R.C.Patel College Of Engineering & Polytechnic, Shirpur

Department of Civil Engineering

Course Title- Highway Engineering **Course Code -** 313323

Programme Name -Civil Engineering **Semester-**Third

Unit	Title	COs	Learning hours	R Level	U Level	A Level	Total Marks
I	Introduction to Highway Engineering	CO1	03	02	04	00	06

Unit-1 Introduction to Highway Engineering

Total Marks = 6

Highway Engineering :

- It is define as to study different types of roads and to provide safe and smooth transportation for People and Vehicle.

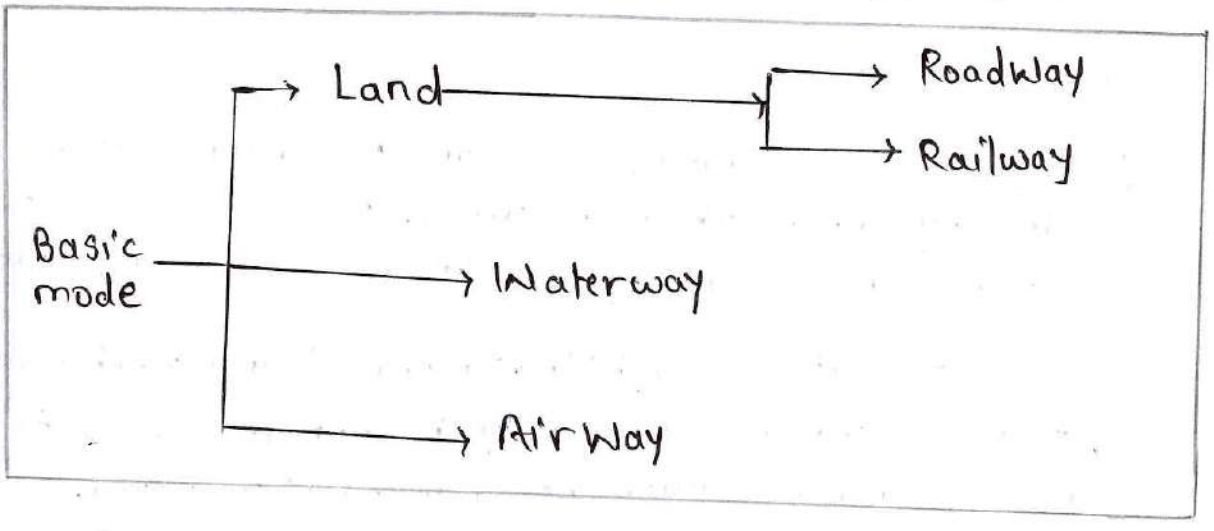
OR

- It is the branch of Civil Engineering that deals with the Planning, design, construction and maintenance of Roads and highways for smooth transportation purpose.

1.1. Different modes of Transportation

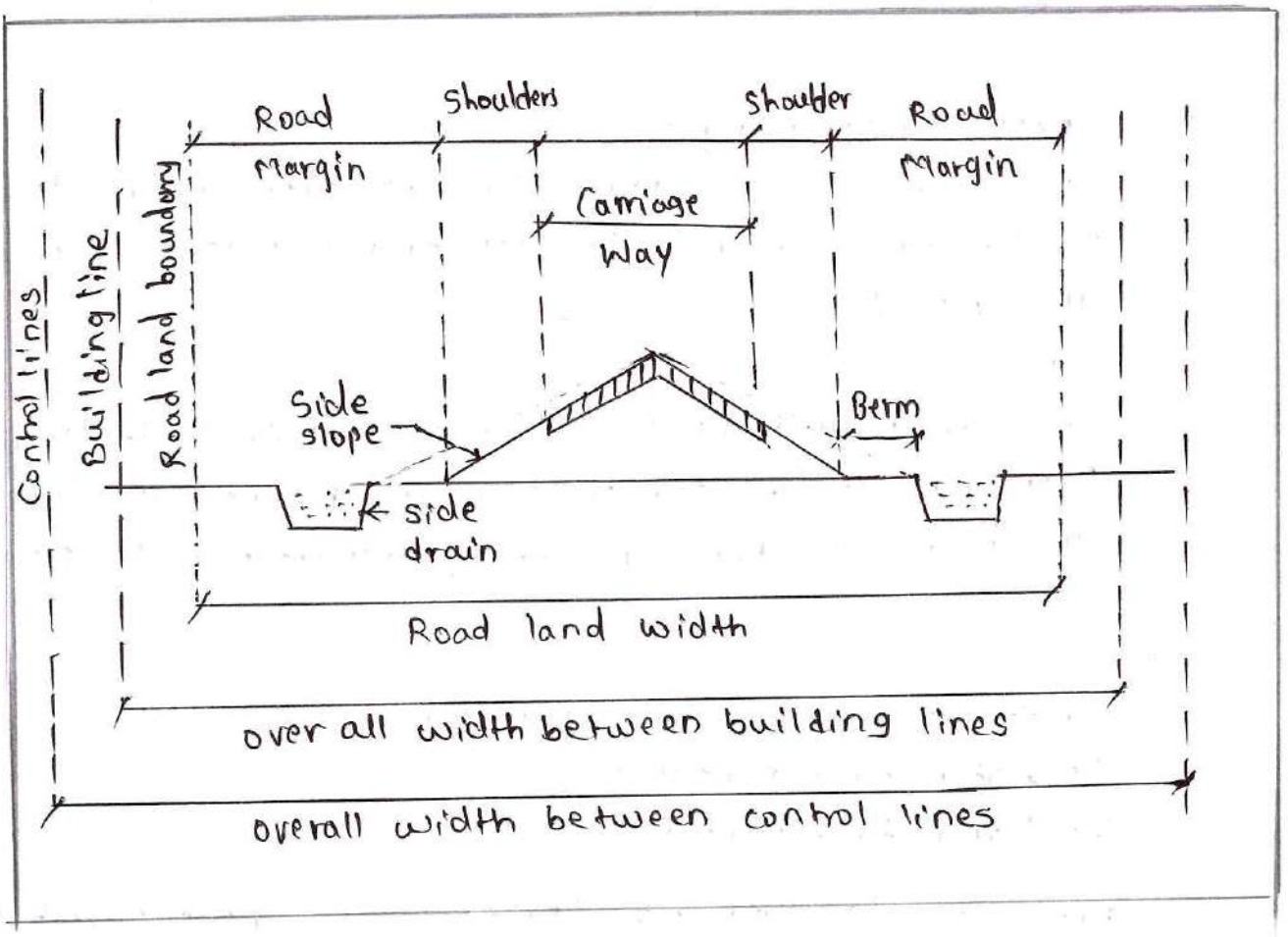
- Firstly Two modes of transportation
  i) Water transportation
  ii) Land transportation

After the development Three modes of transportation as follows:



1. Roadway :- Which is carried out on roads using different vehicles.
2. Railway :- Transportation through trains running on railway tracks.
3. Waterway :- Transportation using water bodies such as ships, boats, submarines etc. or through River, lakes, seas & oceans.
4. Airways : Through the air using Aircraft.

Cross section of Road Embankment



Characteristics / Importance of Road Transportation:

1. Door to Door Service:- Good and passengers can be Reach directly where they required. from one place to other there is no changing vehicle or mode transportation.
2. Flexible Routes:- vehicle can travel any routes according to need which where hilly road, narrow road there is no specilize equipment or material required.
3. Suitable for Short distance:- Suitable for local areas.
4. Fast and safe transportation:- For small or short distance which fast and safe.
5. Easy Available:- Roads are available to villages, towns and cities also.
6. Linking to mode of transportation:- It is link to rural to remote area and Roadway links to Railway, Airways.
7. Economical:- Due to low initial cost compare to other mode of transportation.

1.2 History of the Road development in India and agencies involved in this work.

History of Road development in India:

1. Ancient Period:- (3300 - 185 B.C.E) [Before Common Era]
   - From the Ancient time road construction were started. through Kings Rules were formed for connectivity to important Cities, trade centers, religious places.
   - That time like Harappa & Mohenjo-daro had well planned streets.

2. Medieval Period [Sher Shah Suri Period] (320 - 1857 C.E)
   - After Chandragupta Empire, Mughal Empire were started.
   - In 16th century, He constructed famous grand truck road connecting different parts of northen India.

3. British Period:- (1858 - 1947)
   - The British introduced modern road construction techniques In 1927, Jayakar committee was formed to study road development problems.

4. Post Independence Development: (1947 - Present)
   - India focured on expanding & improving road networks. Many plans were introduced for connectivity of rural and Urban areas.

Agencies involved in Road development in India

1. Ministry of Road Transport and Highways (MoRTH)
   - Responsible for planning, development & maintenance of national highways & Road transport Policies.

2. Indian Road Congress (IRC)
   - Prepared guidelines, standards and specification for construction and maintenance of India.

3. National Highways Authority of India (NHAI)
   - maintain & manage National Highway & Expressway.

4. Public Works Department (PWD)
   - for State highways and district Road maintain and manage.

5. Border Roads Organisation (BRO)
   - maintain & construct roads on Borders and hilly regions.

1.3. General classification of Roads.

- Classification Based on as follows:

1. Traffic Volume
   a) very heavy traffic Roads
   b) Heavy traffic Roads
   c) Medium traffic Roads
   d) Light traffic Roads.

2. Traffic Tonnage [How much load (in tonnes) a road carries due to traffic movement]
   a) Very heavy traffic roads
   b) Heavy traffic roads
   c) Medium traffic roads
   d) Light traffic roads.

3. Location & function. [Nagpur Road Plan]
   a) National Highway (NH)
   b) State Highway (SH)
   c) Major District Roads (MDR)
   d) other District Roads (ODR)
   e) Village Roads (VR)

4. Economy.
   a) Low cost Roads
   b) Medium cost Roads
   c) High cost Roads

5. Traffic Type

a) Pedestrian Ways

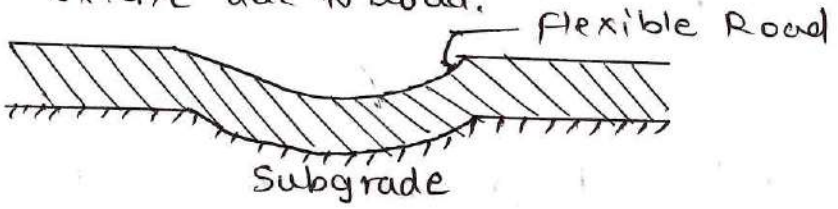
b) Cycle tracks

c) Motor ways.

6. Rigidity.

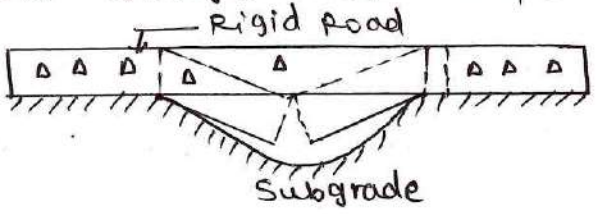
a) Flexible Roads

- The roads which can change shape for some extent due to load.



b) Rigid Roads

- cannot change there shape.



7. Topography

a) Plain area Road

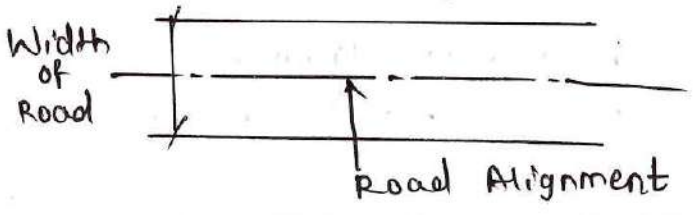
b) Hilly area Road

8. Material.

a) Earthen Roads
b) Gravel Roads
c) Moorum Roads
d) WBM Roads
e) Bituminous Roads
f) Concrete Roads

1.4. Alignment :

Road Alignment :- The Route along which centerline of Road Plan is known as Road Alignment.



Requirement of an Ideal Alignment of Road.

1. short - Provide shortest alignment between two points.
2. Easy - Easy alignment for construction & traffic operations.
3. Safe - Alignment safe for all types of traffic.
4. Economical - In case of construction, maintenance.
5. Alignment should be good for drainage condition.
6. obstacles - Avoid obstacles like bridges & tunnels.

Importance of Road Alignment:

1. The proper Road Alignment helps in safe and smooth traffic movement.
2. The alignment as possible straight for safety
3. Road alignment reduces construction cost & time.
4. It improves fuel efficiency & travel comfort.
5. By providing proper alignment it increases the life of the road.
6. It reduces road maintenance problems.
7. It supports better land use and planning.

Factors affecting Alignment of Road

1. Topography :- Due to Hilly, rolling terrains affects the road path.
2. Need of traffic :- As per need path changes.
3. obligatory points: straight alignment is there but in some distance there is crossing river, so that care alignment will change.
   - obligatory points → means obstructions.
4. Curves - Vertical curve so alignment designed.
5. Gradient - As per the gradient alignment will be provided but it should be flat.

6. Sight distance :- The alignment should finilized in such way that it will eanily observable and not formed restriction.

7. Earthwork :- Less cutting or filling ~~to~~ achieve for Proper alignment Selection.

8. Aesthetical Aspect :- Alignment pass through the natural beauty, to archieve alignment, in case there will obstruction then it will be changed.

Classification of Road According to Nagpur plan.

The Nagpur road plan classified in India as per location & function as follows:

1. National Highway (NH)

- National Highway are main highway of India linked to major ports, foreign highways, capitals of large states and large industrial and tourists centre.

Features :- Handles the works generally central goverment.
- Carry long distance traffic
- Important for trade.

functions :- Fast movement of goods and passengers.
- Increases National economic growth.

Location :- NH4, NH-6, NH9, NH50.

2. Major District Road (MDR)

There roads connects within districts for production areas and markets.

Features :- Medium traffic capacity
- Important for local economic activities.

functions :- Connect rural areas to towns.
-Transport agricultural products.

Location :- District Areas,
Forming belts.

3. State Highways (SH)

State highways are connects National highways of adjacent state, district head quaters and important cities.

Features:- Handles by state government.
- Connects National Highway with district roads.

Functions:- Improve transport inside the state.
- Support regional trade.

Location:- District headquaters,
Important cities,
Agricultural & Industrial regions.

4. Other District Roads (ODR)

Other district Roads are roads, serving rural areas and smaller villages.

Features:- Lower traffic Volume.
Basic road Infrastructure.

Functions:- connects villages to nearby markets & district roads.
Improve local transportation.

Location:- Rural areas, villages.

5. Village Roads (VR)

Village Roads are connecting villages or groups of villages with each other or nearby towns and Roads.

Features:- Small and narrow roads
single lane.

Functions:- Provide rural connectivity.
Provide daily movement of villagers.

Location:- Tribal and hilly areas.
- Agricultural Regions.

Afaq
19/05/26.

ASSIGNMENT QUESTIONS

(UNIT 1)

INTRODUCTION TO HIGHWAY ENGINEERING

1) Enlist the different modes of transportation.
2) Enlist the requirements for an ideal road alignment.
3) Classify the roads according to the Nagpur Road Plan.
4) Classify roads according to Location.
5) State any four factors affecting the alignment of a road in plain area.
6) Define alignment. State factors affecting selection of an alignment.
7) State four characteristics of Road transport.
8) State the importance of road transportation in overall development of a country.
9) Give the classification of road according to traffic.
10) State the modes of transportation and explain any one.
11) Define: (i) National Highway (ii) State Highway(iii) Major District Road
12) State factors affecting alignment of roads.
13) State and explain any two factors affecting road alignment.
14) Explain History of Road development in India.
15) Which Agencies Involved in Road development?