

Road Safety Audit of Selected Stretch from Tarapur to Vataman Junction (SH-8)

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ABSTRACT

India road conditions are worsening day by day and are one of the factors contributing to road accidents. Road safety is an issue of national concern as today, road traffic injuries are one of the main sources of passing's, incapacities and hospitalizations, with serious financial expenses, over the world. Poor road geometry coupled with lack of road control devices are one of the factors making road mischance's and have helped the nation being at the highest point of the table in terms of road death statistics. The essential objective of this thesis is to gather the road accident data of chosen stretch from Tarapur CH 00.00 km to Vataman junction CH 28.00 km from Tarapur police station and to workout useful examination of road accident of it. All out road accidents recorded are 269 amid the period 2010-2015 on selected stretch. Land use and Accident prone Location, road inventory survey, traffic volume count survey, spot speed study and speed and delay study needs to done for the stretch. A measure to reduce road accidents and road audit at the stretch has been shown.

Keyword: Road Accident, Road Safety, Accident prone location, Road inventory

1. INTRODUCTION

Road network of any country has an important role to play for countries economy and growth. Good road networks are required for fast moving in modernization. Transportation through road network satisfies the basic needs of people but here is a great amount of economic loss occurring due to accidents and also many lives are lost in it. There is a loss of productivity and costs to the hospital system and emergency services. A Road safety measure prevents the accidents to a minimum. Road safety can be increased by providing safety measures such as traffic calming devices; proper geometric designs of a location; traffic signs, signals, and markings; street lighting; bridges, culverts, over bridges and underpasses; ditches along the roadway; parking regulations; removing sight obstructions in the roadways; etc.

Road safety audit should form an internal part of designing, planning, construction and maintenance. Road safety Audit has become now mandatory for all the newly all roads towards a safer and better road environment. Road Safety Audit (RSA) is one of the best proven methodologies for ensuring that various safety deficiencies are reviewed at appropriate stage in a cost effective way. .

In India Road accidents are increases rapidly day by day due to mix traffic condition. Road accidents, person killed and injured and accident severity in India (2003-2013) are shown in table-1.

Table-1: Number of Road accidents and Number of persons involved in India (2003-2013)

Year	Number of Accident		Number of persons		Accident Severity*
	Total	Fatal	Killed	Injured	
2003	4,06,726	73,589	85,998	4,35,122	21.1
2004	4,29,910	79,357	92,618	4,64,521	21.5
2005	4,39,255	83,357	94,968	4,65,282	21.6
2006	4,60,920	93,917	1,05,749	4,96,481	22.9
2007	4,79,216	1,01,161	1,14,444	5,13,340	23.9
2008	4,84,704	1,06,591	1,19,860	5,23,193	24.7
2009	4,86,384	1,10,993	1,25,660	5,25,458	25.8
2010	4,99,628	1,19,558	1,34,513	5,27,512	26.9
2011	4,97,686	1,21,618	1,42,485	5,11,394	28.6
2012	4,90,383	1,23,093	1,38,258	5,09,667	28.2
2013	4,86,476	1,22,589	1,37,572	4,94,893	28.3

Accident severity* : Number of persons killed per 100 accidents

Source: Govt. of India MORTH transport research wing -2013 road accident in India

2. STUDY AREA PROFILE

Study area stretch starting from Tarapur to Vataman junction (SH-8) which is the major state highway of Gujarat starting from Vasad-Tarapur-Vataman-Bagodara. Area under study is about 28 km long. Study area consists of Cities and villages such as Tarapur, Tol, Varasda, Galiyana and Vataman. The whole Stretch is Located in Tarapur Taluka of Anand District. This is the main road which connects central Gujarat to Saurashtra. Land use pattern along the study stretch is agriculture. The entire stretch consist 1 bridge, 10 culverts, 2 cross roads and 5 T-sections.

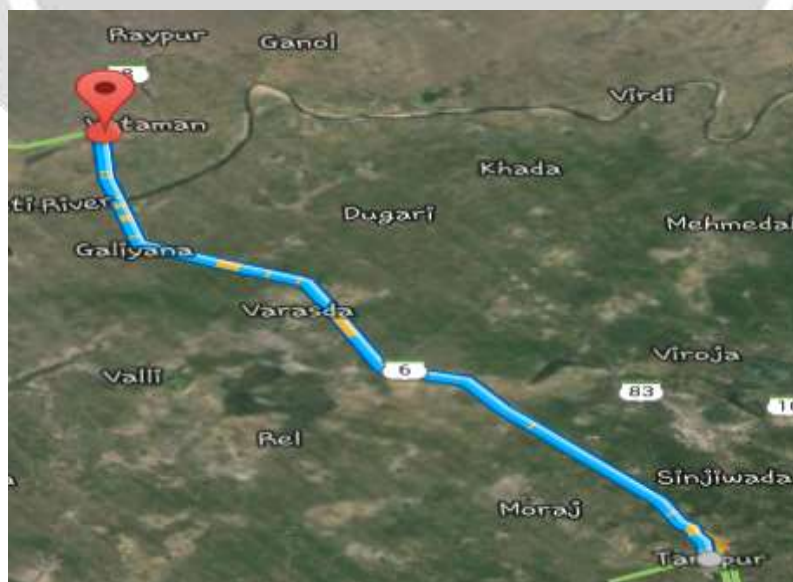


Figure-1: Study area location map

3. AIMS OF THE STUDY

To carry out road safety audit of accident prone locations for a selected stretch from Tarapur CH 00.00 km to Vataman junction CH 28.00 km and to suggest design measures for reduction in accidents on stretch.

4. OBJECTIVES OF THE STUDY

The main objective of any road safety audit is to ensure that all new and existing highway schemes operate as safely as is practicable. This means that safety should be considered throughout the whole preparation, construction and after construction of any project but more specific objectives for the present studies are as follows:

- To Perform Road safety audit of Tarapur–Vataman highway
- To identify the black spot and propose improvements at the location
- To suggest Design safety measures for selected stretch

5. DATA COLLECTION AND ANALYSIS

Following data of study area corridor were collected:

- 1) Road Inventory and surrounding land use pattern.
- 2) Accident Data from Police Stations
- 3) Classified Volume Count.
- 4) Spot speed study

1) Road Inventory and Surrounding Land use Pattern

Road inventory surveys are carried out identify the width of road, no of lanes, median facility, shoulder width, alignment of road, geometric details and Drainage facilities which are shown in Annexure 1. The land Use pattern surrounding the study area corridor is up most agricultural land.

2) Accident Data from Police Stations

Accident data are collected from Tarapur police station for the study area corridor, the whole and sole custodians of the record. In the khatiyar register, accident data is recorded as FIR (First Information Report) as IPC 279, IPC 327/328/304a, M V Act 177/188. There were 269 accidents recorded during the period 2009- 2015 on study area stretch. The collected data are analyzed accordingly.

i. Yearly variation of accidents

Table 2: Yearly Distribution of accident data from year 2010-2015

Year	Fatal	Serious	Minor	Total
2010	24	6	25	55
2011	19	2	27	48
2012	15	5	25	45
2013	26	2	20	48
2014	18	1	19	38
2015	14	4	17	35
Total	116	20	133	269

Table shows that Accident is more during the year 2010 to 2013. There is decrease in rate of accidents after 2013. There are total 269 accidents from 2010 to 2015 in which fatal, serious and minor are 116, 20 and 133 respectively. Accident occurred on road due to poor road conditions and no traffic signs on the road for alerting the driver.

ii. Accidents Classified according to month

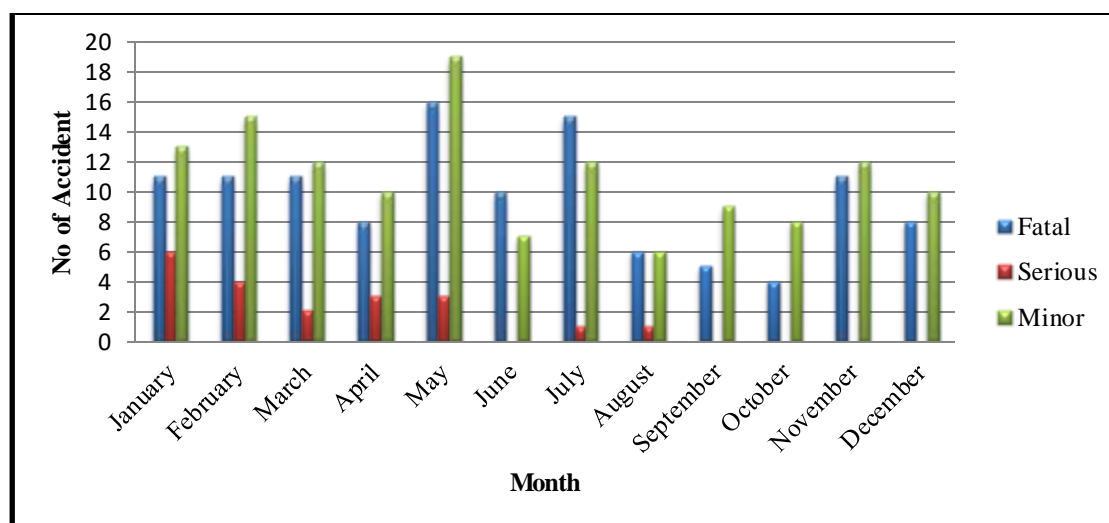


Figure-2: Monthly basis no of accidents

Figure shows that more number of accidents has been occurred during the month of may consisting of 14.1% of total road accidents which are the summer season and driver's do move at excessive speeds and are also inattentive.

iii. Accidents classified according to collision type

Table-3: Accident classified as per collision type

Collision type	Fatal	Serious	Minor
Over turn no collision	11	2	10
Head on	24	4	33
Rear end	40	6	48
Side impact	0	0	0
Side swipe	2	2	9
Hit parked vehicles	4	0	8
Hit fixed object	2	0	5
Hit pedestrian	27	3	14
Hit pedal cyclist	0	1	0
Others	6	2	6
Total	116	20	133

Table shows that accidents 34.9% accidents are rear end collision, 22.7% accidents are due to head on collision and 16.3% of accident is due to hitting pedestrians. The dividers on road are needed on the entire stretch to reduce the accidents.

iv. Accidents classified according to accident spot

Table 4: Accidents classified as per accident spot

Accident spot	Fatal	Serious	Minor
Not at junction	77	14	96
T section	4	2	1
Y junction	0	0	0
Cross roads	32	4	27
Offset	1	0	2
Circle	0	0	0
Railway Crossing	0	0	0
Bridge	2	0	7
Others	0	0	0
Total	116	20	133

Table Shows that 69.5% of accidents are occurred on straight road (not at junction). 23.4% of total accidents are occurred at cross roads. Accidents on straight road occurred due to poor road conditions, geometry and also due to high speed of vehicles. On cross roads, occurrences of accidents are mostly due to improper sight distance.

v. Accidents classified according to vehicle type

Table 5: Accident classified as per vehicle type

Vehicle type	Fatal	Serious	Minor	Total
Motor cycle	11	1	8	20
Scooter	2	0	0	2
Three wheeler	5	4	5	14
Car/Jeep/Van	31	6	48	85
Light goods vehicle	6	2	9	17
Heavy goods vehicle	47	5	51	103
Bus	11	1	11	23
Tractor	1	1	1	3
Others	2	0	0	2
Total	116	20	133	269

Table shows that Car, Light goods vehicle and Heavy goods vehicles are responsible for 76.2% of total accidents. Two wheeler and three wheelers are responsible for 13.3% and buses is responsible for 8.5%. Tractors are least responsible for road accidents. Car, Light goods vehicle and Heavy goods vehicle consist of nearly 70% of traffic on study area corridor.

vi. Accidents classified according to time

Table shows that 56.2% of accidents occurred during night time between 6:00pm to 8:00am and 43.8% of accidents have been occurred between 8:00am to 6:00pm. Accidents are more night time compared to day time. During night time visibility is less, so divider is needed to decrease night time accidents. Also, it is seen that persons going for working place (morning 8:00am to 12:00 noon) and leaving working place (17:00pm to 20:00pm hours) shows the rise in accidents.

Table 6: Accidents classified as per time

Time	Fatal	Serious	Minor
0:00-1:00	7	0	9
1:00-2:00	7	0	7
2:00-3:00	0	3	4
3:00-4:00	5	0	4
4:00-5:00	3	0	5
5:00-6:00	3	0	6
6:00-7:00	4	0	1
7:00-8:00	3	1	4
8:00-9:00	7	3	4
9:00-10:00	2	2	6
10:00-11:00	4	0	6
11:00-12:00	8	0	7
12:00-13:00	4	1	5
13:00-14:00	4	0	6
14:00-15:00	8	0	5
15:00-16:00	5	0	5
16:00-17:00	4	1	5
17:00-18:00	8	2	6
18:00-19:00	6	3	9
19:00-20:00	7	3	10
20:00-21:00	4	1	4
21:00-22:00	5	1	3
22:00-23:00	5	0	9
23:00-24:00	3	0	3
TOTAL	116	20	133

vii. Accidents classified according to Vehicle Manoeuvre

Table shows that 72.12% of accidents have been caused due to vehicle moving straight on road and 18.21% of accidents have been caused due to vehicle overtaking wrong side. The major contribution is due to poor geometry resulting more head on and rear end collision.

Table 7: Accident classified as per vehicle manoeuvre

Vehicle Manoeuvre	Fatal	Serious	Minor
Going straight	87	12	95
Turning left	9	4	6
Turning right	1	0	0
U-turning	0	0	0
Overtaking(wrong side)	15	4	30
Overtaking(same side)	1	0	1
Reversing	0	0	1
Sudden start	0	0	0
Sudden stop	3	0	0
Parked off road	0	0	0
Stoped off road	0	0	0
Other	0	0	0
Total	116	20	133

viii. Accidents classified according to driver's error

Table 8: Accident classified as per driver's error

Driver's error	Fatal	Serious	Minor
None	1	0	2
Fatigue/sleep	0	0	0
Inattention	32	7	37
Too fast	63	8	58
Too close	0	0	1
Disobeying traffic rules	0	0	0
Bad overtaking	15	4	30
Bad turning	5	1	5
Others	0	0	0

Table shows that driving vehicle too fast and improper attention is occurred 47.95% and 28.25% respectively. Also bad overtaking driver error is 18.21%.

ix. **Accidents classified according to weather**

Table shows that 81.41% accidents happen when the weather was clear. During rainy season and when fog/mist is there then accidents happens 8.55% and 10.04% respectively.

Table 9: Accidents classified as per weather

Weather	Fatal	Serious	Minor
Clear	91	16	112
Rain	12	2	9
Fog/mist	13	2	12
Wind	0	0	0
Others	0	0	0
Total	116	20	133

3) **Classified Volume Count**

For determining traffic on selected corridor of SH-8, classified volume count is carried out. When the traffic is composed of a number of types of vehicles, the flow of different types of vehicles is carried out hourly, daily or weekly basis. Classified Volume Counts are done by several methods such as manual methods, combination of manual and mechanical methods, Automatic counters, moving observer method and photographic methods.

Classified volume counts were carried out on weekly basis by manual method on the study stretch. A location where CVC was done is CH: 6.550 km away from Tarapur. At the study stretch the amount of trucks and cars are more because this road is connects central Gujarat to Saurashtra and more number of goods are transport between this two segments.

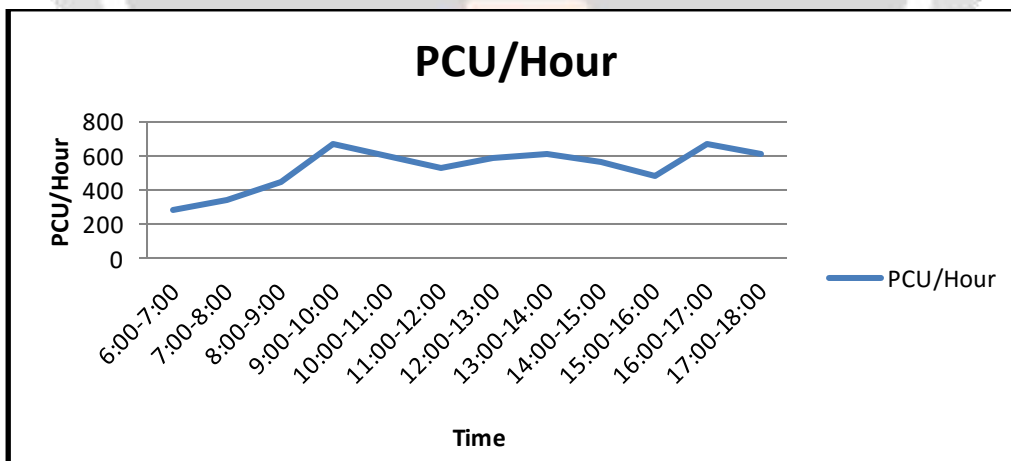


Figure-3: PCU/HOUR vs TIME at CH: 6.550 km towards Vataman

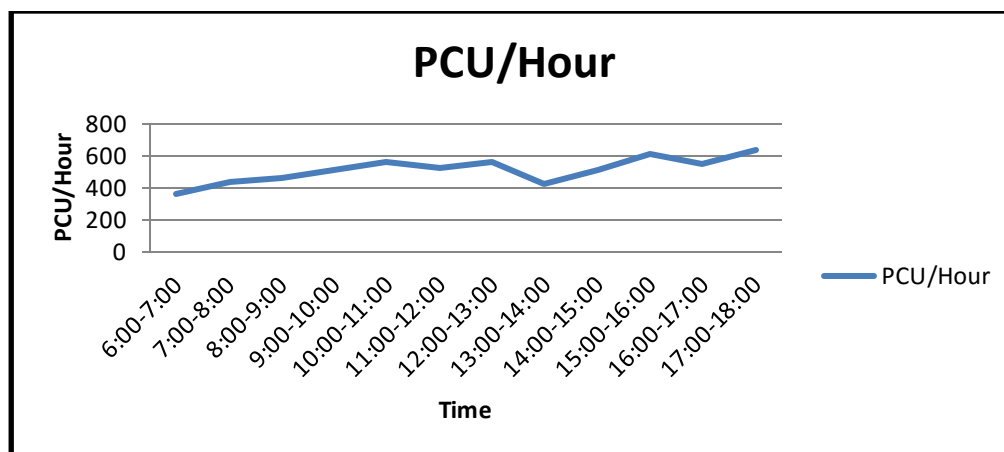


Figure-4: PCU/HOUR vs TIME at CH: 6.550 km towards Tarapur

4) Spot speed study

Spot Speed Study were carried out at high accident prone locations on study stretch nearly Tol Cross road, Khanpur T-section, Varasda T-section and Galiyana Cross road. The survey was carried out for 25 m near location by Direct-timing procedure. Speed were evaluated by keeping distance 25 m constant and considering time taken by vehicle to pass through that distance of 25 m. The objective of survey was to check speed of vehicle match geometric profile or not and found speed match with road profile. However, few vehicles were found over speeding. The details of spot speed study at different places are as shown in table 10.

Table 10: Spot speed study data

Place	Chainage	98 th % speed	85 th % speed	50 th % speed	15 th % speed
Tol	5.600	65	47	37	25
Khanpur	12.570	57	49	40	25
Varasda	18.000	71	61	50	35
Galiyana	22.000	70	57	46	34

6. IDENTIFICATION OF BLACK SPOT

Black spots are found at Tol Cross road, Khanpur T-section, Varasda T-section and Galiyana Cross road On The Study Stretch.

7. CONCLUSIONS

The following conclusion is drawn from analysis of study stretch:

1. The maximum number of accidents especially Fatal accident are found due to vehicle moving straight.
2. Maximum number of accident occur in summer season which indicate that the driver driving vehicle at excessive speed and also inattentive.
3. Rear end, Head-on and Hit pedestrian collisions are found to be in higher range due to high speed and inattention.
4. Majority of accidents are occurred not at junction, which is due to poor road geometry and poor pavement condition.
5. Majority of casualties are occurred to Car, Light goods vehicle and Heavy Goods vehicle. This is 76.2% of total accidents.
6. 56.2% of accidents reported between 6.00pm to 8.00am and 43.8% occurred during day time. It means visibility is the major issue on entire stretch.
7. From the spot speed study, concluded that some drivers preferred to move at high speed which is more than recommended speed. We know that the severity increases geometrically as speed is increase. These indicated that the drivers needs to attention towards the road safety. First the speed is set limited according to 85th percentile speed and put speed sign before 120m ahead to accident prone area.
8. Delay is found in congested areas while as in straight road the delay reduces and speed increases, which may cause a threat of life.
9. On entire stretch there is no street light, which cause glare effect on the driver's eyes and result the uneasiness, inconvenience in visual execution.

8. REFERENCES

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ANNEXURE 1 Road geometric inventory

From Chainage (kms)	To Chainage (kms)	Shoulder Width (m)	Lane Width (m)	Number of curves	No of Cross Roads	No of Bridges	No of T-Sections
0.000	1.000	0.00	5.980	1	0	0	0
1.000	4.150	0.60	4.065	1	0	0	1
4.150	8.000	1.20	4.260	1	1	0	1
8.000	12.500	0.80	4.365	2	0	0	1
12.500	18.000	0.00	4.480	1	0	0	2
18.000	19.600	0.80	4.800	2	0	0	0
19.600	23.200	0.60	4.860	1	1	0	0
23.200	23.550	0.40	3.700	0	0	1	0
23.550	28.000	1.00	4.850	1	0	0	0