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Causes of Accidents and Corrective Treatment

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Abstract: The Classification of the vehicles of the total data collected shows that the share of two wheelers and cars is about 82% of the total vehicles. The inter relation of the various other accident parameters like service road width ,set back distance of trees and bus bay, merging angle, super-elevation, extra widening of curve, sign boards, speed limits etc. can be done by combining with the accident data for further detailed study of accident causes.
Keywords: PCU, Superelevation, Set back distance.

I. INTRODUCTION

Road crashes take away the right to life of 3,000 people every day. This is a global humanitarian disaster, and it is man-made. (Global Road Safety Partnership Annual Report 2011) Road safety is one of the most important problems in our society. Every year 1.2 million of people are killed and between 20 and 50 million people are injured in road accidents. If current trends continue road traffic accidents are predicted to be third leading contributor to the global burden of Disease and injury by 2020(Torregrosa et al.,2012) India had earned the dubious distinction of having more number of fatalities due to road accidents in the world. Road safety is emerging as a major social concern around the world especially in India (Shivkumar and Krishnaraj,2012 They impose a huge socio-economic cost in terms of untimely deaths, injuries and loss of potential income. Ninety percent of road traffic deaths occur in low and middle-income countries, which claim less than half the world's registered vehicle. The problem of accident is very acute in highway transportation due to complex flow pattern of vehicular traffic, presence of mixed traffic along with pedestrians. Traffic accident leads to loss of life and property. Thus the traffic engineers have to undertake a big responsibility of providing safe traffic movements to the road users and ensure their safety. Road accidents cannot be totally prevented but by suitable traffic engineering and management the accident rate can be reduced to a certain extent. For this reason systematic study of traffic accidents are required to be carried out. Proper investigation of the cause of accident will help to propose preventive measures in terms of design and control.

II. OBJECTIVE

A. To study the causes of accidents and to suggest corrective treatment at potential location.

III.METHODOLOGY

A. Accident Study

For finding the accident prone locations, the first step is to collect the accident data. The data collection of the accidents is primarily done by the police. From several police stations there is need to collect the accidents data to find the accident locations, number of accidents; from which fatal/non- fatal accidents can be divided.

B. Traffic Volume Count

A traffic count is a count of vehicular traffic, which is conducted along a road, path. A traffic count is commonly undertaken either automatically or manually.

1) Manual Counting – In this method, the vehicular traffic is noted on field sheet which is used for manual counting.
2) Automatic Recorders – In this method, Video recorders and mechanical recorders are used to record the vehicular traffic.
3) Photographic Method- This method is for measuring flow and other traffic characteristics.

Traffic Volume Data is representing in the form of Passenger Car Unit (PCU).

C. Passenger Car Unit (PCU)

Passenger Car Unit (PCU) is a metric used in Transportation Engineering, to assess traffic-flow rate on a highway. A Passenger Car Unit is a measure of the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single standard passenger car. This is also known as passenger car equivalent.

The following PCU equivalents have been recommended for rural condition collected from book 'Traffic Engineering and Transport planning' by Dr. L. R. Kadiyali.

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Table 1 PCU Equivalents as per Indian Practice

Vehicle Type	Value of PCU
Two- Wheelers	0.5
Cars	1
Buses	3
Trucks	3
Agricultural Tractors	4.5

IV. METHODS OF MEASURING SPOT SPEEDS

Those that require observations of the time taken by a vehicle to cover a known distance.
Radar speed meter which automatically records the instantaneous speed.
Photographic method.
In the study, Radar speed meter is used to record the speed of the vehicles.

A. Radar Gun

A radar speed gun (also radar gun and speed gun) is a device used to measure the speed of moving objects. It is used in law-enforcement to measure the speed of moving vehicles and is often used in professional spectator sport, for things such as the measurement of bowling speeds in cricket, speed of pitched baseballs, athletes and tennis serves.
A laser speed gun measures the round-trip time for light to reach a car and reflect back. Light from a laser speed gun moves a lot faster than sound about 984,000,000 feet per second (300,000,000 meters) or roughly 1 foot (30 cm) per nanosecond. A laser speed gun shoots a very short burst of infrared laser light and then waits for it to reflect off the vehicle. The gun counts the number of nanoseconds it takes for the round trip, and by dividing by 2 it can calculate the distance to the car. If the gun takes 1,000 samples per second, it can compare the change in distance between samples and calculate the speed of the car. By taking several hundred samples over the course of a third of a second or so, the accuracy can be very high.
The advantage of a laser speed gun (for the police anyway) is that the size of the "cone" of light that the gun emits is very small, even at a range like 1,000 feet (300 meters). The cone at this distance might be 3 feet (1 meter) in diameter. This allows the gun to target a specific vehicle. A laser speed gun is also very accurate. The disadvantage is that the officer has to aim a laser speed gun -- normal police radar with a broad radar beam can detect doppler shift without aiming.

B. Radius of Horizontal Curve

Horizontal Curve :
A horizontal curve provides a transition between two straight sections (tangents) of a roadway

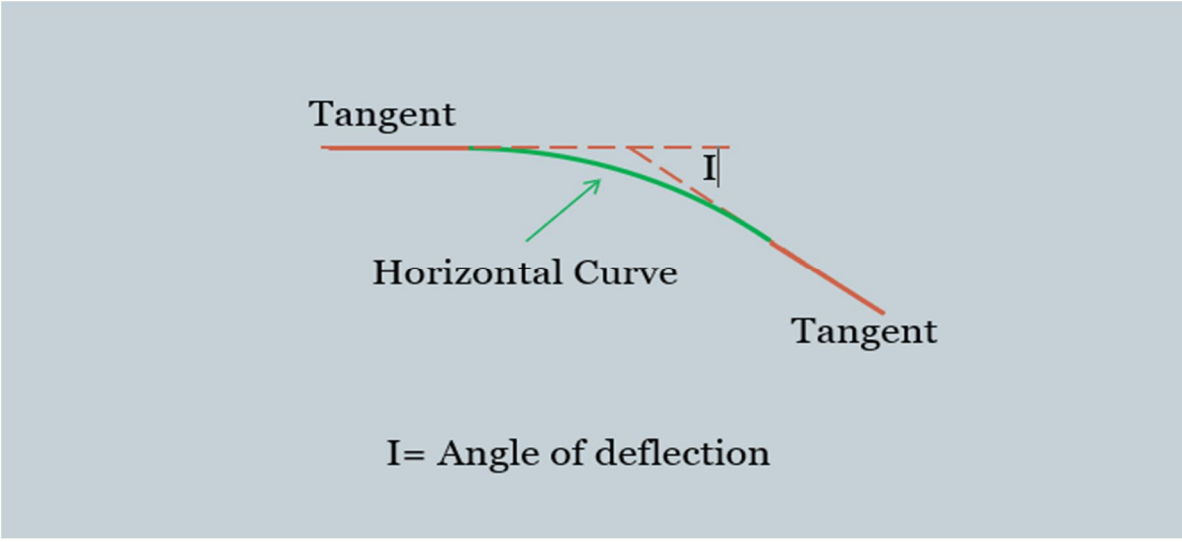


Figure **Error! No text of specified style in document.**-1 Horizontal Curve

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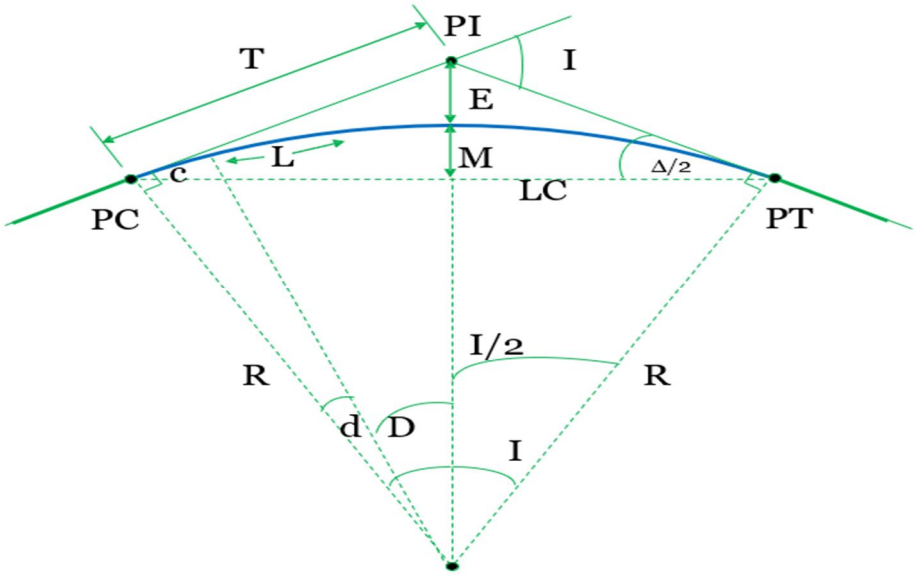


Figure **Error! No text of specified style in document.**-2 Description of curve

PC, PI, PT: Point of Curvature, Intersection, Tangent
L: Length of curve from PC to PT
T: Tangent distance
E: External distance
D: Degree of the curve
I =θ = Intersection angle
R: Radius
LC: Length of the chord
c: Length of the sub-chord d: angle of the sub-chord
l: length of the sub-chord
Curve Length, L = $(\pi R\theta)/180$
Radius of curvature = (Curve length*180)/πθ

V. SUPERELEVATION

When a vehicle is moving on a curved path it is subject to an outward force known as centrifugal force. In order to counteract the effect of centrifugal force, the outer edge of the pavement is raised with respect to the inner edge.
This transverse inclination provided to the pavement surface is known as superelevation.

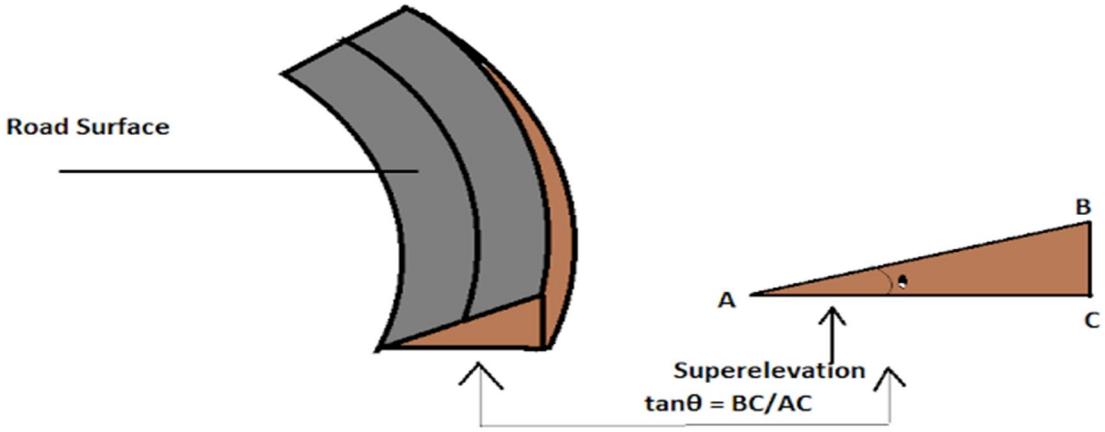


Figure 1 Superelevation at Curve

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Superelevation generally denoted by 'e' and expressed as the ratio of the height of the outer edge will respect to the inner edge to the horizontal width.

Superelevation (e) = BC/AC = tanθ

Extra widening of curve

We = Wm + Wps

Where, Wm =Mechanical Widening

Wps=Psychological Widening

We =Extra Widening

$$We = \frac{nl^2}{2R} + \frac{V}{9.5R^{\frac{1}{2}}}$$

n= No. traffic Lanes

L = length of wheel base of longest vehicle (i.e = 6m)

V= Design Speed (in kmph)

R = Radius of Curve (in m)

VI. CONCLUSIONS

A. The classification of the Vehicles for the total data collected shows that the share of 2- wheelers and Cars is about 82% of total vehicles. Average design speed of the vehicles at the accident prone locations have been found about 102 kmph, but according to IRC the design speed of the vehicles for state highway should be 80 kmph. The over-speeding of vehicles at these locations may be the major cause of accidents.

B. The radius of curves has not been provided as per design standards of the road which further leads to accidents.At site Radius of curve is less.

C. Study also shows that there were not any speed regulation boards, proper markings, and any kind of sign boards placed to assist the traffic on the road.

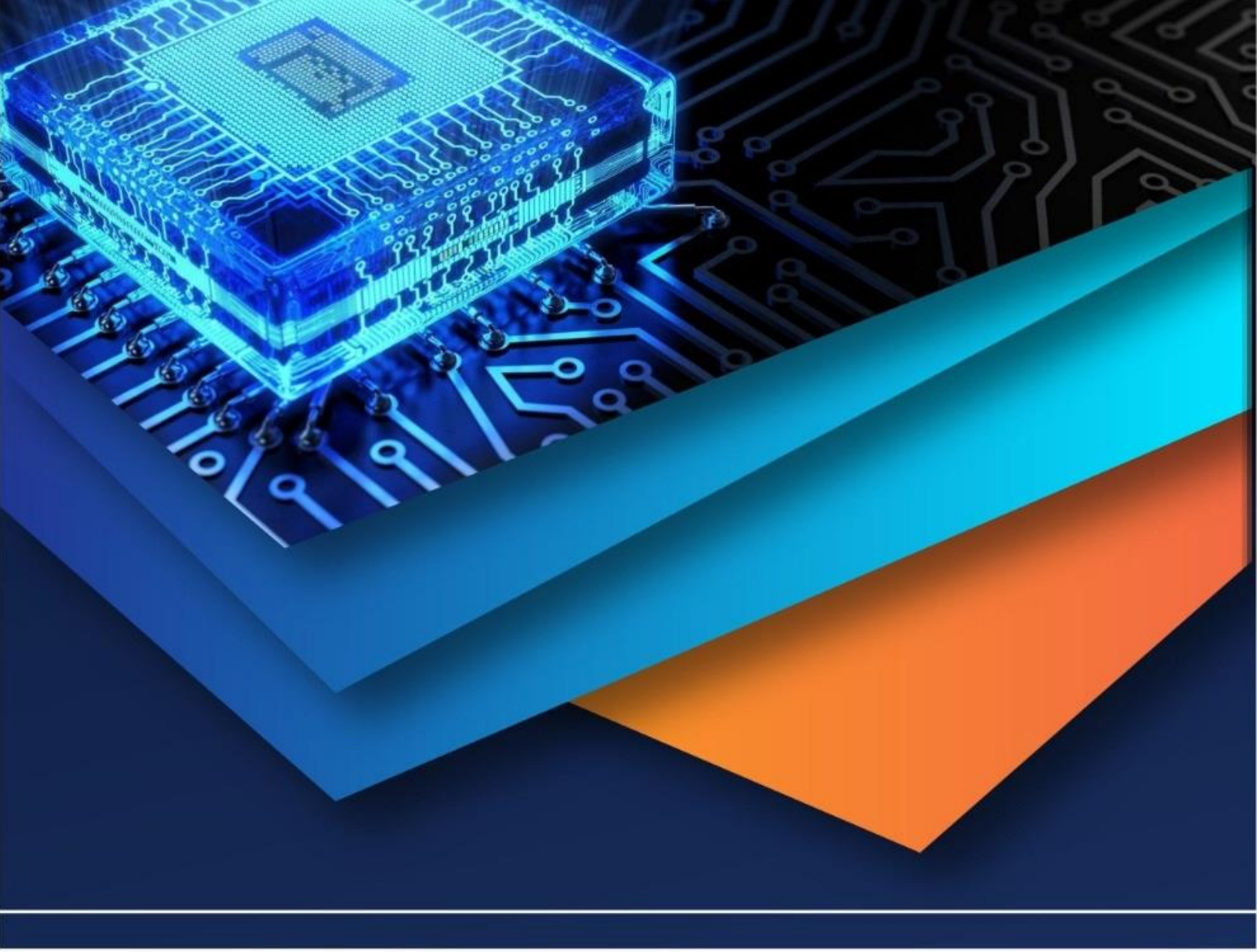
VII. ACKNOWLEDGMENT

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