

ENFORCEMENT OF ROAD SAFETY AUDIT AND ROAD ENGINEERING IN INDIA

Umang Champaklal Modi*,

Assistant Professor, Faculty of Law, The Maharaja Sayajirao University of Baroda, India, e-mail: umang_modi-law@msubaroda.ac.in

*** Corresponding Author**

ABSTRACT

Of all the components of Road Safety, perhaps the two with the potential for maximum impact which can be brought in systematically are – Road Design and Construction and Road Safety Audit. While the former ensures that safety is ‘built-in’ the road, the latter helps with timely identification and rectification of errors. Both take into account the fact that providing a ‘safe system’ overall is required to help minimize the impact of expected and unexpected human errors, negligence and frailties. Road designs and construction is the foundation on which all other tenets of road safety policy can be raised. Many nations have come up with an idea of establishing a nodal agency or lead agency wholly responsible for setting standards and monitoring implementation of these standards by way of audits at both levels initial approval and periodical. They have laid down uniform guidelines and set the standards which are binding on the contractors and builders. In this paper, author will explore the issues concerning safe road engineering with particular emphasis on two interrelated concepts - road design and construction and road safety audits. In our discussion, we not just look at these issues from a domestic lens, but consider some international experience and perspective as well. Finally, author suggestions for better enforcement of Road Safety Audit and Road Safety Engineering so that it becomes easy to enforce safe road engineering and audit

Keywords: *Road Safety Design, Construction, Road Safety Engineering, Road Safety Audit, Safe System*

1. INTRODUCTION

According to World Health Organisation (WHO), Road Traffic Injuries (RTIs) are a major public health problem as crashes kill more than 1.3 million people and injure about 50 million people a year and 90% of such casualties occur in low and middle income countries. According to World Road Statistics 2018, India ranks first in the number of road accident deaths across 199 countries, followed by China and United States. In 2018 1.51 lakh people were killed and 4.69 lakh were injured. These RTI have increased by 0.6% as compared to 2017. In 2019, 1.54 lakh were killed in RTIs. This shows that every year RTIs are only increasing and not decreasing.

Road engineering is an engineering discipline branching from civil engineering that involves the planning, design, construction, operation, and maintenance of roads, bridges, and tunnels to ensure safe and effective transportation of people and goods. The main objective of conducting Road Safety Audit is refers to the procedure of assessment of safety measures employed on roads. Road Safety Audit also helps in reducing Road Traffic Injuries. Various studies around the world suggest that Road Safety Audit is highly cost-effective tool for accident prevention. There was no mechanism of Road Safety Audit in India until 2014 it was introduced by World Bank finance Initiative, National Highways Interconnectivity improvement Project. Project brought various positive changes in India like installation speed reduction method, improvement in road designing, Installation of crash barriers etc... However, That India hasn't seriously considered using Road Safety Audit properly is evident from the fact that it hardly figures in policy discussions around road safety.

2. METHODOLOGY

The Researcher has relied upon the analytical method of Research Methodology. The researcher while writing this research article has taken various primary and secondary sources. The primary source is MORTH's report. The researcher has done extensive research with the help of various secondary sources like various articles published in journals.

3. ROAD CONDITIONS IN INDIA

Poor condition of road is the major cause of the RTIs in India and situation become worse when actual road users can do very little about it. National and State Highway, which comprises of 5% of the total road network, account for about 55% of RTIs and accident relating killing of 61% in 2019. The road conditions that contribute to RTIs are road width, width and state of shoulders, deficiency in sight distance. Indian traffic and transport system has a number of drawbacks mainly heavy encroachments on roads, ribbon development, poor surface conditions and inadequate surface drainage etc...

Potholes on roads damages vehicle shocks and suspension and causes driver to lose control of the vehicle. When a vehicle hits a deep pothole, the impact is similar to that of a collision at 35 mph... The discontinuous service roads lead to wrong side movements of traffic to avoid long detours. Poorly designed access roads from adjacent areas of the highways also leading to frequent conflict between different classes of vehicles.

4. ROAD NETWORK IN INDIA

In today's world, road transport has become necessary part for everyone. India has the largest road network in the world next to United States. The number of vehicles on the road is increasing every year. This introduces complications into organizations of traffic which leads to need to constructions of roads. Consequently, road length in India has increased from 4,00,000 km in the 1950s to about 58,97,671 km in 2017. In this, rural roads account for 61%, Public Works Department (PWD) roads account for 20 %, urban roads account for 9%, National Highways are 2% and State Highways 3% of the total length of roads. Project Roads account for 7%. These include roads built by various state departments like forest, irrigation, electricity, public sector undertaking like Steel Authority of India and Border Roads Organization etc. Since 2000, road network in the country has grown by 39%. But the number of

registered vehicles has grown by about 158%. This increase in the number of vehicles on roads leads to traffic congestion and RTIs.

5. CLASSIFICATION OF ROADS IN INDIA:

Based on speed limits, nature of the road, width of carriageway, etc..., roads are classified as follows:

1. Expressway
2. National Highways
3. State Highways
4. District Roads
5. Village Road

5.1 Expressways

Expressways are an advanced class of road. They are access-controlled i.e., the entrance and exit controlled by ramps that are built-in during its design. Speed limits on expressways in India vary from state to state and vehicle type. In 2018, the Ministry of Road Transport and Highways MoRTH set the maximum speed limit on expressways 120 km/h (for national highways the limit is 100 km/h and for urban roads is 70 km/h) for M1 category of vehicles (passenger vehicle consisting of less than eight seats in addition to driver's seat). Furthermore, as expressways have witnessed numerous RTIs due to speeding, speed restrictions on expressways have been amended due to speeding as 120 km/h for cars and 100 km/h for buses from 2019.

5.2 National Highways and State Highways:

National Highways are roads that nationally important. They connect state capitals, ports and foreign highways and also include road of importance. They are financed by the Central Government. State Highways are important roads within each state. They connect important cities, district head-quarters in the state, National Highways, State Highways of neighboring states etc. They are financed by State Governments i.e., Roads & Buildings department of the state.

5.3 District Roads and Village Roads:

These are roads within district. They are financed by Zila Parishad. The two categories of district roads are Major districts roads and Minor district roads. Major district roads connect various District head-quarters, Taluka head-quarters, important towns in the district, production and market centers, etc., with each other. They also connect State Highways, National Highways and railways. Minor District Roads are usually given less importance. Village roads connect villages and nearby district roads. They are financed by Panchayats.

6. COORDINATION ISSUES WITH DIFFERENT AGENCIES IN INDIA:

From above classification of roads it can be understand that all roads functions are differ on the bases of its geographical locations. All roads are also manage by different agencies and authorities due to which there is lack of co-ordination between all agencies and authorities which are responsible for managing and maintaining road network .The Indian Road Congress (IRC) contained codes of practice and standards of road designing in India. IRC codes are not mandatory to be followed by various agencies due to which IRC does not create any accountability. Apart from IRC there are no comprehensive guidelines for maintenance and repairing of existing road network in India. In near future major roads of the country will be in bad conditions without maintenance and repairing. As per the information/data given in Table 1 of the total number of RTIs, and persons killed in RTIs on National Highways including Expressways, Rural Areas and all roads for the calendar years 2017 to 2019 in the country clearly indicate that rural roads have witnessed more number RTIs and deaths than urban roads and National Highways which is very alarming

Table 1: Total number of RTIs, and persons killed in RTIs on National Highways, Urban Roads and Rural Roads for the calendar years 2017 to 2019

Years		Number of Road Traffic Injuries (RTIs)	Number of Persons Killed
2017	National Highways	1,41,466	53,181
	Urban Roads	1,95,415	51,334
	Rural Roads	2,69,187	96,579
2018	National Highways	1,40,843	54,046
	Urban Roads	1,90,956	51,379
	Rural Roads	2,76,088	1,00,038
2019	National Highways	1,37,191	53,872
	Urban Roads	1,78,062	49,715
	Rural Roads	2,70,940	1,01,398

(Source: Ministry of Road Transport and Highways, Government of India)

7. DISCUSSION ON ROAD ENGINEERING

Road safety engineering is a process is an application of engineering principles based on the analysis of road traffic fatalities information. Road safety engineering also useful in identifying road design and road safety management measure can reduce road traffic fatalities. It is road designing should be done in safety conscious planning of road users. While designing new roads it is important that road safety aspect should be consider. One of major problem is to assess the hazardous locations which cause more number of RTIs on particular location. One of the key aspects of Road safety engineering is to incorporate road safety aspects in existing and future roads to avoid future causalities on road.

Considering Road Safety as an area of immediate concern around the world, the United Nations (UN) has declared Decade 2010-2020 as the Decade of Action for Road Safety. It aims to save 5 million lives by 2020. One of the five “pillars” of the Decade is on “Safer Roads and Mobility”. Safe Road

engineering is an engineering discipline branching from civil engineering that involves the planning, design, construction, operation, and maintenance of roads, bridges, and tunnels to ensure safe and effective transportation of people and goods.

In the context of safe road engineering, defining the built environment including the road design and vehicle design is what constitutes the 'Engineering' component of the '5Es' policy for road accident control.

7.1 Some key elements of Safe Road Engineering

Having a safe road infrastructure, complete with footpaths, cycling lanes, safe crossing points and other such traffic regulating measures can help significantly in reducing road crashes. To promote road safety ownership and accountability, the road authorities were to be encouraged to commit a minimum of 10% of road budgets to dedicate safer road infrastructure programs. Besides the creation of safer road infrastructure, one critical imperative was to monitor the "safety performance of investments in road infrastructure by national road authorities, development banks and other agencies" (WHO). To sustainably increase the safety of road infrastructure, one important method was to promote the safe operation, maintenance and improvement of the existing road infrastructure.

7.2 Fractional Designing of Roads

It is very important that each road should be design according to its function. Controlling speed of vehicle on the road is one of the most important characteristics of well-designed road.

High-Speed Roads: To design safer high speed roads like highways, expressways it is necessary that there should be restricted entry for certain class of vehicles; all vertical and horizontal curves should have median barriers, graded separate junction with entry and exit. Looking into volume of vehicles in low and middle-income countries should have separate lanes for two-wheeler motorized vehicle.

Rural Roads: To design safer rural roads it is necessary that there should be periodic lanes for overtaking and oncoming traffic. There should be median barriers to preventing overtaking in dangerous roads. All rural roads should have proper installation of lighting at junction, advisory of speed limit before sharp bends, speed limits signs, rumble strips and all hazardous obstacles near road like trees and poles should be completely removed.

Transitional Roads: Transitional roads are connecting high-speed roads with low-speed roads to design transition roads it is necessary that road sign guide drivers in reducing speed in time. Rumble strips, speed bumps, visual warning should be properly used. To calm traffic in residential access roads speed limit should not be more than 30 km/h.

8. DISCUSSION ON ROAD SAFETY AUDIT

8.1 Road Safety Audit in India

In 2016, 12357 road crashes were attributed to factors like Engineering faults, defect in Road Conditions and poor lighting. These factors also lead to 5203 people dying, 5202 being grievously injured and 7061 suffering from minor injuries in 2016.

Though every road crash is preventable, but even more so are the crashes caused due to factors extraneous to the road users i.e. which were beyond the control of the road user and primarily includes poor design and infrastructure of roads including availability of amenities like signages and lights. One mechanism that helps prevent these factors from becoming fatal is called a Road Safety Audit (RSA), a cost-effective and preventive technique that India is only waking up to now. That India hasn't seriously considered using RSA properly is evident from the fact that it hardly figures in policy discussions around road safety.

Consider, for instance, India’s National Road Safety Policy which talks about reviewing standards for construction of roads, but finds no place for RSA as a means to ensure that the roads adhere to those standards. Similarly, the Motor Vehicle (Amendment) Act, 2019, makes great strides for road safety by providing for penalties for not following standards of road engineering etc. But it fails to answer the question - in absence of mandatory RSA, how will such failures be determined and penalties fixed?

The Indian Roads Congress published a Road Safety Audit Manual in 2010. As per this Manual, RSA is defined as a ‘formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for improvement and maintenance of existing roads.’

The Manual goes on to identify the essential elements of RSA:-

- A formal process and not just an informal check
- Since, it is an audit, it must be carried out by persons who are independent of design and construction and who are properly trained in carrying out such audits
- Restricted to road safety issues and not to be used to categorize a project as bad or good

As per the Manual, RSA should be integral to different stages of life-cycle of a project – design, construction, pre-opening, operation and maintenance and should assess a road from the perspective of different users – pedestrians, truck / bus drivers, cyclists, motorcyclists etc.

A Cost-Benefit analysis of RSA is presented below which indicates that the benefits derived from RSA far outweigh the cost involved:-

COST of RSA	BENEFITS of RSA
<ul style="list-style-type: none"> ● The cost involved can broadly be categorized into three categories – auditor’s fee, client’s time to manage the audit, costs associated with implementing the recommendations that are adopted ● Research shows that while actual costs vary according to size and complexity of project, RSA may add only 5-10% to design cost which translates to 0.5-1% of total construction cost. ● For smaller or retrofitting projects, cost of RSA may be a higher component of overall cost. ● Cost of rectifying deficiencies depends on how early in the design process the problem has been identified. 	<ul style="list-style-type: none"> ● Likelihood of accidents on road network is reduced ● Severity of accidents is reduced ● Increase greater prominence for road safety in the minds of road designers and engineers ● Cost of remedial work can be minimized ● Overall cost to the economy and society – accidents, disruption, and trauma – is reduced. ● To gain maximum benefit, it has been argued that RSA is most effective when conducted during planning and design stage. Mitigation and remedial work becomes much more expensive post construction and opening.

9. CONCLUSION

Both Road Safety Audit and Road Safety engineering takes into account the fact that providing a ‘safe system’ overall is required to help minimize the impact of expected and unexpected human errors, negligence and frailties. Roads should be well maintained with frequent relaying of road surface and marking of road safety signs. Proper footpaths for pedestrians and pedestrians crossing at intersections should be provided. Roads and junctions should be wide and well lit so that visibility is good. The standard checklist of road safety audit shall be filled out in the feasibility stage or monitoring stage or maintenance stage of when retrofitting existing infrastructure. On all roads, a safety audit using standard

checklist should be carried out every year, preferably every monsoon season. . Road designs and construction is the foundation on which all other tenets of road safety policy can be raised. Researcher has proposed following Suggestions for Enforcement of Road Safety Audit and Road Engineering in India

9.1 Suggestion for better enforcement of Road Engineering

1. The places where frequent accidents occur should be properly mark.
2. Construction of a new road next to the existing road should be done.
3. Pavement without changing horizontal alignment or profile of the road should be done.
4. Channelization of traffic at intersections should be separate.
5. Signs on the roads should be installed with correct shape. colour, size and locations.
6. Street Lighting should be installed properly to reduce RTIs
7. The road should be skid resistance by constructing high friction overlays or cutting grooves into the pavement.
8. Guide posts with reflectors should be installed to guide movement of vehicle during night time.
9. Guard rails should be installed properly on the hilly roads.
10. Construction of flyovers or bypasses should be done properly to reduce road traffic.
11. Encroachment on footpath should be removed for smooth flow of traffic.
12. Blind spot warning should be visible and properly marked.
13. Road markings should be done properly.

9.2 Suggestion to Conduct Safe Road Safety Audit

1. During planning and design stage, the Project Designer/Engineer, the person who is involved in designing or planning of the project, should be responsible for conducting feasibility and design stage audit.
2. During construction stage, the site engineer, the person who is involved in execution or construction of the project, should be responsible for the construction stage audit.
3. During maintenance of existing road infrastructure, the maintenance engineer, the person who is involved in the maintenance of the existing infrastructure or in monitoring newly project, should be responsible for periodic audit.
4. The administrators of various Urban Local Bodies should be responsible for ensuring better planning, construction and maintenance of the road infrastructure to ensure that roads are user friendly.

REFERENCES

- Ministry of Road Transport and Highways, Government of India (MoRTH) (2019), *Road Accidents in India 2019*. https://morth.nic.in/sites/default/files/RA_Uploading.pdf
- Sridevi M (2020) *Road Safety Engineering*, 18, December, 2020
- K.K. Kapila, Aseem Prabhakar, and Sandip Bhattacharjee (2013). *SAFE ROAD INFRASTRUCTURE DESIGN FOR HIGHWAYS*, *Transport and Communications Bulletin for Asia and the Pacific No. 83, 2013* https://www.unescap.org/sites/default/files/bulletin83_Article-2.pdf
- Peden, M, Scrufiled R, Sleet D, Mohan D, Hyder AA, Jarwan E, Mathers C (eds.) (2004). *The World Report on Road Traffic Injury Prevention*. Geneva, World Health Organization.
- Ranade P (2010). *Road Safety Management: Issues and Perspectives*, The Icfai University Press, Hyderabad.
- Financial Express (2019). *Road safety audits will help reduce number of accidents, May, 15, 2019*.