



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 6, June 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118



9940 572 462



6381 907 438



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Identifying Critical Safety Issues and Proposed Countermeasures on NH965DD - A Case Study from Bhore to Mahad 47Km

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ABSTRACT: The state of road accidents is more 'dangerous' than Covid in India. The Department of Labor, Housing and Communications has a duty to care for all road users, so you have always been concerned about the safety of its roads. However, the increase in road accidents over the years has prompted the Department to intensify its efforts to promote road safety. A small part of this effort is a new process to ensure that the safety of all road systems is checked by experts before construction. This is called safety inspection. The need for transportation, safety is a matter of great concern to the community and the area of intensive research. The level of danger in developing countries such as India is rising year by year. An accident is an unplanned and uncontrolled incident, which occurs on a busy public road that resulted in personal injuries, property damage and deaths where at least one motor vehicle was involved. Globally, India has the largest traffic and accidents in the world. It is necessary to provide road safety. Lack of infrastructure, the interaction of vulnerable road users (VRU) with high-speed vehicles, and improper geometric structure are some of the major shortcomings identified in the audit process. The information contained in the South African report could not be found in the accident reports alone. Finally, countermeasures were proposed based on the precautions taken during the RSA.

KEYWORDS: Accident Black Spots, Road Safety Audit, vulnerable road users, countermeasures

I. INTRODUCTION

The term highway is used to refer to a public road and the road signifies a path designed to travel between places by cars, pedestrians, cyclists, animals, etc. Previously, robbers on the highway were known as highway men. Engineering is the art of designing, building and maintaining jobs. Therefore, highway engineering means the art of designing, building and maintaining public roads. Roads are considered one of the least expensive and popular means of transportation. It is easily accessible and accessible to all sections of the community. It facilitates your travel of both men and building materials from one place to another in the country. It helps to bring about national integration and provide for national and economic development. It is an important infrastructure unit that links to other modes of transport such as rail, transport, aviation, etc. Therefore, an efficient and sustainable road network is inevitable in order to promote trade and commerce and to meet the requirements of a robust transport system. In the world, it is important to note that highway networks exist in all parts of the world through the flow of people and goods. The first carrier on the highway was a man himself followed by a camel, a donkey, a horse and after the invention of the wheel, the wagon and many other wheeled vehicles. The method of highway engineering is so well known to man, a hundred years and even thousands of years before our time. Highway engineering problems such as construction, maintenance, administration, funding, traffic congestion, etc. those before us also faced and resolved these issues in their own way to meet their needs.

Assessing the legal performance of existing or future road safety or intersections by an independent, multi-sectoral team. It accurately assesses and reports potential road safety issues and identifies opportunities to improve safety for all road users. A road is a road or trail between two or more places connected to the movement and

transportation of people, goods, etc. with vehicles such as motorcycles, buses, trucks, tempos, bicycles, namely 2 wheels and 4 wheels. In 1943, a conference of the Central Engineers of the Central and Provincial Government of India, Nagpur, presented by the central government, drafted an equal plan for the Indian Road Development Plan called the 'Nagpur Road Plan' by the Indian Road Congress (IRC). According to it, it is divided into National Highway (NH), State Highways (SH), Major District Roads (MDR), Other District Roads (ODR), Village Roads (VR). India has a network of 5.5 million km which is the second largest in the world. Road transport is the only mode of transport that offers the highest services. India's Department of Road Transport and Highways has taken on the responsibility of building high-quality roads and highways inland. For the year 2016-17, it was decided to build 16,271 km NH and build 8,231 km. In 2016-17, MORTH built a 22-kilometer highway a day. They set a target of 40 km of highway per day for the 2017-18 financial year. As at 31 March 2016, India has a network of 2nd largest roads with more than 6,603,293 km in the world.

Describing the state of road accidents in India "is more dangerous than the COVID-19 epidemic", Union Minister Nitin Gadkari said Rs 90 lakh per person could be saved by preventing deaths and reducing minor injuries in such incidents. India accounts for the highest number of road accidents with 1.5 lakh deaths and more than 4.5 lakh annual disabilities in 4.5 lakh road accidents and losses of up to 3.14 percent of GDP. In India the cost of a seriously injured person amounts to Rs 3.64 lakh and the cost of a minor injury is Rs 77, 93 and the cost of death per person is estimated at Rs 91.16 lakh. So the cost of death is 100 times greater than the cost of injury. It shows that if we succeed in preventing road deaths and measuring the lives of those killed in minor injuries only, we can save an estimated Rs 90 lakh per person. About 70 percent of the deaths are in the working age group between the ages of 18 and 45 and India causes 415 deaths a day in road accidents.

The minister said IITs and engineering colleges could take the highways to be tested for road safety with financial assistance and a third road safety study would help identify engineers and fix errors. It is necessary for future roads to be constructed in accordance with the appropriate design, steps to be taken to prevent accidents, provision of safety signs and signs, appropriate road signs, etc. and provide better access to services.

II. SITE SELECTED FOR STUDY

National Highway 965DD (India)

National Highway 965DD, commonly referred to as NH 965DD is a national highway in India. It is a secondary route of primary National Highway 65. NH-965DD runs in the state of Maharashtra in India.

Two-Lane NH965DD (Bhor To Mahad 47km)

Bhor is located in India at the longitude of 180° 14'58" N and latitude of 730°84'20"E Mahad is located in India at the longitude of 180°0'80"N and latitude of 730°42'24"E. Straight Line Distance : 45 KM and 200 meters / 28.1 miles.

Travel time : 1 hours and 24 minutes. Direction and bearing : West side, 260 degree

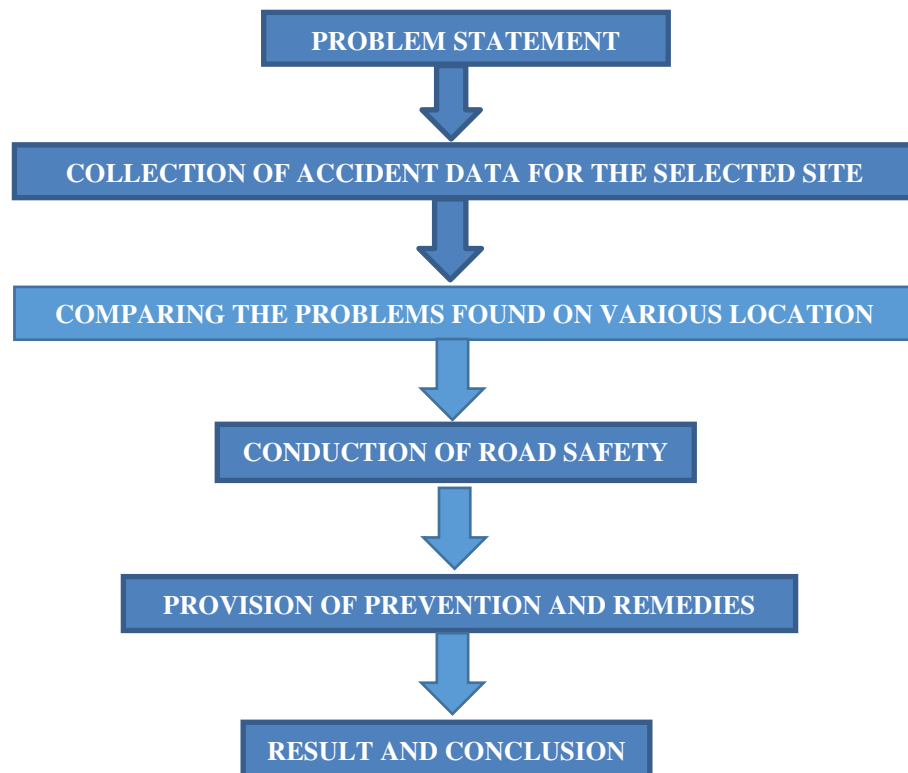


III. OBJECTIVE

- The nature of road accidents is more 'dangerous' than Covid in India.
- Study the effect of road geometry and traffic conditions on this road.
- It is intended to treat hazardous areas or stages using appropriate calculation methods.
- Road safety tests to reduce the risk of crashes, as well as to reduce the risk of any possible crashes.
- Reduce the long-term costs of a new road design. Unsafe designs can lead to accidents, and crashes put huge costs on communities. It can be difficult and expensive to fix later.
- Promoting awareness of the principles of safe road engineering by all stakeholders in the planning, design, construction, and maintenance of roads.
- Reduce the need for remedial measures after the opening of the road project
- Identification of high-risk areas for highways.

IV. METHODOLOGY

Every job has a way. Safety Audit can be taken on new, existing or existing roads. In order to further assess road safety in the given section of the road tracking system was adopted.



V. PROBLEM STATEMENT

I selecting Bhor to Mahad route. This route is selected because less travelling time, excellent scenery and increases transportation and development of rural areas but here main problem are occurring in rainy seasons due to heavy rain fall in kokan likes lands slides, damaging roads surfaces and due to heavy rain falls close the contact to any regions in this time so we are achieved here selected route in future to reduces accidental incidents to provide safety roads for this regions and routs.

VI. DATA COLLECTION

Accident data collected from the concerned police department, Bhor office as the project comes under the Pune District, Maharashtra. Data collected (05 years) from the period January 2017 to December 2021. At each accident site the following parameters are recorded namely, Date, Time, Location, Type of Accident, Division of Accident, Cause, Road Traffic, Intersection details, Responsible Vehicle, Value of affected people. This data is used for further risk analysis. Seventy-nine (79) accidents occurred over a period of 5 years (January 2017 to December 2021) in the design tunnel.

Accident raw data summary is given below in table and chart format:

Table -1: Cumulative Data of 05 years (2017- 2021)

SR. NO	DESCRIPTION	YEAR 2017	YEAR 2018	YEAR 2019	YEAR 2020	YEAR 2021
1	TOTAL NO OF ACCIDENT	20	17	17	6	19
2	FATAL ACCIDENT	3	2	1	0	2
3	GRIEVOUS	6	8	5	2	7
4	MINOR	7	5	6	3	7
5	NON-INJURED	4	2	5	1	3

**Chart:1 Cumulative Data of 05 years (2017- 2021)**

Table -2: Crash data based on nature of accident in last 05 years (2017-2021)

SR. NO	NATURE OF ACCIDENTS	NUMBER OF ACCIDENTS	PERCENTAGE OF ACCIDENTS
1	Overturning	15	18.98
2	Head on collision	5	6.32
3	Rear end collision	4	5.06
4	Collision brush/Side Wipe	1	1.44
5	Right turn collision	1	1.44
6	Skidding	29	36.70
7	Left turn merging	0	0.0
8	Other	23	29.11

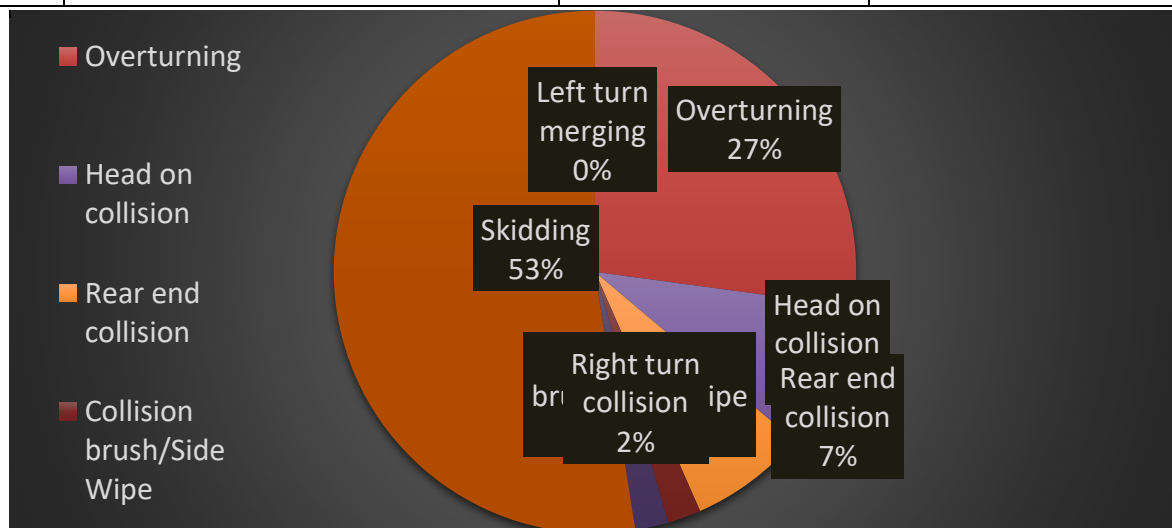


Chart:2 Crash data based on nature of accident in last 05 years (2017-2021)

Table -3: Crash data based on time of accident in last 05 years (2017-2021)

SR. NO	TIME SLOT	NO. OF ACCIDENTS	PERCENTAGE
1	03:00 To 06:59	9	11.39
2	07:00 To 10:59	7	8.86
3	11:00 To 14:59	17	21.51
4	15:00 To 18:59	10	12.65
5	19:00 To 22:59	24	30.37
6	23:00 To 02:59	12	15.18

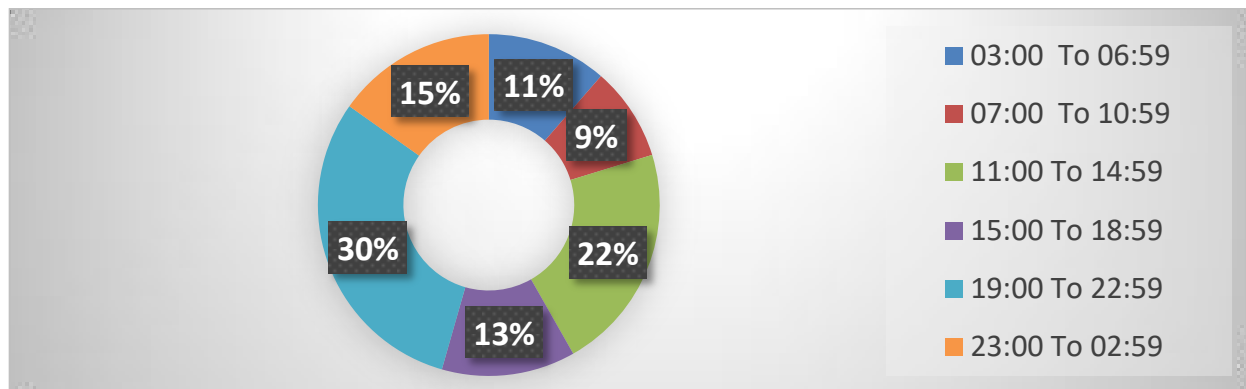


Chart:3 Crash data based on time of accident in last 05 years (2017-2021)

Real Time Potholes Data Collection

Pit damage to a building in a roadway area, caused by the initial failure of a paved road due to the presence of moisture or water in the underground area and traffic congestion in the affected area. The presence of water weakens soil-based soils

Table -4:Potholes Data Collection of Selected of Road

SR.NO	POTHOLES SIZE IN (CM)	NO. OF POTHOLES
1	10 to 20	70
2	20 to 30	66
3	30 to 40	42
4	40 to 50	38
5	50 to 60	20
6	60 to 70	6
7	70 to 80	22
8	80 to 90	12
9	90 to 100	24

Table -5: Potholes Data Based On Location

SR.NO	ACCIDENT LOCATION IN KM	LOCATION	NO . OF ACCIDENT IN LAST 5 YEAR
1	0 To 10	Start point (Vadgaon Dal To Ambeghar)	15
2	10 To 20	(Ambeghar To Nigudaghar)	19
3	20 To 30	(Nigudaghar To Hirdoshi)	10
4	30 to 47	(Hirdoshi To Varandha ghat) End point	35

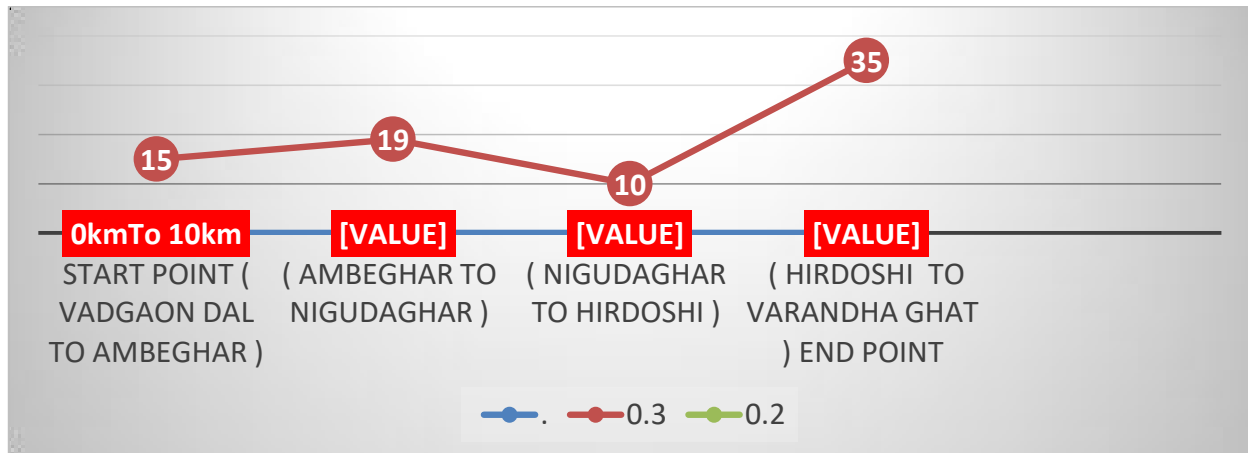





Chart:4 Potholes Data Based On Location

VII. RSA FINDINGS AND RECOMMENDATIONS

Sr. No	Risk Element	Risk factors	Proposed Countermeasures
1	Horizontal Curves (Hirdoshi Bhor) 	1.Restricted sight distance 2.Vehicles overtaking at blind curves 3.Inadequate super elevation	1.Segregate conflicting traffic from opposite direction by flexible pole barriers. 2.Centre and edge line rumble strips to warn and alert drivers 3.Delineation and warning signs should be provided
2	Narrow bridges(Sanjay Nagar Bhor mahadnaka) 	1.Sudden reduction in lane width. 2.Presence of concrete parapet wall pose as a hazard. 3.Vehicles speeding/overtaking near narrow bridge. 4.Pro at night due to low visibility.	1.Warning signs should be provided before the approach of a narrow bridge. 2.The guard rail should be embedded in the parapet wall 3.The approach of the narrow bridge should be free from vegetation to provide a clear view of the bridge.

3	<p>Intersections (Venavadi Bhor)</p> 	<p>1. Mostly unsignalised and uncontrolled</p> <p>2. Many are located under the influence area of the curve</p> <p>3. Restricted sight distance from minor roads</p> <p>4. Over Speeding</p> <p>5. Undisciplined driving</p>	<p>1. Delineation and warning signs should be provided</p> <p>2. Channelize vehicular movements wherever possible</p> <p>3. Restrict speed on the minor road before merging by speed humps</p> <p>4. Corners should be flared for better turning movements</p> <p>5. Road marking and signs to be provided</p>
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4. Problems due to slope failure

Excess precipitation leads to intense surface-water flow with pressure and triggers mudslides. Consequently

- Erosion and mobilisation of loose soil or rock on steep slopes.
- Removal of material from the toe of the slope.
- Saturation by rainwater reducing shear (moving apart) resistance of the slope material.

Moreover, increased seepage of water into ground through soil or cracks in the bedrock that results in,

- Groundwater concentration in the bedrock and pressure on rocks making it to fall.
- Increase in pore pressure affecting the soil grains
- Cracks in bedrock, developed by the impact of gravity or groundwater
- Freeze and thaw weathering in extreme weather conditions.

Reasons

- Deforestation
- No check over weak material (loose sand/rocks/debris)
- Improper drainage
- Silting of rivers due to improper disposal of muck and other construction materials.

RiskElement

Land slide (Vardhaghat Bhor)



Fig 1 Land slide (Vardhaghat Bhor)

Proposed Countermeasures

1. **Benching:** Horizontal benches can be excavated into a slope for most effective protection from steep slope failures as it reduces the height of slope.
2. **Creating Support for Overhang:** Overhang of rocks should be scaled or a wall, creating support for it should be built with suitable strong material else sandbags can be used.
3. **Retaining Wall :** Retaining wall gives support to slope material by restraining the lateral movement of the material. Soil parameters like bearing capacity, influence the design of retaining wall.
4. **Constructed Gabion wall**
5. **Rock bolts**

VIII. CONCLUSION AND PREVENTIVE MEASURES

- The scope of this study to reduce accidents on the road network, reduce the severity of accidents and the need for costly problem-solving work is decreasing. The road chosen for the study is Bor To Mahad 47km. The risk analysis is based on five-year data.
- Regular or necessary maintenance and marking of road safety signs.
- Provide suitable footpaths for pedestrians and pedestrians at intersections.
- Road and intersection should be wide and well lit to look good.
- Provision of street lights on a particular section of road.
- All unauthorized central spaces must be closed and adequate provision for local people must be made first.
- Road parking must comply with traffic laws.
- Regular road maintenance and repairs.
- Road safety awareness programs should be planned and implemented directly in the community. Strict measures must be taken for traffic violations.

IX. FUTURE SCOPE

- The scope of the study is to reduce accidents on road network, reducing severity of accidents and the need for costly remedial work is reduced. The road selected for the study is Bhor To Mahad 47km. The accident analysis is done from Five years data.
- Analyze existing accident problems: Location, time of accident/s, conditions during accident.
- Travel the total length of the route to investigate the known accident sites and assess the road in general.
- Assess existing conditions that are potential hazards
- Record location of deficiencies and photograph some of the problems identified.
- Development of suitable counter measures.
- Assessment will be conducted during the day and night.

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ISSN INTERNATIONAL
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