

# A Case Study on Road Safety Auditing

Sathya Dharan S<sup>1</sup>, Salini P N<sup>2</sup>

<sup>1</sup>Department of Civil Engineering, National Institute of Technology Karnataka, Surathkal, India

<sup>2</sup>Traffic Engineering and Safety division, KSCSTE - NATPAC

**Abstract:** *This study explores the primary concern for developing countries like India having huge network i. e., road safety. Although there are several other recognized practices for identifying road safety deficiencies or risk factors involved, Road Safety Audit (RSA) can be considered as a cost - effective and proactive method used for improving road safety by checking whether the roads are having the highest safety standards for all types of road users. The present study aims to identify critical safety issues observed while performing an RSA on a road is of six - lane divided carriageway in the city of Hyderabad, Telangana. Several deficiencies and risk factors were identified at different hazardous locations along the considered stretch of the road during the RSA. Some of such safety deficiencies identified during the audit process are Interaction of pedestrians with vehicular users, visibility and lack of infrastructure (improper usage in some locations). The insights obtained from the RSA report could not have been gained from the accident reports alone. Finally, countermeasures were suggested based on the observations made.*

**Keywords:** Safety Audit, Vulnerable Road users, risk - factors, assessment, critical spots, countermeasures

## 1. Introduction

Roads can be considered as a sign of development bringing enormous benefits to community in the form of socio - economic and logistic promoter. But due to the growth of road network road crashes also increased which led to premature deaths of productive age group. Road traffic injuries (RTIs) are one of the public health problems in which the community and decision makers continue to accept inevitably large - scale deaths and disabilities (S K Singh, 2016). Vulnerable Road User can be considered as the person who is at most risk in traffic, that is, those unprotected by an external shield. Pedestrians, pedal cyclists and motorcyclists are considered vulnerable road users (VRUs), as they are prone to injury in any vehicular collision, primarily because there is little or no external protective device that could absorb the impact of a road crash (George Yannis et al., 2020).

### 1.1 Background

To reduce deaths due to RTI, we should be able to predict the effectiveness of various interventions and then prioritize them to optimize our efforts in every location. While accident analysis is a reactive technique, proactive safety assessment such as Road Safety Audit (RSA) is a very effective technique to identify potential road safety problems in such scenarios (Sudipa Chatterjee et al., 2020). The unique objective of the RSA process is to minimize the future road accident count and severity of the road accidents by systematically identifying potential risk factors for existing or new roads by an independent audit team at different stages of project.

### 1.2 Objectives

The main objective of this study is to minimize the risk of crashes occurring on the considered existing road and to minimize the severity of any crashes that do occur or are likely to occur.

The specific objectives can be formulated are as follows:

- To perform RSA on an existing road (identified based on

the crash data obtained) at the operation and maintenance stage.

- To identify the potential safety hazards at the critical or most vulnerable locations based on the RSA conducted.
- Based on the findings of RSA, suitable countermeasures were proposed.

### 1.3 Scope

Scope of this study is to understand the importance of road safety auditing which is listed as follows in order to minimize the risk of the accidents:

Road Safety Audit: Performing a stage road safety audit (as there are five stages at which RSA can be conducted) of the selected project so that potential road safety problems can be identified as per the manual IRC: SP: 88 – 2019.

The audit report includes a clear description of all safety concerns which have been identified. It contains practical recommendations for each safety concern which shall be of an appropriate and specific nature.

## 2. Literature Review

Road Accidental deaths and injuries in India varies according to age, gender, month and time it was found that the economically active group is the most vulnerable population group. Overall male users face higher fatality and accident risk than their female counterparts. (S K Singh et al., 2016).

Pedestrians, pedal cyclists and motorcyclists are considered vulnerable road users (VRUs), as they are prone to injury in any vehicular collision. Measures for PTWs' safety focus on either crash prevention or increased protection from injuries may be like applying Active safety systems (For E. g.: Antilock braking) for PTW safety. (George Yannis et al., 2020).

RSA is a recognized technique for safety assessment of accident - prone locations. RSAs can be conducted at five

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stages to ensure that the needs of all road users are considered during each phase of project development: (i) planning phase, (ii) preliminary design phase, (iii) detailed design phase, (iv) construction phase, (v) operation and maintenance phase of an existing road. In this study, Road Safety audit has been conducted upon an existing road to ensure the road safety for users.

### 3. Methodology and Study Area

In the present context, the RSA was performed on an existing road at the operation and maintenance stage. After conducting the RSA major findings to be noted and making countermeasures and any recommendations in order to minimize the risk of occurring of crashes in the considered road section. The procedure followed for this study is as follows:



Figure 1: Methodology of the study

For the study, road stretch of 2 km section of a six - lane divided urban road comprises of 2 x 10.75 m wide carriageway with footpath of 1.8 m wide on both sides and kerb height is of 150 mm but from chainage 0/000 to 0/500 km of stretch from Balanagar to IDPL (S – N direction) having a two - lane carriageway of width 7.25 m. The marked locations in Fig - 2 of the considered road stretch are critical spots based on the crash - data reports. An accident - prone location is identified and designating based on the criteria of number of fatalities and accidents.



Figure 2: Study Location (Source: Google Maps)

### 4. Summary of RSA Findings

There are precarious elements identified by conducting RSA on the considered stretch of the road. Each hazardous element is associated with numerous risk factors. The risk elements associated are discussed in this section are as follows:

#### For Pedestrians

Pedestrians were found to be the most vulnerable road users. The major findings from the RSA are as shown in the following figures. Mainly they are:

Pedestrian crossing road markings are absent on the project road where pedestrians are likely to cross.



Figure 3: Pedestrian crossing markings are absent on the road

Pedestrian crossing sign boards present on the shoulder is covered with vegetation



Figure 4: Signboard is covered due to dense vegetation

Dropped kerbs are not provided at the mid - block locations where pedestrians are likely to cross or utilize the facility.



Figure 5: Abrupt closure of Pedestrian track

For the above findings, appropriate or recommended countermeasures in order to minimize the risk of occurrence are as follows:

Pedestrian crossing marking with retro reflective studs need to be provided as per IRC: 35 – 2015.



Figure 6: Pedestrian crossing markings as per IRC: 35 - 2015

All grass and vegetation covering the sign board should be cut and removed to enhance the visibility of the sign boards. The continuity of footpath in the public right - of - way should be maintained, incorporating existing wall openings, steps and other features that might obstruct the walkway.



**Figure 7:** Continuity in Pedestrian Track (Source: IRC: 103 - 2012)

Separate pedestrians from high - speed traffic by providing pedestrian guard rails at risky areas is desirable in order to avoid interaction between pedestrian and vehicular users (risky crossing of roads).

**For Vehicular Users**

In case of vehicular users, the major risk elements associated in the considered road stretch are as follows:

Inappropriate or Improper usage of Signboards: In some locations, signboards are provided which are not required whereas in some locations required signboards are absent. In some scenarios, signboards are covered with vegetation present on the shoulder.



**Figure 8:** U - Turn Ahead Signboard and Traffic calming measures are absent

Vegetation is present on the shoulder causing visibility obstruction for the openings (side road, other entries etc.)



**Figure 9:** Signboard covered with vegetation

Speed calming measures are absent (ahead of U - turns and along the appropriate locations along the stretch) in order to maintain the required speed.

□

□

□



**Figure 10:** Wrong Signboard placed on the project road

For the above findings, appropriate or recommended countermeasures in order to minimize the risk of occurrence are as follows:

All grass and vegetation should be cut and removed to enhance safe mobility of road users.



**Figure 11:** Remove dense Vegetation present along the shoulder

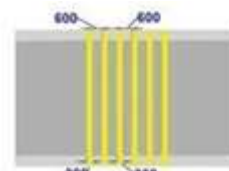
Appropriate signboards should be provided in the road stretch. In the current section, U - Turn and Bus stop ahead signboards should be provided as per IRC: 67 – 2012.



**Figure 12:** Signboards as per IRC: 67 - 2012 (U - Turn Ahead, Bus Stop Ahead)

At some locations the visibility funnel is occupied which would affect the mutual visibility of the traffic in the main road and that from the side roads/other entries. Hence visibility funnel should always be kept obstruction free as per IRC: SP: 88 – 2019.

Traffic calming measures are to be provided on the considered road section as per IRC: 99 – 2018.



**Figure 13:** Traffic calming measures as per IRC: 99 - 2018

Check the warning signs installed in the project and ensure the purpose. The existing signboards which are not required as per IRC 67 - 2012, should be removed from the project road.

Strong enforcement by local police authority in order to restrict the reckless behaviour of vehicular users. Awareness

for road safety should be spread among the local people and they should be educated to abide by safety rules to make road users follow traffic rules and to restrict speeding of vehicles which is one of the main reasons for crashes.

## 5. Conclusions

In this present study, the main scope of the RSA was to identify the critical safety deficiencies at the risk prone locations on the considered road stretch and provide appropriate recommendations. During the audit, the risk factors involved were identified and it clearly projected that the interaction between pedestrians and vehicular users is one of the major concerns in order to minimize the risk of occurrence of accidents. The salient findings emerged from the RSA based safety assessments are as follows –

The absence of appropriate infrastructure had led to the exposure of vulnerable road users to high - speed traffic in many locations. Moreover, in a few places, although the infrastructure was provided, they were misused or were unutilized (For example, Signboards either covered with vegetation or wrongly placed). Further, enforcement of the traffic rules and regulations should be ensured by Police and local authorities.

In some locations due to dense growth of vegetation on the shoulders there is an obstruction in visibility. The sight distance is one of the major requirements on the road stretch especially when there are other entries/sides roads on to the major road.

It was also observed that some of the road users lack the concept of road safety (like performing crossing manoeuvre at vulnerable locations like U - turns, pedestrians using carriageway instead of pedestrian track and crossing roads other than provided pedestrian crossings etc.). Education and awareness among the road users can influence and change in their present attitudes and behaviours. Spreading consciousness about traffic rules and safe road driving can help in producing better road users.

Road Safety is a complex issue which can be only achieved when there is improvement in multiple fronts in order to minimize the risk of occurrence of road accidents. A systematic incorporation of countermeasures along with enforcement can improve the safer and better usage of road.

In the present context due to some constraints, RSA could not be conducted over a large stretch to incorporate much more effective results. Risk factors and issues regarding road geometry can be also be considered for better understandings if in case longer stretches are considered.

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