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Case Study on Rolling Barrier on Pune-Mumbai Highway

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Abstract: ***In India, the transportation industry has grown quickly, especially since the turn of the century. To connect diverse cities and towns, the Indian government is pouring enormous sums of money into the infrastructure and transportation sectors. This paper highlights on the need for cost effective road safety investments using 'rolling barrier' systems which can redirect the deviated automobiles onto the right path and also prevent the overturning of vehicles. Road accidents are a result of the interaction of many factors, including the length of road networks, the number of vehicles, the population's adherence to and enforcement of traffic laws, etc. This study intends to assess the rolling barrier's efficiency and comprehend its crash cushioning properties, as well as how to rectify the vehicles' running direction and the necessary barrier strength. The Rolling Barrier satisfied the ministry of construction and transportations, "Guidelines for Installation and management of road safety facilities". Curved road portions, ramps, medians, and entrance or departure ramps in parking garages can all be safely protected by the Rolling Barrier.***
Key points: Accidents, Government, Highways, Tremendous, Rolling Barrier, Urethane, Rotational Energy, Shock Energy.

I. INTRODUCTION

A safety device called a Safety Roller prevents deadly collisions between vehicles and their occupants by both absorbing shock energy and transforming it into rotational energy. At locations where accidents involving automobiles are common, safety rollers must be installed. By absorbing shock energy, the Safety Roller can safely guide a car back to the road or bring it to a stop. The Safety Roller's distinguishable colour and self-luminescence will enable drivers to operate their vehicles properly A solution was created by a Korean company to lessen the severe impacts of guardrails and, perhaps, save lives. Around 1.25 million individuals per year pass away in road traffic accidents.

The railing can be used to direct a vehicle back to the road, slow it down until it comes to a stop, or allow it to pass the guardrail, according to the Federal Highway Administration. The guardrail can't completely protect against the situations drivers may find themselves in. 5.04% of total roads in India comprise of National and State Highways and have cumulatively accounted for almost 54% accidents and 60% deaths in the country with the balance 94% of Indian roads contributing to 45% of road accidents and 39% of deaths.

The high number of accidents on highways are indicative of over speeding being the primary cause for such accidents. To minimize the no. of accidents (major damage to vehicles and human body) a company called ETI (Evolution in Traffic Innovation) designed "Rolling Barrier System". Accidents are generally due to Over Speeding, Drunken Driving, and Distraction to the driver, Over Taking etc.

The majority of road users are aware of general safety precautions; however, accidents still happen because of other road users. To control road accident a small Korean manufacturing company came up with an innovative concept of roller barrier. Roller barrier contains ring of urethane material having a long pipe . The urethane ring is constructed to resemble an abacus and operates on the premise of converting shock energy into rotational energy. The barrier corrects the vehicle directionand prevents the vehicle from overturning and crossing the barrier.

II. LITERATURE REVIEW

A. *International Research Papers*

1) A Rolling Barriers: Emerging Concept to Reduce Road Accidents: An Indian Perspective September 2018IOP Conference Series Materials Science and Engineering By: Muhammad Farhan Aligarh Muslim University, Mohd. Anas Integral University, Mohammad Azeem University Technology PETRONAS. The latest emerging technologies for road safety focuses on finding ways to avoid or minimize road accidents to road users with special concern by reducing the causes of road accidents. As

depicted by data of certain advanced countries like Korea, Malaysia, Australia, United States ofAmerica, the major number of accidents causing death was very high during a previous couple of years due to the increased number of vehicles on road, which is getting unmanageable. However, Urethane Rollers invented in Korea has served to re-direct the uncontrolled moving vehicles and to balance it again causing reduction of accidents. In this paper, a study is carried out to explain its need in India perspective for using "Rolling Barriers" (RB) which has minimized the accidents rate in the abovementioned countries. Rolling barriers provides cushioning effect during a crash, reduces the high-speed effect, constitutes material resilience with stiffness andhave other performance characteristics that reduce injury to occupants and damage to the vehicle. The roller barriers are extremely effective and its implementation has given signified results in reducing the road accidents at flat roads, curved roads sections, ramps, medians, entrances/exit ramps in the parking garage etc. steep curved roads as in the mountainous terrain.

2) Research A STUDY ON “ROLLING BARRIERS SYSTEM ON HORIZONTAL CURVES” BY:- Vivek Lodhia, Aakash Poojari The latest emerging technologies for safety of road is focusing on finding new ways/methods for reducing accidents and reducing damage due to accidents. Road accidents are increasing day by day and death due to accidents has also been increased. But accidents cannot be reduced due to increasing population and thus increasing vehicles onthe road. If the accident does not cause death, it does damage to the driver and other passengers and also to the vehicle. In a study it has been revealed that many accidents occur at horizontal curves. So, we have studied and promoted the use of a concept called “ROLLING BARRIERS”. By using rolling barriers on horizontal curve, number of deaths, damage to vehicle or injury to human body can be minimized. Use of these rolling barriers have proved to be effective. It has been used in many developed countries and it should be used in India to minimize accidents.
3) G .Udayakumar et al. In his research paper he suggested idea of flexible median divider with use of polymer material for reducing the risk level of accidents on the median divider on researching on the topic he suggested a new flexible barrier he also used ANSYY engineering simulation software he suggested that the use of PVC barrier instead of RCC. barrier he worked on parameter like flexibility collision input reduction cost effective.
4) Guido Bonin et al has suggested the use of road safety barrier in his paper he suggested the use of road safety barrier with lightweight concrete elements, by replacing conventional concrete with short elements lightweight concrete in his paper he categorized types of accidents. He suggested that the roller barrier is only the solution to reduce road accidents on the expressway.
5) Nagadarshan Rao B. J. In his paper suggested the use of roller barrier instead of the conventional barrier system in the year 2015 there was 2.5% increase in total road accidents and 3.2% accidents on the highway, in this paper he evaluated the property of roller barrier likecrash cushioning and correction of the vehicle running direction
6) Kim et al In his paper, he stated that the longitudinal barrier help in reduction of accidents by 50% in a year. When the strength performance test was done on 8-ton truck and a passenger protection test on 1.3-ton car the barrier satisfied the guidelines of installation and managing of road safety.
7) Rao. Etal In his paper, he stated that in 2015 1347 accidents took place and 400 deaths took place he said that 57 accident take place every hour he said RB saves lives and prevent damageto the vehicle and said roller barrier are future of road safety and management.
8) By Kyung-Whan Kim In this paper, he stated that in 2001 3,638 traffic accidents took place onthe freeway of Korea. He studied the effectiveness of roller barrier and crash cushioning characteristic. He calculated the difference between the roller barrier and conventional barrierhe verified the crash cuioshning and required the strength of barrier by a mathematical equation. From his study, he suggested the suitable road section for implementation of roller barrier.
9) Gabriel Jigaeduce. In this paper he analyses and proposes the impact behavior of 2 new safety barrier system to raise impact energy absorption he concluded that crash attenuator damage to vehicle and motorist he said that lamellar and rubber roller elements should replace simplerdeformable damper.
10) Wadekar et al In his paper, he stated that in 2017 14500 accidents took place in which 1400 death took place in which 1400 death took place he suggested that the developing countries like India should implement the use of shock absorbing roller barrier.

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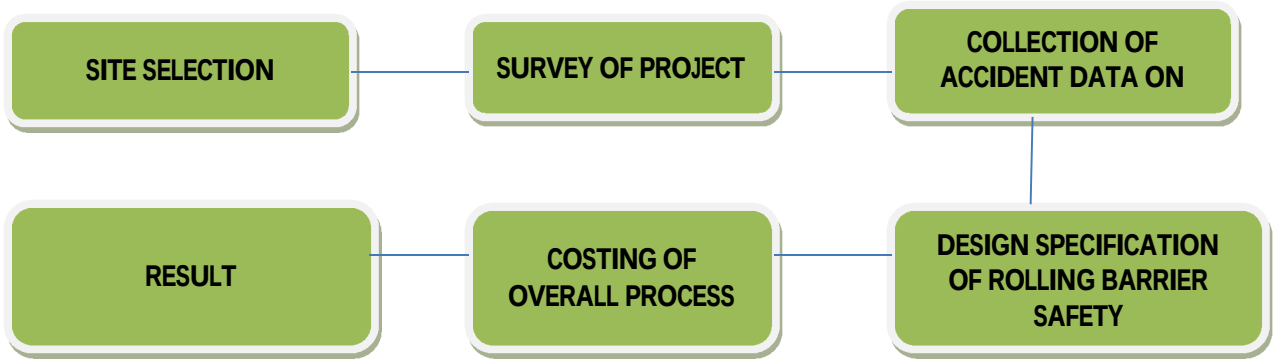
III. METHODOLOGY

A. *Flow Chart*



B. *Site Selection*

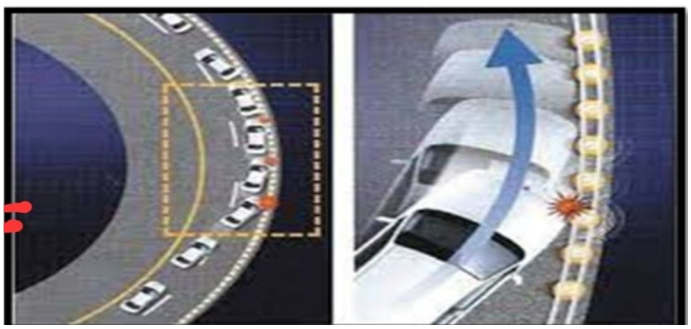
NH48 Pune-Mumbai highway survey of selection site is done by the data available by NH 48 depending on that basis a small section of curve path is been selected as a project site for designing Rolling barrier having speed limit 100kmph Vehicle movement on the NH 48 were very high and frequently all sort of vehicles pass through so many accidents do occur the place is more curve therefore using roller barrier will reduce the accident rate. *Survey of Project site* there is a sharp curve in lonavla ghat. The categories of vehicles include tempo, auto, and cars, mini-truck, bus, motor cycle, tanker, truck and bus. The information available for accident studies is the HPMS (highway police Maharashtra state) lodged in the police station. The data from these records of last six years (2015 – 2021) were extracted from the HPMS record field under IPC no.

1) Date and Time of occurrence of accidents
2) Location of accident.
3) Details of accident i.e., injuries, fatalities and property damage.
4) Type of Hitting Vehicle.

C. *Survey and Collection of Accident Data on NH 48*

National Highways are the arterial roads of the country for inter-state movement of passengers and goods. They traverse the length and width of the country connecting the National and State capitals, major ports and rail junctions and link up with border roads and foreign highways. The total length of NH (including expressways) in the country at present is 1,32,499 kms. While Highways/Expressways constitute only about 1.7% of the length of all roads, they carry about 40% of the road traffic. Accident details during 2015-2021 on this road section are shown. Accident data were collection is year wise form each police station records and then sorted out.

Working Principle: This long-standing customary system has shown to be subpar, as seen by the amount of deadly accidents on the expressway. The rolling barriers, on the other hand, help the vehicle stay on course and prevent overturning by both absorbing the impact energy and transferring it into rotational energy. As we can see in Fig. 1, as soon as a car deviates from the intended path and strikes the barriers laterally at any angle, the rollers rotate in response to the collision, converting the impact energy into rotational energy. In addition to lessening the intensity of the collision, the rotational energy helps move the vehicle forward rather than potentially smashing through an impassable barrier.



D. Analysis

The characteristics of road accidents examined in this study include their overall number, their causes, their nature and types of injuries, the types of vehicles involved, and the times of accidents.

1) According to the type of injury: Whenever a road accident happens on the road, primarily four sorts of accidents are said to happen, based on the severity of the injury: death injury, serious injury, minor injury, and non-injury.

2) In accordance with the type of accident: On-road accidents can be caused by a car flipping over, a head-on or rear-end collision, a hit-and-run, a collision with a right turn or right angle, a brush or side swipe, a vehicle skidding, etc.

3) According to the accident's cause: A road accident can happen for a variety of reasons, including the fault of the driver of the motor vehicle or the driver of the other vehicle, as well as defects in the state of the motor vehicle or the condition of the road.

4) Based on the kinds of cars involved in the collision: The type of vehicle involved in the accident determines how serious the accident is. When large vehicles are involved in an accident, the likelihood of a fatality is higher than when light cars are.

Depending on the accident's time, road accidents are primarily divided into two categories based on the time period. The first one is from 10:00 a.m. to 2:00 p.m., the second from 5:00 p.m. to 6.00 p.m. It is observed that more accidents take place during day time than night time. This may be attributed to a smaller cars during night.

IV. CONCLUSION

Accidents are caused by either human error or a natural occurrence. There are many different kinds of obstacles to having unique qualities. The roller barrier stands out from all other types of barriers in a significant way. Compared to other forms of barriers, roller barriers offer more safety. In order to prevent accidents, the concept is to erect barriers on dangerous curves, steep hills, and national routes. From the previous discussion of barriers and test results, it is clear that roller barriers rank highly in terms of safety strength and outcome. Life is more valuable than the car, so when we ignore a roller barrier, we both save lives and prevent vehicle damage. Highways should strictly enforce the use of roller barriers. Future technology for managing and enhancing traffic safety will include roller barriers.

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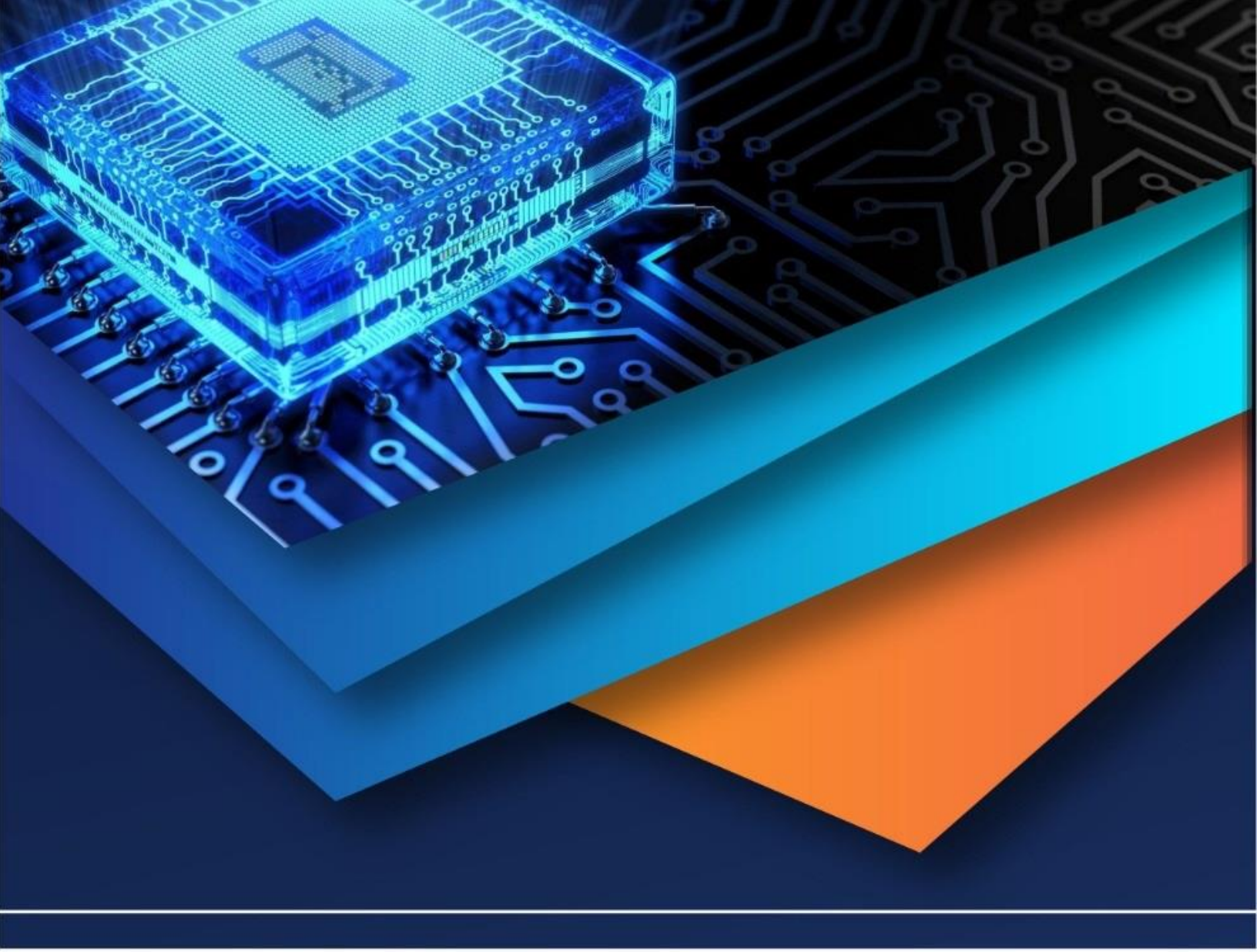

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