Impact Factor Value 4.046 **e-ISSN: 2456-3463**
National Conference on **"Emerging Trends In Engineering & Technology"**
Organized by **Manoharbhai Patel Institute Of Engineering& Technology, Shahapur, Bhandara**
International Journal of Innovations in Engineering and Science, Vol. 4, No.5, 2019
www.ijies.net

Geometric Design of Horizontal Curve

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Abstract *–The study and design the exrural road into more spacious road for heavy traffic and safe transportation. The road from ganeshpur to wainganga river, are located in bhandara city .These road for transportation of goods, sand, brick etc. form wainganga river. The studies involves collection of details such as road gradient, width ,deflection angle, radius of curve and length of curve and design them to the standards of IRC code. The curve parameters have been measured using survey compass by traversing along center line of the curve.*

Keywords—*Gradient,compass, deflection angle, IRC code.*

I- INTRODUCTION

The major purpose in horizontal curve design is to ensure that the driver able to see any possible road hazard in sufficient time to take action and avoid an accident .in these design also studies the alignment, sloping sight distance and intersection.

I) **Horizontal alignment:** involve the understanding on the design aspect such as design speed.
II) **Sloping sight distance:** The distance that the driver must be able to see head along the roadway while traveling at or near the design speed and to safely stop before reaching an object weather stationary or not.
III) **Intersection:** An intersection is an at –grade junction where two or more roads meet or cross.

Different types of horizontal curve

❖ **Type 1:- Simple curve:**

It is a curve of a single arc of consistent radius.

❖ **Type 2 Compound curve:**

It is a curve which is comprised of a series of two or more simple curve of contrary radii which turn in the same direction.

❖ **Type 3 Reverse curve:**

It is a curve consisting of two simple curves of same or contrary radii which turn in the diametrical direction**.**

❖ **Type 4 Transition curve:**

It is a curve having a radius which reduces from infinity at the tangent point to a designed radius of the circular curve**.**

Figure 9-4. Types of horizontal curves

II-METHODOLOGY

Designing any horizontal curve the curve feature are required like radius of curve, gradient, angle of deflection, extra widening, super elevation, etc.,. The required data collected Planning is essentially needed for to do work effectively, so we can reduce much necessary time and effort of achieving the goals. In planning methodology we had done the following works:-

1. Selection of road alignment

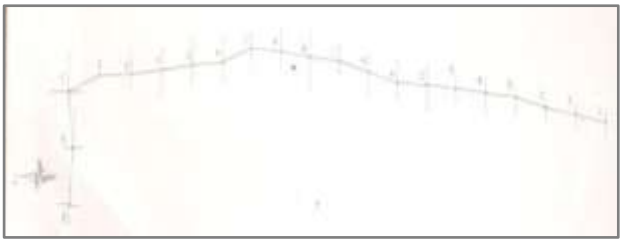

Fig: Road Alignment

2. Survey work:

a. Reconnaissance survey

Radius of curve	Upto 20m	21 to 40 m	41 to 60 m	61 to 100m	101 to 300m	Above 30m
a. wo lane	1.5	1.5	1.2	0.9	0.6	nil
b. angle lane	0.9	0.6	0.6	nil	nil	nil

b. Preliminary survey

c. Detailed survey

SELECTION OF ROAD ALIGNMENT

The position of center line of the road on the ground is called as road alignment.

It should be-

a. Short alignment
b. Easy
C. Safe

b. Economical

For selecting a alignment we have taken the following points into consideration such as:-

Obligatory points

Traffic
Geometric design
Economics
Other consideration

The exsisting road and design as per IRC recommendation and plotted. The curve parameters have been measured using auto level by traversing along the center line of the curve for required length. The data so gathered and compared with IRC 37-2001.

SUPER-ELEVATION

The inward transverse inclination provided to the cross section of thecarriageway at horizontal curve portion of a road is called as super-elevationcant or banking.

AS We know,

e+f-v'/127R

e+0.15-50/127*90

e= 0.068

Widening of carriageway on curve

The provision of extra pavement width of sharp horizontal curve isknown as widening of carriageway on curves.

Extra pavement width at horizontal curve as per recommendation of IRC

(A)Radius of the curve :

$R=(360^0XL)/DX6.285$
Where,L=Length of arc D=Deflection Angle

(B)Super elevation :

$e=V^2/225R$
Where,
V=design speed in Km per Hour

Design speed of village road as per IRC recommendation.

Sr. No.	Category of road	Design speed in kmph	
		Plain area	
1.	Village road	Rulling	Minimum
		50	40

'

(l) SIGHT DISTANCE

The distance along the center line of a road at which a driven hasvisibility of an object, stationary or moving at a specified height above thecarriage way is known as sight distance.

AS PER I.R.C.

speed	Perception and break reaction		breaking		Safe S.S.D (meter)	
V(Km /hr)	Time (s)	Distence D1=0.278vt	Coefficent of friction (f)	D d2=v/2 54f	(d1+d2)	Design value
50	2.5	35	0.37	27	62	60
40	2.5	28	0.38	17	45	45

- **OVERTAKING SIGHT DISTANCE**

The minimum sight distance needed by a driver on a two way road toenable him to overtake another vehicle a head with safety against the traffic from opposite direction is called overtaking sight distance.

AS PER I.R.C.

Intermediate sight distance for 50km/hr speed

Speed (Km/hr)	Intermediate sight distance
50	120
40	90

SLOPING SIGHT DISTANCE:

In SSD the values are based on perception and break reaction time of 2.5sec, and coefficient of longitudinal friction varying from 0.4 at 20 km/hr to35 at 100 km/hr.

CURVES

The geometrical arcs provided on the change in alignment or gradient of aroad is known as curve. Curve play important role in geometrical design of road.

Types of curve

Fig: Curve

Minimum radi of horizontal curve for different terrain condition:

Sr.no	Category or road	Minimum radii of horizontal curve in meter			
		Plain terrain		Ruling terrain	
		ruling	absolute	ruling	absolute
1	Village road	90	60	60	45

CONCLUSION

1. Curves are provided according to the topography of the area to avoid excessive cutting and filling.
2. For all curves below the desirable standards, warning signs are proposed to restrict the speed of the vehicles.
3. Horizontal curves at grade separation are more dangerous causes 30% of accidents more.
4. It was observed that apart from sight distance, superelevation and extra widening can also be used for the analysis of horizontal curves.
5. Horizontal curves are more dangerous when combined with gradients and surface with low coefficient of friction.
6. Horizontal curves have higher crash rates than the straight sections of similar length of traffic composition; this different becomes apparent at radii less than 1000m.

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