LEC-1
TRAFFIC ENGINEERING

Definition

Traffic engineering is the science of:

- Measuring traffic and travel, the study of basic laws relating to traffic flow and generation, and
- Application of this knowledge to the professional practice of planning, designing and operating traffic systems to achieve safe, efficient and convenient movement of persons and goods.

History

- Traffic Engineering as it is known today has evolved gradually with increase in traffic (both vehicle and pedestrian).
- Initially it was limited to application of simple rules and regulations such as left driving rule, road signs, marking and intersection control by flag etc.
- Subsequently, analysis of traffic and accidents led to the realization of the traffic regulations and other methods of traffic control should be based on proper engineering studies.
- In consequence as extension of traffic regulations-many new traffic control and management techniques were devised viz. speed zoning, traffic signals, turn restrictions, parking restrictions, bus priorities, one-way street etc.
- Eventually it became evident that the planning and design of efficient road network largely depends upon the integrated land-use and transport policies and effective demand management (road pricing to control and distribution peak hours).
- Modern traffic engineering measures are mostly restrictive and dynamic in nature and largely depend on public transport facilities and information technology.

Traffic Engineering (TE) includes

- Studies and analysis of traffic characteristics and flow parameters
  - Geometric design (mainly improvement)
  - Planning of regulatory measures
  - Design and application of control devices
- Functional planning of road network

Why TE is so essential now-a-days?

Because of-

- Increased urbanization process
- Increased traffic demand-phenomenal growth in traffic specially within urban areas.
- Difficulties in expanding roadway facilities within built up areas.
- Congestion becomes chronic in everywhere.
- Increased air pollution.
- Increased accident numbers.
- Road network become larger.

Therefore, there is a need to maximize the utilization of existing facilities by better traffic management and control measures.

Bottlenecks – Causes of Congestion

For better management of road network, traffic engineers must know the common causes of congestion and accident.

Causes of Congestion

External (Geometric) factors:

- Road intersections
- Railway crossings
- Narrow road/bridge/culverts
- Inconsistent roadway width
- Poor turning radius
- Side frictions
    - Scattered parking/non-motor activities along road
    - Frequent side roads entries
    - Bus stops/parking near junctions
    - Road side cut/unfinished repair of road side pavement
- Poor roadway environment
    - Poor road discipline
    - Uncontrolled pedestrian crossing
    - Poor road surface condition
    - Speed breaker
    - Poor sight distance
    - Poor lighting
    - Poor drainage facilities.

Internal (Traffic) factors:

- Heterogeneous traffic stream
- High volume of traffic (demand > capacity)

Safety Problems may arise mainly -

From conflicts-

- At intersections
- Along on-street parking
- Where pedestrian activities are high
- At blind spots – viz. bends, spots with poor sight distance/lighting facilities etc.

Due to-

- Poor road surface condition
- Faulty road geometry
- Poor traffic operating condition – lack of traffic control devices
- Drivers' fault
- Mechanical failure

Traffic Engineering tools

Physical measures

- *To control vehicular movements*
  - Road signals/markings
  - Road divider/Channelisation/islands
  - Exclusive turning lane – flaring/widening of intersection
  - Slip road
  - Bus lay-by
  - Speed breakers
  - Segregated bus lane
  - Grade separation etc.

- *To control standing vehicles*
  - On/off parking
  - Off street loading/unloading for freight vehicles
  - Terminals etc.

- *To control pedestrian movements*
  - Guard rail/median/pedestrian barriers
  - Side walk
  - Cross walk
    - Un-signalized – Zebra crossing
    - Signalized – (time separated/sharing)

- Grade separated
  - Underpass
  - Overpass

Regulatory measures

- Banning right turn
- One-way operation
- Junction clear-way
- Speed control
- Parking control
- Access control
- Road pricing etc.