## Definition of highway engineering

**:** a branch of civil engineering dealing with the planning, location, design, construction, and maintenance of highways and with the regulations and control devices employed in highway traffic operations

**1.2.** **Factors Affecting Transportation**

• The preferred transportation system according to the passenger and load situation to be carried; depends on factors such as capacity, speed, economy, safety, resource etc.

• The effects of natural conditions and landforms

• Climate conditions

• Economic Conditions

**1.3 The following criteria should be taken into account in the selection of modes of transport**

• Volume / capacity ratios

• Number of passengers carried in different modes of transport

• Average journey times

• Transfer forms and numbers

• Interpersonal passenger shifts

• Operating characteristics (speed, punctuality, frequency, safety, etc.)

• Comfort and system standards

Figure1.3. Transportation modes.

 Table Advantage and Disadvantage Different Modes of Transport

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Security | speed | volume | Cost | Intermodal capability |  |
| Road and Highway | Media | High | Low | Low |  |  |
| Rail | High | Media | High | Media |  |  |
| Water | High | Low | Very High | Low |  |  |
| Air | Very High | Very High | Low | High |  |  |
| Pipeline |  | slow |  | Low | Very low |  |
| Multimodal | Media | High | Media | Media |  |  |

**Rail Transport:**

**Advantages of Rail transport:**

It is a convenient mode of transport for travelling long

distances.

It is relatively faster than road transport.

It is suitable for carrying heavy goods in large quantities over

long distances.

Its operation is less affected by adverse weathers conditions

like rain, floods, fog, etc.

**Limitations of Railway transport:**

It is relatively expensive for carrying goods and passengers

over short distances.

It is not available in remote parts of the country.

It provides service according to fixed time schedule and is not

flexible for loading or unloading of goods at any place.

It involves heavy losses of life as well as goods in case of accident.

Road Transport

**Advantages**

It is a relatively cheaper mode of transport as compared to

other modes.

Perishable goods can be transported at a faster speed by road

carriers over a short distance.

It is a flexible mode of transport as loading and unloading is

possible at any destination. It provides door-to-door service.

It helps people to travel and carry goods from one place to

another, in places which are not connected by other means of

transport like hilly areas.

**Limitations of Road transport**

Due to limited carrying capacity road transport is not

economical for long distance transportation of goods.

Transportation of heavy goods or goods in bulk by road involves high cost.

**Water Transport**

**Advantages:**

It is a relatively economical mode of transport for bulky and heavy

goods.

It is a safe mode of transport with respect to occurrence of accidents.

The cost of maintaining and constructing routes is very low most of

them are naturally made.

It promotes international trade.

**Disadvantages:**

The depth and navigability of rivers and canals vary and thus, affect

operations of different transport vessels.

It is a slow moving mode of transport and therefore not suitable for

transport of perishable goods.

It is adversely affected by weather conditions.

Sea transport requires large investment on ships and their maintenance.

**Air Transport:**

**Advantages:**

It is the fastest mode of transport.

It is very useful in transporting goods and passengers to the

area, which are not accessible by any other means.

It is the most convenient mode of transport during natural

calamities.

It provides vital support to the national security and defence

**Disadvantages:**

It is relatively more expensive mode of transport.

It is not suitable for transporting heavy and bulky

goods.

It is affected by adverse weather conditions.

It is not suitable for short distance travel.

In case of accidents, it results in heavy losses of goods, property and life.

Road Transport Advantages

1. Less Capital Outlay

2. Door to Door Service

 3. Service in Rural Areas

4. Flexible Service

5. Suitable for Short Distance

6. Lesser Risk of Damage in Transit

7. Saving in Packing Cost

8. Rapid Speed

9. Less Cost

Disadvantages

1. Seasonal Nature 2. Accidents and Breakdowns 3. Unsuitable for Long Distance and Bulky Traffic 4. Slow Speed 5. Lack of Organisation

1.2. Road Transport

A large part of the passenger and cargo transportation is carried by land. The reason is that roads can reach to the most remote places and transportation can be made faster. 92% of the freight transport and 95% of the passenger transport is provided by road (Figure 1.4).

**1.2.1. Advantages of Highway Transportation**

• Easy and Flexible: Door-to-door system. The transportation network is unlimited under appropriate geographical conditions.

• It provides ease of passage from high slopes (such as village roads).

• Establishes infrastructure for other transport systems.

• It is economical in transportation in short distances compared to other transportation systems.

• Terminal requirements are usually small.

• Vehicle planning and easy to find, frequent trips

• Transportation in very different volumes.

**1.1.1. Disadvantages of Highway Transportation**

• It is the transportation system where the accidents are the most.

• Continuous maintenance is required.

• There is external dependence on asphalt road construction.

• Dependent on fuel consumption.

• Not environmentally friendly.

• It is more costly than railways in long-distance transportation.

• High transport costs (especially over long distances)

• Low amount of freight transported at once

• Weight restrictions

• Bad weather conditions

1.4. Railway Transportation

The first railway line in our country was established in 1856 between the British and İzmir-Aydın. The city suburb of the city was built between Izmir and Buca. In the first years of the Republic, the construction of the railway has been emphasized. However, after 1950, the construction of the railway has never been made and the road has been weighted. The current railway length in our country is 10000 km.

There are differences between the transportation systems in terms of travel speed, walking to the station, waiting at the stop, reaching the desired point after getting off the vehicle. In this regard, automobile systems save time in any case. On the other hand, over long distances, metro systems are more advantageous.

1.4.1 Advantages of Railway Transportation

• Land use by road is approximately three times less.

• It is more suitable for mass transportation than highway.

• Environmentally friendly compared to highways in terms of environmental pollution (exhaust gas, noise pollution).

• The construction cost is approximately 2.5 times cheaper on the flat terrain, approximately 1.5 times cheaper on the medium rough terrain.

• It is a transportation system that can use electricity. It is not dependent on oil.

• Carrying capacity is 3 times higher. It is extremely advantageous in terms of the load it carries in bulk cargo and container transportation according to the road at once. When a load train has an average capacity of 1,100 tons, a load train between two points means that there are less than 110 TIRs of traffic with a capacity of 10 tons.

• It is safer than traffic on highways.

• Saves energy.

• Strengthens tourism activities.

• In terms of speed, the railway is the fastest means of transport after the flight.

1.4.2. Disadvantages of Railway Transportation

• It is difficult to change after construction.

• It is difficult to reach every desired point. Road support is needed.

• Short-distance transportation costs more than road transport.

1.5. Waterway Transportation

Maritime transport is an economic transportation such as railway transportation. The most widely used mode of transportation in the world trade is the sea route. In our country, which has a coastline of 8333 km, our share in the world marine trade fleet is 1%. However, with the development of industry and trade in recent years, there has been an increase of 8 - 10 times in the downloaded- superimposed load in our ports. In recent years, the share of our maritime trade fleet has reached 30%. Istanbul and Izmir ports have developed in most of our ports. In order to develop a port, the connection to the inner regions (Hinterland) must be good.

In recent years, transportation is also possible with dam lakes and rivers. In the North American continent, Three Lakes Region, Van Lake, Keban Dam Lake, Rivers in Northern Scandinavian Countries, Nile River, Danube River, Don and Volga Rivers are examples of other water transportation.

1.5.1. Advantages of Waterway Transportation

• The lowest cost transport model. Passenger and freight transport by sea is cheaper than land and air.

• It is used to transport low value (especially raw material) products where speed factor is not very important.

• A large number of passengers and thousands of tons of loads can be transported together at very long distances. A large amount of dry cargo, liquid and gas are transported by sea.

• There is no road construction and maintenance costs in maritime transport.

1.5.2. Disadvantages of Waterway Transportation

• Sea transportation is less preferred

Geri bildirim gönder

Geçmiş

Kaydedilenler

Topluluk

1.6. Air Transportation

1.6.1. Advantages of Air Transportation

• It is faster than other types of transportation.

• It is the most efficient way for light cargoes to reach their addresses on long distances.

• High safety level in handling and handling.

1.6.2. Disadvantages of Air Transportation

• High cost of transportation. Since all destinations are not available

    Short distances are not economical.

• Airports can be built on certain areas.

• Small volume transports can be made.

• It is affected by weather conditions.

1.7. Pipeline Transportation

• It is the most efficient and reliable transportation system for the transport of liquids and natural gas.

• According to sea and air transport, transport of fuel fluids is safer and more economical.

1.7.1. Disadvantages of Pipeline Transportation

As in the railroad, the first investment cost is high in this type of transportation.

**The path should be determined by considering:**

* **Should not pass where ice accumulates**
* **Should not pass where flood potential is high**
* **Should not pass where soil slope failure will occur**
* **Keep far from the earthquake zones**
* **Should not pass where ice accumulates**
* **geometric and physical standards of the road should be suitable for the safe course of traffic.**
* **Low construction and maintenance costs**
* **Environmental needs and capacity,**

 

Ditch

Banket

lane

Banket

Banket

Fill slope

Figure2.1. Devided lane

Traffic is the state and movement of pedestrians, animals and vehicles on highways.

Table 2.1. Design (Project) speeds-path geometric class****

**6.1. Road Geometric Standards**

Geometric standards for a road (Tables 6.1 and 6.2.):

• Platform width (width of strip and banquet)

• Minimum horizontal and vertical curves

• Maximum longitudinal and transverse slopes

• Expropriation width

6.2. Parameters that are effective in the selection of geometric standards

• Project Speed

• Topography of the land

• Ground condition of the route

• Traffic Safety

• Climate conditions

• Road Capacity

• Vehicle Composition in Traffic

• Road Class (Service Level)

• Traffic Safety

• Financial Opportunities

**Table 6.1.** Köy yolu geometrik standartları

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Service level (A,B,C) | A | B | C | A | B | C |
| Average annual traffic | 200 | 200 | 200 |  |
| Topographic structure | Düz | Dalgalı | Dağlık | Düz | Dalgalı | Dağlık |
| Project speed (Km./Sa.) | 80 | 70 | 70 | 60 | 50 | 70 | 70 | 60 | 60 | 50 | 50 | 30 |
| Minimum curve R (m) | 250 | 200 | 200 | 120 | 80 | 50 | 200 | 120 | 120 | 80 | 50 | 30 |
| Maksimum Vertical slope (%) | 6 | 6 | 8 | 8 | 9 | 8 | 7 | 7 | 10 | 10 | 12 | 12 |
| Superelevation, (%) | 8 | 8 | 8 | 8 | 9 | 8 | 8 | 8 | 8 | 9 | 10 | 10 |
| Şerit Genişliği (m) | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Banket Genişliği (m) | 1.00 | 1.00 | 1.00 | 1.00 | 0.50 | 1.00 | 1.00 | 1.00 | 0.50 | 0.50 | 0.50 | 0.50 |
| Platform Genişliği (m) | 9.00 | 9.00 | 9.00 | 9.00 | 8.00 | 9.00 | 8.00 | 8.00 | 7.00 | 7.00 | 7.00 | 7.00 |

**Table 6.2.** Örnek karayolu geometrik standartları.

