SNS COLLEGE OF TECHNOLOGY
Accredited by NBA-AICTE
Sathy Main Road , Vazhiampalayam Pirivu,
Coimbatore-35 , Tamilnadu , India.
Department of Civil Engineering

UNIT- I

23CET204-

HIGHWAY

AND

RAILWAY ENGINEERING

Highway Cross Sectional Elements
Right of Way, Carriage Way,
Camber, Kerbs, Shoulders

HIGHWAY CROSS SECTIONAL ELEMENTS:

Camber:

Camber or cant is the cross slope provided to raise middle of the road surface in the transverse direction to drain off rain water from road surface. The objectives of providing camber are:

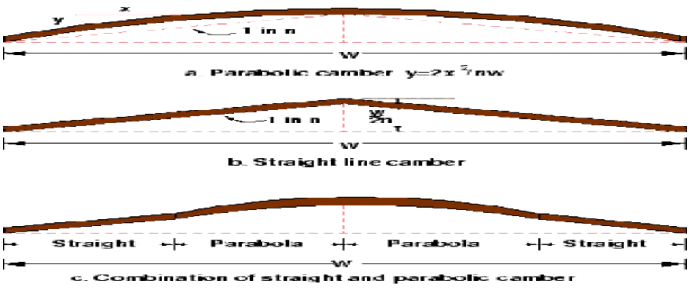
- Surface protection especially for gravel and bituminous roads
- Sub-grade protection by proper drainage

Too steep slope is undesirable for it will erode the surface. Camber is measured in 1 in n or n% (Eg. 1 in 50 or 2%) and the value depends on the type of pavement surface. The values suggested by IRC for various categories of pavement are given in Table. The common types of camber are parabolic, straight, or combination of them.

Table IRC Values for camber

Surface	Heavy	Light
Type	rain	rain
Concrete/Bituminous	2 %	1.7 %
Gravel/WBM	3 %	2.5 %
Earthen	4 %	3.0 %

common types of camber are parabolic, straight, or combination of them



Width of the Carriage Way:

Width of the carriage way or the width of the pavement depends on the width of the traffic lane and number of lanes. Width of a traffic lane depends on the width of the vehicle and the clearance. Side clearance improves operating speed and safety. The Maximum permissible width of a vehicle is 2.44 and the desirable side clearance for single lane traffic is 0.68 m. This require minimum of lane width of 3.75 m for a single lane road (Figure 1a). However, the side clearance required is about 0.53 m, on either side and 1.06 m in the center. Therefore, a two lane road require minimum of 3.5 meter for each lane (Figure 1b). The desirable carriage way width recommended by IRC is given in Table

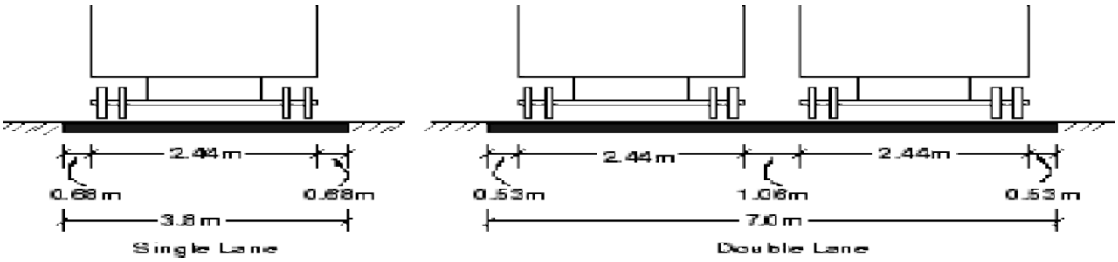


Table: IRC Specification for carriage way width	
Single lane	3.75
Two lane, no kerbs	7.0
Two lane, raised kerbs	7.5
Intermediate carriage	5.5
Multi-lane	3.5

Kerbs:

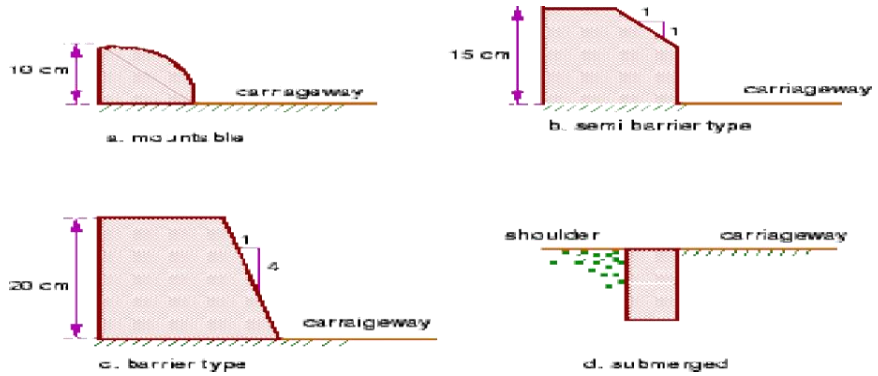
Kerbs indicate the boundary between the carriage way and the shoulder or islands or footpaths. Different types of kerbs are (Figure 1):

Low or mountable kerbs : This type of kerbs are provided such that they encourage the traffic to remain in the through traffic lanes and also allow the

driver to enter the shoulder area with little difficulty. The height of this kerb is about 10 cm above the pavement edge with a slope which allows the vehicle to climb easily. This is usually provided at medians and channelization schemes and also helps in longitudinal drainage.

Semi-barrier type kerbs: When the pedestrian traffic is high, these kerbs are provided. Their height is 15 cm above the pavement edge. This type of kerb prevents encroachment of parking vehicles, but at acute emergency it is possible to drive over this kerb with some difficulty.

Barrier type kerbs: They are designed to discourage vehicles from leaving the pavement. They are provided when there is considerable amount of pedestrian traffic. They are placed at a height of 20 cm above the pavement edge with a steep batter.Submerged kerbs: They are used in rural roads. The kerbs are provided at pavement edges between the pavement edge and shoulders. They provide lateral confinement and stability to the pavement.



Road Margins:

The portion of the road beyond the carriageway and on the roadway can be vehicular traffic is high. Minimum width is 1.5 meter and may be increased based on the traffic. The footpath should be either as smooth as the

pavement or more smoother than that to induce the pedestrian to use the footpath.

Guard rails

They are provided at the edge of the shoulder usually when the road is on an embankment. They serve to prevent the vehicles from running off the embankment, especially when the height of the fill exceeds 3 m. Various designs of guard rails are there. Guard stones painted in alternate black and white are usually used. They also give better visibility of curves at night under headlights of vehicles.

Width of formation:

Width of formation or roadway width is the sum of the widths of pavements or carriage way including separators and shoulders. This does not include the extra land in formation/cutting. The values suggested by IRC are given in Table 1.

Table: Width of formation for various classed of roads

Table: Width of formation for various classed of roads

Road	**Roadway Width (m)**	
Classification	**Plain And Rolling Terrain**	**Mountainous And Steep Terrain**
NH/SH	12	6.25 - 8.8
MDR	9	4.75
ODR	7.5 - 9.0	4.75
VR	7.5	4.0

Right of Way:

Right of way (ROW) or land width is the width of land acquired for the road, along its alignment. It should be adequate to accommodate all the cross-sectional elements of the highway and may reasonably provide for future development. To prevent ribbon development along highways, control lines and building lines may be provided. Control line is a line which represents the nearest limits of future uncontrolled building activity in relation to a road. Building line represents a line on either side of the road, between which and the road no building activity is permitted at all. The right of way width is governed by:

Width of formation: It depends on the category of the highway and width of

- Height of embankment or depth of cutting: It is governed by the topography and the vertical alignment.
- Side slopes of embankment or cutting: It depends on the height of the slope, soil type etc.
- Drainage system and their size which depends on rainfall, topography etc.
- Sight distance considerations: On curves etc. there is restriction to the visibility on the inner side of the curve due to the presence of some obstructions like building structures etc. Reserve land for future widening: Some land has to be acquired in advance anticipating future developments like widening of the road.

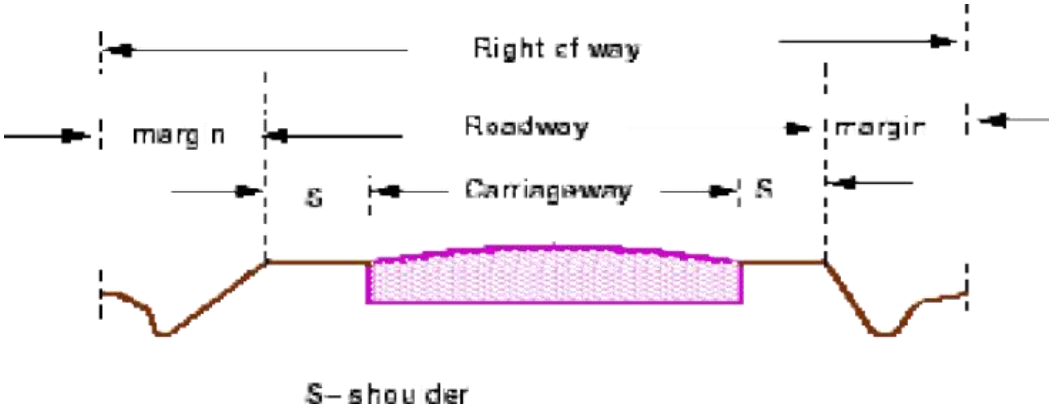
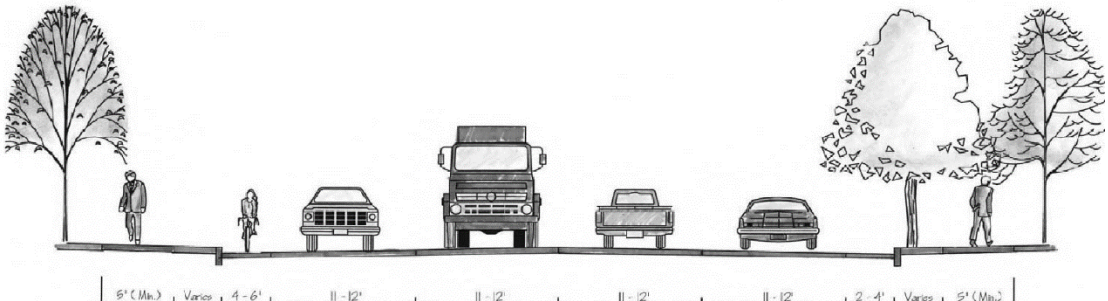


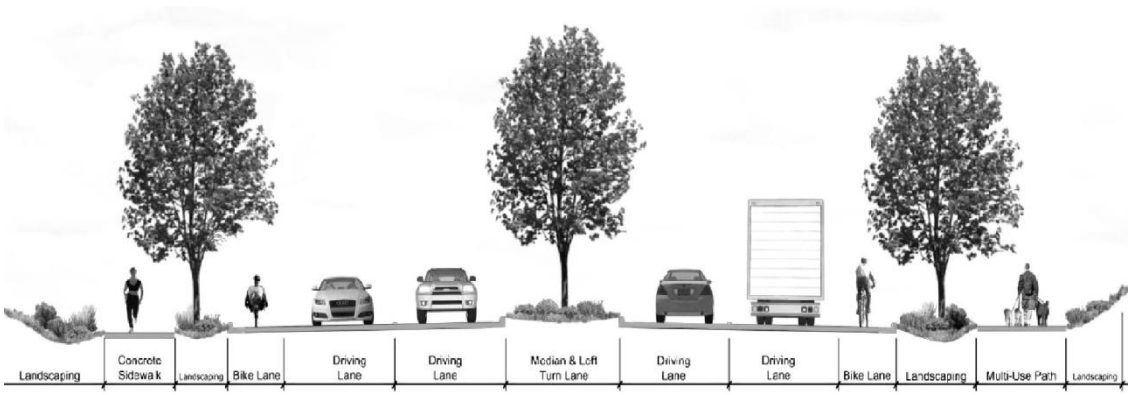
Table 1: Normal right of way for open areas

Road	**Roadway Width (m)**	
Classification	**Plain And Rolling Terrain**	**Mountainous And Steep Terrain**
Open Areas		
NH/SH	45	24
MDR	25	18
ODR	15	15
VR	12	9
Built-up areas		
NH/SH	30	20
MDR	20	15
ODR	15	12
VR	10	9

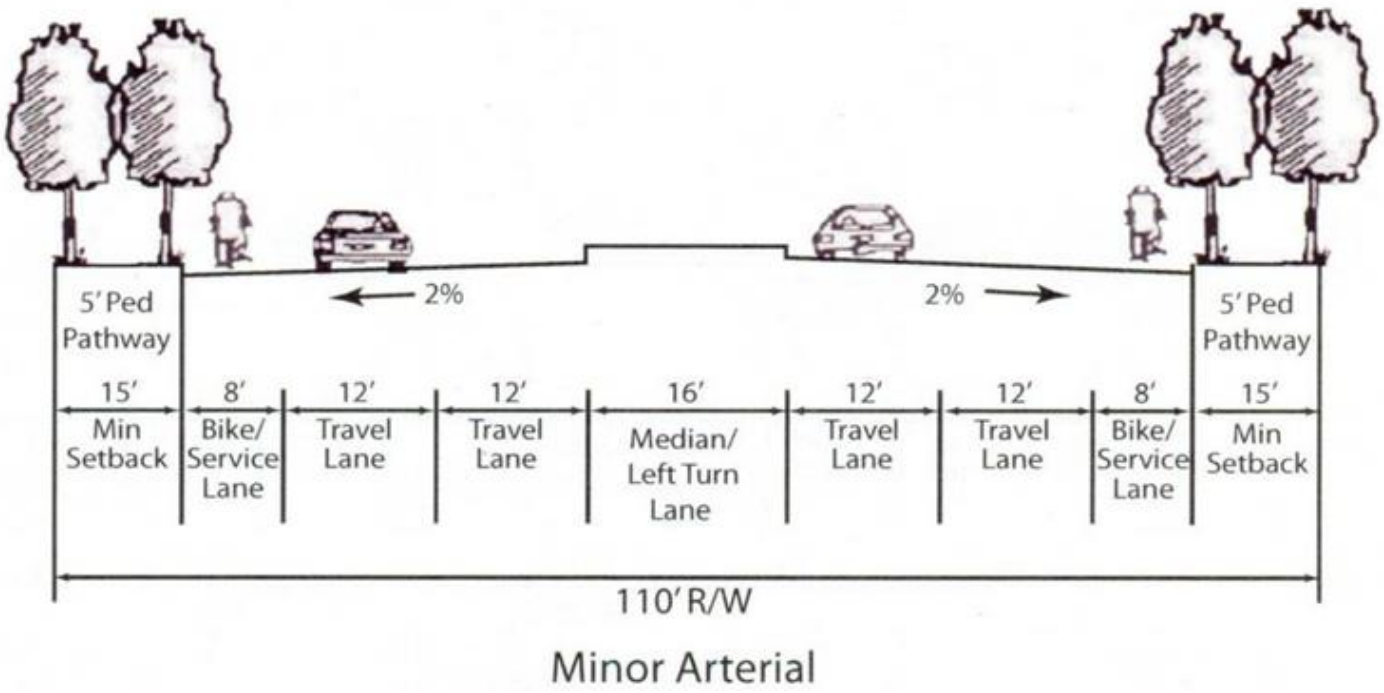
TYPICAL CROSS SECTION OF FOUR LANE



TYPICAL CROSS SECTION OF 4LANE DIVIDED HIGHWAY:



TYPICAL CROSS SECTION OF URBAN ROAD (4LANE DIVIDED)



Minor Arterial

TWO LANE UNDIVIDED: