

Highway Geometric Design

Definition of Geometric Design :

- ▶ geometric design of highways deals with the dimensions and layout of visible features of the highway.
- ▶ Geometric design fulfills the requirements of the driver and the vehicle, such as comfort, efficiency and safety.
- ▶ Proper geometric design will help in the reduction of accidents and their severity.

Goals of geometric design

- ▶ Maximize the comfort, safety and economy of facilities.
- ▶ Provide efficiency in traffic operation.
- ▶ Provide maximum safety at reasonable cost.
- ▶ Minimize the environmental impacts.

Factors affecting geometric design :

- ▶ Design speed.
- ▶ Topography.
- ▶ Traffic.
- ▶ Environmental factors.
- ▶ Economical factors.
- ▶ Vehicles properties (dimensions, weight, operating characteristics, etc.).
- ▶ Humans (the physical, mental and psychological characteristics of the driver and pedestrians like the reaction time).

Highway alignment

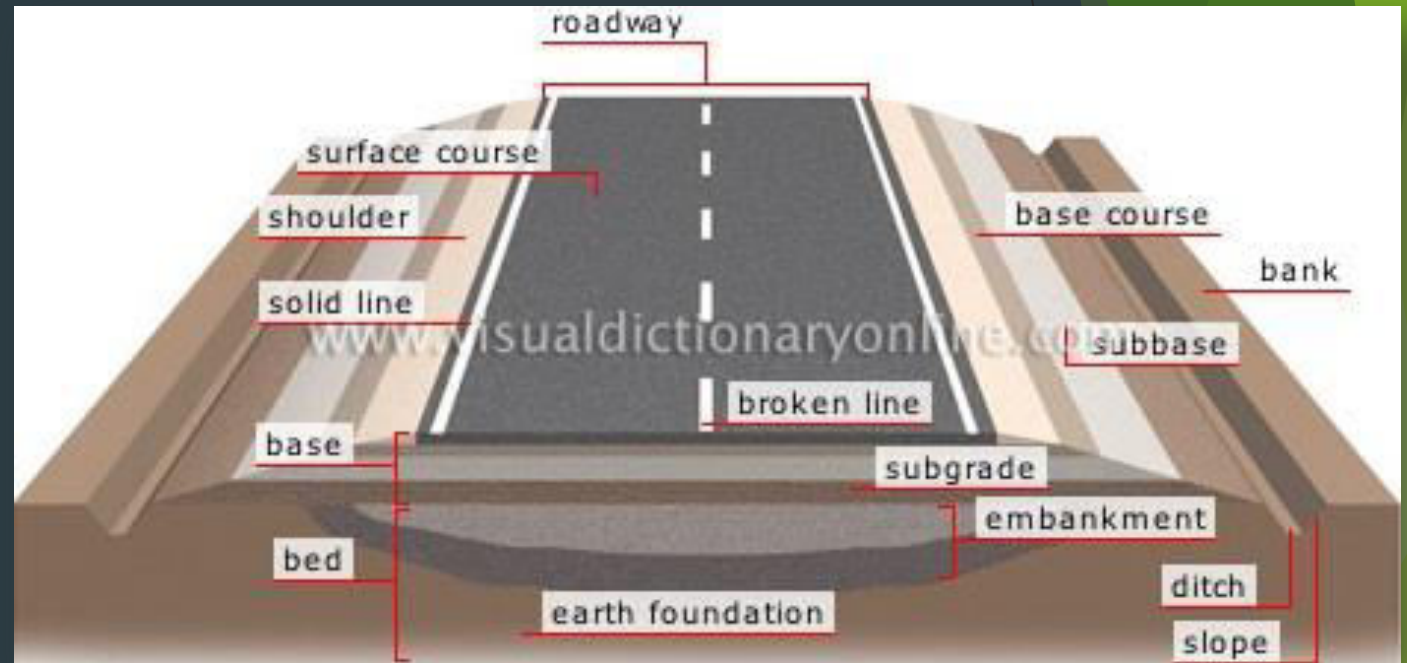
- ▶ First of all lets understand the meaning of the word alignment by itself.

alignment :

is an arrangement in a straight line or in correct relative positions.

Road alignment :

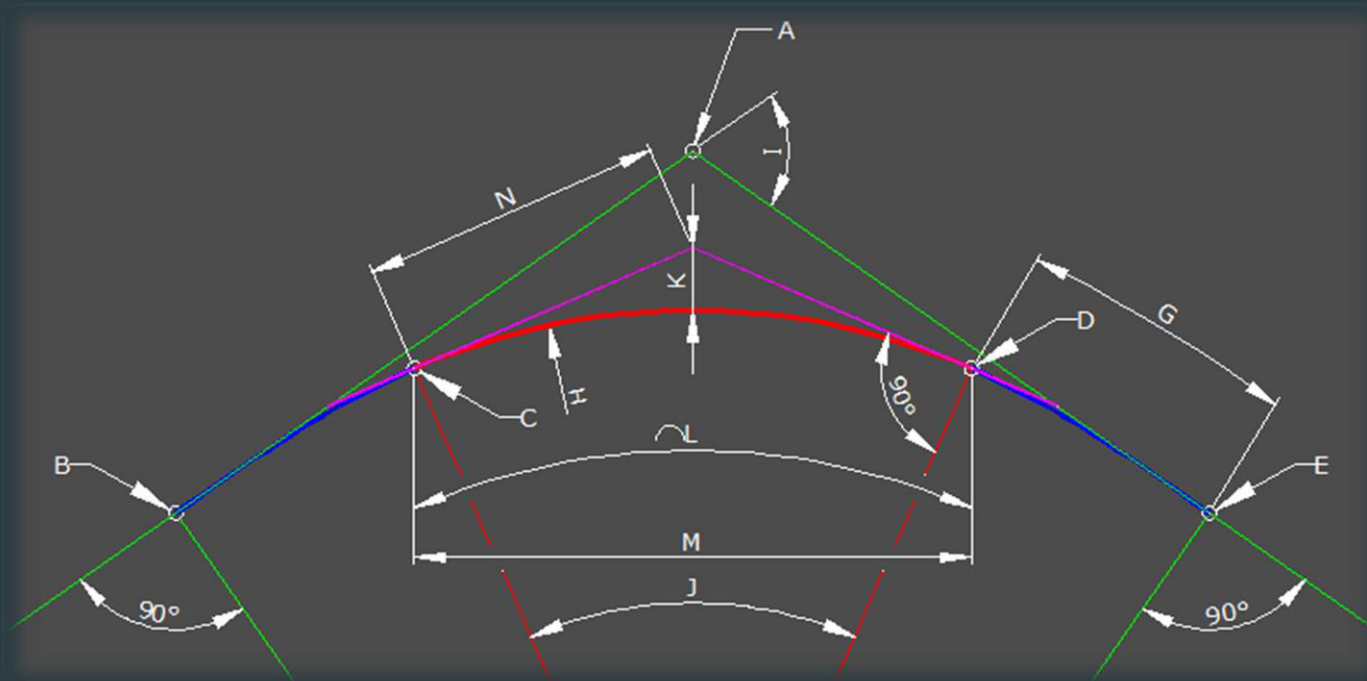
- ▶ The position or the layout of the central line of the highway on the ground is called the alignment.
- ▶ Horizontal alignment includes straight and curved paths.
- ▶ Vertical alignment includes level and gradients.



Alignment decision is important because a bad alignment will enhance the construction, maintenance and vehicle operating cost. Once an alignment is fixed and constructed, it is not easy to change it due to increase in cost of adjoining land and construction of costly structures by the roadside.

Horizontal alignment :

- ▶ Horizontal alignment in road design consists of straight sections of road, known as tangents, connected by circular horizontal curves.



More about horizontal alignment :

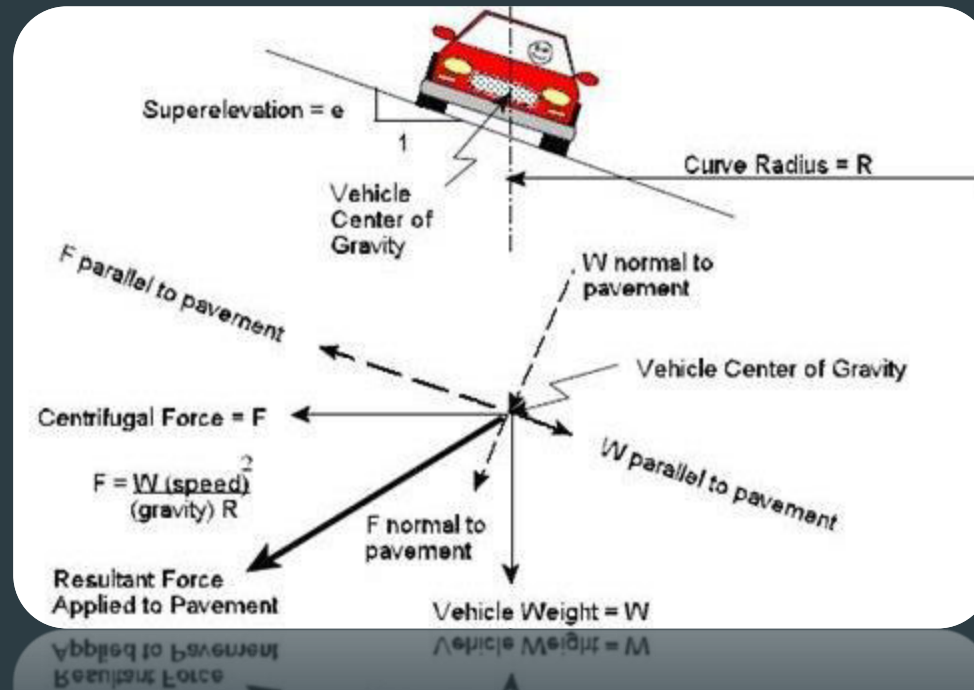
- ▶ It is the design of the road in the horizontal plane.
- ▶ Consists of a series of tangents (straight lines), circular curves and transition curves.
- ▶ Should provide safe travel at a uniform design speed.

Super elevation :

- ▶ is the slope across pavement surface and is fully developed in the circular curve.

(or)

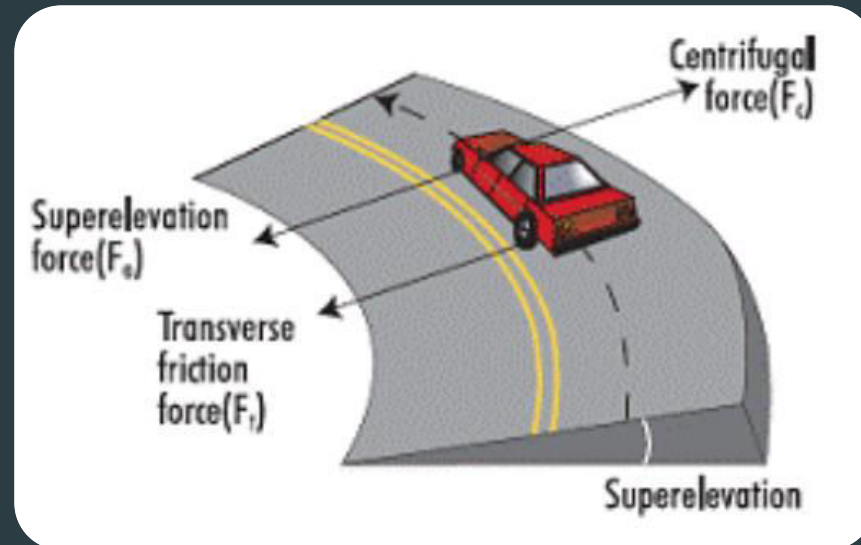
- ▶ Super-elevation (banking) is the transverse slope provided at horizontal curve to counteract the centrifugal force, by raising the outer edge of the pavement with respect to the inner edge, throughout the length of the horizontal curve.
- ▶ So super elevation helps the vehicle to overcome the centrifugal force on the curves on pavements



- ▶ The need for super-elevation on road curves, to ensure safety against skidding and over turning with the advent of fast moving traffic.
- ▶ In the past, roads were constructed without any regard to super-elevation on curves and had generally a cambered section for drainage purposes. It was little realised then that a vehicle moving on a curve had to overcome a centrifugal force to enable it to follow the curved path instead of a straight line, but, in justice to the early designers of roads, it must be said that there was no fast traffic in those days.

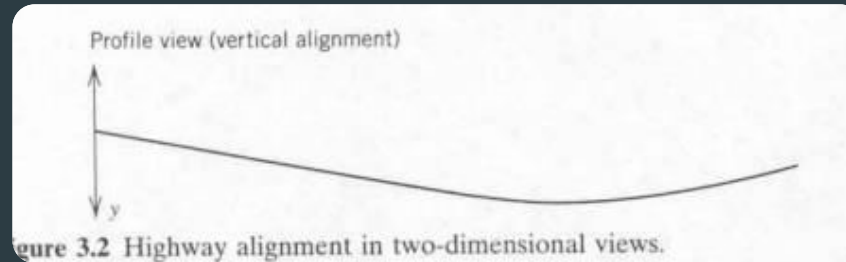
Side friction :

- ▶ is the lateral friction, specifically its the Friction between tyre and road surface which is taken at right angles to the line of movement of the vehicle.
- ▶ Generally there are two types of friction :
 1. longitudinal friction (tangential to the curve of the road).
 2. lateral friction.



Vertical alignment :

- ▶ Vertical alignment is the longitudinal section (shown on the y-axis of a road, it consists of straight grades joined by vertical curves.



- ▶ Vertical alignment specifies the elevations of points along the roadway.



Pavement design :

- ▶ A highway pavement is a structure consisting of superimposed layers of processed materials above the natural soil sub-grade.
- ▶ The pavement must provide an acceptable riding quality, adequate skid resistance, favourable light reflecting characteristics, and low noise pollution.
- ▶ There are two types of pavements :
 - 1.rigid pavements.
 2. flexible pavements.

