

Name

Ashfaq Hussain

ID

7854

Section

B

Semester

06

Subject

Highway and Traffic  
Engineering

Instructor

Dr. Eng'r Nadeem Anwar

Date

14.4.2020

①

Q No 1: Keeping in view different modes of Transportation Compare railways with Highways.

Ans Modes of Transportation

▷ Railways :-

- The transportation along the railways track could be advantageous by railways between the stations both for the passengers and goods, particularly for long distance.
- It depends upon the road transport i.e road could serve as a feeder system.
- Energy require to drag a unit load through unit distance by the railway is only  $\frac{1}{4}$  to  $\frac{1}{5}$  of that required by road.
- Safety (minimum crash rate if handled carefully else severe crash can occur)

②

## ▷ Highways :-

- It gives the maximum service to one and all.
- It gives maximum flexibility for travel with reference to route choice, direction, time and travelling speed.
- It provide door to door service
- Other modes are depend on it.
- It requires small investment for the government.
- Motor vehicles are cheaper than other carriers like rail engines
- It saves the time for short distance
- High degree of accident due to flexibility of movement.

(3)

Ques: You are a Transportation engineer. You have been tasked to conduct Office Study as a preliminary step for design of new highway. What reference material you will study and what data you will extract

Ans Phases of Design of new highway

- ▷ Office Study of existing information
- ▷ Reconnaissance Survey
- ▷ Preliminary location Survey
- ▷ Final location Survey

Office Study:-

The first phase in any highway location study is the examination of all available data of the area in which the road is to be constructed

We have data source like National departments, Provincial departments, transportation, agriculture, geology, and mining, existing engineering reports, Maps, Aerial photographs, Charts.

(4)

Area Characteristics covered in data Collection:

Engineering: including topography, geology, climate and traffic volume.

Social and demographic: including land use and zoning patterns.

Environmental: including types of wildlife, location of recreational, historic, and the possible effect of air, noise and water pollution.

Economic: including unit costs for construction and the trend of, agricultural, commercial and industrial activities.

▷ Preliminary analysis of data:

Will indicate whether any of the specific sites should be excluded from further consideration because of one or more of above characteristics.

⑤ At the completion of this phase of study, the engineer will be able to select general areas through which the highway can traverse.

Reconnaissance Survey: The object of this phase of the study is to identify several feasible routes, each within a band of a limited width of a few hundred feet.

Preliminary Location Survey: During this phase of the study, the positions of the feasible routes are set as closely as possible by:

- 1) Establishing all the control points.
- 2) Preliminary a vertical and horizontal alignments for each.

▷ Preliminary alignments are used to evaluate the economic and environmental feasibility of the alternative routes.

▷ Economic Evaluation: Economic evaluation of each alternative route is carried

(6)

Out to determine the future effect  
of investing the resources necessary  
to construct the highway.

▷ Factors considered in economic evaluation

- Road user costs
- Construction costs
- Maintenance costs
- Road user benefits
- Road user dis-benefits

▷ Environmental Evaluation

- Highway construction at any location has significant impact on surroundings
- A highway - an integral part of the local environment.

• Environmental include plant, animal and human communities and encompasses, social, physical, natural and man-made variables.

## Final Location Survey: ⑦

The final location survey is a detailed layout of the selected route.

- ▷ The horizontal and vertical alignment are determined, and the positions of structures and drainage channels are located.

The above which we discuss from this we can collect data from this and we can also know about the reference material of highway.

Q No 3 What is importance of vehicle performance in highway design?

Ans Acceleration and deceleration rates of vehicles are often critical parameters in determining highway design.

- ▷ These rates often govern the dimensions of such design features:



⑧

- Free way ramps
- Climbing or passing lanes
- Turnout bays for buses.
- Acceleration and deceleration lanes
- Highway alignment
- Determine the need for truck climbing lanes.

Q No 4. Write short note on Directional distribution in design of highways?

Ans Directional Distribution:

- ▷ Highways must be designed to adequately serve the peak-hour traffic volume in the peak direction of flow.
- ▷ Total hourly traffic in both directions is used to design two-lane roads.
- ▷ In the design of highways with

(9)

more than two lanes and on two lane roads where important intersections are encountered or where additional lanes are to be provided later, knowledge of the hourly traffic volume for each direction of travel is essential

Directional traffic is used for multilane roads and streets.

▷ Typically, one direction contributes by 55-70% in total traffic, although occasionally 80% is observed.

▷ Directional Distribution - Directional Design Hourly Volumes

DDHV - ADTs are converted to a peak-hour volume in the peak direction of flow

$$DDHV = AADT \times k (\text{Peakhr}) \times D (\text{Peakdir-flow})$$

▷  $k$  = Proportion of daily traffic occurring during peak hour.

▷  $D$  = Proportion of peak hour traffic travelling in peak direction of flow

(10)

Example:

Consider a rural road with a design volume of 4,000 vehicles per hour (vph) for both directions of travel combined.

▷ If during the design hour, the directional distribution is equally split or 2,000 vph in one direction, two lanes in each direction may be adequate.

▷ If 80 percent of the DTV is in one direction, at least three lanes in each direction would be needed for 3,200 vph.

Q Nos Explain broad classification of surface distress modes

Ans Surface distress modes can be broadly classified into the following three groups:

• Fracture:

This could be in the form of cracking or breaking, generally, due to excessive loading, fatigue, thermal changes.

(11)

Distortion:

This is in the form of deformation, which can result from such things as excessive loading, densification, consolidation or subgrade issues.

Disintegration:

This is in the form of stripping or raveling or removal of paving materials, which can result from such things as loss of bonding, chemical reactivity, traffic abrasion, aggregate degradation or binder aging.

Q No 6 Explain Alligator cracking, block cracking, Longitudinal Cracking and Transverse Cracking.

Ans Alligator Cracking :-

▷ Alligator cracking may be considered a combination of fatigue and block cracking.

▷ It is a series of interconnected cracks of various stages of development.

(12)

▷ Alligator cracking develops into a many-sided pattern that resembles chiken wire or alligator skin.

▷ Occurs in areas subjected to repeated traffic loadings.

### Block Cracking :-

• A pattern of cracks that divides the pavement into approximately rectangular pieces, with sides generally longer than one foot.

• Rectangular blocks range in size from approximately  $0.1m^2$  to  $10m^2$

• Possible cause: shrinkage of asphalt

### Longitudinal Cracking :-

Cracks predominantly parallel to pavement centerline. Location within the lane is significant.

(13)

Possible Causes:

Expansion and contraction of pavement material, road bed settlement, poorly constructed paving joints.

Causes:

Subsoil settlement

Fixes

- Crack Sealing
- Full depth replacement
- Subsurface stabilization

Transverse Cracking :-

Cracking across the centerline, not due to reflection cracking.

Possible Causes:

Expansion and contraction of pavement material, road bed settlement, poorly constructed paving joints.

(14)

Causes :

- Slab longer than required.
- Excessive thermal stresses.

Fixes :

Crack Sealing

- Full depth rigid repair
- Dowel bar retrofit.