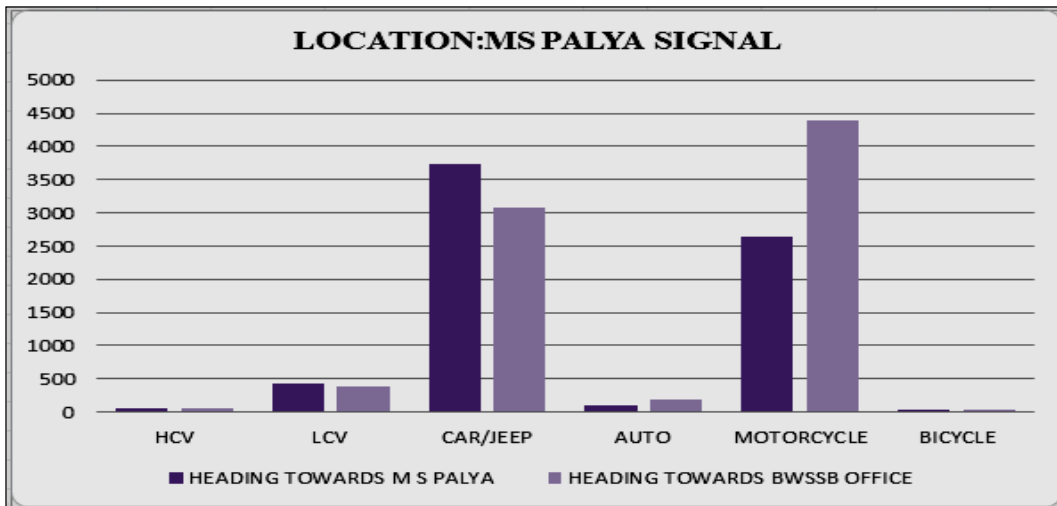

**Figure 4: Photos of improper parking activities and no proper median**
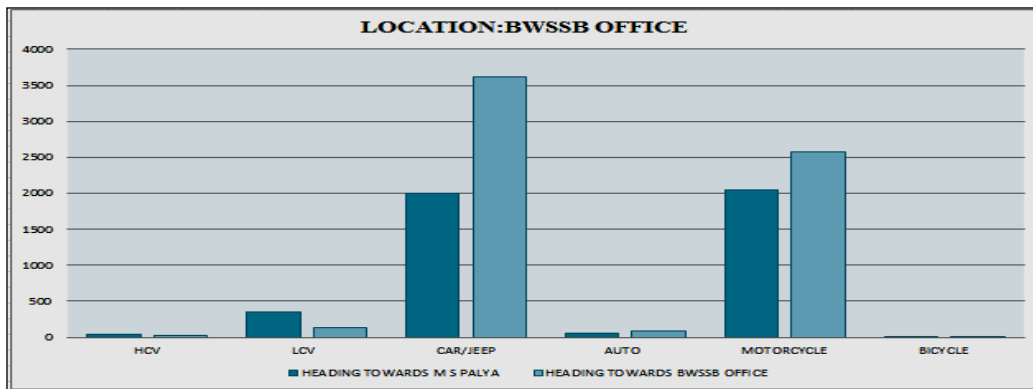
Figure 5: Volume count difference between direction heading towards MS Palya signal and BWSSB Office at the location BWSSB office.
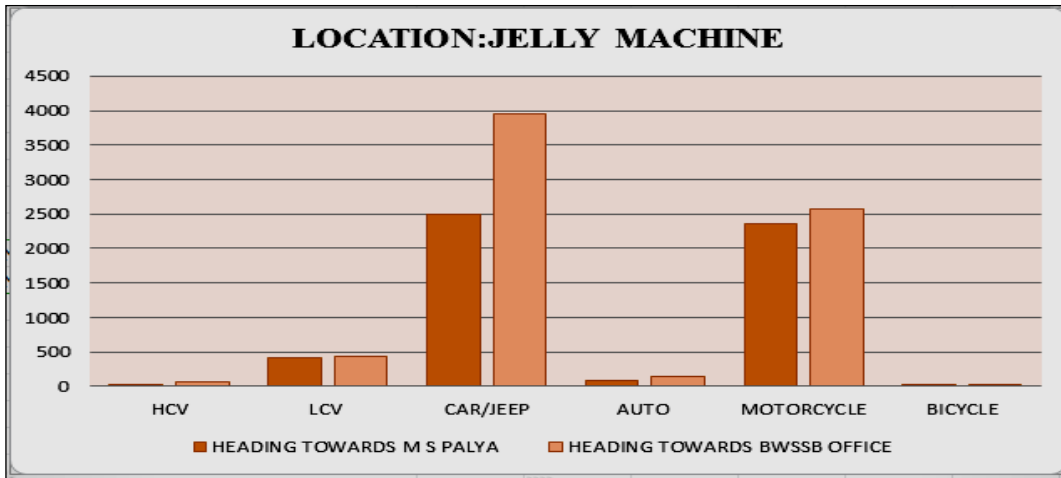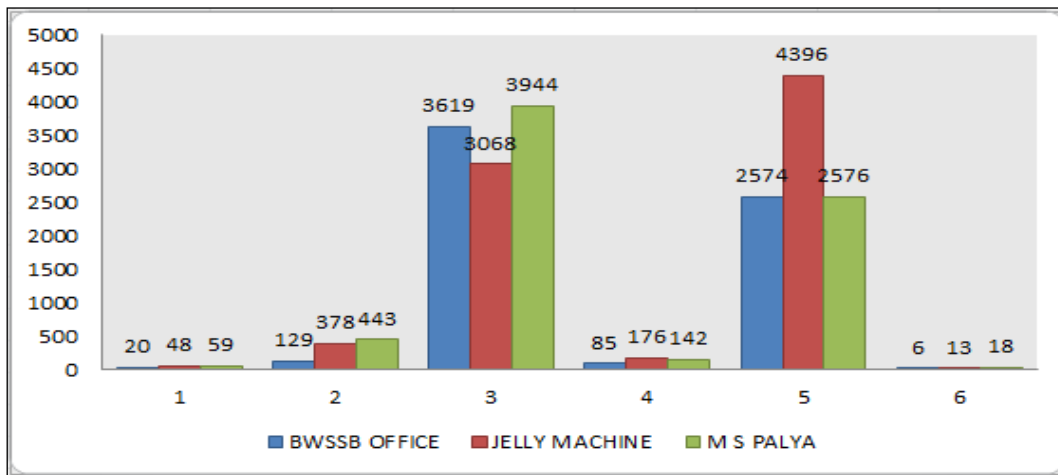

**Figure 6: Volume count difference between direction heading towards MS Palya signal and BWSSB Office
at the location Jelly Machine**.

**Figure 7: Volume count difference between direction heading towards MS Palya signal and BWSSB Office
at the location MS Palya signal**
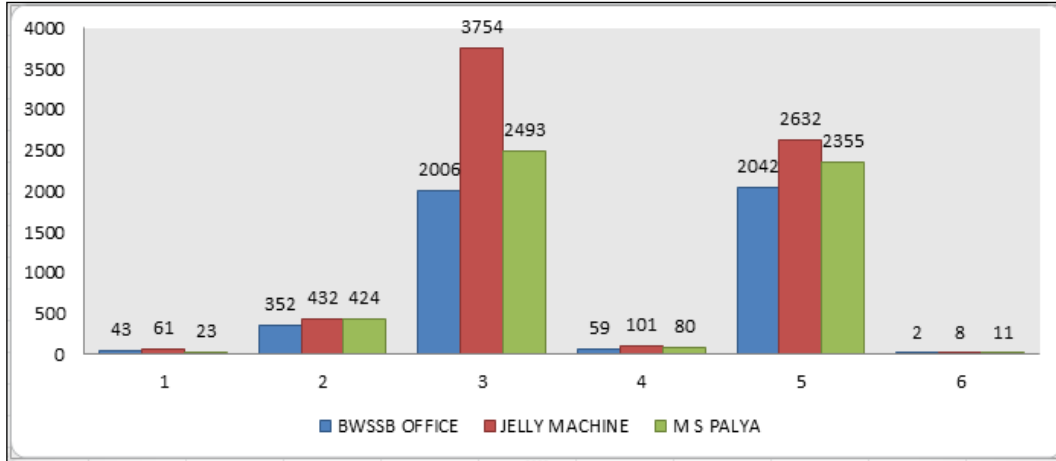
Figure 8: Difference in morning peak hours

Figure 9: Difference in evening peak hours

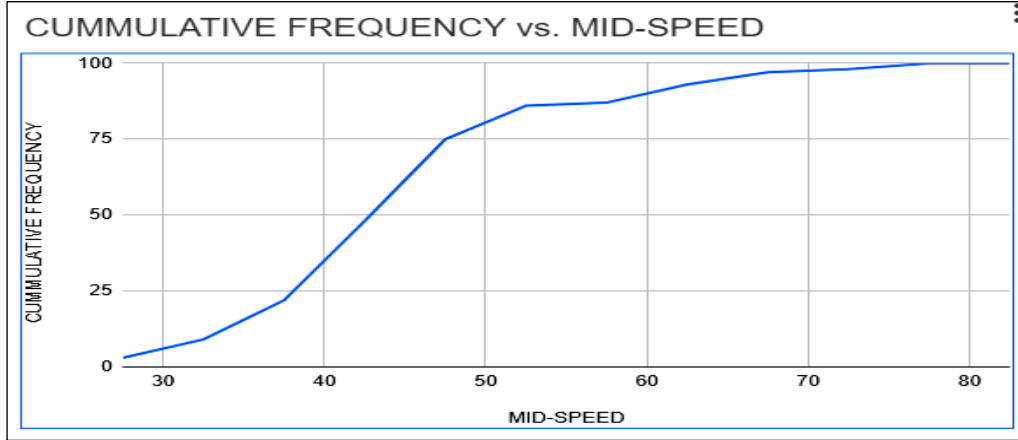**Table 3: Shows the spot speed study at peak hours**

SPEED IN kmph	FREQUENCY	MID-SPEED	% FREQUENCY	CUMMULATIVE % FREQUENCY
25-30	3	27.5	3	3
30-35	4	32.5	4	7
35-40	12	37.5	12	19
40-45	20	42.5	20	39
45-50	14	47.5	14	53
50-55	15	52.5	15	68
55-60	6	57.5	6	74
60-65	7	62.5	7	81
65-70	12	67.5	12	93
70-75	4	72.5	4	97
75-80	1	77.5	1	98

80-85	2	82.5	2	100
	100		100	

Graph 1: Shows the 85th percentile of speed of vehicle at the region
**Time mean speed=46.65 kmph**
Space mean speed=44.78 kmph

Table 4: Shows the spot speed study at non-peak hours

SPEED IN kmph	FREQUENCY	MID-SPEED	% FREQUENCY	CUMMULATIVE % FREQUENCY
25-30	3	27.5	3	3
30-35	4	32.5	4	7
35-40	12	37.5	12	19
40-45	20	42.5	20	39
45-50	14	47.5	14	53
50-55	15	52.5	15	68
55-60	6	57.5	6	74
60-65	7	62.5	7	81
65-70	12	67.5	12	93
70-75	4	72.5	4	97
75-80	1	77.5	1	98
80-85	2	82.5	2	100
	100		100	

Graph 2: Shows the 85th percentile of speed of vehicle at the region

Time mean speed=50.9 kmph
Space mean speed=47.96 kmph

CUMMULATIVE FREQUENCY vs. MID-SPEED
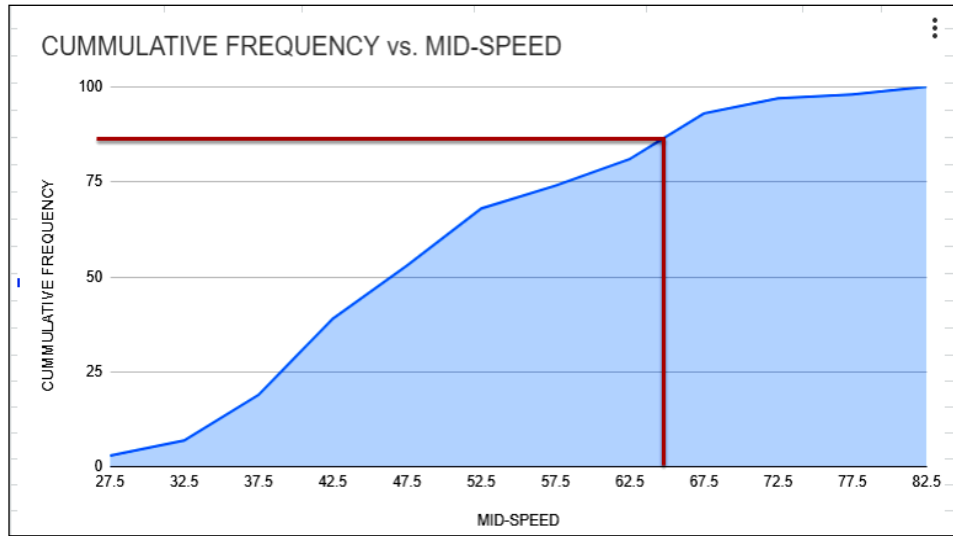
Table 5: Speed and delay studies

SPEED AND DELAY STUDIES BY MOVING CAR OBSERVER METHOD						
DATA SHEET						
LOCATION: YELAHANKA				NUMBER OF ENUMERATORS: 05		
DATE: 10.03.2020				STUDY STRECH LENGTH: 5 km		
TRIP NUMBER	DIRECTION OF TRIP	JOURNEY TIME (min.sec)	TOTAL STOPPED DELAY TIME (min.sec)	NUMBER OF VEHICLES OVERTAKING	NUMBER OF VEHICLES OVERTAKEN	NUMBER OF VEHICLES FROM OPPOSITE DIRECTION
1	SUK ROAD TO MS PALYA	16.45	2.52	4	7	183
2	MS PALYA TO SUK ROAD	20.45	5.02	3	5	165
3	SUK ROAD TO MS PALYA	17.13	3.12	6	4	201
4	MS PALYA TO SUK ROAD	20.32	5.05	3	6	174
5	SUK ROAD TO MS PALYA	15.52	3.06	4	4	186

6	MS PALYA TO SUK ROAD	20.26	4.59	7	7	160
7	SUK ROAD TO MS PALYA	16.04	3.4	3	8	193
8	MS PALYA TO SUK ROAD	20.32	4.53	5	8	187

Table 6: Mean Values of speed and delay data

DIRECTION OF TRIP	JOURNEY TIME (min.sec)	TOTAL STOPPED DELAY TIME (min.sec)	NUMBER OF VEHICLES OVERTAKING	NUMBER OF VEHICLES OVERTAKEN	NUMBER OF VEHICLES FROM OPPOSITE DIRECTION
SUK ROAD TO MS PALYA	16.45	2.52	4	7	183
	17.13	3.12	6	4	201
	15.52	3.06	4	4	186
	16.04	3.4	3	8	193
Total	65.14	12.1	17	23	763
Mean	16.285	3.025	4.25	5.75	190.75
MS PALYA TO SUK ROAD	20.45	5.02	3	5	165
	20.32	5.05	3	6	174
	20.26	4.59	7	7	160
	20.32	4.53	5	8	187
Total	81.35	19.19	18	26	686
Mean	20.3375	4.7975	4.5	6.5	171.5

4. RESULTS AND CONCLUSION

4.1 RESULTS

1) From the road inventory study carried out the design standards of the road along the selected stretch does not meet the IRC standards and has to be improved.

2) Pavement condition survey carried out shows that the condition of pavement along the stretch is poor. Hence, periodic maintenance of the stretch to be carried out for improving the design standards of the road.

3) PCU value obtained is 40,666.35, for the calculated volume count. Extra-lane should be provided as per IRC specifications.

4) 85th percentile of spot speed study is found to be
   (a) 52 kmph at peak hours
   (b) 65 kmph at non-peak hours
   1) During peak hours
   a) Time mean speed = 46.65kmph
   b) Space mean speed = 44.78kmph
   2) During non-peak hours

a) Time mean speed = 50.9kmph
b) Space mean speed = 47.96kmph

5) From the speed and delay studies

SUK ROAD TO MS PALYA
Average Volume = 4.64 veh/min
Average journey time, t=20.66 mins
Average journey speed=14.52kmph
Average stopped delay time= 4.49 min
Average running time = 16.17min
Average running speed = 18.55kmph

5. CONCLUSIONS

1) Along the stretch, the geometric feature of the road does not meet the design standards and it is necessary to make sure the design standards are satisfied. Non-periodic maintenance of the roads has caused formation of pot-holes, ruts, raveling, etc. In order to prevent these from happening periodic maintenance of road to be carried out.
2) From the studies carried out, it has been observed that speed control devices such as speed breakers, sign boards are necessary at certain locations. Road markings have been washed away and have to be repainted and maintained occasionally.
3) Conducting the Traffic Volume study gives the gist of traffic flow in the stretch. Illegal movement of vehicles can be avoided through proper sign boards and barriers. One-way roads can be provided at areas where there are illegal crossings and also during peak-hour traffic alternative routes can be provided to reduce the traffic density.
4) The footpaths are not provided at many locations and misuse footpaths for throwing away garbage has been observed in strength. Ease of movement for the pedestrians can be fulfilled by designing the footpaths to the geometric standards and also providing pedestrian crossings, signals at junctions.

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