



आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश
IFTM University, Moradabad, Uttar Pradesh
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ROAD TRANSPORT

DEVELOPMENT AND CLASSIFICATION



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INTRODUCTION

Road transport means transportation of goods and people from one place to the other on roads. Road can be called a route between two destinations, which has been paved to enable transportation by way of motorized and non-motorized carriages. There can be many advantages of road transport in comparison to other modes of transport. The capital required in road transport is very less compared to other means of transport such as railways and airways. The cost of construction and maintenance roads is cheaper than that of the railways or airways.

DESCRIPTION

Road transport is a easy medium of transporting either goods or people. One of the major advantages of road transport is that it enables door-to-door delivery of goods and materials and can provide a very economical means of loading and unloading. Sometimes road transport can be the only way for carrying goods and people to and from rural areas which cannot be accessed by rail, water or air transport. Connectivity between cities, towns and small villages is possible only by road transport. However, road transport has some major disadvantages. For example, there are more chances of accidents and incidents in case of road transport. So, motorized transport is not as safe as other means of transport. Road transport is can be quite irregular and undependable. Flow rates for road transport are also unstable, while the speed in road transport is slow and limited, which is a major limitation. Transportation of heavy goods over long distances is also costly. In today's scenario, road transport have serious negative impact on the environment. Construction materials like tar, concrete used in building roads harms the associated environment. Since roads provide platform for motorized vehicles who emits various air pollutants that have an adverse respiratory health effects and a serious threat to global warming.

HISTORY OF HIGHWAY DEVELOPMENT

The history of highway engineering gives an idea about how roads have evolved from ancient times to modern times. Romans are considered as pioneers in road construction. Roads in Rome were constructed on large scale to help them in military operations. In this article we will see how roads were developed through various civilizations till modern day.

ANCIENT ROADS

The first mode of transport was by foot. These pathways would have been made for purposes like camping, for food, streams for drinking water etc. The next major development in mode of transport was the use of animals for transportation of people and goods. Since animals require more clearways, the concept of path on ground came into existence. When the wheel was invented in Mesopotamian civilization, animal drawn vehicles were used. So, the need for roads with harder surface emerged as it would be capable of carrying heavy loads. For adequate strength to carry the wheels, a path would have been made on either side of the road. Hence, the concept of foot path emerged. Traces of such hard roads can be seen in various ancient civilizations dated as old as 3500 BC. The first authentic record of construction of road was found from the Assyrian empire about 1900 BC.

ROMAN ROADS

Romans started a large scale road construction spreading out in various directions from Rome. This was a remarkable achievement as it provided connectivity across Europe, Asia, and North Africa. Roman roads included good drainage, durable material and fine workmanship. Their roads were very durable, and some are still existing. They constructed roads on a firm ground and sub-grade. Longitudinal drains were provided on both sides. They constructed an agger which was a raised formation up to a 1 meter high and 15 m wide. Materials used in the agger were excavated during the longitudinal drain construction. Sand was used as a base course. The agger contributed greatly to moisture control in the pavement. The pavement structure on the top of the agger varied greatly. Then, a surface course of large hexagonal flag stones was provided. Romans built straight roads in spite of variation in gradient and used heavy foundation stones at the bottom. A mixture of lime and volcanic puzzolana to make mortar is also seen in Roman roads and they added gravel to this mortar to make concrete. Thus concrete can be said as a major innovation in Roman road making.

FRENCH ROADS

The next breakthrough in the road construction came during the time of Napoleon. The significant pioneer was Tresaguet in 1764. He invented a cheaper way of construction in comparison with Roman road construction. 200 mm pieces of quarried stone in compact form

were used and shaped one flat side was placed on a compact formation in the pavement. Spaces between larger stones were filled with compacted smaller pieces of broken stones to provide a level surface. Top layer consisted of 25 mm sized broken stone. This structure was kept in excavated ditch to keep pavement surface in level with ground. But due to this drainage problem occurred which was resolved by making the surface as impervious as possible and deep side trenches were provided. Roads were divided into sections between villages such that an entire road section could be maintained men living nearby.

BRITISH ROADS

The first scientific road construction method was developed by the British engineer John Macadam. Macadam gave importance to the stone size used in road. He replaced large stone blocks with 250 mm layers of well compacted broken angular stones that would provide a better strength and stiffness. Thus an economical method of road construction was introduced in British reign.

The individual stone pieces were mechanically interlocked which in turn provided strength and stiffness to the road, but the inter particle friction that eroded the sharp interlocking faces was countered by introducing good quality finer material to produce a well-graded mix. Such mixes also proved less permeable and easier to be compacted.

MODERN ROADS

The modern road construction was based on Macadam method. Bituminous and concrete were introduced as primary construction materials for roads. After 1960, inventions of new and fast equipments related to construction were developed which in turn road construction. Due to fast and cheap means of transportation, materials required for road construction were available readily. Hence, the factor contribute for making roads economical and pavements durable.

NAGPUR ROAD PLAN

After second World War road traffic increased rapidly by size and quality and hence need for greater length of roads and their maintenance were required. A conference of chief engineers of provinces at Nagpur was held in 1943. This conference is known as the Nagpur plan.

- A twenty year programme was developed between 1943-1963. It was an attempt to develop a well planned co-ordinated road development programme.
- 2 lakh kms of road was planned to be constructed across the country in a span of 20 years.
- A recommendation of the construction of star and grid pattern of roads throughout the country was given.
- An objective of this plan was that the road length should be increased to the density of 16 kms per 100 sq. km.

BOMBAY ROAD PLAN

Nagpur road plan was quite a success, but the planning of road system lacked many aspects. After independence, the economic, industrial and agricultural scenario of India changed so a review of the Nagpur plan was needed. A 20-year plan was drafted by the Roads wing of Government of India, which is popularly known as the Bombay plan.

The points highlighted in this plan were:

- It was the second 20 year road plan (1961-1981)
- A target of 10 lakh kms of road was planned to be constructed across the country in a span of 20 years.
- Rural roads were given importance and new scientific methods of construction were to be used in the construction of rural roads.
- State PWD's were directed to give necessary technical advice to the Panchayaths.
- An objective of this plan was that the road length should be increased to the density of 32 kms per 100 sq. km.
- Expressways of 1600 km were to be constructed in this plan.

JAYAKAR COMMITTEE

For betterment roads and swift movement of motorized transport carrying heavy loads and people, the Government of India appointed a committee called Road development committee under Mr. M.R. Jayakar as the chairman. This committee was known as Jayakar committee.

This committee was appointed in 1927 for reviewing Indian road development.

The salient features of this committee were:

- Central government should be responsible for the road development in India as length of the roads to be constructed and maintained were beyond the capacity of state governments.
- Long terms plans were needed for the road development i.e., for 20 years and a watch should be kept for these 20 years for the implementation of these plans.
- Committee recommended road conferences to be held at regular intervals for the discussion about road construction and development. This lead the way for establishment of a body called Indian Road Congress (IRC) in 1934 which will be responsible for road developments in India.
- A development fund called Central road fund in 1929 was introduced by the recommendation of the committee. Several taxes like Vehicle tax, license fees were introduced. This fund was to be used for road development.
- Central Road Research Institute (CRRI) founded in 1950 was the result of recommendation of this committee. It was a dedicated research organization which carried out research and development work related to roads.

CLASSIFICATION OF ROADS

1. Based on the materials used in the construction of the road -

EARTHEN ROADS

These roads are temporary roads laid with the available soil. These are the cheapest roads among all the roads. A very low volume traffic can pass through these roads. These roads can be used for moving constructing vehicles while building a structure or for moving army vehicles during war times.

GRAVEL ROADS

Gravel roads are constructed by the mixture of gravel and available soil. This mixture is then well compacted. They are also very cheap roads bur costlier than earthen roads. These types of roads are built easily and generally used in rural areas.

KANKAR ROADS

Kankar is an Indian word meaning an Impure form of Limestone. These roads constructed where sufficient quantity of lime is present. Kankar road is one of the low-quality roads but better than Earthen roads and gravel roads.

WATER BOUND MACADAM ROADS [WBM]

These roads are also called WBM road and are generally laid in rural areas having low volume and light traffic. WBM roads are constructed in layers. Aggregates or crushed stones are spread in layers with top layer of aggregate having 10 cm thickness. Then water is sprinkled on each layer and rolled for a smooth finish.

BITUMINOUS ROADS

The bitumen can be called binding or adhesive material that is obtained during the distillation of petrol. Bituminous roads are most commonly used roads all over the world because they are easy to construct and provides smooth and good surface finish. Sub- base and base and course constitute of course and fine aggregates respectively. Then bitumen is spread as top layers and well compacted by rolling.

CONCRETE ROADS

The main composition of concrete roads is a mixture of cement and aggregates. These roads are costlier than all other roads. These roads are constructed for the high volume and heavy traffic. Time required for the construction of concrete roads is quite long as the concrete requires proper curing. The average life of a concrete road is 40 years whereas bituminous road has an average life of 3 years.

2. Based on Nagpur plan -

NATIONAL HIGHWAYS

National highways as the name suggests run in whole country. They connect state capital cities to the national capital cities. A minimum of two lanes are provided in national highways, one for each direction and these two lanes are divided by a strip of boulders.

They are usually denoted by the nomenclature like NH1, NH24.

STATE HIGHWAYS

Important cities within the state are connected to the state capital city with the help of state highways. State highways lead to the connection with National highways and also connect to the state highways of the neighbouring states.

A minimum of two lanes are provided but they may or may not be divided with a strip of boulders.

DISTRICT ROADS

District roads lead to the connection with State highways of a state. District roads connect the important towns and cities of the district and they are also connected with the neighbouring district roads.

There are two different types of district roads

Major District roads (MDR): These roads connect to the neighbouring district headquarters.

Other District roads (ODR): These roads connect the important towns and places within the district to the district headquarters.

VILLAGE OR RURAL ROADS

These roads run in rural or village areas. These roads connect the nearest town and also connect the important areas of villages like temples, market, etc. Village roads are connected to the neighbouring villages.

3. Based on Carriageway -

PAVED ROADS:

The roads are constructed with a hard pavement (both flexible and rigid) course. Some examples of paved roads are Cement concrete road, Bituminous road, WBM road.

UNPAVED ROADS:

The roads are not constructed with a hard pavement but from gravel and available soil. Some examples of unpaved roads are Kankar road, Earthen road.

4. **Based in rigidity –**

FLEXIBLE ROADS

The flexible road has four layers. A sub-base, base and sub-grade course are the underlying layers in flexible roads. The outermost surface layer is use bitumen as a construction material and all these layers make the road flexible. Maintenance of these roads are easy but require periodically otherwise it can disintegrate easily with heavy traffic.

All roads except cement concrete roads are flexible roads.

RIGID ROADS

These roads are composed of only three layers i.e., Surface course, Base and Sub-base course which makes road non-flexible. Cement concrete road is an example of rigid road.

5. **Based on the Volume of traffic -**

LOW TRAFFIC ROADS

The roads carrying less than 400 vehicles on an average per day are called low traffic roads. Examples of these roads are Village roads or rural roads.

MEDIUM TRAFFIC ROADS

The roads carrying 400 to 1000 vehicles on an average per day are called Medium traffic roads. Examples of these roads are District roads.

HIGH TRAFFIC ROADS

The roads carrying more than 1000 vehicles on an average per day are called High traffic roads. Examples of these roads are National highways and State highways.

6. **Based on the economy-**

LOW-COST ROADS

These roads require less capital and can be constructed with the available local soil or locally available materials. These roads are used for low volume of traffic. Some examples of low-cost roads are Kankar road, Earthen road.

MEDIUM COST ROADS:

The capital required constructing medium-cost roads is higher than that of low-cost roads. Road to travel from village to nearest town is one of the examples of medium-cost roads. Normally low volume of traffic is present in these roads but they can be used for occasionally high traffic volume. These roads are generally constructed using bitumen. Other district road is an example of medium cost road.

HIGH-COST ROADS

The construction of these roads involve huge amount of money can be of made of Bitumen or Cement concrete. Example of high-cost roads are State Highways and National highways. They are used for high volume of traffic.

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