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Installation of Safety Roller Barrier at Accidental Prone Site

Akash Kumar[1], Vivek Gangwar[2], Ravi Kumar[3] , Vikas Kumar Sahu[4]

[1234]*Department of Civil Engineering, Rajkiya Engineering College Mainpuri, Uttar Pradesh*
[1]*akashshakya315@gmail.com*, [2]*vgindia1996@gmail.com*, [3]*1552000ravikumar@gmail.com*, [4]*vkumarsahu77@gmail.com*

Abstract – In the research work presented installation of safety roller barrier at an accidental prone site is given. Accident study, traffic survey and site survey are done to check the feasibility of safety roller barrier (SRB) at such sites. These barriers are very helpful in reducing the severity of accidents as we have found in two case studies of different sites in Southern India. Estimation and costing of SRB is 18000 rupees per metre. This cost can be reduced significantly by manufacturing the materials in our country. Initially we have to import the materials for such projects. Installation procedure is very simple as we have studied.

Key Words: accident, installation, import, costing, severity

1.INTRODUCTION

With only 1% vehicles India accounts for 11% of global death in road accidents, the highest in the world according to the report "Traffic Crash Injuries and Disabilities: The Burden on Indian Society" released by the World Bank in February 2021. Severity of accidents is generally a consequence of over speed, dangerous curves, safety barrier crash, drunk and drive, low visibility and many other reasons. Vehicles have various safety features like Airbags, ABS, Seat Belts, etc. but still the accidents become severe due to heavy impact transferred to the vehicle from external objects. Conventional barriers (concrete barriers, w beams, steel guard rails, etc.) are not so much effective in reducing the impact. So at accident prone areas safety roller barriers can be implemented. These barriers reduce the severity of accidents by converting impact energy into rotational energy.

2. Case Studies

Case Study 1:-The site we have selected for case study regarding our project work is situated at Ooty - Masinagudi Road near Kalahatty, in the Nilgiris district, Tamil Nadu. This route connects two major tourist destinations- Masinagudi and Udhagamandalam (commonly known as Ooty). The above route is also known as Kalahatty Ghat Road is considered as one of the most dangerous roads in the Nilgiris for the vehicles. Mostly the accidents that occur along this road are caused due the brake failures while descending quickly. In 2018 five tourists lost their lives due to plunging off the car at 35th hairpin bend. As per the information available in newspapers, hairpin bends 20 to 36 are accidental prone sites. Problem on such bends is there when a car is at high speed and unable to slow down at these dangerous bends , it get crash through the existing steel guard rails and tumble down the cliff. To reduce the severity of accidents an effective measure which is taken by the road administration is safety roller barriers provided at these dangerous curves. Kalahatty Ghat road has been fitted with special type of safety roller barriers to make it safe. This stretch is about 19 kilometres long. The purpose of these fitted safety roller barriers is to absorb the impact from the vehicles and converting it into rotational energy so that vehicle can be redirected safely towards its lane.

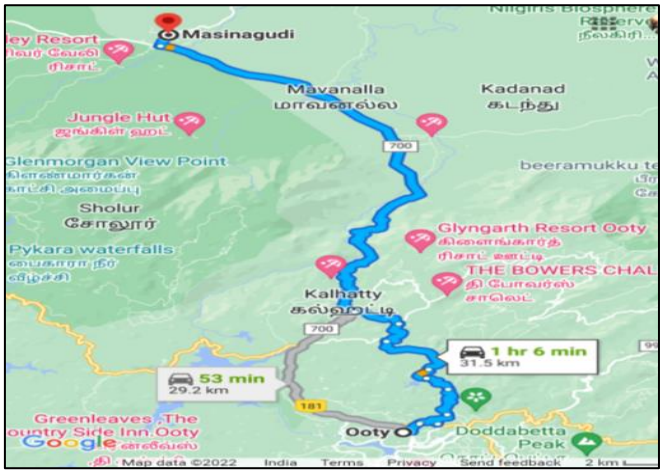

Fig-1: Ooty-Masinagudi Road, Tamil Nadu

Fig-2: Hairpin Bends

Fig-3: Installation of SRB at Ooty-Masinagudi Road

Case Study 2:- Between Mahabalipuram and Puducherry, accidents reported are higher than any other part of East Coast Road (ECR). The main cause of these accidents is the configuration of two lane without centre median. To avoid the head on collision vehicles have more chances to get off the road . To prevent the vehicles falling in the ditches and to reduce the accidents government has taken various steps. As the alternative solution a company named Ador India came up with an innovative solution to address highway blackspots in India. This solution was Safety Roller Barriers. These barriers were installed at Vilampur at kilometers 101/800 in ECR. Length of these barriers is 193 metre. These barriers are installed in the year 2018. These safety roller barriers highlight the hazard area and protect the lives of motorists who are unknown to the sudden curve or any escarpment. These barriers seem to be very useful to the public, especially during the night time. The installed barriers can be seen in the figure below.

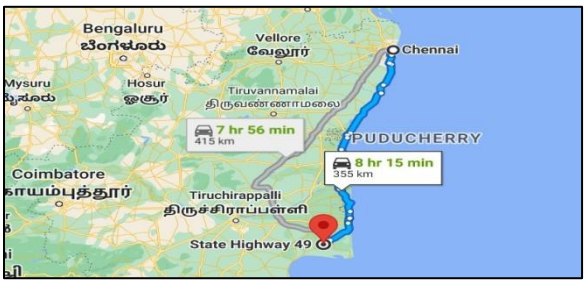

Fig-4: East Coast Road

Fig-5: Night View of Installed SRB on ECR

3. Work Methodology

To reduce the severity of accidents on road curves, firstly the causes of severity are identified. A site is selected and various studies are performed. These studies include traffic volume study, speed study, reconnaissance survey and detailed site survey. On the completion of these studies layout of the curve is prepared. The estimation and costing of the project is done on the basis of prepared layout.

3.1 Identification of Accident Prone Site

Accident studies are very helpful in such identifications. The various aims of accident studies are:-

- To study the cause of accidents
- To provide preventive measures
- To evaluate existing designs and other controlling features present at the site
- To evaluate financial losses
- To provide economic and efficient solution

Accidents figures can be collected from nearby police stations, hospitals, road side interview and various published reports stating the accidental data. Based on the above details we have selected a site which is having more chances of being accident prone . This site is located at Dannahar, SH84 (Bhongaon to Shikohabad). It is situated in Tahsil Ghiror District Mainpuri. It is 4.7 km away from Rajkiya Engineering College Mainpuri, 650 m from Dannhar police station and 15 km away from Mainpuri railway station.

Fig-6: Google Map of Selected Site Dannahar, Mainpuri

Fig-7: Drone View of Selected Site, Dannahar, Mainpuri

3.2 Traffic Volume Study

To check the feasibility and efficiency of the safety roller barrier, traffic volume study should be performed. This study can be performed by manual count or automatic traffic counters -cum –classifiers. We have used manual count method. We have conducted the study for 7 days. In this study we have found that 165 PCU per hour per lane are passing from Shikohabad to Mainpuri and 198 PCU per hour per lane are passing from Mainpuri to Shikohabad.

3.3 Speed Study

Despite of higher traffic volume, if vehicles are moving under permissible speed then chances of accidents will be lower. To analyse vehicular speed, speed study is required. It is of two types:- Spot Speed Study and Speed and Delay Study. We have conducted the spot speed study with the help of Laser Speedometer and found out the following results:-

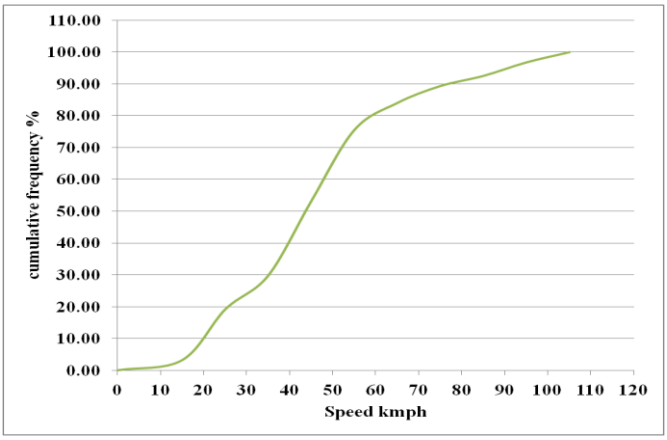

Fig-8: Cumulative Speed Distribution Diagram

Table -1: Results of Speed Study done at selected Site

Permissible Speed	30 kmph
98th percentile speed	99 kmph
85th percentile speed	65 kmph
15th percentile speed	24 kmph
Model speed	54 kmph

Fig-9: Permissible Speed Limit

Fig-10: Arboriculture Situation at the Site

3.4 Reconnaissance Survey

The selected site consists of two curves joined by a bridge constructed over Lower Ganga Canal. By conducting the reconnaissance survey we have found the following details:- The terrain is plain and average elevation is 160 metres. We have considered environmental conditions, underground services and overhead services. Other visual features are given in the following table:-

Table -2: Visual Characteristics of selected site

Features	Numbers
Government Buildings • Police Station • Colleges • Ration Shop	 1 1 1
Private Schools	2
Shops	80
Houses	11
Temples	2
Public Hand pumps	7
Electric Poles	15
Trees	25

3.5 Detailed Site Survey

We have performed levelling and found out the following details:-

Table -3: Results of Detailed Survey

Features	1st Curve	2nd Curve
Super-elevation	4.3 %	4.7%
Radius	185 metres	85 metres
Gradient	0.6%	1.67%

3.6 Preparation of Layout

We have conducted Plane Table Survey and prepared the layout of curve with the help of intersection method. The details are captured from the layout prepared by plane table and AutoCAD drawing is prepared with the help of these details. The centre to centre spacing of rollers is 700mm.

3.7 Estimation and Costing of Safety Roller Barrier

The cost of the materials used in this project depends on the specification of materials and centre to centre spacing used while installation of the roller barrier system. The estimated cost of safety roller barrier is 18000 per metres.

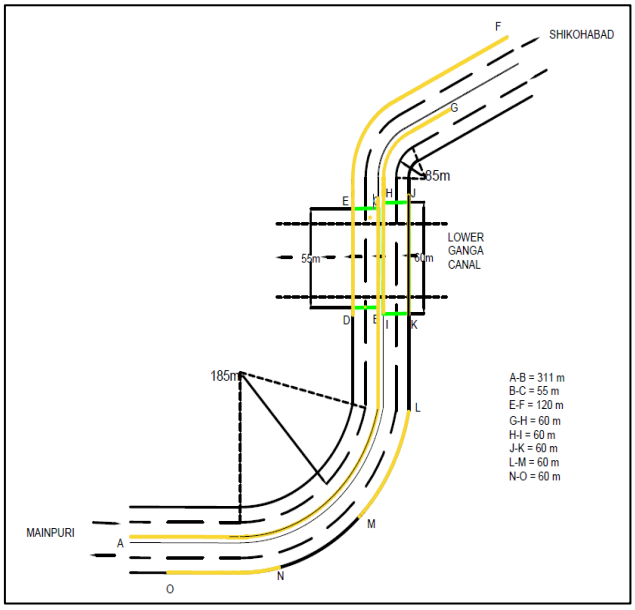

Fig-11: Layout of Selected Site, Dannahar, Mainpuri

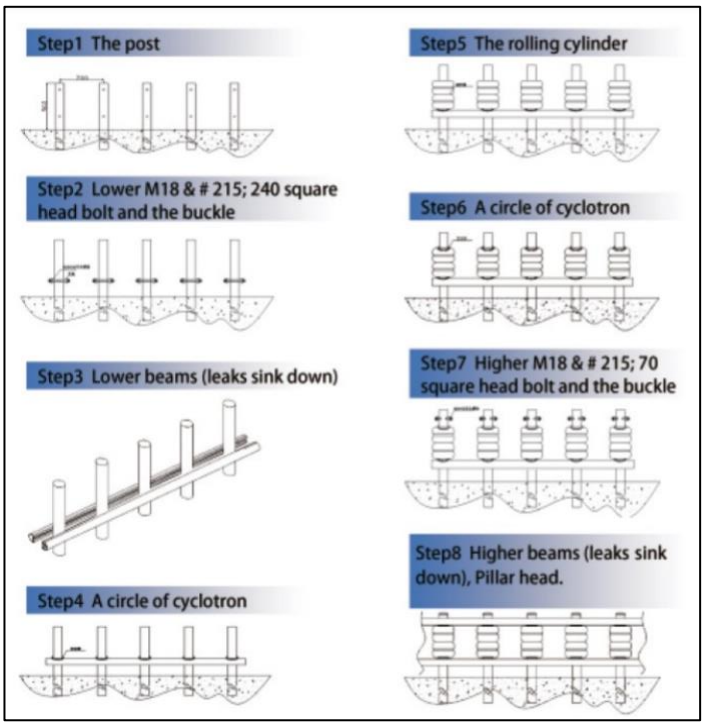

Fig-12: Installation Procedure for SRB

4. Economy of Project

The cost of SRB is a little bit higher in India due to low production. Mostly we have to import the materials. If the manufacturing of the materials used is done in India, the cost of project can be significantly reduced.

5. CONCLUSION

Everyone deserves safer roads but unfortunately accidents are happening severely in our country. So to overcome that severity being caused by road side collisions due to conventional barriers we have come up with Safety Roller Barriers. These barriers are not the substitute of conventional barriers but they are additional safety features especially on hairpin bends and dangerous curves. It is strong need to use such technologies for safer commute. In current scenario these barriers are being imported which results in higher cost so we need local manufacturing units so that we can provide the safety in minimum cost without compromising with life and quality of service.

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BIOGRAPHIES

Akash Kumar, presented a research paper regarding reducing severity of accidents on road curves in an international conference ICMREMMS - 2022. Currently working on academic project on “Reducing Severity of Accidents on Curves by Safety Roller Barrier”

Vivek Gangwar, presented a research paper regarding reducing severity of accidents on road curves in an international conference ICMREMMS - 2022. Currently working on academic project on “Reducing Severity of Accidents on Curves by Safety Roller Barrier”

Ravi Kumar, presented a research paper regarding reducing severity of accidents on road curves in an international conference ICMREMMS - 2022. Currently working on academic project on “Reducing Severity of Accidents on Curves by Safety Roller Barrier”

Vikas Kumar Sahu, presented a research paper on regarding reducing severity of accidents on road curves in an international conference ICMREMMS - 2022. Currently working on academic project on “Reducing Severity of Accidents on Curves by Safety Roller Barrier”