

MODULE - I

TRANSPORTATION ENGINEERING

Transportation contributes to the economic, industrial, social and cultural development of any country. Transportation is vital for the economic development of any region, since every commodity produced whether it is food, clothing, industrial products or medicine needs transport at all stages from production to distribution.

MODES OF TRANSPORTATION

1. LAND
 - ROAD
 - RAILWAY
2. WATER
3. AIR

1. Road transportation

- This mode has maximum flexibility for travel with reference to route, direction, time and speed of travel etc.
- Provide door to door service
- The road network is therefore needed not only to serve as feeder system for other modes of transportation but also to provide independent facility for road travel by a well-planned network of roads throughout the country.

2. Rail transportation

- The transportation along with railway track could be advantageous by railways between the stations both for the passengers and goods, particularly for longer distance.
- The energy requirement to haul unit load through unit distance by the railway is only a fraction (one fourth to one sixth) for that required by road.

3. Water transportation

- Transportation by water is the slowest among the four modes.
- This mode needs minimum energy to haul unit load through unit distance.

4. Air transportation

- The transportation by air is the fastest among the four modes.
- Air travel also provides more comfort apart from savings in transportation time for the passengers and goods between the airports.
- Energy required and operating expense is high.

HIGHWAY ENGINEERING

It is a branch of transportation engineering which deals with the design, construction and maintenance of different types of roads. It also called as road engineering and it involves the study of the following:

- a) Planning , location and development of roads.
- b) Highway design, geometric and structure.
- c) Materials required for construction
- d) Highway traffic performance and its control.
- e) Drainage of roads etc.

HISTORY OF ROAD DEVELOPMENT (*world*)

- ROMAN ROADS
- TRESAGUET CONSTRUCTION
- METCALF CONSTRUCTION
- TELFORD CONSTRUCTION
- MACADAM CONSTRUCTION

HIGHWAY DEVELOPMENT IN INDIA

- Jayakar committee (1927)
- Central road fund (1929)
- Indian road congress (IRC) (1934)
- Central road research institute (CRRI) (1950)
- Motor vehicle act (1939)
- National highway authority of India (NHAI) (1995)
- First twenty year road plan (1943-61)
- Second twenty year road plan (1961-81)
- Third twenty year road plan (1981-2000)

Indian Road Congress (IRC)

- It was formed on 1934
- IRC has become the active body to recommend specifications regarding design and construction of roads and bridges.

Function of IRC

- (1) To providing a platform for expression of collective opinion of its members for all the matters affecting the construction and maintenance of roads in India.
- (2) To suggest improve method of planning, design, construction and maintenance of roads in India.
- (3) To promote the use of standard specification and practices for roads construction, roads materials and designed of roads
- (4) To Make Laws for the development, improvement and protection of roads..
- (5) To conduct periodical meeting to discuss technical issues regarding road construction.
- (6) To publish journals, research publication, Standard specifications and other guidelines on various aspects of highway engineering.

IRC CLASSIFICATION OF ROADS

- NATIONAL HIGHWAY
- STATE HIGHWAY
- MAJOR DISTRICT ROAD
- OTHER DISTRICT ROAD
- VILLAGE ROAD

NATIONAL HIGHWAY

- National Highways are the main highways which run through the length and breadth of India
- Connecting major ports, capitals of states, and large industrial and tourist centres which includes various roads required for a strategic movement for the defence of India.
- All the national highways are assigned the respective numbers.
- Responsibility of construction and maintenance of these roads given to CPWD and military engineering services (MES)

STATE HIGHWAY

- The Highways linking up with the National Highways of adjacent States district headquarters and important cities with the states are known as state highways.

- The responsibility of construction and maintenance of the state highways taken by State Government.
- The geometry design specifications and design speed for National Highways and State Highways are the same.

MAJOR DISTRICT ROADS

- The major district roads are one of the important roads which are located within the district.
- It serves an area of production and Markets and connecting these places with each other or with the main highway.
- Lower speed and design specification than NH&SH

OTHER DISTRICT ROADS

- The roads serving rural areas of production and providing them with market centres, headquarters, and block development headquarters, railway station, etc are known as Other district roads.
- Lower design specification than MDR

VILLAGE ROADS

- The roads connecting villages or groups of villages with each other or with the nearest road of the higher category are known as village roads.
- Village roads place a very important role in the development of rural areas.

20 YEAR PLAN

- 1st 20 Year Plan

NAGPUR PLAN - 1943-63

- 2nd 20 Year Plan

BOMBAY PLAN - 1961-81

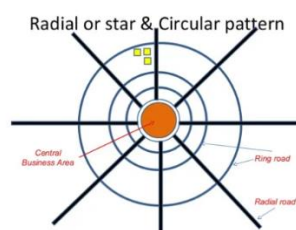
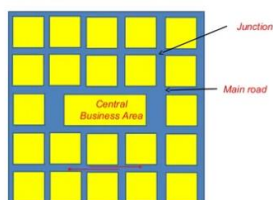
- 3rd 20 Year Plan

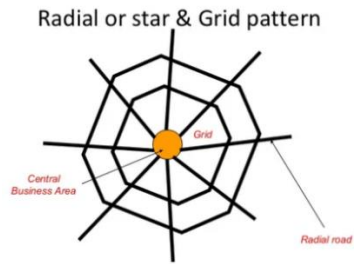
LUCKNOW PLAN - 1981-2001

1 st 20 YEAR PLAN	2 nd 20 YEAR PLAN	3 rd 20 YEAR PLAN
Nagpur plan	Bombay plan	Luck now plan
Target road density		
16km/100km ² area	32km/100km ² area	82km/100km ² area
Category roads:		
1. NH (<i>national highway</i>) 2. SH (<i>state highway</i>) 3. MDR (<i>major district road</i>) 4. ODR (<i>other district road</i>) 5. VR (<i>village road</i>)	EW (Express way)	Primary Roads EW NH Secondary Roads SH MHD Tertiary roads ODR,VR
Target road length:		
2 LAKH km road construction.	10 LAKH km road construction.	12 LAKH km road construction.
Star grid pattern road		Square and grid

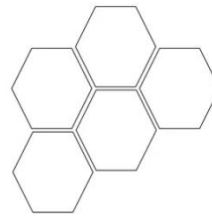
DIFFERENT ROAD PATTERNS

Rectangular or block pattern





Hexagonal pattern



Major SH &NH in Kerala

NH-44 (formerly NH-7) - Kanyakumari to Varanasi

NH-66 (formerly NH-17) - Panvel to Kanyakumari

NH-85 (formerly NH-47) - Salem to Kanyakumari

NH-183 (formerly NH-47C) - Kundannoor to Alappuzha

NH-544 (formerly NH-47) - Salem to Kochi

NH-766 (formerly NH-212) - Kozhikode to Mysore

SH 1 - Main Central Road or MC road

SH 2 - Thiruvananthapuram-Thenmala Road

SH 3- Nedumangad- Shorlacode Road

SH 5 - KP Road or Kayamkulam-Punalur Road

SH 6 - Kayamkulam-Thiruvalla Highway

SH 7 - Thiruvalla-Pathanamthitta-Kumbazha highway

URBAN ROAD CLASSIFICATION

1. EXPRESS WAYS
2. ARTERIAL ROADS
3. SUB ARTERIAL ROADS
4. COLLECTORS ROADS
5. LOCAL STREETS

EXPRESSWAYS :

- For speedy and heavy traffic.
- Speed – 120 kmph
- Pedestrians, 2 wheeler not allowed
- Connect main markets, important places
- Complete separation of opposite moving traffic by divider or median
- Level crossing , sharp curves, steep gradients avoided

ARTERIAL ROADS:

- For heavy / important traffic inside city
- Usually along the expressways serving as principal network of traffic flow
- Parking, loading, unloading prohibited
- Pedestrians are allowed to cross only at intersections

SUB ARTERIAL ROADS

- Less traffic than arterial streets
- Pedestrians are allowed to cross only at intersections
- Parking, loading, unloading usually restricted and controlled.

COLLECTOR 'S STREETS

- Meant for collecting the traffic from local streets to arterial streets.
- Full access allowed from properties along side
- Situated in residential , commercial, industrial areas.
- Few parking restrictions except for peak hours.

LOCAL STREET

- Open access from residents, business or other properties
- Does not carry large volume of traffic
- Unrestricted parking and pedestrians allowed.

HIGHWAY ALIGNMENT

- The layout of centre line of highway on the ground is called the alignment.
- The horizontal alignment includes the straight path, horizontal deviation and curves.
- Change in gradient and vertical curves are covered under vertical alignment of roads

Requirements

- Short – short alignment

- Easy – easy to construct and maintain the roads
- Safe – safe for construction and maintenance and also for traffic operation
- Economical – total cost is lowest

Factors controlling alignment

1. Obligatory points
2. Traffic
3. Geometric design
4. Economics
5. Other considerations

In hilly roads additional care has to be given for

- stability
- drainage
- geometric standards of hill roads
- resisting length - should be minimum

a) Obligatory points

There are control points governing the alignment of the highways

These control points may be divided broadly into two categories

- (i) Points through which the alignment is to pass

- The various examples of this category may be bridge site, intermediate town, a mountain pass etc

- (i) Points through which the alignment should not pass

- This include religious places, very costly structures, unsuitable land etc

b) Traffic : The alignment should suit traffic requirements.

c) Geometric design : Geometric design factors such as gradient, radius of curve and sight distance also would govern the final alignment of the highway.

d) Economy : The alignment finalised based on the above factors should also be economical. In working out the economics, the initial cost, the cost of maintenance and vehicle operation should be taken into account.

e) Other considerations : Various other factors which may govern the alignment are drainage considerations, hydrological factors, political considerations.

TRAFFIC ENGINEERING

- Deals with the improvement of traffic performance of road networks and terminals

Scope of traffic engineering

- To achieve efficient free and rapid flow of traffic, with least number of traffic accidents

TRAFFIC STUDIES

1. Traffic volume study

- Number of vehicles crossing a section of road per unit time at any selected period
- Unit – veh/day, veh/hr

Counting of traffic volume

a) Mechanical counters

- Automatically record
- Fixed or portable
- methods
 - pneumatic hose
 - magnetic detector
 - radar detector
- Advantage : work throughout the day and night
- Drawback : not possible to get the traffic volume of various classes of traffic

b) Manual counts

- done manually
- classification of vehicle is possible
- not practical for 24 hours counting

PRESENTATION OF TRAFFIC VOLUME DATA

1. Annual average daily traffic

* $AADT = \frac{\text{no of. Vehicles in a year}}{365}$

365

* helps in deciding relative importance of route and in phasing road development programme

2. Trend chart

* shows volume trends over a period of years

* helps in planning future expansion

3. Variation chart

* shows hourly, daily and seasonal variation

* helps in deciding the facilities and regulation needed during peak traffic period

4. Traffic flow map

* the thickness of line representing the traffic volume

* helps to find the traffic volume distribution

5. Intersection flow diagram

* showing details of crossing and turning traffic

* these data are needed for intersection design

6. 30th highest hourly volume

* it is the hourly volume that will be exceeded only 29 times in a year and all other hourly volumes of the year less than this value

7. Average daily traffic

$ADT = \frac{\text{no. of vehicles in a week}}{7}$

7

8. Annual average working day traffic

$AAWT = \frac{\text{no. of vehicle throughout the working day in a year}}{260}$

260

9. Annual average hourly traffic

$$AAHT = \frac{AADT}{24}$$

24

TRAFFIC SPEED STUDIES

- Type of speed

1. Spot speed

* instantaneous speed of vehicle at a specified section

2. Average speed

* average spot speeds of all vehicles passing at a given point.

a. Time mean speed

* average of instantaneous speeds of observed vehicles at the spot

b. Space mean speed

* average speed of vehicles in a certain road length at any time

3. Running speed

$$\text{Running speed} = \frac{\text{length of travel}}{\text{running time}}$$

Running time = journey time – delays

4. Overall speed / travel speed / journey speed

$$\text{Journey speed} = \frac{\text{length of travel}}{\text{journey time}}$$

EQUIPMENT USED ARE:

- Enoscope
- Graphic Recorder
- Photo Electric Meter
- Speed Meter
- Photographic Method
- Radar

SPEED & DELAY STUDIES

- The speed and delay studies give the running speeds, overall speeds, fluctuations in speeds and the delay between two stations of a road spaced far apart.
- They also give the information such as location, duration frequency and causes of the delay in traffic stream.
- The results of the speed and delay studies are useful in detecting the spots of congestion, the causes and in arriving at a suitable remedial measure.
- They are various methods of carrying out speed and delay study, namely:
 1. Moving observer method or Floating car method
 2. License plate or vehicle number method
 3. Interview method
 4. Elevated observations
 5. Photographic technique

ORIGIN AND DESTINATION STUDY

USES/OBJECTIVES:

- It gives information on the actual location of origin of individual passenger trips and their destination.
- These studies provides details such as direction of travel, selection of routes, trip length & no. of trips.
- O&D studies on vehicular trip are essential for either comprehensive planning of new road network or improvements in the existing road network

Methods used in O/D studies:

- Road side interview method
- License plate method
- Return post card method
- Tag on car method
- Home interview method

Representation of O&D studies

- O&D Tables- showing no of trips b/w different zones
- Desire lines- it is a graphical representation (*more accurate*)
- Contour lines- similar to topographic contours

PARKING STUDIES

- **NEED FOR PARKING:**

- All the vehicle don't keep moving during entire day, so some portion of the area will need to stop or park at the desired locations for durations.
- off street parking
- on street parking
 - * kerb parking
 - * parallel parking
 - * angle parking

ACCIDENT STUDIES

- The traffic accidents may involve property damages, personal injuries or even casualties.
- One of the main objective of traffic engineering is to provide safe traffic movements. Road accident cannot be totally prevented, but suitable traffic engineering and management measures, the accident rate can be considerably decreases.

Objectives of accident studies

- To study the causes of accidents and to suggest corrective treatment at potential location
- To evaluate the existing design
- To support the proposed designs
- To make computations of financial loss

INTERSECTIONS

- An intersection is the area shared by the joining or crossing of two or more roads.
- Its main function is to guide vehicles to their respective directions.
- Intersections are classified as follows :
 - (i) At Grade Intersection
 - (ii) Grade Separated Intersection.

AT GRADE INTERSECTION

- All roads meet at more or less the same level.
- Merging, diverging and crossing are involved in the intersection at grade.
- **Sub classification:**
 - Un-channelized
 - Channelized
 - Rotary intersection
 - Signalized intersection

Un-channelized intersection

- Intersection area is paved and there is absolutely no restriction to vehicles to use any part of intersection area.
- Hence the un channelized (all-paved) intersections are
 - ✓ the lowest class of intersection
 - ✓ easiest in the design but most complex in traffic operations
- resulting in maximum conflict area and more number of accidents, unless controlled by traffic signals or police.
- **PLAIN INTERSECTION:** No additional pavement width
- **FLARED INTERSECTION:** pavement is widened at intersection

Channelized Intersection

- Channelized intersection is achieved by introduction of islands into the intersectional area, thus reducing the total conflict area available in the un channelized intersection.
- The radius of entrance and exit curves and the area are suitably designed to accomodate channelizing island of proper size and shape
- Channelization may partial or complete.
- Superior to all paved intersection

ROTARY INTERSECTION

- it is an enlarged road intersection where all converging vehicles are forced to move round a large central island in one direction before they can weave out of traffic flow into their respective direction

- The main object of providing a rotary are to eliminate the necessity of stopping even for crossing streams of vehicles and to reduce the area of conflict
- Dis advantage : Even when there is relatively low traffic, the vehicles are forced to reduce their speed.

SIGNALIZED INTERSECTIONS

- The intersections at grade that are controlled by traffic signals.

GRADE SEPARATE INTERSECTION

- Highest form of intersection
- Much superior to intersection at grade from point of view of traffic safety and efficient operation.

Classification of grade separate intersection

1. Underpass
2. Overpass
3. Trumpet Interchange
4. Diamond Interchange
5. Cloverleaf Interchange

Underpass

- An underpass or a tunnel is an underground passageway, completely enclosed except for openings at each end.
- A tunnel may be for foot or vehicular road traffic, for rail traffic.
- If an underpass is constructed for pedestrians and or cyclists beneath a road or railway, allowing them to reach the other side in safety, then such a construction is termed as a **Subway**.

Overpass

- An overpass also known as a flyover, is a bridge, road, railway or similar structure that crosses over another road or railway.
- A pedestrian overpass allows pedestrians safe crossing over busy roads without impacting traffic.

Trumpet Interchange

- Trumpet interchanges have been used where one highway terminates at another highway.
- These interchanges are useful for highways as well as toll roads, as they concentrate all entering and exiting traffic into a single stretch of roadway, where toll booths can be installed.
- The principal advantages are low construction cost and are useful for highways as well as toll roads.

Diamond interchange

- It is the simplest form of grade separated intersection between two roadways.
- The conflicts between through and crossing traffic are eliminated by a bridge structure.
- It requires a minimum amount of land and is economical to construct

Cloverleaf Interchange

- A cloverleaf interchange is a two-level interchange in which left turns are handled by ramp roads .
- The objective of a cloverleaf is to allow two highways to cross without the need for any traffic to be stopped by red lights, even for left and right turns
- partial cloverleaf interchange is similar to a full cloverleaf, except that loop ramps are present in three quadrants or less

ROAD MARKINGS

- Guide and control traffic on a highway
- Ensure safe, smooth and harmonious flow of traffic
- **Types:**
 - Longitudinal markings
 - Transverse markings
 - Object markings
 - Special markings

LONGITUDINAL MARKINGS

- Placed along the direction of traffic on road surface.
- Provided for separating traffic flow in the same direction.
- Predominant colour used is white.
- Yellow colour is used to separate the traffic flow in opposite direction
- Lines can be either broken, solid or double solid.

Types of longitudinal marking:

- Centre line
- Traffic lanes
- No passing zone
- Warning lines
- Border or edge lines
- Bus lane markings
- Cycle lane markings.

TRANSVERSE MARKINGS

- Transverse markings are marked across the direction of traffic.
- They are marked at intersections etc.
- Stop line markings, markings for pedestrian crossing, direction arrows, etc. are some of the markings on approaches to intersections.

OBJECT MARKING

- Physical obstructions in a carriageway like traffic island or obstructions near carriageway like signal posts, pier etc. cause serious hazard to the flow of traffic and should be adequately marked.

Objects within the carriageway

- The obstructions within the carriageway such as traffic islands, raised medians, etc. may be marked by not less than five alternate black and yellow stripes.
- The stripes should slope forward at an angle of 45 degree with respect to the direction of traffic.
- These stripes shall be uniform and should not be less than 100 mm wide so as to provide sufficient visibility.

Objects adjacent to carriageway

- Sometimes objects adjacent to the carriageway may cause some obstructions to the flow of traffic.
- Objects such as subway piers and abutments etc. are some examples for such obstructions.
- They should be marked with alternate black and white stripes at a forward angle of 45degree with respect to the direction of traffic.
- Poles close to the carriageway should be painted in alternate black and white up to a height of 1.25 m above the road level.

WORD message

- Information to guide, regulate, or warn the road user may also be conveyed by inscription of word message on road surface.
- Characters for word messages are usually capital letters.
- The legends should be as brief as possible and shall not consist of more than three words for any message.
- Some of the examples of word messages are STOP, SLOW, SCHOOL, RIGHT TURN ONLY etc.

Parking marking

- The marking of the parking space limits on urban roads promotes more efficient use of the parking spaces
- Such parking space limitations should be indicated with markings that are solid white lines 100 mm wide.
- Words TAXI, CARS, SCOOTERS etc. may also be written if the parking area is specific for any particular type of vehicle

Hazardous location

- Wherever there is a change in the width of the road, or any hazardous location in the road, the driver should be warned about this situation with the help of suitable road markings.
- Road markings showing the width transition in the carriageway should be of 100 mm width.
- In the figure, the driver is warned about the position of the pier through proper road markings.

TRAFFIC SIGNALS

- Traffic signals are control devices which could alternately direct the traffic to stop and proceed at intersections using red and green traffic light signals automatically.

Advantages of traffic signals:

- They provide orderly movement of traffic and increase the traffic handling capacity of most of the intersections at grade.
- They reduce certain types of accidents, notably the right angled collisions.
- Pedestrians can cross the roads safely at the signalized intersection.
- Signals provide a chance to crossing traffic of minor road to cross the path of continuous flow of traffic stream at reasonable intervals of time
- Automatic traffic signal may work out to be economical when compared to manual control.

TYPE OF TRAFFIC SIGNAL

The signals are classified into the following types:

1. Traffic control signals
 - a. Fixed-time signals
 - b. Manually operated signals
 - c. Traffic actuated (automatic) signal
2. Pedestrian signal
3. Special traffic signal

1. TRAFFIC CONTROL SIGNALS

RED light - STOP

GREEN light - GO

AMBER or YELLOW light - CLEARANCE TIME

a). Fixed-time signals

- **Fixed-time** signals or **pre-timed** signals are set to repeat regularly a cycle of red , amber and green lights.
- The timing of each phase of the cycle is predetermined based on the traffic studies
- Simplest type of automatic traffic signals which are electrically operated.

- Drawback : sometimes the traffic flow on one road may be almost nil and traffic on the cross road may be quite heavy.

B).Traffic actuated signals

Traffic actuated signals are those in which the timings of the phase and cycle are changed according to traffic demand.

1.Fully actuated Signal

In fully actuated traffic signals the detectors and a computer assigns the right of way for traffic movements on the basis of demand and pre-determined programming. But these are very costly to be installed at all intersections.

2.Semi actuated Signal

In semi-actuated traffic signals the normal green phase of an approach may be extended up to a certain period of time.

C).Manually operated signals

This type of signal operated by manually.

Normally traffic police can operate this type signals.

2.PEDESTRIAN SIGNAL

It give the right of way to pedestrians to cross a road during the “walk period” when the vehicular traffic shall be stopped by red or stop signal on the traffic signals of the road.

3. SPECIAL SIGNALS

Flashing red – shall stop before entering at an intersection

Flashing yellow – driver may proceed with cautions

TRAFFIC SIGNS

Traffic signs are the signs erected at the side of roads to provide information to road users

Types of signs

1. Regulatory signs
2. Warning signs
3. Informatory sign

REGULATORY SIGNS

- These signs are also called mandatory signs because it is mandatory that the drivers must obey these signs.
- If the driver fails to obey them, the control agency has the right to take legal action against the driver.
- Circular in shape, except

STOP – OCTAGONAL

GIVE WAY – INVERTED TRIANGLE

Regulatory signs are further sub-divided into two types:

1. Prohibitory signs

- These signs are part of the regulatory signs, which are intended to inform the highway users of traffic laws or regulation.
- They may be of the following types:
 - Movement prohibition (such as prohibition of right turns, prohibition of overtaking, prohibition of entry, one way streets)
 - Waiting restriction signs
 - Speed limit and vehicle control signs
- According to the I.R.C. standards, the prohibitory signs are
 - circular in shape
 - white in colour
 - red border
 - diameter of 600mm

The common prohibitory signs are:

- straight prohibited, no entry, bullock cart and hand cart prohibited, cycle prohibited, pedestrian prohibited, right/ left turn prohibited, U-turn prohibited, overtaking prohibited, horn prohibited

No parking sign

- It is meant to prohibit parking of vehicles at that place
- The No Parking sign is :
 - circular in shape

blue black ground

red border

oblique red bar at an angle of 45 degrees.

No stopping/standing sign

It is meant to prohibit stopping of vehicles at the place

circular in shape

blue background

red border

two oblique red bars at 45 degree and right angle to each other.

Speed limit signs

- It is meant to restrict the speed of all or certain classes of vehicles on a particular stretch of a road.

circular in shape

white background

red border

black numerals indicating the speed limit.

Compulsory direction control Signs

using arrows

blue background

white direction arrows

2. Mandatory signs

- Mandatory signs are part of regulatory signs and are intended to convey definite positive instructions when it is desired that motorists take some positive actions.
- The two most important mandatory signs are the

(i) STOP sign

(ii) GIVE WAY sign.

(i) STOP sign

- According to I.R.C stop sign is :

octagonal in shape

red in colour

white border

the side of the octagon being 900mm

- It is generally used at an intersection where the following conditions exist:
 - (i) Street entering a through highway or street
 - (ii) Un signalized intersection in a signalized area
- The stop sign should not be used:
 - (i) On the through expressways
 - (ii) For speed control
 - (iii) At signalized intersections

(ii) **GIVE WAY** sign

- It is used to control the vehicles on a road so as to assign right of way to traffic on other roadways.
- According to the I.R.C :
 - shape is downward pointing equilateral triangle
 - red border band
 - white background.

It is used under the following conditions:

- (i) On a minor road at a entrance to an intersection where it is necessary to assign right of way to the major road.
- (ii) On the entrance ramp to an express way when acceleration lane is not provided.

The GIVEWAY or YIELD sign should not be used:

- (i) On the expressways
- (ii) To control the major flow of traffic at an intersection
- (iii) On the approach more than one of the intersection streets

WARNING SIGNS

- Warning or **cautionary signs** are used to warn the road users of certain hazardous conditions that exist on or adjacent to the roadway.
- Shape - equilateral triangle with its apex pointing upwards.

- According to I.R.C warning signs are :
white background
red border
black symbols
side of triangle is 900mm

The commonly used warning signs:

- right hand/left hand curve, right/left hair pin bend, right /left reverse bend, steep ascent/descent, narrow bridge/road ahead, Slippery road, pedestrian crossing, school zone, men at work, falling rock.

INFORMATORY SIGNS

- These signs are used to guide the road users along routes, inform them of destination and distance and provide with information to make travel easier, safe and pleasant.
- The information signs are:
 - Direction and Place Identification signs
 - Facility Information Signs
 - Parking signs
 - Flood Gauge

1. Direction & place identification signs

- Rectangular in shape with longer horizontal.
- Colour of the background of sign board and the colour of arrows and letters depends on the class of the road where signs are installed.
- For NH & SH
green background
word message white in colour
- Other roads
white background
word message black in colour

2. Facility information signs

- Signs are rectangular with blue background and white/black letters/symbols
- Some of these signs are

Public Telephone, Petrol Pump, Hospital, Eating Place etc.

3. Parking signs

- PARKING SIGNS are setup parallel to the road using square sign board with blue background and white coloured letter 'P'.
- Definition plate may used to indicate the category of vehicle for which parking space is reserved, direction of parking space etc.

4. Flood gauge

It is installed at causeways and submersible bridge or culverts to indicate the road users the height of the flood above road level.