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‘‘The Study on Identification and Improvementation of problems in a Surli ghat section (Western Maharashtra, India) by using various Construction Techniques’’.

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Abstract *:* Access routes into the mountains known as "ghat roads" have many twists and are far riskier than regular routes. Therefore, there is a higher risk of accidents in the ghat portion due to factors including valley side, steep bends, small roads, and poor camber. accidents brought on by a lackluster construction of hazard zones and national highways. This subject covers a number of crucial topics, such as the causes, effects, and prevention of traffic accidents as well as ways to control the situation and make it better. There are several factors that contribute to these kinds of accidents in the Surli Ghat area, including speed, inadequate design of steep roadways, and road width. Many drivers have accidents when driving on the roads in the ghat section, which cause them to suffer life-threatening injuries or even pass away. The main cause of these accidents is the curves and bends of the roadways when turning into ghats. One car can only turn at a time at turnings, which makes it difficult for drivers to notice other vehicles coming from the other lane and forces them to assume a route for turning at such crucial sections, greatly increasing the risk of death. Therefore, it is crucial to initially manage this situation and implement certain safety precautions in this region. Any place's development depends heavily on its roads. The least expensive and most dependable way to carry items from one location to another is by road.

1.INTRODUCTION

A ghat road is characterized by steep slopes, deep gorges, multiple watercourses, and widely varied heights. It runs across terrain with a transverse slope of at least 25%. In certain regions, these are also referred to as ghat roads. It includes things like more drainage crossings, rock cuttings in challenging regions, erosion control techniques, and parapets to mark the boundaries of the roadway. Road design in hilly regions is very different from that in plain regions. The development of roads in mountainous areas is regulated by a number of important ecological challenges, including steep topography, soil erosion, landslides, and degradation. These issues call for more thoughtful design. This research is used to generate ideas and solutions for enhancing safety in the Surli Ghat area. The collapse of mountains, trees, and large rocks is another factor contributing to the issue at Mountain Road. Curved roads have a severe problem in that trees and other impediments in the middle obscure the view of the opposite end of the road from the motorist, which leads to many accidents.

Keywords — Road accident, Ghat section, Road safety, Traffic, Curve road, Surli ghat.

1.1 Research Gap :

We are all aware of the daily rise in hill road accidents. Road travel presents a difficulty to the traveler.The same is one of the issues that Surli Ghat Road (Surli,Tal- Karad Dist -Satara Western Maharashtra,India) has produced the most. Research on current issues such as accidents, building, innovative designs, and adequate planning has not been conducted.

There are more incidents and issues with accidents. In this location, accidents are a major problem due toconstruction, one-way traffic, etc. Nobody can resolve the issues on this Surli Ghat problems preceding ten years. This study is the first suggestion on surli ghat..

1.2 Objectives -

This work is a develop for a improvemental suggestion plan for Surli ghat section.

1. To minimize the construction problems, accidental problems in the Surli ghat section.
2. To identify locations which have both high risk of crash losses and justifiable opportunity for reducing the risk.
3. To adopt advanced techniques & materials for existing ghat Section for better

Performance.

4. To prepare best suitable plan and suggestions for improvement in Surli ghat section.

1.3 Problem Statement

Surli Ghat links Satara and Sangli, two important districts in Western Maharashtra.India, hence there is two way traffic in this section of the ghat. Construction and geographical issues were the most common. There are accidents happen frequently so improvemental solutions are needed.

1.4 Methodology: -

The following steps are undertaken for planning, management, quality and safety improvement of the Surli ghat. It is step wise procedure or systematic layout of the whole work related of the research.

1. Study literature review regarding development of ghat section.
2. Taking previous data 5 years and current data of accident from Karad police station.
3. To carry out the topographical survey by using Google Earth software, traffic volume study by manual counting method upto 10 days data of Surli ghat .
4. Find out a number of accident prone areas of Surli ghat.
5. Identify the causes and defects of accidents, real condition of Surli ghat.
6. Find out best possible solution of each accident prone zone by using following parameters.

To apply construction techniques and material like,

a) Land slide places like provision for construction of retaining wall.
b) Barrier like roller barrier system.
c) Lighting improvement devices like LED Road.
d) Ground improvement techniques like lime stabilization.
e) Roadway marking like Block marking.
f) Pot holes like Pot hole detector.
g) Hair pin curves like proper super elevation provided as per IRC.
h) Road drainage like catch water drains.
i) Road signs provided like Informatory sign, Regulatory sign etc.

7. Make a improvemental and safety suggestion plan of overall Surli ghat.
8. To make cost analysis of road widening in surli ghat for improvement purpose.
9. To make Construction Scheduling plan for road widening in surli ghat by using MSP Software.

1.5 Literature review

Sr No	Author Name	Year	Scope of the study
1.	**Athira Mohan**	2017	This paper describe that the identification and analysis of accident black spots help in identifying the stretches where accidents are more and these spots reduce the road safety in general.
2.	**Govindarajulu Preethi & Dr. P. Ezhumalai**	2018	This paper implementing the Intelligent Transport System in the vehicle by using internet of things will improve the road safety and provide safe and comfort to the vehicle user.
3.	**Greeshma & Krithi K J. etal**	2020	The purpose of this paper is to decrease the number of accidents in the ghat section. This is done by alerting the driver by means of LED lights which glows when a vehicle comes from the other side of the curved road
4.	**Shailendra Singh, & Shivam Singh Patel (2020)**	2020	This paper describe that the accidents are increasing Inadequate sight distance, road condition, poor visibility at night, drivers negligence etc.

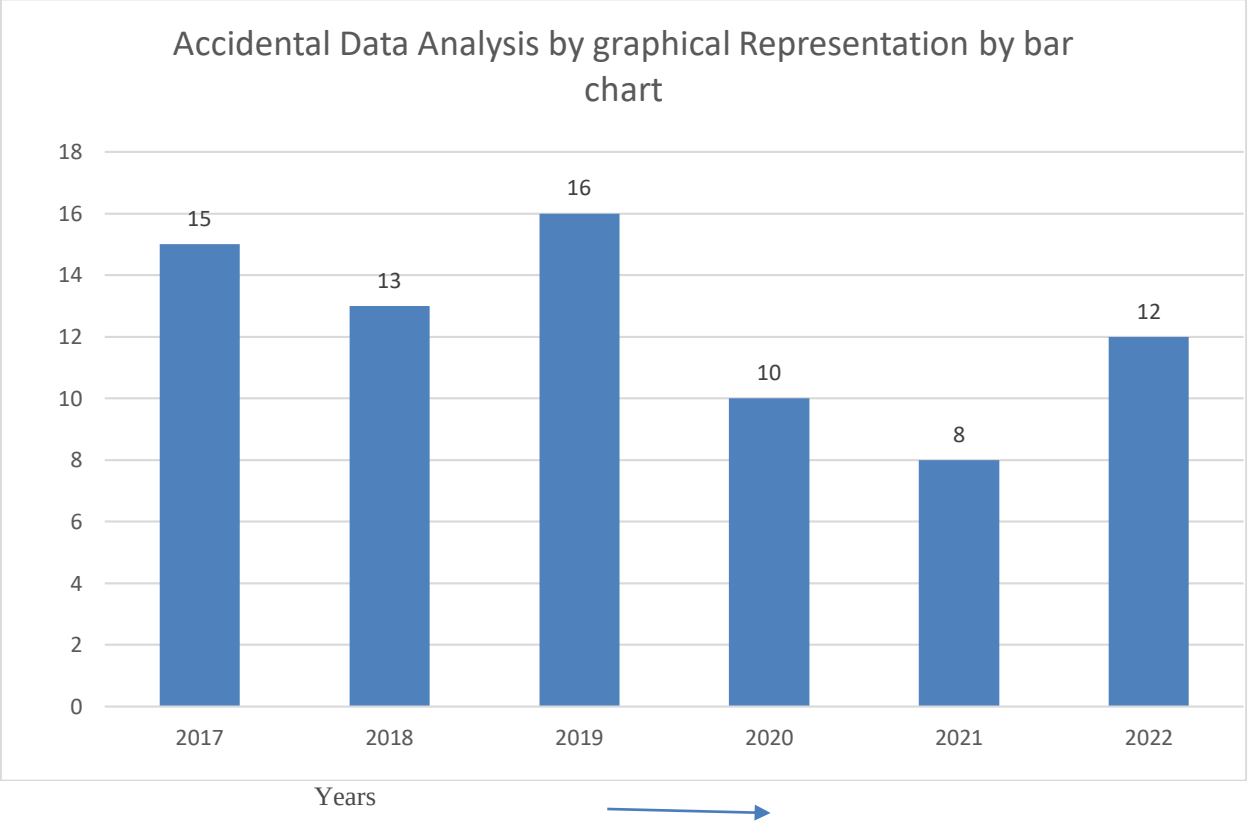
2.0 . DATA ANALYSIS AND RESULTS

In order to identify the accident blackspots, Surli Ghat accident data from the Karad police station .

2.1 Accidental data Year 2017 to 2022 From police station.

Years	2017	2018	2019	2020	2021	2022
No of Accidents	15	16	13	10	8	12
No of Deaths	11	7	9	8	12	7

Table no.1



Graph No 2 Accidents Data Analyis

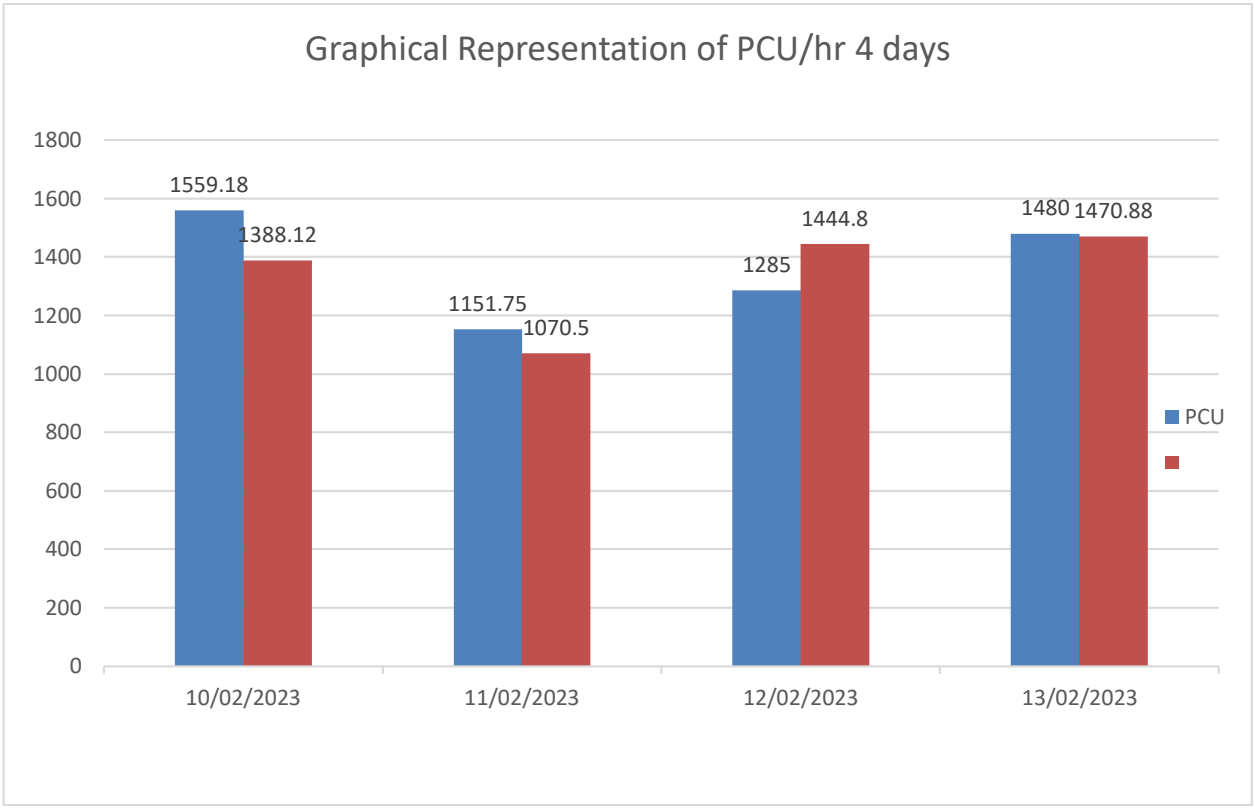
Average rate of accidents 15 per year .the reason of accidents is more construction problems, defects in roads construction so there required improvement solution plan.

2.2 Surli Ghat 10 days Traffic Volume PCU Factor

1. Traffic Volume count from Date 10 /2/2023 to 13/2/2023 PCU Factor

Table No 2.Traffic Volume count Details

Dates	Karad to Kadegaon(PCU /Hr)	Kadegaon to Karad (PCU/Hr)
2/10/2023	1559.18	1388.12
2/11/2023	1151.75	1070.5
2/12/2023	1285	1444.8
2/13/2023	1480	1470.88

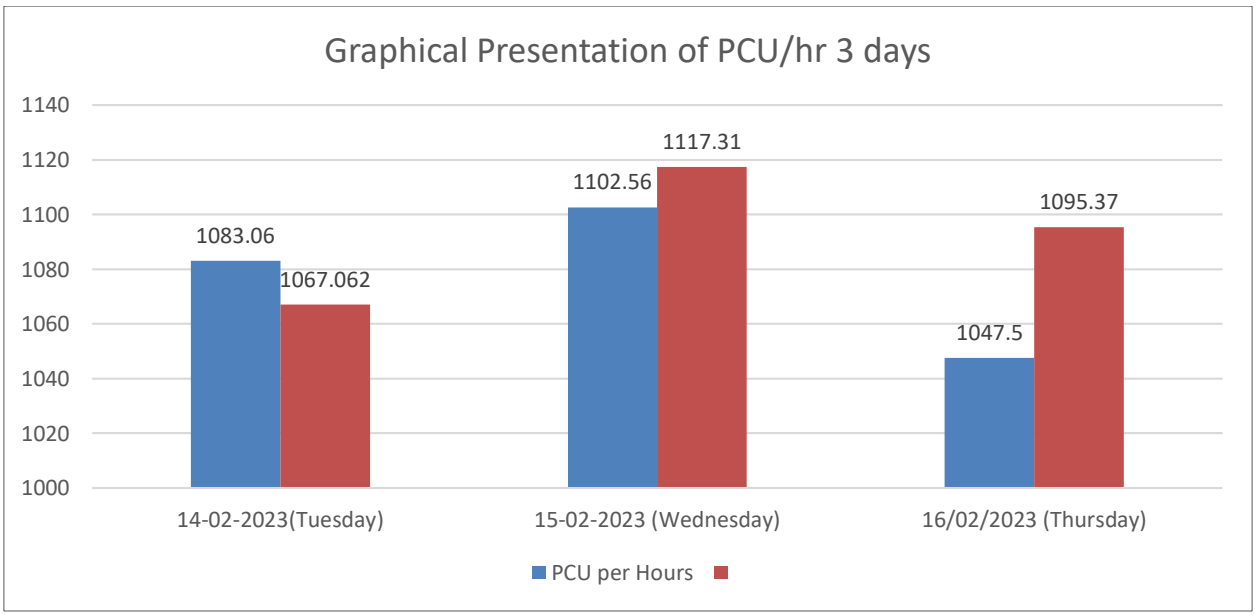


Graph No 3 PCU Factor Date 10/2/2023 to 13/2/2023

2. Traffic Volume count Date 14/2/2023 to 16 /2/2024 PCU Factor

Table No 3.Traffic Volume count Details

Dates	Karad to Kadegaon(PCU /Hr)	Kadegaon to Karad (PCU/Hr)
14-02-2023	1083.06	1067.062
15-022023)	1102.56	1117.31
16/02/2023	1047.5	1095.37



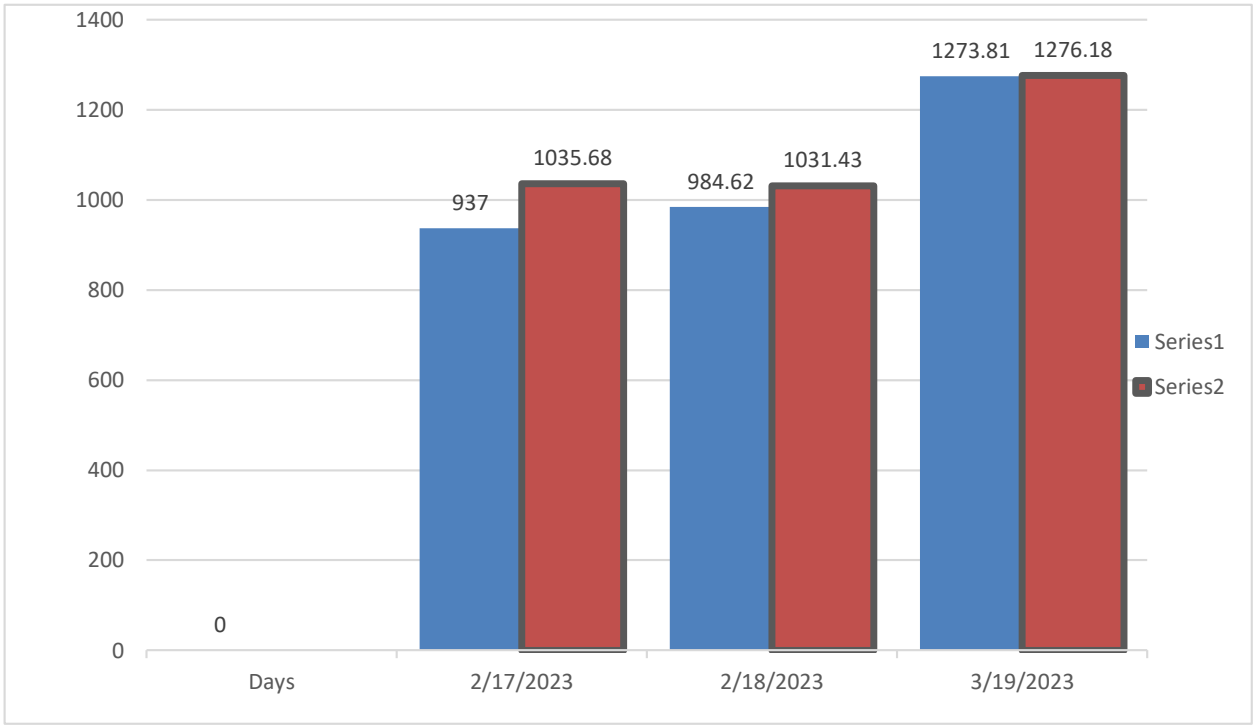
Graph No 4 PCU Factor Date 14/2/2023 to 16/2/2023

3. Traffic Volume count Date 17/2/2023 to 19/2/2023 PCU Factor

Table No 4 Traffic Volume count Details

Dates	Karad to Kadegaon(PCU /Hr)	Kadegaon to Karad (PCU/Hr)
2/17/2023	937	1035.68
2/18/2023	984.62	1031.43
3/19/2023	1273.81	1276.18

Graphical presentation of Traffic Volume 3 days



Graph No 5 PCU Factor Date 17/2/2023 to 19/2/2023

The dense traffic flow there, with an average of 1085.47 PCU/hour over ten days. Because of the increased traffic density, better solutions were needed.

2.3 Improvemental Suggestion plan to surli ghat road by using Various Construction techniques and materials .
2.3.1 Design a new pavement of ghat

Name of Work:- Design a new pavement of Surli ghat

Parameter Considered

1) Carriageway - 7m wide
2) Initial traffic in the year 2023-24 as per traffic census taken on this road at Km 8/500 Total Commercial Vehicles Per Day = 498
3) Traffic Growth per Annum (r) = 5%
4) Design Life (x) = 15 years

A = Commercial Vehicles per day (A) = 498

5) Vehicle damage factor (F) - for 150 to 1500 CVPD is 1.70 in Hilly terrain .
6) Lateral distribution factor (D) - 75 % (0.75) for 7 .00 m wide

Computation of Design Traffic

$$N = \frac{365 \times [(1 + r)^{x} - 1]}{r} \times A \times D \times F$$

$$N = \frac{365 \times [(1+ 0.05)^{15} - 1]}{0.05} \times 498 \times 0.75 \times 1.70$$

$$N = \frac{365 \times [(2.078) - 1]}{0.05} \times 634.95$$

N = 4996675.53

N = 4.99 MSA

$N = 365 \times [(1 + r)^{x} - 1]$

N =4.99 MSA

7) Average CBR is 8.00 as per detailed Survey

8) Total pavement thickness from Page No 37 of IRC 37-2018- Catalogue for pavement with bituminous surface Effective CBR 8 % (plate -4) Refer fig 12.4

9)Designed Pavement crust thickness :- 480 mm

Table No5 Design Pavement Details

Crust required as per IRC37-2018		Crust proposed for Stage Construction	
Provision	Thickness in mm	Provision	Thickness in mm
GSB	150	GSB	150
WMM	250	WMM	250
Base Course (DBM)	50	Base Course (DBM)	50
Surface course(BC)	30	Surface course(BC)	30
Total	480	Total	480

2.3.2 Road widening details as per IRC guidelines.

By Using Hill Road Manual IRC : 52-2019
In Mountainous and steep terrain MDR road
1.Carriageway - 7m wide
2.Width of shoulder =1.hill side = 0.9m
2.vallry side =0.9m
Total =1.8 m
3. Drainage = 0.6 m
4. Parapet wall = 0.6m
Total length required for hill road = 7+1.8+1.2=10 m

2.4 Actual width of surli ghat road is

1. Carriage way =5.66 m
2. Shoulder = 2*0.5 =1m
3. Prapet wall = 0.4m
4. Drainage =0.5 m

Actual length =5.66+1+0.4+0.5=7.56m

2.5 Total Widening = 10-7.56 = 2.44 M

Extra Widening at Curve Places - 1.5 m

2.6 Information Of Surli Ghat

- **Location – Near Surli Village ,Surli Ghat ,Tal- Karad Dist -Satara**
- **Latitude - 17.32382**
- **Longitude - 74.272540**
- **Total Ghat Length - 1.850 Km**

2.7 Black Spots In Ghat

- **1.Black Spot No 1**
- **2.Black Spot No 2**
- **3.Black Spot No 3**
- **4.Black Spot No 4**
- **5.Black Spot No 5**

Image showing the details of Black spots in ghat

3.1 Suggestive Advanced Construction Techniques for Ghat

- 1.Solve Accidents Problems – Design of New Pavement.
- 2. Potholes - Cold mix asphalts techniques.
- 3.Cracks-Bitumen Crack sealing materials techniques .
- 4.Drainage –Provision of side gutter and catch water drain
- 5. Land slide - Grouting techniques.
- 6.Road sign – Provide hill road signs .
- 7.Barrier - Rolling barriers.
- 8.Road Marking – Block road marking
- 9. Lighting -LED lamps.

3.2 Earthwork Statement

- Total Cutting - 42815.95 Cu.M
- Total Filling - 15371.8 Cu.M
- Total Cost Of Project- **3,46,90,764.66 RS** (1.85Km).

3.3Project Scheduling Activity of Ghat

- Work Start- 1 November 2023
- Work End - 30 April 2024 (7 Months)

3.4 Overview of Improve mental suggestion planning sheet

Sr No	Name Of problem	Description of problem	Location of problem in Surli Ghat	Used construction techniques and material
1.	Road widening	There are mostly problems arises for overtaking.	total road width 7.56m widening is required 2.44 m .details made in estimate	Use construction equipment's like JCB power shovel, drag line ,Claimeshell ,dumpers, tractors ,bulldozers etc for land excavation ,compaction ,levelling purpose.
2	Potholes	No of pot holes (30 to50 Cm diameter)	Overall Ghat	Cold mix asphalts techniques Provision of pothole detectors at curve places.
3	cracks	Cracks are formed 1.5to 3m	Overall Ghat	Bitumen crack sealing materials techniques

4.	Drainage	Not proper provision of drainage .	Black Spot No 1 Black Spot No 2 Black Spot No 3	Provision of side gutter and catch water drain
5.	Land slide	There are hill in sloping form and there strata is in soft soil forms, in rainy seasons stones are fallen due to not proper provision of landslide minimize techniques.	Black Spot No 1 Black Spot No 2	Provision of by Cement grouting techniques to ghat.
6.	Road Sign	Not proper provision of Road Sign.	Black Spot No 1 Black Spot No 2 Black Spot No 3 Black Spot No 4 Black Spot No 5	There are Provide Speed limit sign, not overtaking sign, not stopping sign, right /left hand curve sign, steep slope sign ,go slow sign to ghat area.
7.	Barrier	Not proper provision of Barrier.	All Valley side only	Provide Metal beam crash barrier or Rolling barrier at valley side .
8.	Road Marking	Not provision of road marking	Overall Ghat	Provide block road marking
9.	Lighting	Not provision of road Lighting	at all curve places	Provide Lighting LED Lamps at curve places

4.1 CONCLUSION

The following points concluded after completion of Dissertation of work :

1. Data collection on a various topics, such as, accident data, traffic volume studies, and topographical survey data of ghat. after studying all data it is realize this ghat needs a better improvemental suggestion plan .
2. The different softwares are used for the completion of work such as ‘‘MSP’’ software for planning and scheduling , ‘‘Active Road software’’ for quantity calculation and ‘‘Google Earth application ’’ for topographical survey.
3. The following Black Spots are identified after topographical data, traffic volume, and accident data are analyzed.
   I . Black Spot No 1
   II. Black Spot No 2
   III. Black Spot No 3
   IV. Black Spot No 4
   V . Black Spot No 5
4. The advanced construction techniques were used to solve problems like,
   I. Solve Accidents Problems – Design of New Pavement.
   II. Potholes - Cold mix asphalts techniques.
   III.Cracks-Bitumen Crack sealing materials techniques .
   IV.Drainage –Provision of side gutter and catch water drain
   V. Land slide - Grouting techniques.
   VI.Road sign – Provide hill road signs .
   VII.Barrier - Rolling barriers.
   VIII.Road Marking – Block road marking
   IX. Lighting -LED lamps.
5. After Completion of Road Widening Work calculation ,Cost analysis, and Scheduling of New design of a pavement of a work concluded that,

I. Total Quantity of Cutting – 42815.95 Cu.m and Filling – 15371.8 Cu.m Total Road .
II. Road Widening Project Cost With GST - **52470219.71** RS (1.850Km)
III. Tentative Schedule of Project - 1 November 2023 To 30 April 2024 (7 Months)

4.2 FUTURE SCOPE

Different areas have scope for further studied,

1. Traffice Volume count calculation for 24 hours or more time.
2. Different surveying techniques can be used.
3. Different software's can be used.
4. This study can be used other ghat section.

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