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Research Paper

Road safety audit: a case study on NH-65

Tummala Bharat Kumar[1], Chukkapalli Jeswanth Chowdary[2]

[1,2] Under graduate student, Civil Engineering Department, Velagapudi Ramakrishna Siddhartha Engineering College, Vijayawada, Andhra Pradesh, India
**Corresponding author E-mail: tbharatkumar96@gmail.com*

Abstract

In India there is road network of 33 lakh kilometres of which nearly 65% of the cargo activity and 80% of traveller movement is on the road networks. National Highways constitute around 1.7% of the road network but carry about 40% of the aggregate road traffic. Number of vehicles has been increasing at a normal pace of 10.16% for every annum in the course of the most recent five years. Road safety audit is the formal methodology for getting accident potential and safety potential in the development of new road schemes and the schemes for the improvement and maintenance of the existing road facilities. Accident prevention and accident reduction are the two main strategies in the road safety. In this case study we analyse the NH-65 which is the major highway connecting VIJAYAWADA and HYDERABAD from the 270thKM to 247th KM. The highway carries considerable amount of traffic throughout the day and it has number of conflict points such as villages, industries. Detailed analysis of NH-65 will be carried out from the point of view of safety and geometric design aspects will be performed. This paper aims to identify deficiencies, improving design aspects, enhancing credibility of the roads.

Keywords: *Accident, improving design aspects, road safety.*

1. Introduction

Road safety audit is comparatively an extraordinary tool for the improvement of road safety and to recognize potentially dangerous areas, includes on highway and propose remedial measures. [4] RSA Definition: It is a systematic approach for evaluating of new and existing roads by an independent team at different stages of planning, design, construction, operation and maintenance to achieve accident free roads and to increase overall safety performance. JSRPRCD [2012]: defined road safety audit as formal procedure for assessing accident potential & safety performance in the provision of new road as well as maintenance, improvement, rehabilitation of existing roads. AUSTROADS [2002]: describes it is a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team report on the projects crash potential and safety performance. ADB [2003]: defined RSA as systematic procedure for accessing the road safety of roads and road schemes

1.1 Objectives of the study

- Identify designing imperfections and recommend intercessions.
- Identification of accident prone regions on the highway.
- To study about the impact of roadway geometrics and traffic conditions on the highway. [6]

In this paper it is expected to assess Road Safety of National Highway [NH-65, previously NH-9] of India and will concentrate on assessing the advantages of the proposed activities that have exuded from lacks recognized through the review procedure. [4]

1.2.Site location

The site is from 247.650km to 270.340km i.e., from donabanda to neelima theatre at bhavanipuram, Vijayawada. The selected highway stretch has been studied for the safety aspect. The important areas on the survey area are Gollapudi, Ibrahimapatnam on the NH-65 in the Andhra Pradesh, India. The highway passes through a level and moving landscape for the most part rural, urban settlement land and stone crusher plants. The location map, route map and terrain map of the study area are shown in Figure 1, Figure 2 and Figure 3 respectively. The National Highway-65 is built under BOT [Build-Operate-Transfer] model and began its commercial operations from 09-sept-2004.

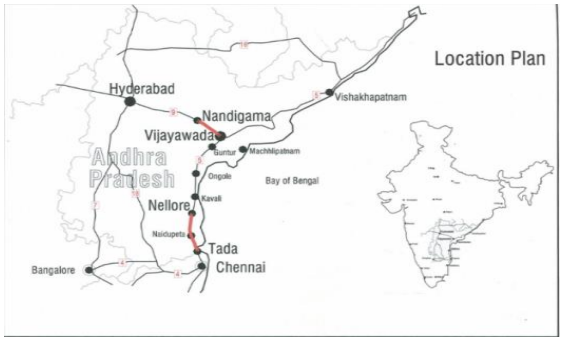


Fig.1: route map of NH-65.

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Fig.2: Key plan of the NH-65.



Fig.3: Showing the TERRAIN MAP of surveyed area.

Source: Google maps.

2.0 Salient features of the highway:

The width of main carriageway is of 7.00m with 2.00m earthen shoulder on both left and right carriage way of the highway. The width median is 4.5m and raised type in general. Road infrastructures details are as under,

MajorJunctions	:07 number
Major Bridges	: 02 number
Minor Bridges	: 05 number
Culverts	: 86 number
Truck lay bays	: 02 number
Bus lay bays	: 34 number
Industries/institutions	: 53 number
T-junctions	:16 number
Intersections	: 2 number
Y-junctions	: 01 number
Gap in median	: 22 number
Road curves	: 91 number
Petrol bunks	: 12 number
Pilgrimage	: 17 number
Road intersections	: 185 number

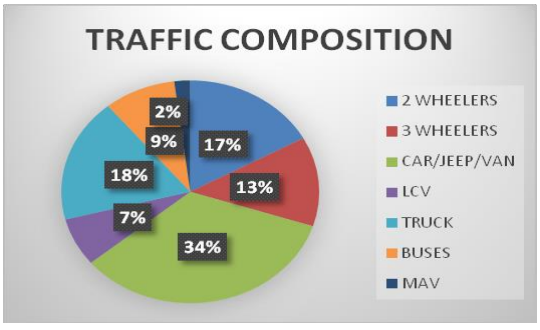


Fig.4: showing the traffic composition on NH-65.

Source of data: NHAI

3.Accident data

The accident data is collected from the national highway authorities from stretch Vijayawada to Nandigama. The data collected is for the period 2008-2017[October]. Principle perception from the analysis of the gathered accident data was that it gave an opinion of under-reporting. Real figures may be much more. It is moreover noticed that minor accidents were overlooked by and where as severe accidents involving death or severe injuries were frequently reported.

Table-1: Accident details

DETAILS OF ACIDENTS DURING DAY TIME AND NIGHT TIME					
			Details of accident victims		
Year	Day time	Night time	Fatal	Serious	minor
2008	88	29	39	75	95
2009	60	27	31	58	66
2010	62	40	37	46	105
2011	81	68	33	43	160
2012	145	116	53	118	194
2013	125	121	44	125	234
2014	120	122	39	112	178
2015	129	92	37	87	192
2016	123	94	58	82	216
2017[October]	105	74	33	72	180

Source: Accident data collected from NHAI

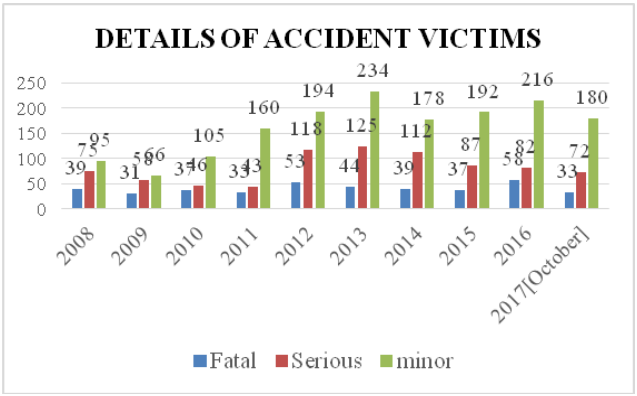


Fig.5: graph showing the accident's severity.

From the figure-5 we can notie the increase in the rate of accidents is noticed from 2008 to 2013 and there is decrease in 2014 and there is increase from 2015 to 2017[october] and the necessary measures has to be taken to rectify the defects on the highway.From the figure-6 we can notice that accidents occurs on the day time are more when compared to night time. The accident rate can be decreased at night time by providing illumination at the villages, industries/institutions

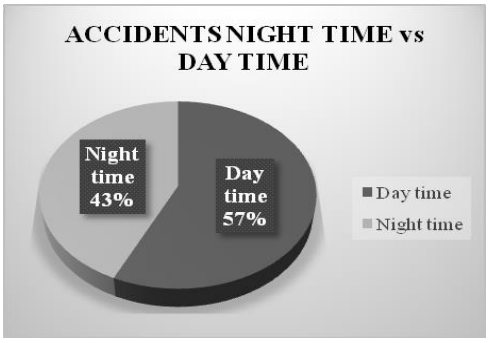


Fig.6: accidents occurring night time v/s day time.

4. Design aspects and general observations

4.1. Crash barrier location

The crash barriers are to be provided on banks whose height difference is greater than 3.0m, they should be placed at the major and minor bridge approaches and also at sharp curves. There shouldn't be space between metallic crash barrier and rigid concrete crash barrier. [1]

4.2.Central lightening arrangement

Adequate lighting arrangement should be provided at-grade roads for the nearby village and town boundaries. Provision of high mast lighting at all the minor and major intersections of the national highway for the safe motion of vehicles and also for pedestrians during the night time.

4.3.Road marking

Road markings are to be properly laid on the carriage way for controlling, warning, guiding and informing the road users. [3]

4.4.Pedestrian facility

Raised foot path should be properly maintained in the nearby village area and towns for safety of pedestrians. Provision of pedestrian guardrail on the raised foot path on the sides of either of the carriageway particularly at the bus stops and bus bays for the length not less than 20 m for safety of pedestrians where their activity is high and also the provision facilities for differently abled persons should be done.

4.5.Truck lay bay and Bus bay

Informatory sign boards should be kept in front of truck lay and bus bay. Proper lane marking need to be carried out. Raised pedestrian footpath has to be constructed for safety of passengers. Proper transition lane should be provided and facilities for the differently abled people has to be provided.

4.6.Median and islands

The median and islands are to be raised at least to a height of 300mm by using kerb stones and the gap has to be filled by the locally available material for the plantation along the median.

4.7.Service roads

Service Roads has to be developed in the areas which have high urban area such that local traffic can be separated from highway traffic. Appropriate flaring at beginning and ending of service roads should be provided. Proper road signs should be kept at all flaring areas. Proper chevron board marking should be provided at separator between main highway and service road. Hazard board marking should be kept at beginning of the divider.



Fig.7: at chainage: 258.220km RCW.



Fig.8: at chainage: 266.500km LCW.



Fig.9: at chainage: 256.720km LCW.



Fig.10: at chainage: 249.756km LCW.

From the figures 7,8,9,10 the waste is being dumped by the surrounding villages people at the culverts which can cause the blockade of the water at the culvert.



Fig.11: at chainage:268.671km.



Fig.12: at chainage:267.407km.



Fig.13: at chainage:266.848km.



Fig.14: at chainage: 264.870km RCW.



Fig.15: at chainage: 264.608km RCW.



Fig.16: at chainage: 262.427km RCW.

In the figures 15,16 there is no shelter lane provided near the gap in median.



Fig.17: at chainage:256.125km RCW.

In the figure-17 there is no proper drainage facility as the rain water stagnant at gap in median.



Fig.18: at chainage: 268.817km.

In the figure-18 un-authorized gap in median is provided for the pedestrians.



Fig.19: at chainage:269.557km. LCW

In the figure19 though there is parking sign facilities are not provided for the parking.



Fig.20: at chainage:269.528km.



Fig.21: at chainage: 260.921km.RCW



Fig.22: at chainage: 254.605km.LCW

In the figure-21,22 the earthen shoulder is damaged due to the water stagnation proper drainage has to be provided.



Fig.23: at chainage: 269.260km. RCW



Fig.24: at chainage: 254.017km RCW.

In the figure24 there is no proper approach provided on to the NH, the approach road is very steep.



Fig.25: at chainage: 267.193km.

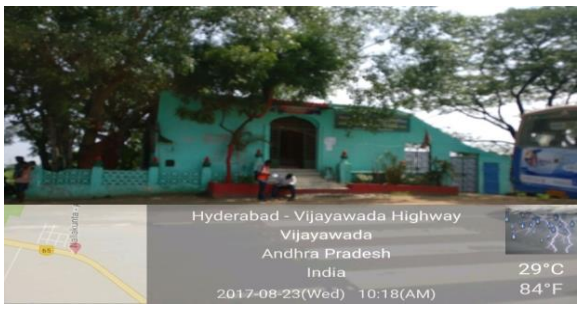


Fig.26: at chainage: 264.910km. LCW

In the figures 25,26 the pilgrimages are on the side of the NH without any parking facilities which are causing obstruction to the flow of traffic.



Fig.27: at chainage: 247.915km.LCW

In the figure-27 the approach to the NH is not provided it has to be laid.



Fig.28: at chainage: 250.939km

In the figure-28 there is an un-authorized gap in median in-front of the Z. P. H school, Mulapadu village where the vehicles are using it to change the lanes which can cause accidents

5. Conclusions

Based on this case study on the four-lane national highway-65 [previously NH-9] the following conclusions have been drawn

From the four lane National Highway-65 i.e., from 247.650km to 270.340km, by analysing the information it is found that road markings, condition of shoulder, condition of carriageway and median opening are the factors for causing accidents on the NH-65. It also observed that the moderately moving vehicular traffic is generating traffic problems for the fast moving vehicular traffic as it generally occupies innermost lane of national highway. Along this four lane national highway, service roads need to be provided so as to isolate slow moving vehicular traffic from fast moving vehicular traffic.

All the unauthorized gap-in-median should be closed and necessary provisions like foot-over bridges to be provided for the local neighbourhood to cross the national highway on the priority basis.

All undeveloped minor and major crossings should be developed with necessary lighting provisions such that the accident rate can be decreased along the surveyed areas.

Footpath for the pedestrian need to be developed near the habitant areas, industries, educational institutions and to be properly maintained wherever it is there and also the guard rail need to be provided along the entire length of the footpath. Facilities for the differently abled people at bus stops need to be developed on the NH-65.

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