



# SNS COLLEGE OF TECHNOLOGY

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Sathy Main Road , Vazhiampalayam Pirivu,  
Coimbatore-35 , Tamilnadu , India.



## Department of Civil Engineering

# UNIT- II

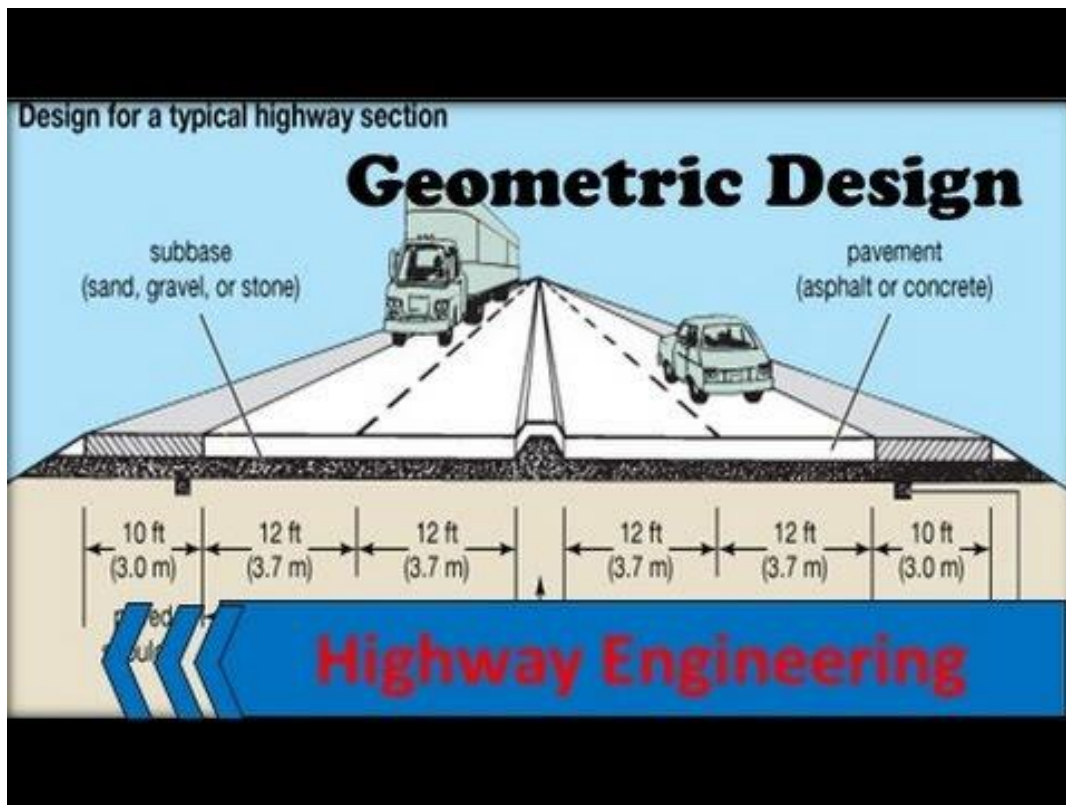
19CET205-

HIGHWAY

AND

RAILWAY

ENGINEERING



Transition curves - Theory

&

Problems



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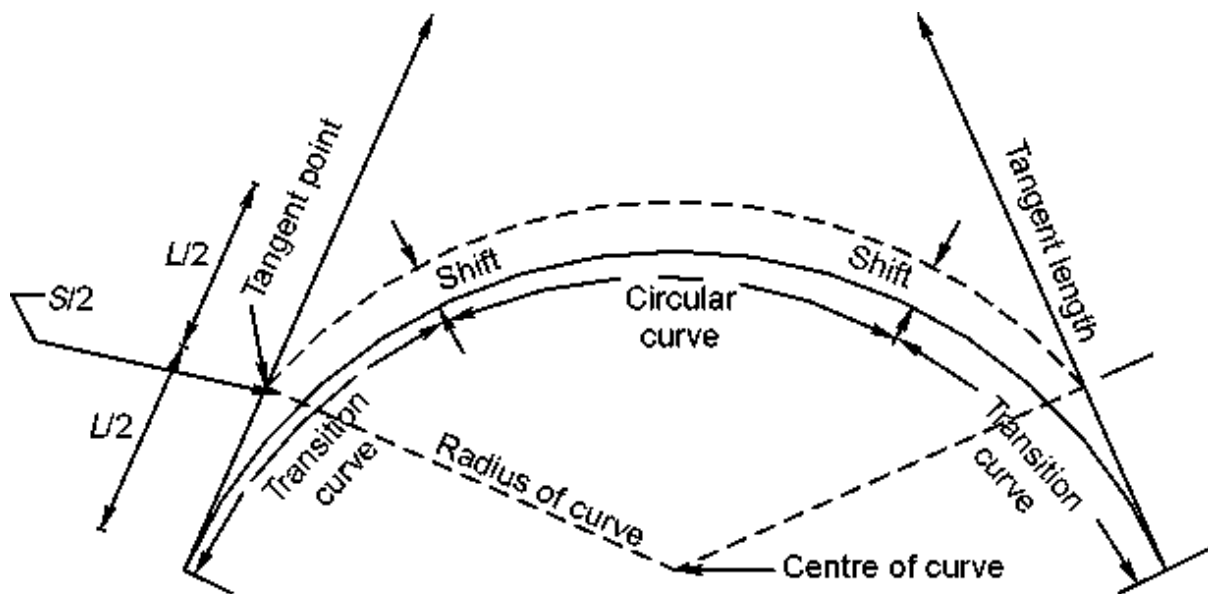
### Transition Curve



Transition curve as the name suggests, is usually a horizontal curve in plan provided to allow transition from a straight alignment to a circular curve gradually. In other words, it is a curve which connects a with infinite radius and radius  $R$ . Transition curves are usually provided between a straight and curved track/roads.



### Objectives or Purpose



**Fig.13.12 Shift**

Transition curves are provided to serve following purposes. To provide **Super Elevation** in a gradual manner and to reduce the radius from infinity at a straight junction to a radius  $R$  at curved junction gradually. Transition curves also reduces the effect of sudden jerk on passengers due to the effect of centrifugal force induced on vehicles at curves.

An ideal Transition curve should satisfy following requirements,

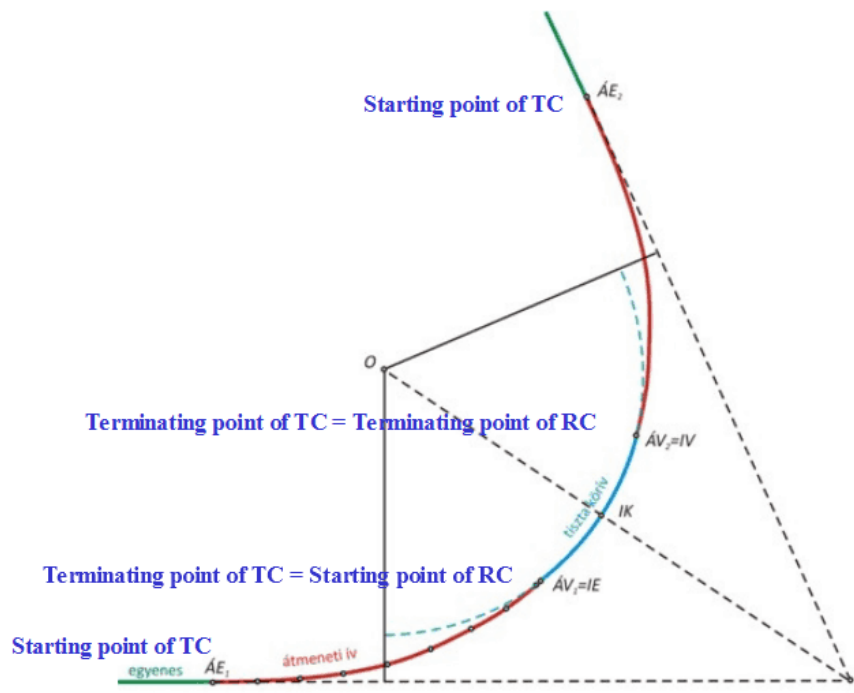
- The curve should be tangential at its junction points so that the radius of transition is infinity at straight junction and  $R$  at the curved junction.
- Rate of change of super elevation is equal to the rate of change of curvature so that full super-elevation can be provided within the length of transition curve.

Spirals and clothoids are mostly adopted to provide transition curves, as suggested by design codes. Apart from these, cubic parabolic curves and lemniscates are also used as per alignment requirements. Governing parameters for setting out these curves are the acceleration of vehicles, the required super



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elevations, lengths available for transition and deflection angles. Empirical formulas are used to design transition curves.



### Example Transition Curve Calculation

Determine the length of transition curve for a BG track having 4deg curvature and super-elevation of 12 cm. The maximum permissible speed on the curve is 85kmph.

$$\text{Radius} = 1720 / 4 \text{ deg} = 430\text{m}$$

maximum speed allowed on track, Martin's formula

$$V_{\max 1} = 4.35 \times \sqrt{430 - 67} = 82.87\text{kmph}$$

$$\text{Max Cant deficiency for BG} = 7.6\text{cm}$$

$$\text{Theoretical super-elevation} = SE_{act} + D = 12 + 7.6 = 19.6 \text{ cm} = 0.196\text{m}$$

$$V_{\max 2} = \sqrt{127 \times R \times SE_{th} / G} = \sqrt{127 \times 430 \times 0.196 / 1.676} = 79.9$$

$$\text{therefore maximum speed allowed } V_{\max} = \min(82.87, 85, 79.9) = 79\text{kmph}$$

Length of Transition curve

$$L = 4.4 \sqrt{R} = 4.4 \sqrt{430} = 91.2\text{m}$$

$$L = 3.6 SE = 3.6 \times 12 = 43.2\text{m}$$



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$$L \text{ (as per rate of change of radial acc.)} = 3.28 * V^3 / R = 3.28 * (0.278 * 79)^3 / 430 = 80.80\text{m}$$

Therefore Length of TC ~92m

