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PREVENTION OF ACCIDENTS IN HILLY REGION

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Abstract: - Road safety is an issue of national concern. Today, Road Traffic Injuries are one of the leading causes of deaths, disabilities, and hospitalizations, with severe socioeconomic costs, across the world. Road traffic safety constitutes the safety measures to be taken up to prevent road users from being killed or injured. Road users are typically drivers, passengers, cyclists, pedestrians, etc. The road safety system's strategy is to ensure that in an event of a crash, the impact is not so much as to cause death or any serious injury. Any road accident is all the more depressing as the victims are very healthy just before the crash. More than one million people die on the road every year according to the WHO (World Health Organization) and road traffic injuries are the leading cause of death among young people

Keywords: - *Hilly Road, Black spot analysis, Dive Ghat, Accidental Spot Identification,*

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I INTRODUCTION

The design of roads can have a severe impact on their safety. Ideally, roads should be designed keeping in mind the safety of all road users. This would mean making sure that there are adequate facilities for pedestrians, cyclists, and motorcyclists. Measures such as footpaths, cycling lanes, safe crossing points, and other traffic calming measures can be critical to reducing the risk of injury among these road users.

Mostly, in the hilly areas of Dive Ghat, Pune-Pandharpur highway, Maharashtra accidents occur due to poor development of likely national highways and hazard zones. In India, the rate of accidents in the hilly section is increasing day by day. The rapid increase of vehicular traffic and congestion on the hilly area began hampering the safe and efficient movement of traffic. To reduce the rate of accidents in this zone we have to suggest safety solutions by using advanced highway technology.

1. DATA COLLECTION

1.1 Accident Record

Accident records were obtained from the respective police station's accident log books. It is filed by the attendant police officer for all accidents at which an officer is present. This generally includes fatal accidents or mostly accidents involving serious injury required emergency or hospital treatment or which have incurred heavy property damage.

1.2 Site Visit

Dive Ghat is on the way to Saswad from Hadapsar, its almost 3/4 km ghat which need to cross from this section. Frequency of accidents is major, severity is Medium. We Have Visited dive ghat, The road was just resurfaced so that there were no problems with the surface of the pavement, i.e. road pavement was intact and free from any potholes also good amount of friction was there, in some corners there were some gritty slippery areas but overall surface was free from defects. But the safety components were poorly maintained and insufficient compared to the speed design and vehicular traffic. Some of the images captured at the time of visit to the dive ghat are as below.

Image -1: Open Side Drain and no shoulder

Image-2: No closed drain

Image-3: Damaged and useless Side barrier

Image-4: No barrier at the hair pin turn

II. IDENTIFICATION

After the visit and data collection the further process is started, The Dive ghat is divided into 3 categories on the basis of Crash frequency (CF) method as shown in map below (Fig-1), this identification gives us clear idea about accidental prone zones.

Figure -1: Identified Zones

III. METHODOLOGY

3.1 Analysis

Analysis is classified in 2 categories, they are as follows.

3.1.1 Analysis based on location

The stretch is separated into 11 parts of identical length for location-based analysis, and then further divided into right and left lanes for study.

Section	Time of Accident	No. of Affected Persons	Fatal	Grievous	Minor	Injury
1T	00:00-02:59	102	8	16	54	24
2T	03:00-05:59	52	10	21	64	13
3T	06:00-08:59	56	8	22	84	15
4T	09:00-11:59	139	7	27	74	18
5T	12:00-14:59	126	11	28	70	17
6T	15:00-17:59	162	16	34	82	30
7T	18:00-20:59	181	14	36	86	38
8T	21:00-23:59	160	12	38	72	40

3.1.2 Time-based analysis

The study stretch is divided into 8 time periods of 3 hours each for time analysis, and the associated number of accidents is determined. Because the data is only accessible for

BLACK SPOT ANALYSIS				
Location of accident	**No. Of accidents**	**Details of accident**	**Vehicle(s) involved**	**Possible reasons**
A	28	Lost control due to over speeding, Vehicle left the track	4 wheeler, Heavy vehicles	Steep slope , No speed breaker
B	110	Skidding of vehicle out of track, Head to head collision	All kinds of vehicles	Hair pin turn, Blind spot, poor banking, Defective roads, inadequate sight distance
C	69	Collision of vehicle on side barrier	4 wheeler, Heavy vehicles	Steep slope, Sharp curves.
D	46	Skidding of vehicles to open side drain	4 wheeler, Heavy vehicles	Inadequate width of shoulder, Open side drain
E	37	Skidding of vehicles to open side drain	4 wheeler, Heavy vehicles	Inadequate width of shoulder, Open side drain

three years, year-by-year sorting is done for a more in-depth analysis.

3.2 Black spot analysis

The identified accidental regions further analysed and by black spot analysis 5 accidental hotspot were detected which are shown in fig-2 below.

Figure -2: Black Spot Analysis

The treatment of specific types of accidents at a single location or on specific lengths of roads, (e.g. 300 m - 500 m section of road) this involves treating a specific site or short length of road. Rather of selecting sites just based on overall accident statistics, look for clustering by accident type. Specific accident types can be identified, for example, there may be cluster of right angle accidents or run off road accidents.

IV. DESIGN & SOLUTION

Major arterials and expressways should bypass major towns, with spurs connecting them. For linear land use regulation, distinct zones should be established.

Horizontal Geometry- Horizontal geometry consistency, avoiding repetitive straight lines or sudden changes in pace. A sufficient offset distance from natural roadside features is required.

Vertical Geometry- Un-divided Carriage ways designed for desirable Overtaking Sight Distance (OSD)

Cross-sectional Elements- Wider lane widths and shoulders for high speed roads, inside widening for sharp curves, Wider depressed median for high speed roads to prevent glare and jumping of vehicles, extended slopes for out of control vehicles. Separate slow moving motorized traffic (heavy trucks, rickshaws, etc.) from fast moving traffic

Entry/ Exit- Entry Exit only through separate lanes with proper acceleration and deceleration lanes.

Passenger Transit- Separate lane for buses and trucks to facilitate segregation and improve visibility

Rolling Barriers- Barriers should be designed to Dissipate the energy and deflect the vehicle and not crash it. Rolling Barriers are a safety Feature that prevent drivers and passengers from fatal accidents by:

- Absorbing shock energy & distribute the energy
- Rolling Barrier is best utilized in sites where vehicles are frequently exposed to accidents, like the black spots.
- It will safely lead a vehicle back onto the road or completely stop it by dissipating the shock energy through spinning rollers during an accident.
- Noticeable to drivers due to noticeable color and self-illuminant.
- It will minimize deaths of people and vehicles by absorbing collision shock

Road Signs- The road signs should be placed as they are visible and noticeable.

Retaining walls-The formation of a hill road is generally prepared by the excavation of the hill and the material which is excavated is dumped or stacked parallel to the cut portion. The retaining wall is constructed on the uphill side of the roadway to prevent the sliding of backfilling.

Speed hump- Speed humps are placed to reduce driver speeds down to 10–15 miles per hour over the hump, and 25–30 miles per hour between humps in a series. They should be placed to avoid disruption of cycling lanes and on-street parking.

Suitable solutions for the analysed accidental spots are as follows,

V CONCLUSIONS

SUITABLE SOLUTIONS		
Location of accident	**Causes of accident**	**Solution**
A	Over speeding, No guardrails	Rolling Barriers, Speed humps
B	Hair pin turn, Blind spot, poor banking, Defective roads, inadequate sight distance	Rolling Barriers, Side Drain, Super elevation as per speed design, Horizontal curve correction
C	Poor Banking, No side barrier	Rolling Barriers, Super elevation redesign
D	Inadequate width of shoulder	Widening of shoulder
E	Inadequate width of shoulder	Widening of shoulder, Covered Side Drains

Material we studied has various implementation in the areas of Dive Ghats, Pune which is our area under study. The findings of the above referred paper and previously identified results are going to contribute in ensuring in implications of safe driver behavior. Various factors found during study would help us identify crash prone positioning and most likely mechanisms of head-on crashes. Committing to the effective safety facilities is the need to be attended. The above study reinforces the need of speed enforcement, further improving road safety in hilly areas.

Road design should be perfect in width as per IS recommendation and also the quality of material that used to construct the road in hilly area should must be good.

The hilly road has more number of dangerous turns or another chance to accidents. So it is very much advisable to have ample number of road size put up to warn and alert the drivers. This technique reduces the number of accidents as well as the impact of expected accident in that hilly region.

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