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UNIT 3

Types of civil engineering structures

There are many Civil Engineering structures, few of the structures areas follow:

1. Buildings
2. Bridges
3. Tunnels
4. Railways
5. Ports and harbour
6. Airports
7. Dams
8. Water supply systems
9. Water tanks

1. Building

- Building is any structure which comprises of foundation ,plinth ,walls ,floor and roofs.

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Buildings may be classified on different parameters like Occupancy, load transfer, material used ,degree of fire resistance etc.NBC classifies buildings in the following nine groups:

1. **GROUP A- Residential Buildings** –includes lodgings, hotels, flats, bungalows, villas, cottages, houses, motels etc.
2. **GROUP B- Educational buildings** includes schools, colleges and other educational buildings.
3. **GROUP C- Institutional buildings** –includes hospitals Sanatoria, Penal mental institutes, custodian institutions.
4. **GROUP D- Assembly buildings -** includes theatres, cinema halls, auditorium, assembly halls, places of worship,
5. **GROUP E- Business Buildings –** includes banks, offices, courthouses etc**.**
6. **GROUP F- Mercentile Buildings-** includes shops ,stores ,markets,
7. **GROUP G- Industrial Buildings-** includes gas plants, assembly plants, power plants, refineries, laundries etc.
8. **GROUP H- Storage Buildings- includes cold storages, ware houses, godowns, stables of animals, garages etc**
9. **GROUP J- Hazardous Buildings-** includes industries producing fireworks, synthetic leather, ammunitions etc. Buildings used for storage &manufacturing of hazardous materials.

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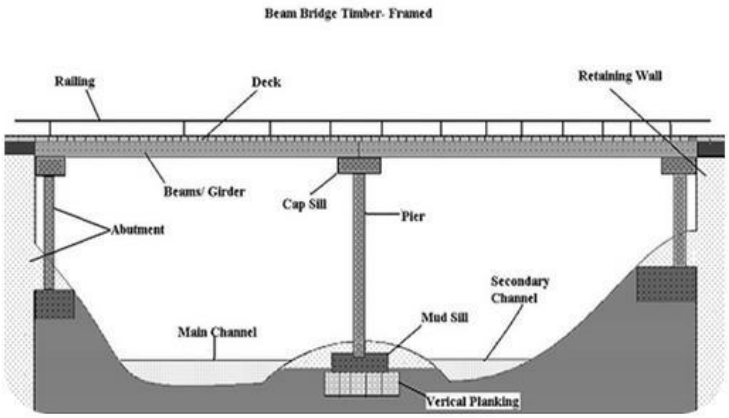
2. BRIDGES : A **bridge** is a structure built to span a physical obstacle (such as a body of water, valley, road, or rail) without blocking the way underneath. It is constructed for the purpose of providing passage over the obstacle.

COMPONENTS OF BRIDGE

•Deck
•Abutment
•Piers
•Bearing



Importance of bridges

1. Bridges serve as the most useful link on the land connecting towns and cities. It is the vital part of the development of a county since these enable transporting of materials from area to another.
2. Bridges connect full country with network of roads and railways connections maintaining uniform flow of people ,goods and other essential commodities.
3. To provide more socio-economic benefits to people.
4. They help the military in moving their troops and vehicles during hospitality or war emergencies.

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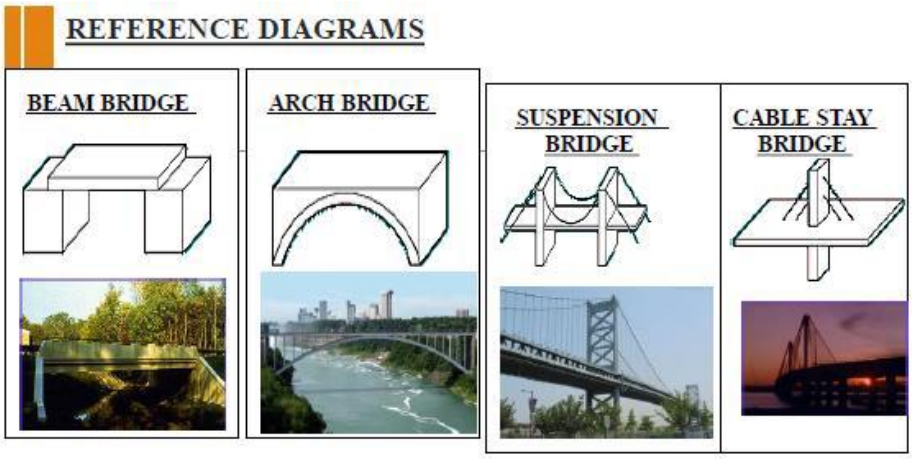
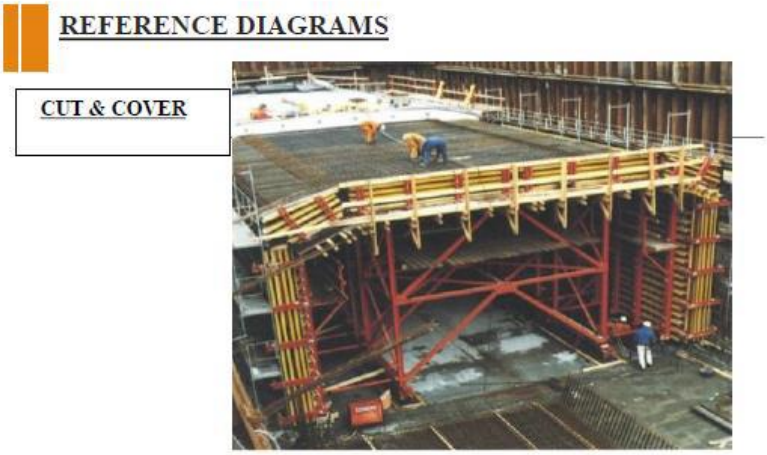


3. TUNNELS

A tunnel is an underground passageway, dug through the surrounding soil/earth/rock and enclosed except for entrance and exit, commonly at each end.



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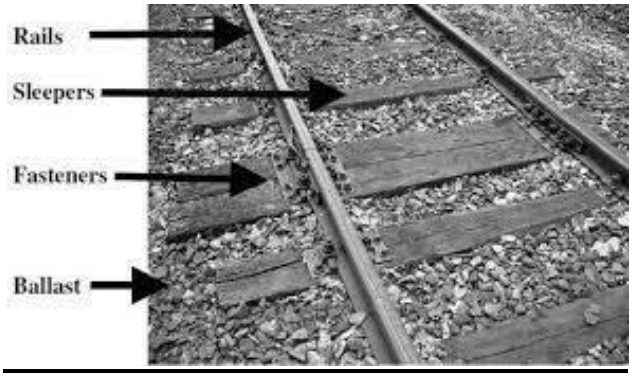
Importance of tunnels

1. If technically feasible tunnels are best options to cross a water body, mountains, existing roads, junctions, railways and other obstacles.
2. Tunnels are the most expensive part of road infrastructure but in some cases they are necessary to overcome some obstacles where other solutions cannot be applied.
3. Minimizing potential environmental impact due to traffic congestion and congestion due to pedestrian movement.
4. It reduces impact of air quality and noise pollution as it is covered.
5. It minimizes visual intrusion and land acquisition not required.
6. Tunnels are adopted to protect areas of special cultural and historical importance.
7. Tunnels can be adopted to avoid impact on natural habitats.

4. RAILWAY

Rail transport is a means of transferring passengers and goods on wheeled vehicles running on rails, which are located on tracks.

Components of railway



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IMPORTANCE OF RAILWAYS

1. The railways are the biggest undertaking in the world, they employ many people and carry out big turnover.
2. Railways are the cheapest mode of transportation compared to other modes.
3. Railways alone can carry a lot of people quickly and safely through big towns and cities.
4. It helps in reliving some traffic congestion in cities which increases the mobility of people.
5. It stabilizes the prices due to easy, speedy and efficient mobility of products and natural resources.
6. Helps in migrating population on a mss scale.
7. Broadening the social outlook of the masses as they can visit different places in the country.

TYPICAL USES OF RAILWAY

1. Railway is the cheapest mode of transportation

2. Trains are capable of hauling large loads. Trains can handle high volume of freight. This can be very beneficial for shippers with large loads.

3. Railways have standardized transit schedules and don't share their tracks with public like trucks do with the roads. For that reason trains are not hindered by traffic.

4. Shipping via railway in more environmental friendly. Trains burn less fuel per ton mile then trucks. Using rail transport over road transport can reduce the emissions of greenhouse gasses by 75%.

5. Railways contribute to social vibrancy and economic competitiveness by transporting multitudes of customers and workers to city centres and inner locations.

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5.PORTS AND HARBOURS :A harbour is a sheltered body of water where ships, boats, and barges can be docked. A port is is a man-made facility built for loading and unloading vessels and dropping off and picking up passengers. Ports usually include one or more harbours.

IMPORTANCE OF PORTS AND HARBOURS

1. Water transportation plays an important role in making cultural relations and growth of a civilization.
2. Harbours assists and provides a powerful means of defence in the emergency of national security.
3. Water way is the cheapest mode of communication because road and rail transport will require special tracks and surfaces before they are used. But natural water ways in nature's gift.
4. Due to increased construction of harbours in the country, foreign goods like medicines and machinery can be used by the people.
5. Harbours have helped in the industrialization and economic progress of many countries like UK, USA, Belgium, France etc
6. Due to connecting harbours in water ways, countries separated by oceans have come closer due to which there is increase in economic activities.
7. Ports provide terminal facilities to passengers and travellers in the ship landing at the harbour.
8. Under any emergency situation port facilities like communication with the country, advanced culture, trade and industries appear to give more advantages to people.
9. Ports also provide shelters to ships along with ship servicing centres all seasons of the year.

Typical Uses of ports and harbours

1. Ports provide protection facilities for the ships from wind and waves, break waters are used to protect the basins.
2. Entrance facilities, guiding facilities, locking facilities, docking and turning facilities are provided at the ports.
3. Cranes are provided on the ports to help loading and unloading of goods n the harbour.
4. Good storage facilities are also provided along with its checking, entry and destination dispatching.

5. Quarantine inspection facilities i.e the passengers coming abroad are checked medically before they enter into the country.
6. Harbours are specially used to allow the ships coming from long distances to rest or land at a site and fill their necessary travel goods or unload the goods to be exported.

6. AIRPORTS

An airport is an aerodrome with extended facilities, mostly for commercial air transport.
It is the location where aeroplanes take off and land.

BASIC COMPONENTS

1. Runway
2. Control Towers
3. Helipads
4. Hangers
5. Terminal Buildings

1. Runway

Runway is a paved land strip on which landing and takeoff operations of aircrafts takes place. It is in levelled position without any obstructions on it. The number of runways for an airport is depends upon the traffic.

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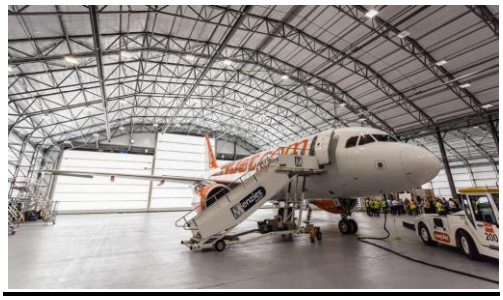
2. Control Towers

The control tower is a place where aircrafts under a particular zone are controlled whether they are on land or in air. The observation is done by the controller through radars and information is carried through radio. The controller from the control tower observes all the aircrafts with in that zone and informs pilots about their airport traffic, landing routes, visibility, wind speeds, runway details, etc.

3. Hangers

Hanger is a place where repairing and servicing of aircrafts is done. It is constructed in the form of large shed using steel trusses and frames. Large area should be provided for Hanger for comfortable movement of aircrafts.



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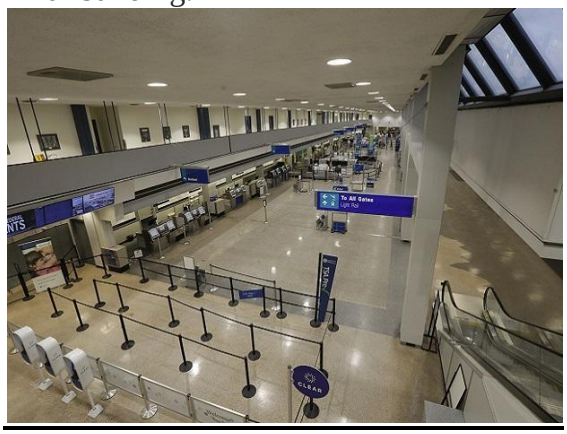
4.Terminal Building

Terminal building is a place where airport administration facilities takes place. In this building, pre-journey and post journey checking of passengers takes place. Lounges, cafes etc. are provided for the passengers. Passengers can directly enter the plane from terminal buildings through sky bridge, walkways etc. Similarly, the passengers from plane also directly enter into the terminal building.



5.Helipads

A **helipad** is a landing area or platform for helicopters and powered lift aircraft.

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Importance of airports

1. Airports are important to a community because they provide local businesses with access to the global market.
2. With phenomenal growth in air traffic the importance of air transport in the whole economy has increased considerably.
3. Its role in the transportation of people, cargo and creation of jobs is important.
4. Airports have become the key nodes in the production and commercial systems and engines of local economic development.
5. With more and more business taking place around airports, a new urban form is fast emerging.
6. Civil Aviation contributes to prosperity and creates opportunities for employment, business, commerce, trade and tourism industry.
7. They help retain and attract businesses to a community and thurs provide jobs and economic prosperity for the area.
8. Safe, efficient air service creates an environment that allows both existing and new businesses to succeed and thurs increase a communities tax base.
9. Major airports and international airports bring in a lot of foreign exchange and economic importance to India.

7. Dams

A dam is defined as an impervious barrier or an obstruction constructed across a natural stream or a river to regulate the flow of water.

Importance of dams

1. The construction of dam across the river results in storage of water on it's upstream side which is helpful.
2. The stored water in the dam is used for irrigation purposes.
3. It forms a very god supply of water in areas where ground water source is absent.
4. A dam can act as a flood control measure.
5. Also helps in fish breeding.
6. A dam with green surroundings is an excellent place for recreational purposes.

Typical uses of dams

1. Used for storing water across the river.
2. The stored water can be used for irrigation, water supply and production of hydroelectricity.
3. Used for fish breeding and cultivation (aquaculture)
4. Acts as flood control measure.
5. Supports tourism by various recreational activities such as boating etc
6. It is a good source of water in areas where ground water sources have depleted.

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WATER SUPLLY SYSTEM

A Water supply is a provision to deliver water to consumer with appropriate quality, quantity and pressure by public utilities, commercial organizations, community endeavours or individuals via a system of pipes and pumps.

BASIC PRINCIPLES

1. Water quality should not get deteriorated in the distribution pipes.
2. It should be capable of supplying water at all intended places with sufficient pressure head.
3. It should be capable of supplying requisite amount of water during fire fighting.
4. The layout should be such that no consumer should be without water supply during repair of any section of the system
5. All the distribution pipes must preferably be laid at least one metre away or above sewer lines.
6. It should be fairly water tight to keep losses due to leakage minimum.

Importance and uses of water supply

1. Water supply system, infrastructure for collection, transmission, treatment, storage and distribution of water is required for homes, commercial establishments, industry, irrigation, as well as for public needs like fire fighting and street flushing.
2. Out of all the municipal services provision of portable water is perhaps the most vital.
3. People depend on water for drinking, cooking, cleaning, carrying away wastes and other domestic uses.
4. Water supply systems must also meet requirements for public, commercial and industrial activities.
5. In all cases, water must fulfill both quality and quantity requirements.

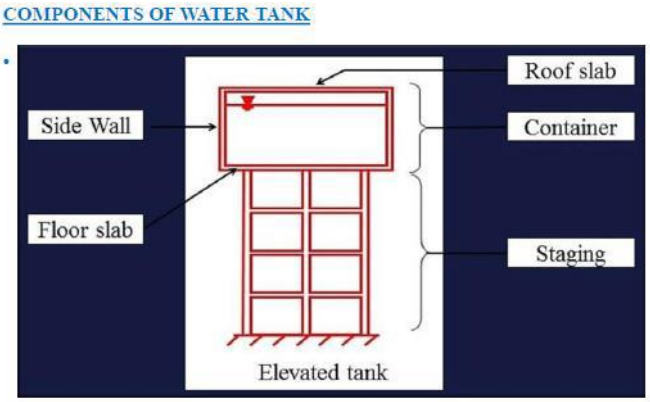
Water Distribution

1. A water distribution system to is a network of pumps, pipelines, storage tanks and other appurtenances.
2. It must deliver adequate quantities of water at pressures sufficient for operating plumbing fixtures and fire fighting equipments, yet it must not deliver water at high pressures to increase the occurrence of leaks and pipeline breaks.
3. Pressure- regulating valves may be installed to reduce pressures in low lying service areas.

4. More than half of the cost of the municipal water supply system is for the distribution system

WATER TANKS

A water tank is a container for storing water. Water tanks are used to provide storage of water for use in many applications, drinking water, irrigation agriculture, fire suppression, agricultural farming, both for plants and livestock, chemical manufacturing, food preparation as well as many other use.



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Types of water tanks

Based on the location water tanks can be classified into three main types:

1. Underground water tanks
2. Tanks resting on the ground
3. Overhead water tanks

UNDER GROUND WATER TANK

OVER HEAD WATER TANK

WATER TANK RESTING ON GROUND

- **A special type of tank called Intze tanks is used for storing large amount of water for an area at an elevation.**
- The overhead tanks are supported by columns which acts as staging. These columns can be braced for increasing strength as well was for improving aesthetic view.

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Storage reservoirs

A reservoir is an enlarged natural or artificial lake or storage pond created using a dam used for storing large quantities of water.

USES OF WATER TANKS

1. Used for storing of water for various uses such as:
   - Irrigation water for crops and gardens can be temporarily stored
2. Water tanks can be used as settling tanks for silt laden for dirty water before filtration occurs.
3. Municipal water can be directed to a water tank before entering the building and kept full as an emergency supply back-up of drinking water in case of water supply cuts.
4. Water tanks can be used as primary points of treating borehole, dam, river water and then tested for portability before allowing it to enter main supply lines.
5. Rainwater can be harvested and stored in water tanks for many uses.
6. Water tanks can be used as temporary water supply points where municipal water services are disrupted.
7. Some types of water tanks can be used as mobile water tankers.
8. Water tanks can be used to store water for livestock and wild animals.
9. Waste water or grey water can be stored temporarily for short periods before it undergoes further treatments or before being used for recycling or irrigation purposes.
10. Some types of water tanks can be used for fish breeding or aquaculture applications.
11. Where pressure is required water can be pumped to and stored in water tanks that have been placed on tank stands of varying heights according to pressure requirements.

Overhead tank

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Above ground RCC water tank