

Determination of Road Safety Index for Urban Road of Rajkot City

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Abstract— Road Safety Audit is concerned with assessing safety performance and accident potentiality of a road during construction or existing road. Rapid urbanization has led to increase in the number of road accidents occurring on urban roads. This scenario especially in India needs to be dealt with at the earliest because urban population would reach about 600 million by 2031. Rajkot is a major city in Saurashtra region of Gujarat state in India. In this study, one urban arterial road sections viz. 150' Ring Road is selected for carrying out Urban Road Safety Audit. The section on ring road is provided with BRTS corridor. Ring road is four lane divided road and comprises of 5 four leg intersections and 14 roundabouts. Accident data were collected for past 5 years from respective police stations. The black spots were identified for both the sections. Speed data was collected with radar gun and volume count was done manually with electronic counters for morning and evening peak hours. Urban Road Safety Audit Toolkit (2013) published by Ministry of Urban Development, Government of India was adopted for preparation of checklists. Various indicators utilised for preparation of checklists were speed, footpath & pedestrian accessibility, cyclist accessibility, lighting, signage, motorised vehicle safety and intersections. Based on the checklists the scores for each section were calculated and recommendations for increasing the safety are suggested.

Index Terms—Road Safety, Road Safety Index, Road Safety Audit, Urban Road Safety Audit, Urban Roads

I. INTRODUCTION

Road Safety Audit was developed by traffic engineers in early 1980s in the UK. The idea of Road Safety Audit became popular among the engineers when they realized that they were carrying out remedial measures on new roads with point of view of accidental risks those roads would have offered if the Audit would have not been carried out. Lack of feedback from safety facilitators to the highway designers and constructors led to the birth of Road Safety Audit.

In India National highways constitutes for 20% of the total road accidents occurring on them which accounts for 25% of total road traffic fatalities occurring on Indian roads. According to 12th Five Year Plan, over 1.3 lac people die annually in road accidents alone which is about 10% of world figure, though India's share in number of vehicles in the world is only 1%. Vulnerable Road Users (VRUs) constitute 60-80% of total road traffic fatalities in India.

II. SITUATION IN RAJKOT CITY

Rajkot is 4th largest city in the state of Gujarat and is center of the Saurashtra region with more than 1.2 million population. Unfortunately, traffic situation has nearly reached to its saturation point on most of the city roads and no special attention is given towards safety of road users which has resulted in much private and government financial losses. Below table shows comparison between accidental deaths in state of Gujarat to that with Rajkot city as per vehicular type.

Table 1 Accidental Deaths as per vehicular type

Gujarat					Rajkot				
Truck/Lorry	Bus	Tempo/Van	Jeep	Car	Truck/Lorry	Bus	Tempo/Van	Jeep	Car
1415	470	547	738	815	14	7	4	4	21

III. STUDY AREA AND METHODOLOGY

Study area selected was 150' Ring Road which is one of the major arterial road of Rajkot city. Length of this road is 11 km from Madhapar Chowkdi to Gondal Chowkdi. Urban Road Safety Audit Toolkit 2013 under "Sustainable Urban Transport Project" by Ministry of Urban Development, Government of India has been referred for carrying out staged Urban Road Safety Audit process.

Density clustering was prepared from the accidental data collected from respective police station under which this road came. Density clustering is graphical representation of accidents spots on the map which would help in identifying the spots of frequent accidents on a particular road.

IV. DATA COLLECTION AND ANALYSIS

Basic data required for Urban Road Safety Audit are:

- i. Accident data from police station
- ii. Speed Measurement
- iii. Traffic Volume Count
- iv. Roadway Inventory

v. Roadside Development

Accident trend for 150' Ring Road from the accident data collected from police station between year 2010 to 2014 is shown in Fig. 1

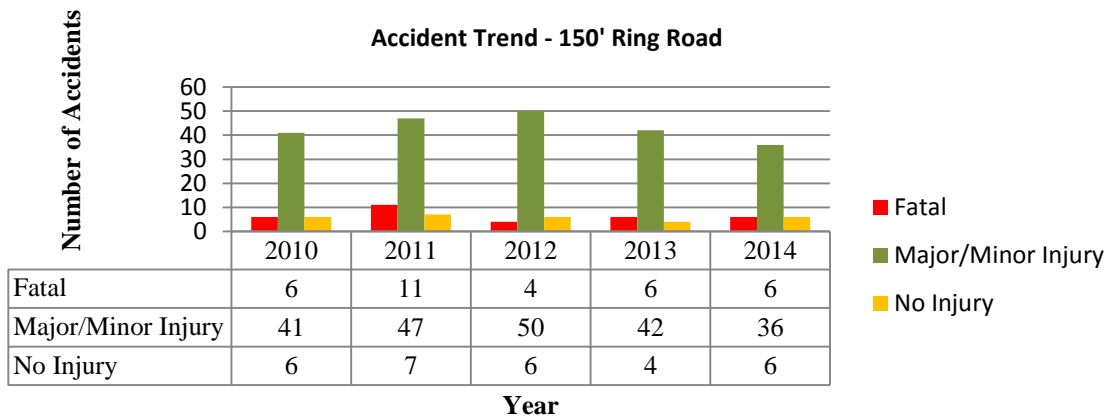


Figure 1: Accident Trend 150' Ring Road

Accident Density Clustering is done from the accident data collected from the police stations. Accident Density Clustering is a procedure of locating accidents on a map which helps in knowing the number of accidents occurring at a particular location on the roadway.

V. SPEED MEASUREMENT AND VOLUME COUNT

Speed measurement is carried out with the help of radar gun and volume count is carried out with the help of electronic counters. Four locations were selected on the road for carrying out both the surveys. Surveys were carried out during peak traffic hours i.e. 9am to 12pm and 5pm to 8pm for two days consecutively on both the directions of travel.

Figure 2 and 3 shows speed and volume measurements for the 150' Ring Road.

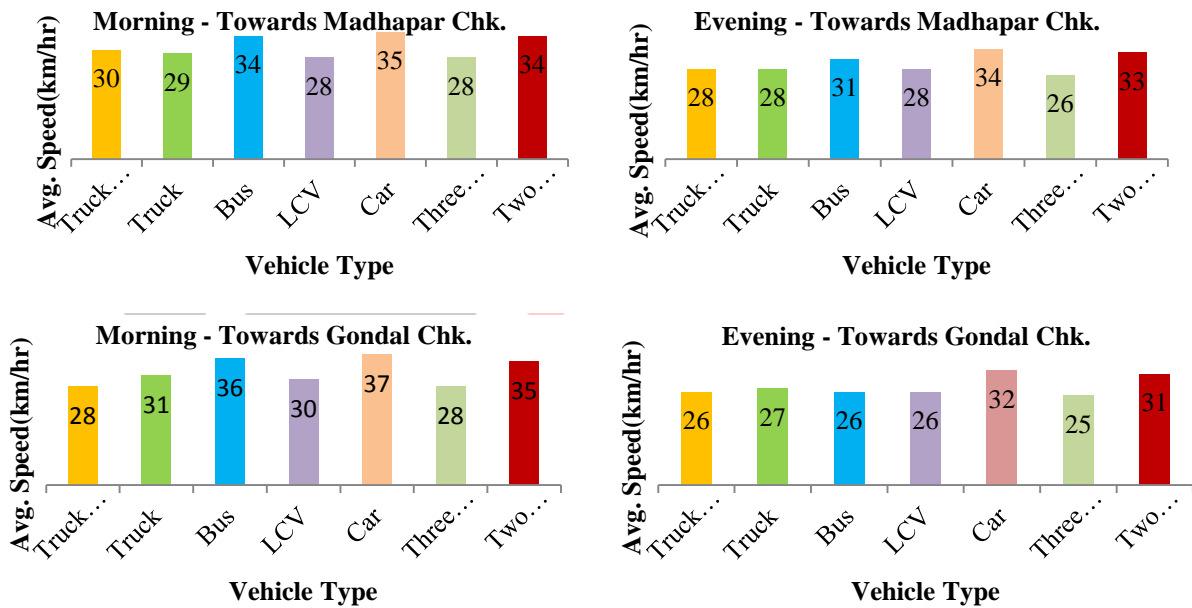


Figure 2: Speed measurement for 150' Ring Road

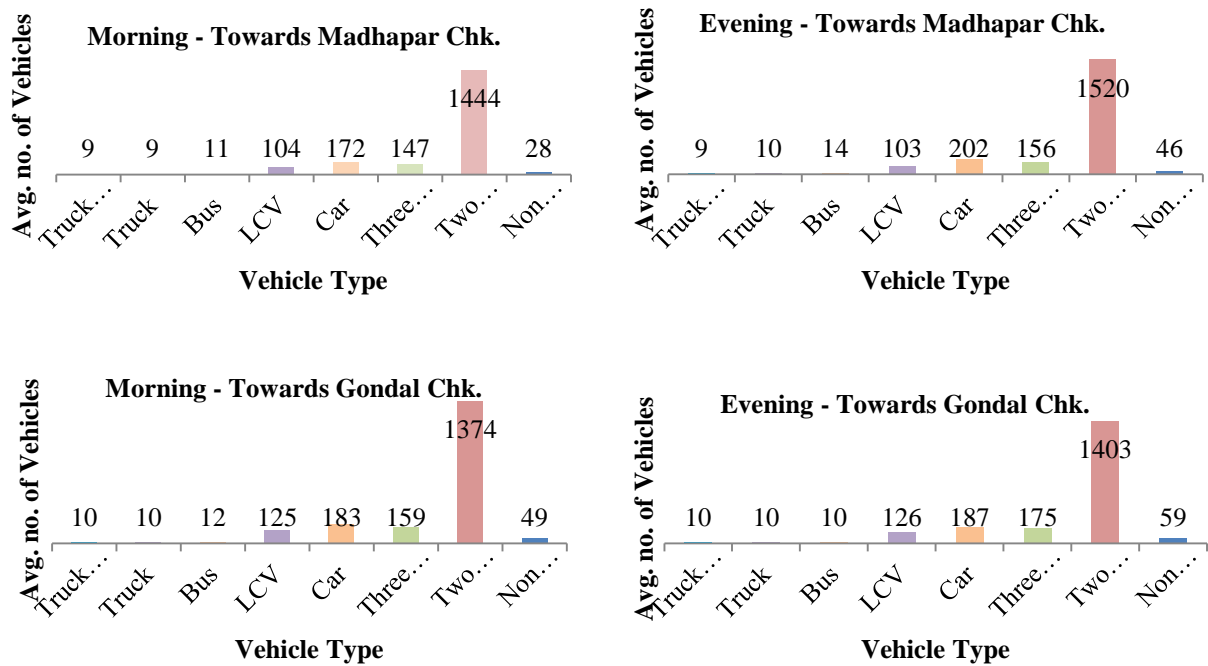


Figure 3: Volume count for 150' Ring Road

VI. CHECKLISTS

Checklists are important part of Road Safety Audit as they play an important role in identifying the factors responsible for occurrence of accidents over a particular road section. Indicators for checklists preparation utilized are:

- i. Checklist – 1: Speed
- ii. Checklist – 2: Footpath and Pedestrian Accessibility
- iii. Checklist – 3: Cyclist Accessibility
- iv. Checklist – 4: Lighting
- v. Checklist – 5: Signage
- vi. Checklist – 6: Motorized Vehicle Safety
- vii. Checklist – 7: Intersections

Based on the above indicators, checklists are prepared for 150' Ring Road and final scoring is done based on this checklists. Table 2 shows the Final Urban Road Safety Audit Score for 150' Ring Road.

Table 2 Final Urban Road Safety Audit Score

URBAN ROADS SAFETY AUDIT FINAL SCORE			
[150' RING ROAD]			
Road Section	Score		Final Avg. Score
	Towards Madhapar Chk.	Towards Gondal Chk.	
1. GokulMathura Bldg.	0.83	0.83	0.83
2. RNS Bank	0.83	0.83	0.83
3. Raiya Telephone Exchange	0.83	0.83	0.83
4. Jade Blue	0.83	0.83	0.83
5. Bet. Nanamuva Chk. & Balaji Hall	0.83	0.83	0.83
6. Mahadev Auto - Mavdi Chk.	0.83	0.83	0.83
TOTAL			4.98

150' Ring Road along with BRTS corridor was made open to public in the year 2012. It consists of 5 intersections and 14 roundabouts. The results are similar to the above when checklists were prepared at other locations. For this reason only the above specified locations are taken into considerations.

Score for RSA = $4.98/6 = 0.83$ i.e. 83%

GOOD BUT REQUIRES IMPROVEMENT FOR PEDESTRIAN CROSSINGS

VII. CONCLUSIONS

It was observed that even though 150' Ring Road is a newly constructed road there is a wide lack of pedestrian crossings throughout the road. Pedestrians could only cross the roads safely at roundabouts and at many locations it was seen that pedestrians tend to climb the BRTS corridor railing to cross the road from one side to another which is highly unsafe for their life and people moving by motorised vehicles on the roads. Implementation of safe pedestrian crossings is required as early as possible on this road. Chevron markings were found out to be absent near flyover approaches.

Police controlled intersections need to be controlled in more proper way because it was observed that people ignore the policemen giving signs and try to cross the road at high speeds which is unsafe.

VIII. RECOMMENDATIONS

- i. Construction of speed tables at regular intervals on the whole 150' Ring Road which would work as pedestrian crossing and help in accident prevention.
- ii. Strict police enforcement at intersections whether signalized or police controlled.
- iii. Proper maintenance and renewal of roadway markings.

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REFERENCES

- [1] Accidental Deaths and Suicides in India, National Crime Records Bureau, Ministry of Home Affairs, Government of India, 2013
- [2] IRC SP:88, Manual on Road Safety Audit, 2010
- [3] Urban Road Safety Audit Toolkit, Ministry of Urban Development, Government of India, December 2013