

## “Road Safety Audit: A Case Study for Wardha Road in Nagpur City”

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### ABSTRACT

India has a road network of an estimated 3.3 million km, which carries nearly 65 per cent of freight and 85 per cent of passenger traffic. The road traffic is estimated to be growing at an annual rate of 7-10 per cent, while the vehicle population is growing at a rate of 12 per cent per year.

A Road Safety Audit (RSA) qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. The Road Safety Audit consists of safety principles to the design of a new or a rehabilitated road section, to prevent frequent occurrence of accidents or to reduce their severity.

In this project analysis of one of the major arterial street of Nagpur city will be undertaken. The location of interest for the analysis is Wardha Road from Morris College Square to Airport Intersection. The roadway carries considerable amount of traffic throughout the day and it has number of conflict points such as merging of traffic from flyover. A detailed analysis of Wardha Road will be carried out from the point of view of safety and supplemental analysis regarding the traffic growth and accident analysis will also be performed.

The project aims to identify deficiencies, developing mitigating strategies, improving public relations, enhancing credibility of the roads and calculating the crash rate of intersection or length of roads.

**Keywords:** Accident, road safety

### I. INTRODUCTION

Road fatality rates in India are probably among the highest and out of 1.25 million deaths worldwide every year, 8-10 per cent of all road deaths are in India. The road system and the traffic operations in India are deficient in safety management. One of the reasons for this situation is that there is very little opportunity to learn from the past mistakes. The accident records are supposed to provide the clue about deficiency in the road, vehicle and user systems to explain the causes of accidents and to develop remedial measures. This road safety management system is poor in India, with untrained police officers collecting only incomplete records of fatal accidents and always stating the road user's fault as the cause of the accident. In a road environment where the road designs, knowledge of traffic rules, traffic control and policing (enforcement) are responsible for the accident. In a deficient road and traffic environment, causes are related to poor road geometry and poor traffic control aggravated by poor traffic sense.

In this analysis of one of the major arterial street of Nagpur city will be undertaken. The location of interest for the analysis is Wardha Road from Morris College Square to Airport Intersection. The roadway carries considerable amount of traffic is higher. A detailed analysis of Wardha Road will be carried out from the point of view of safety and supplemental analysis regarding cent of passenger traffic.

### II. Problem Definition:

In India, 4,00,000 accidents occur annually with about 1,00,000 people losing their lives. Besides fatalities, nearly 4,00,000 people suffer injuries in road accidents which lead to lifelong miseries for the victims and their families. Accidents are caused by several reasons such as human error, machine failure, or weather condition. Some of these variables cannot be tackled but those which can be tackled should be addressed. To reduce these losses (human as well as property), effort needs to be made towards thorough investigation and subsequent corrective action.

### III. Objective of Review

The primary objective of undertaking a road safety audit on the wardha road is to ensure increased safety for the users. Specifically, the objectives and various tasks to be achieved can be stated as follows:

1. To collect traffic and road inventory of Wardha Road from Morris College Square to Airport Intersection.
2. To collect Accident Data and perform accident data analysis.
3. To develop a model for identification of safety influencing parameters in minimizing accident rate on selected squares of roads.
4. To examine safety fetatures and find out deficiencies and conflict point in the road network which lead to accident and safety hazards to road users.

YEAR 2010 FROM 1/1/2010 to 31/12/2010					
	FATAL	SERIOUS INJURED	MAJOR INJURED	MINOR INJURED	NO. OF ACCI.
SITABURDI	15	19	15	5	54
DHANTOLI	6	21	34	7	68
SONEGAO	16	17	10	0	43
TOTAL	37	57	59	12	165

YEAR 2011 FROM 1/1/2011 to 31/12/2011					
	FATAL	SERIOUS INJURED	MAJOR INJURED	MINOR INJURED	NO. OF ACCI.
SITABURDI	8	24	44	10	86
DHANTOLI	9	31	37	8	84
SONEGAO	7	18	13	8	46
TOTAL	24	73	94	26	216

#### IV. Scope of study

In this project we are going to analysis of Wardha Road from Morris College Square to Airport Intersection. The project aims to identify deficiencies, developing mitigating strategies and calculating the crash rate of each intersection or length of road. with the help of Microsoft visual studio mimimizing the accident rate or crash rate in future.

#### V. Checklist for existing road:

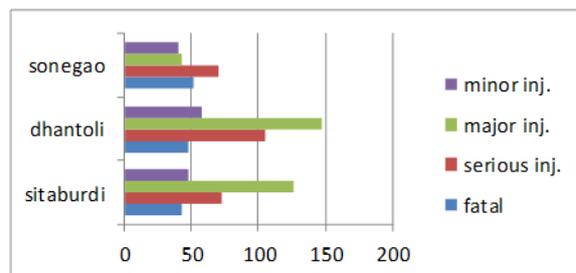
- Are the prevailing speed levels within desirable limits
- Are there signs of other conflict situations and minor accident.
- Are the surface and carriageway markings in good condition.
- Are medians and islands of adequate width for the likely users.
- Are there signs of pedestrian traffic in places that seem hazardous to pedestrian.
- Does there appear to be need for more or better crossing facilities for pedestrian.
- Are overtaking opportunities available for heavy vehicles where volumes are high.
- Is sufficient warning provided in advance of breaks in service roads and openings in medians for traffic using multilane highway.
- Any provisions for parking satisfactory in relations to traffic operations and safety.
- Does there appear to be need for more or better facilities for cyclist.

- Do road users park in ways that could constitute hazards.
- DO plantations obscure visibility or the view of sign.
- Are the specified distances to rigid obstacles to maintained for all group road users.

#### VI. Data Collection:

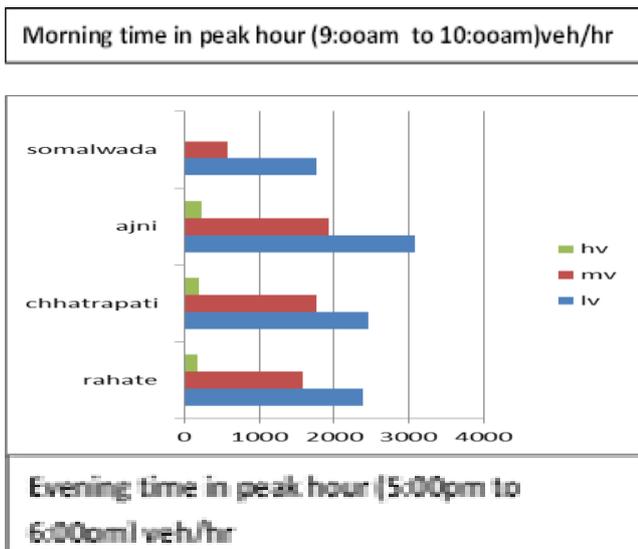
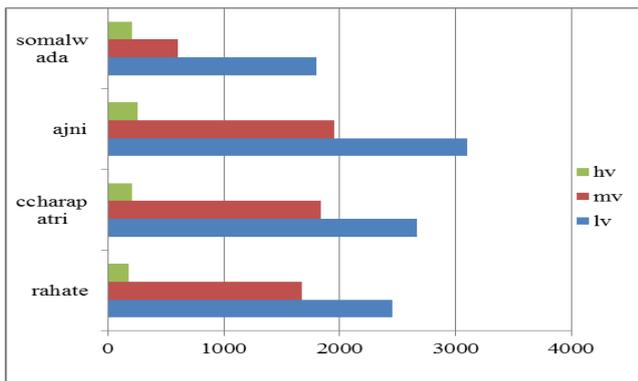
YEAR 2012 FROM 1/1/2012 to 31/12/2012					
	FATAL	SERIOUS INJURED	MAJOR INJURED	MINOR INJURED	NO. OF ACCI.
SITABURDI	9	15	54	13	91
DHANTOLI	16	33	50	18	117
SONEGAO	18	20	3	14	55
TOTAL	43	68	107	45	263

YEAR 2013 FROM 1/1/2013 to 31/12/2013					
	FATAL	SERIOUS INJURED	MAJOR INJURED	MINOR INJURED	NO. OF ACCI.
SITABURDI	10	15	13	20	58
DHANTOLI	17	20	27	25	89
SONEGAO	10	15	17	18	60
TOTAL	37	50	57	63	207



If we see the figures in above table are increases per year that shows the number of accidents increases. To prevent accident safety checks or safety audits plays a important role and during analysis number of accident occur due to rush driving, breaking the signal and drung and drivecase which shows road safety audit is necessary in six months or in a year.

#### VII. Traffic count( vehicle count):



Above table shows that the data was collected at different important squares of city, i.e rahate square, chhatrapati square, ajni square, and somalwada square. The first row of each square indicating the volume of light, medium and heavy traffic at morning time during peak hour while the second row indicating the volume of traffic at evening time during peak hour of working day.

### VIII. methodology:

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft Windows superfamily of operating systems, as well as web sites, web applications and web services. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code.

Microsoft Visual Studio supports different programming languages and allows the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. Built-in languages include C, C++ and C++/CLI (via Visual C++), VB.NET

(via Visual Basic .NET), C# (via Visual C#), and F# (as of Visual Studio 2010[6]). Support for other languages such as M, Python, and Ruby among others is available via language services installed separately. It also supports XML/XSLT, HTML/XHTML, JavaScript and CSS.

Using Microsoft visual studio we can calculate the crash rate or accident rate of intersection or length of roads.

Formula for crash rate or accident rate are

Crash rate by route length

$$R = 1000000 * C / 365 * N * V$$

R = Crash rate for the intersection expressed as accident per million entering

Vehicle (MEV)

C = Total number of intersection crashes in the study period

N = Number of years of data

V = Traffic volumes entering the intersections daily

Crash rate vehicle miles travelled are

YEAR	Crash rate	Crash rate width	(%) difference
2011	61.23	60.230	1
2012	63.36	60.360	3
2013	65.51	59.51	6
2014	67.66	58.66	9
2015	69.83	57.83	11
2016	72.01	57.01	15
2017	74.20	56.20	18
2018	76.40	55.40	21
2019	78.62	54.62	24
2020	80.84	55.84	25
2021	83.08	53.08	30

$$R = C / N * L$$

R = Crashes per miles for the road segment expresses as a crashes per year 1 mile of roadway per year

C = Total number of crashes in the study

Sr. No.	Location	LV	MV	HV	Total
	square	Vehicles/hr			
1	Rahate	2460	1678	180	4318
		2390	1580	175	4145
2	Chhatrapati	2670	1835	210	4715
		2455	1760	190	4405
3	Ajni	3100	1950	260	5310
		3080	1930	230	5240
4	Somalwada	1802	605	213	2620
		1765	578	174	2517

period.

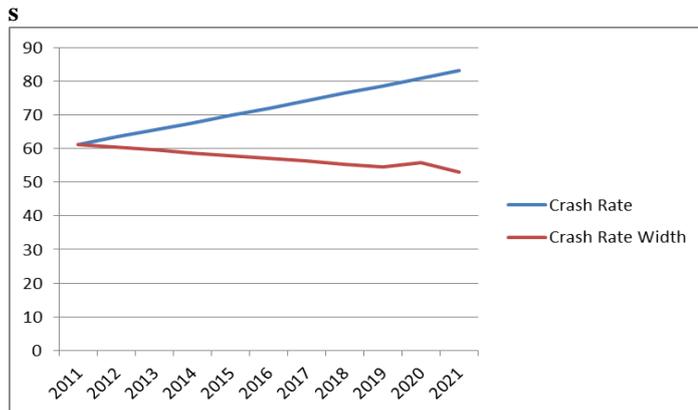
N = Number of years of data

L = Length of roadway segment in miles

### IX. Result:

Validation is done of crash rate.

The above table shows that the crash rate, crash rate width and percentage (%) difference of intersection Sitabuldi, dhantoli, and sonogao from year 2011 to 2021. If we increased the width by 2m the crash rate are decreasing and we can also see the percentage difference in the table.



### X. Conclusion:

1. Minimising the risk of accidents occurring in the future as a result of planning decisions on new transport infrastructure schemes
2. Reducing the risk of accidents occurring in the future as a result of unintended effects of the design of road schemes.
3. Reducing the long-term costs associated with a planning decision or a road scheme.

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