SIGNIFICANCE OF HIGHWAY PLANNING

Transportation contributes to the economic, industrial, social, and cultural development of any country. It 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. The adequacy of the transport system of a country indicates its economic and social development.

MODES OF TRANSPORTATION

1. Roadways
2. Railways
3. Waterways
4. Airways
* The transportation by air is fastest among the 4 modes. It also provides more comfort apart from saving time.

* Transportation by water is slowest. It needs more energy to haul a unit load through water distance. It is possible both ports on searoute or along the river or canals where inland transportation facilities are available.

* Road Transport can provide door to door service only by road Transport. This mode has also the most flexibility for travel with reference to route, direction, time as speed of Travel.

The road pavements are generally constructed on small
embankments slightly above the general ground level wherever possible, in order to avoid difficult drainage & maintenance problems.

Scope of Highway Engg:

- Historical background, planning, & basis for planning, Master plan, Engr surveys & highway alignment.
- Design, geometric design, & structures
- Road design, Rigid & Flexible Pavements, Design Factors, Thickness design, Overlay design, Design of drainage system
- Traffic performance & its control
- Traffic study analysis, Need for new & road link, Traffic regulation, control, Intersection design, their controls with signs.
Necessity of Highway Planning:

1. To plan a road network for efficient and safe traffic operation, but at minimum cost. The cost of construction, maintenance & renewal of pavement layers & the vehicle operation cost are to be given due to consideration.

2. To arrive at the road system and the length of different categories of roads which could provide maximum utility and could be constructed within the available resources during the plan period under consideration.

3. To fix up datewise priorities for development of road links based on utility as the main criteria for phasing the road development programme.
Historical development of road construction was in ancient Rome.

Roman roads:

During the period which many roads were built of stone blocks of considerable thickness. The Appian way was built in 312 BC extend over 580 km which illustrate the road building techniques used by Romans.

Building techniques used by Romans:

- Large stone slabs in lime mortar.
- Concrete 250 cm thick.
- Broken stones.
- Large Foundation stones in lime mortar.
- 2.2 to 2.5 m (1 m mortar)
- 1.2 m hard soil stratum
- 0.7 to 0.8 m hard soil stratum
- They were built straight regardless of straightness.
- They were built after the soft soil was removed and hard stratum was reached.
The thickness of construction may be in the order of 20 cm.

Construction steps:

The subgrade was prepared and a layer of large foundation stones were laid on edge by hand. At the two edges of pavement, large stones were embedded edge-wise to serve as submerged kerb stones. Corners are filled with smaller stones. They were thickness of 8 cm.

\[ \text{Construction steps} \]
Telford construction

In this, heavy foundation stones used above. The soil subgrade is to
keep the road foundation firm.

Broken stones in L, M

Angular broken
Foundation stones, stone 7 cm size,
40 cm thick

* A level subgrade was prepared to
design work of about 9m

* Large foundation stones of the 7
stone 2 cm were laid with hand
with their largest face down so as to
be laid in a stable position

* The interstices are filled with
small stones or

* The central portion was covered
with a layer of angular section
Macadam constructions

The importance of subgrade drainage and compaction was realized, subgrades were prepared with sufficient slope.

Heavy foundation stones were replaced with broken stones, and with adequate drainage system.

The thickness of 25 cm,

The size of broken stones based on stability under animal drawn vehicles.

4.5m

Cross slope 1 in 36

25 cm

Broken stones

Compacted subgrade with cfs 1 in 36.
History of road development in India:

Ancient period ↓
Mughal period ↓
British period ↓
Jayakan committee report ↓
IRC ↓
CRRI

Recommendation of Jayakan committee

1. The road development in the country should be considered as a national interest as this has become beyond the capacity of state, ports and local bodies.
Classification of highway

Based on

1) Weather
2) Type of carryway
3) Traffic volume
4) Load
5) Location

6) Weather

a) All weather roads
b) Fair weather roads

All weather roads

Negotiable during all weather except at major river crossings

where interruption to traffic is permissible up to a certain extent.

Fair weather roads

Traffic may be interrupted during

the monsoon season @ causeways
where streams may be overflow
Fair weather roads: Traffic may be interrupted during the monsoon season at causeways where streams may be over.

b) Carriageway

a) Paved roads:

If they are provided with a hard pavement course which should be at least a water bound macadam layer.

b) Unpaved roads:

If they are not provided with a hard pavement course at least a WBM layer. This may be called unpaved roads. Position (a)

iii) Based on pavement surfacing.

a) Surface Roads:

Provided with a block topped bituminous or cement concrete surfacing.
b) Unsurfaced roads:
- not provided with cement concrete surfacing

e) Traffic Volume:
- a) heavy
- b) medium
- c) light traffic

f) Load Transport or Tonnage:
- class I
- class II
- class I

vii) Location and Function:
- National highways:
  - connecting major ports, overseas highway
  - connecting capitals of states, large industrial tourist centres
b) State highways:

- Connecting national highways of adjacent state, districts & important cities within the state.

- Major District Roads:

  Roads within district serving areas of production & markets and connecting these with each other or with main highways of district.

- Other District Roads:

  It serves rural areas of production with market centres, tahuk & main roads.
Village Roads:

- Connect villages or groups of villages with each other to the nearest road of a higher category.

Urban Roads:

1. Arterial roads - streets primarily for through traffic or continuous movement.
2. Sub-arterial roads - same as #1, but they have lower level of traffic mobility than above.
3. Collector streets - provide access to arterial streets; they collect and distribute traffic from one to local streets.
Highway alignment:
The position or the layout of the control line of highway on the ground is called alignment.

H2L Alignments:
Includes the Ht. path, the H2L deviation & curves.

V2L Alignments:
Changes in gradient & vertical curves are covered under alignment requirements.

In short: It is desirable to have a short alignment btw two stations.

Easy: It is easy to construct & maintain the road with min. problem. Easy for vehicles to cross gradient.
(iii) says, it should be safe enough for construction, maintenance.

(c) Economics

- The total cost including initial cost, maintenance cost & vehicle operation cost is lowest

Utility of road:

- Utility value per unit length of road

Factors controlling alignment:

(a) obligatory points

(b) Traffic

(c) Design

(d) Economics

(e) Considerations

In hill roads

- Stability
- Drainage
- Geo. standards
- Resisting lengths
**Engineering Survey**

Stages:

1. Map study
2. Reconnaissance
3. Preliminary survey
4. Final location and detailed survey

**Map Study**

- Alignment: Avoiding valleys, ponds, and lakes.
- When a road has to cross a row of hills, possibility of crossing through a mountain pass.
- Approximate location of bridge site for crossing rivers, avoiding bends of rivers, and
- When a road is to connect b/w 2 stations on the top of a hill or on foot of a hill.
2) Reconnaissance Survey

1) Valleys, ponds, lakes, marshy lands, ridge, hills along the route which are not available.

2) Approx. values of gradient
1. No of drainage system, max. flood level & natural ground water level
2. Soil type along routes
3. Sources of construction material

Preliminary surveys:
1. To survey alternate alignments proposed after the reconnaissance & collect all physical information & details of topography
2. Compare different proposals
3. To estimate qty. of earthwork material, cost of alternate proposals

Methods:
1. Conventional approach
2. Modern rapid approach
Procedure for conventional methods

1. Primary Traverse
2. Topographical Features
3. Levelling Work
   a. Drainage studies
5. Soil Survey
   b. Material Survey
7. Traffic Survey
8. Determination of centre line