

MODULE - I

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INTRODUCTION TO CIVIL ENGINEERING.

civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewerage systems, pipelines, structural components of buildings and railways.

It is considered the second-oldest engineering discipline after military engineering. Civil engineering takes place in the public sector from municipal through to national governments, and in the private sector from individual homeowners through to international companies.

DISCIPLINES OF CIVIL ENGINEERING

(1) ARCHITECTURE & TOWN PLANNING

- Giving beauty to buildings is architecture
 - Enhancing the appearance
 - Maintaining heritage
- Proper planning of towns & cities
 - Planning the layout
 - Planning the road
 - Separating the commercial, residential, academic and industrial areas
 - Planning green belt
 - Planning sewage disposal units
 - Planning water treatment plants and water storage units.

(2) BUILDING MATERIALS TECHNOLOGY

(2)

- This deals with materials used for construction. Brick, tiles, soil, cement, stone, sand, steel, aggregates, glass, wood, plastics etc. include construction materials. Some are natural and many are man made.
- This deals with the proper use of desired material economically and safely.
- The mechanical properties of these materials shall be sufficient to avoid failure and excessive deformation and provide durability.
- The chemical properties shall be to maintain good environment.

(3) CONSTRUCTION TECHNOLOGY & MANAGEMENT

- Deals with planning, scheduling and execution of construction activity related to a project.
- Comprises of men, material, time and money management.
- Emphasis will be on new construction practice, use of appropriate and local technology, safety of men and material, utilization of marginal materials etc.

(4) ENVIRONMENTAL ENGINEERING

- Environmental engineering deals with the technology to save nature from human and natural abuse and pollution.
- The study involves balanced compromise between environment and safety.
- It deals with,
 - Technique of water collection, purification & supply
 - Waste water collection, treatment and disposal
 - Control of all types of pollution.

(5) GEOTECHNICAL ENGINEERING

(3)

- To assess the quantity of soil or rock to carry the structure.
- Proper knowledge of geotechnical engg is necessary for safety and stability of structures.

(6) HYDRAULICS, WATER RESOURCE & IRRIGATION ENGINEERING

- Hydraulics deals with mechanics of water (fluid) flow.
- Water resource engineering deals with identification & utilization of available water resources minimizing the loss. This also deals with ground water utilization, ground water recharge and rain water harvesting.
- Irrigation engineering deals with water management for agriculture purpose.

(7) REMOTE SENSING & GIS (Geographic information system)

- GIS is a hightech equivalent of map. It represents a means to locate ourselves in relation to world around us. It deals with measurement, mapping, monitoring and modelling of geographic information around us.

(8) STRUCTURAL ENGINEERING

- Deals with planning of positions, layout of different elements and design (determination of size, shape and material) of component such that safety and serviceability requirements are not sacrificed, yet economy is considered.
- Dams, Bridges, Stadiums, Auditoriums, Multi-storeyed buildings are analysed & designed.

(9) SURVEYING

(4)

- Activity involved in collection of topographic features of a location for future construction.
- Feasibility survey, alternate and most suitable method is evolved.
- Helps in environmental impact assessment.

(10) TRANSPORTATION ENGINEERING

- Application of scientific approach (planning, design, operation and management) of transportation systems such as roads, railway, sea/river & air transport.
- Maintenance and upgradation of docks, harbors, airports, railway system based on requirement population growth is a part of this discipline.

IMPORTANCE OF CIVIL ENGINEERING IN INFRASTRUCTURE DEVELOPMENT OF THE COUNTRY

- Increase in food production.
- Protection from drought, famine, flood.
- Healthy and comfortable housing facility.
- Safe domestic and industrial water supply.
- Safe and scientific waste disposal.
- Improvement in communication and transportation.
- Generation of electricity from, nuclear, hydel, thermal, solar or wind energy
- Improved wealth, prosperity, standard of living.
- Overall growth of a nation.

INTRODUCTION TO TYPES OF BUILDINGS AS PER NBC

(5)

NBC (The National Building Code of India), a comprehensive building code, is a national instrument providing guidelines for regulating the building construction activities across the country. It serves as a model code for adoption by all agencies involved in building construction works be they public work departments, other government construction departments, local bodies or private construction agencies.

The code mainly contains administrative regulations, development control rules and general building requirements; fire safety requirement; stipulations regarding materials, structural design and construction (including safety); and building and plumbing services.

NBC Part IV - 2005, classifies the buildings in the following nine groups based on occupancy:

- (1) Residential
- (2) Educational
- (3) Institutional
- (4) Assembly
- (5) Business
- (6) Mercantile
- (7) Industrial
- (8) Storage
- (9) Hazardous

⑥ RESIDENTIAL BUILDING : Buildings in which sleeping arrangements are provided with or without cooking arrangement. It includes Single or multi-family dwelling, apartments, lodgings, restaurants, hostels, dormitories and hotels.

Sr. No	Building Components	Functions
1.	Foundation	It transmits the load coming from superstructure on to the sub-soil below it.
2.	Plinth	It protects the building from rainwater, damp or moisture, insects and transmits the load of superstructure to the foundation.
3.	Walls	Provided to enclose or to divide the floor space into rooms as per requirement and also provide privacy, security and protection against sun, rain, etc.
4.	Column	Transmits the load coming from the beams on the sub-soil below it.
5.	Sill	Supports window frame at bottom.
6.	Door	Provides access into the room offers privacy of sight and sound
7.	Window	Opening made in wall for providing light and ventilation.

8.	Ventilator	Small opening made in wall, provided at lintel level for removal of exhaust air or foul smell.
9.	Roof/Slab	It is the uppermost part of a building to cover the space below and protect it from sun, wind, rain and snow.
10.	Beam	Means by which all loads of slab are transferred to vertical supports of a building.
11.	Lintel	Supports the weight of the wall above the openings of doors, windows and ventilator.
12.	Stair	Means of vertical transportation between the floors. provides access between various floors.
13.	Floor	Provides plane surface and supports the occupants, furniture, fixtures and equipments of a building.
14.	Watershed / Chajjas	Generally combined with lintels to protect doors, windows or ventilators from sun, rain, wind, etc.
15.	Parapet	Acts as a protective solid balustrade for the users.

- EDUCATIONAL BUILDING: These include any building used for school, college, education purposes.
- INSTITUTIONAL BUILDING: These buildings used for different purposes, such as medical or other treatment. They include hospitals, Sanatorium, jails, asylum.

- (8)
- ASSEMBLY BUILDINGS: These are the buildings where group of peoples meet or gather for amusement, social, religious, political, civil, travel and similar purposes. E.g. theatres, motion pictures, houses, assembly halls, restaurants.
 - BUSINESS BUILDINGS: These buildings are used for transactions of business, for keeping accounts and for similar other purposes.
 - MERCANTILE BUILDING: These building are used as shops, stores, market for display and sale of merchandise either wholesale or retail, office, shop, storage services.
 - INDUSTRIAL BUILDINGS: These are buildings where products or materials of all kinds and properties are fabricated, assembled, manufactured or processed.

TYPES:

(a) Warehouse / Distribution Buildings

Warehousing & Distribution buildings are very large, single-story structures used primarily for warehousing and the distribution of business inventory.

(b) Manufacturing Buildings

(Also called heavy industrial buildings) are designed to house specialized equipment used to produce goods or materials.

(c) Refrigeration / Cold Storage Buildings

Specialized industrial buildings that offer large capacity cold storage such as cooler (34°F) and freeze

(d) Telecom / Data Hosting Centers

Highly specialized industrial buildings located in close proximity to major communications trunk lines with access to an extremely large and redundant power supply capable of powering extensive computer servers and telecom switching equipment.

(e) Flex Buildings

This versatile building type (short for "Flexible") covers a broad range of uses and often is used to combine one or more uses in a single facility, including office space, research & development, showroom retail sales, light manufacturing, research and development (R&D) and even small warehouse and distribution uses.

(f) Light Manufacturing Buildings:

Flex buildings can be used for light manufacturing that do not require extensive physical plant and space requirements such as light assembly.

(g) R&D Buildings:

Popular in high technology industries such as computers, electronics and biotechnology because they effectively support a hybrid of office, manufacturing and warehouse space housed in a single location.

(h) Showroom Buildings

Combine retail display space with extensive onsite storage and distribution.

(i) Biotech (Wet lab) Buildings

Highly specialized flex buildings that support a range of laboratory space where chemicals, drugs or other material or biological matter are tested and analyzed.

SELECTION OF SITE FOR BUILDINGS

(10)

- ① Site should be fairly level.
- ② Good quality of soil.
- ③ Location should be calm but reasonably developed.
- ④ Well connected by roads and other modes of transport.
- ⑤ Good communication facilities.
- ⑥ Electricity, water and sewer lines should be available.
- ⑦ Should be away from hazardous industries.
- ⑧ Flood, water logged areas should be avoided.
- ⑨ Site should have good natural ventilation and lighting.
- ⑩ Amenities like schools, recreation centers, shopping centres, hospitals should be nearer.
- ⑪ Site should have quick drainage properties.
- ⑫ Regular shape with sufficient frontage.
- ⑬ Area should be sufficient for future development.
- ⑭ Proper ownership and other legal matters have to be checked before buying the site.

BUILDING PLANNING

(11)

Set of drawings which consist of floor plan, site plan, cross sections, elevations, electrical, plumbing and landscape drawings for the ease of construction at site.

The planning and construction of a building should be aimed at fulfilling the following requirements:

(1) Strength and Stability

Building should be capable of transferring the expected loads in its life period safely to the ground.

(2) Dimensional Stability

All structural components, should be so designed that deflections do not exceed the permissible values specified in the codes.

(3) Resistance to Dampness

Dampness is a great nuisance and it may reduce the life of a building. Great care should be taken.

(4) Resistance to Fire

- the structure should not ignite easily.
- Building orientation should be such that spread of fire is slow.
- In case of fire, there should be easy means to vacate building quickly.

(5) Heat Insulation

A building should be so oriented and designed that it insulates interior from heat.

(6) Sound Insulation

Buildings should be planned against outdoor and indoor noises.

(7) Protection from Termites

Buildings should be protected from termites.

(b)

(8) Durability

Each and every component of the building should be durable.

(9) Security against Burglary

This is the basic need the owner of the building expects.

(10) Lighting and Ventilation

Diffused light and good cross ventilation should be available inside the building.

(11) Comforts and Conveniences

Various units in the building should be properly grouped and integrated keeping in mind the comfort and convenience of the user.

(12) Economy

Economy without sacrificing comfort, convenience and durability is another basic requirement of the building.

The following are the basic elements of a building:

(1) Foundation

(2) Plinth

(3) Walls and columns

(4) Sills, lintels and chejjas

(5) Doors and windows

(6) Floors

(7) Roof

(8) Stairs, Staircases and lifts

(9) Finishing

(10) Building Services

INTRODUCTION TO VARIOUS BUILDING AREA TERMS

(13)

(1) PLOT AREA (OPEN AREA)

Area of the plot on which you intend to construct a building.

(2) CARPET AREA (FLOOR AREA)

Area enclosed within the walls of the proposed flat. The actual area on which you can lay the carpet. This area does not include the thickness of the inner walls. It is the actual used area of an apartment.

(3) BUILT UP AREA (PLINTH AREA)

Carpet area plus the thickness of outer walls and the balcony.

(4) SUPER BUILT UP AREA

Built up area plus proportionate area of common areas such as the lobby, lifts, shaft, stairs, etc. Sometimes it may also include the common areas such as (swimming pool, garden, clubhouse, etc).

COMPUTATION OF PLINTH AREA

Plinth area is calculated by taking the measurement of walls outer to outer dimensions at the floor level.

Plinth area = Carpet area + area of walls + area of balcony
Carpet area is 70 percent of plinth area.