UNIT-I

Overview of Building Components

CEPC201 BUILDING CONSTRUCTION

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WHAT IS A BUILDING?

- **Any structure** for whatsoever purpose and of whatsoever materials constructed and every part thereof whether used as human habitation or not and includes foundation, plinth, walls, floors, roofs, chimneys, plumbing and building services, fixed platforms, VERANDAH, balcony, cornice or projection, part of a building or anything affixed thereto or any wall enclosing or intended to enclose any land or space and signs and outdoor display structures.
- A building is generally defined as a structure with walls and a roof, typically designed for permanent use, such as a house, factory, or office space.
- Tents/ SHAMIANAHS/PANDALS, tarpaulin shelters, etc, erected for temporary and ceremonial occasions shall not be considered as building.

1. CLASSIFICATION OF BUILDINGS (AS PER NATIONAL BUILDING CODE – NBC)

- The **National Building Code (NBC) of India** classifies buildings based on their **occupancy** and **usage** into nine broad groups (Group A to Group I):
- **Occupancy-wise Classification (NBC):**

Group	Type of Building
A	Residential Buildings
B	Educational Buildings
C	Institutional Buildings
D	Assembly Buildings
E	Business Buildings
F	Mercantile Buildings
G	Industrial Buildings
H	Storage Buildings
I	Hazardous Buildings

GROUP A: RESIDENTIAL BUILDINGS

- A residential building is a structure designed and built for habitation, primarily providing living spaces for individuals or families.
- It encompasses a variety of forms, including single-family homes, multi-family dwellings like apartments and condominiums, and other structures with independent living units.
- These buildings are characterized by features like bedrooms, bathrooms, kitchens, and living areas, and may also include amenities such as laundry facilities, parking, and recreational spaces.

SUBDIVISIONS UNDER GROUP A INCLUDE:

- **A-1: Lodging or rooming houses:** Hotels, hostels, motels, inns, and private dormitories where accommodation is provided for individuals not necessarily related to each other.
- **A-2:** One or two-family private dwellings: Individual houses, villas, and bungalows.
- **A-3: Dormitories:** Accommodation facilities typically found in educational institutions or hostels.
- **A-4: Apartment houses (flats):** Multi-family residential buildings.
- **A-5: Hotels:** Commercial lodging establishments.
- **A-6: Starred hotels:** A new subdivision specifically for hotels with higher service and facility standards.

GROUP B: EDUCATIONAL BUILDINGS

- Educational Buildings refer to buildings that are specifically designed and constructed for educational purposes, such as schools and colleges.
- They are typically larger in size compared to other commercial buildings and are located on spacious land to accommodate the needs of students and faculty.
- Subdivisions under Group B include:
- **B-1: Schools up to senior secondary level:** Schools for students up to the senior secondary level.
- **B-2: All others/training institutions:** Includes colleges, universities, and vocational training centers.

GROUP C: INSTITUTIONAL BUILDINGS

- An institutional building is a structure designed for specific public services or communal activities, often with sleeping accommodations.
- Examples include hospitals, schools, government buildings, and religious structures. These buildings are generally not used as dwellings and serve purposes beyond individual residences.
- Subdivisions under Group C include:
  C-1: Hospitals and sanatoria: Facilities for medical treatment.
  C-2: Custodial institutions: Orphanages, old age homes, and similar care facilities.
  C-3: Penal and mental institutions: Jails, prisons, and mental health facilities with restricted liberty.

GROUP D: ASSEMBLY BUILDINGS

- Assembly buildings are structures designed for the congregation of people for various purposes like recreation, social gatherings, religious ceremonies, or civic events.
- They encompass a wide range of facilities, including theaters, concert halls, exhibition spaces, places of worship, and transportation hubs.
- Essentially, any building where a group of people gathers for a common purpose can be considered an assembly building.

SUBDIVISIONS UNDER GROUP D INCLUDE:

- D-1: Buildings with a theatrical stage and fixed seats for over 1000 people.
- D-2: Buildings with a theatrical stage and fixed seats for up to 1000 people.
- D-3: Buildings without a permanent stage accommodating 300 or more people without fixed seating.
- D-4: Buildings without a permanent stage accommodating less than 300 people without fixed seating.
- D-5: Other structures for assembly, including temporary ones, not covered by D-1 to D-4, at ground level, such as grandstands and stadiums.
- D-6: Mixed assembly occupancies (introduced in NBC 2016).
- D-7: Underground elevated railways (introduced in NBC 2016).

GROUP E: BUSINESS BUILDINGS

- A "business building" refers to a structure designed for commercial activities, where businesses conduct operations and transactions. These buildings can encompass various ty
- Subdivisions under Group E include:
- E-1: Offices, banks, professional establishments, and police stations.
- E-2: Laboratories, research establishments, libraries, and test houses.
- E-3: Computer installations.
- E-4: Telephone exchanges.
- E-5: Broadcasting and TV stations (introduced in NBC 2016), pes, including office spaces, retail locations, industrial facilities, and more.

GROUP F: MERCANTILE BUILDINGS

- Mercantile building means a building or part thereof used as shops, stores or markets for display and sale of wholesale or retail goods or merchandise, including office, storage and service facilities incidental thereto located in the same building.
- Subdivisions under Group F include:
- F-1: Shops, stores, and markets up to 500 m^2.
- F-2: Shops, stores, and markets over 500 m^2.
- F-3: Underground shopping centers and related storage/service facilities within the same building.

GROUP G: INDUSTRIAL BUILDINGS

- Industrial buildings are structures designed for manufacturing, storage, or distribution of goods and products.
- They can range from small workshops to large factories and warehouses. These buildings are crucial for various industries, facilitating the production, storage, and movement of goods.
- Subdivisions under Group G include:
- G-1: Buildings for low hazard industries.
- G-2: Buildings for moderate hazard industries.
- G-3: Buildings for high hazard industries.

GROUP H: STORAGE BUILDINGS

- Storage buildings are structures primarily used for storing or sheltering goods and personal property. They come in a wide range of types, sizes, and materials to suit various needs and purposes.
- Storage buildings can range from small garden sheds for tools and equipment to large warehouses and distribution centers used by businesses.
- Other types include garages for vehicles and storage, barns for agricultural use, cold storage facilities for perishable goods, and self-storage units for personal or business rentals.
- Additionally, there are container storage options using repurposed shipping containers, lock-up garages for budget-friendly storage, and portable storage units for temporary needs.

GROUP J: HAZARDOUS BUILDINGS

- Hazardous buildings are structures or parts of structures that pose a significant risk to life, health, safety, or welfare due to the presence of dangerous materials, substances, conditions, or structural instability.
- Hazardous buildings are typically characterized by the presence of certain materials or conditions that present potential dangers.
- These can include buildings used for storing, handling, manufacturing, o processing combustible, explosive, corrosive, toxic, noxious, or radioactive materials.
- Buildings with explosive dust mixtures are also considered hazardous.
- Additionally, buildings deemed unsafe due to inadequate maintenance, dilapidation, damage, unsanitary conditions, or those in danger of collapse or posing a fire hazard can be classified as hazardous.

2. CLASSIFICATION OF BUILDINGS (AS PER TYPES OF CONSTRUCTIONS)

Construction systems are primarily classified based on how loads (such as dead load, live load, wind load, seismic load, etc.) are transferred from the structure to the foundation. The three main types are:

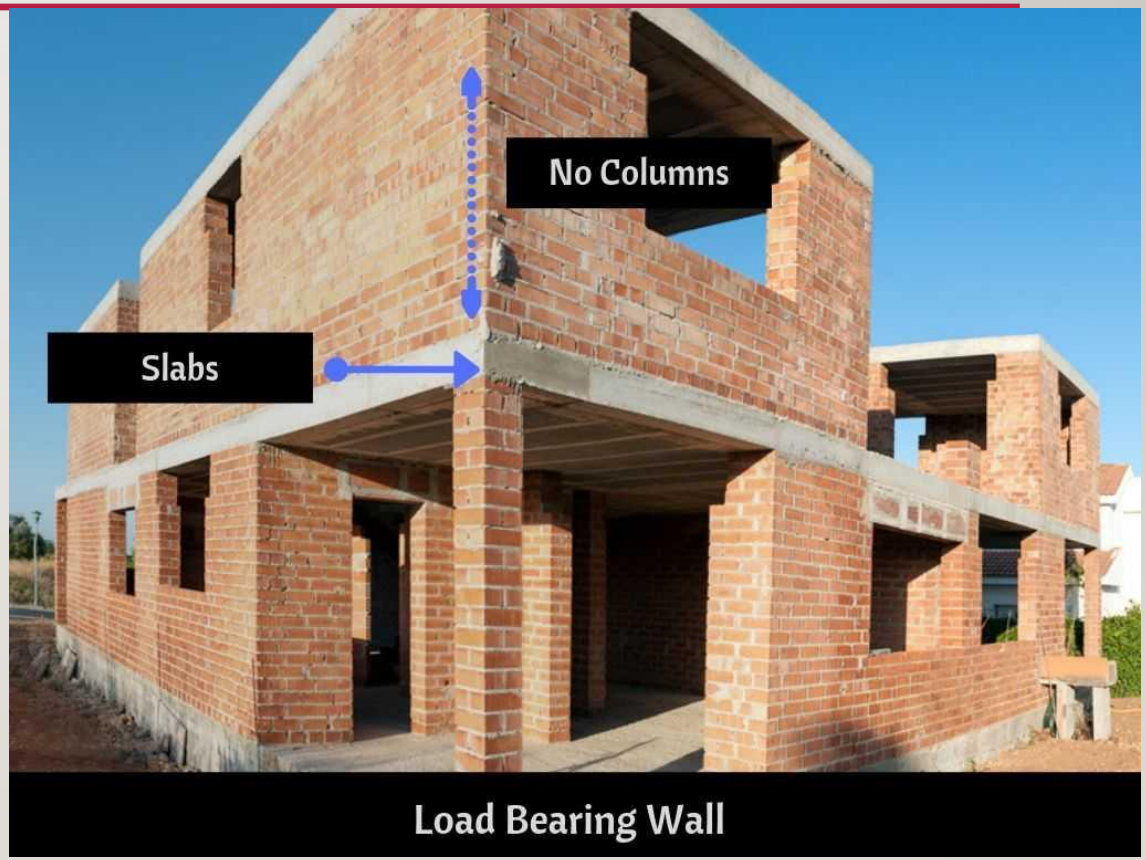
a) Load Bearing Structure

b) Framed Structure

c) Composite Structure

A) LOAD BEARING STRUCTURE

- In this system, the walls themselves support the load of the roof, floors, and upper levels, and transmit it directly to the foundation.
- No separate structural framework (no beams or columns).
- Walls are **structural components** — they bear both the vertical and lateral loads.
- Thicker walls, especially at the base, are needed to carry the load.
- **Materials Used:** Brick masonry, stone masonry, or concrete blocks.



Applications:

- Common in **low-rise** buildings (usually up to 2-3 storeys).
- Widely used in **residential houses**, small offices, and rural constructions.

Advantages:

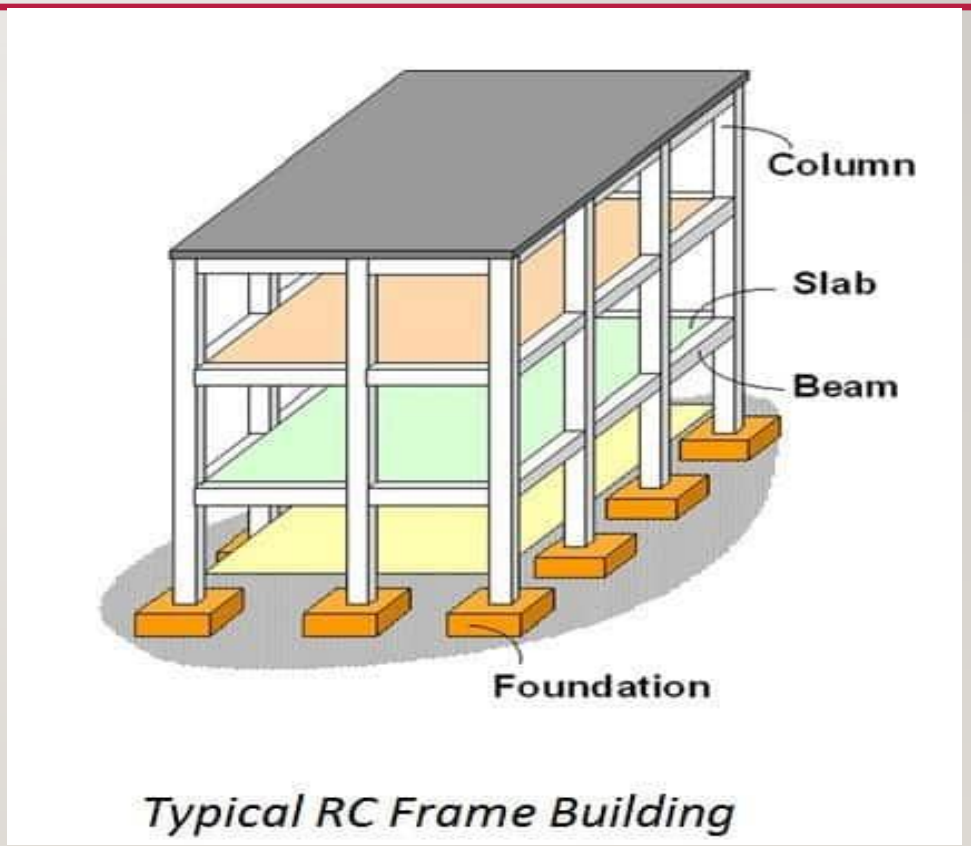
- Simple design and construction.
- Economical for small-scale projects.
- Less skilled labor required.

Limitations:

- Not suitable for high-rise buildings.
- Limited flexibility in internal layout due to load-bearing walls.
- Alterations (e.g., removing walls) are difficult and risky.

B) FRAMED STRUCTURE

- This structure consists of a **skeletal framework** made of beams and columns.
- The entire load is carried by this framework and transferred to the foundation.
- **Walls are non-load bearing**; they serve as partitions or enclosures only.
- Uses **reinforced concrete (RCC)** or **structural steel** for frame construction.
- Slabs rest on beams, which are supported by columns.



Typical RC Frame Building

Applications:

- Suitable for **multi-storey buildings**,
- commercial complexes, high-rise apartments, malls, hospitals, etc.

Advantages:

- Greater **flexibility in internal space planning** (open floor concept possible).
- Easy to remodel or modify.
- Can withstand **earthquake and wind loads** more efficiently.

Limitations:

- Requires **skilled labor** and proper engineering design.
- More expensive than load-bearing structures for smaller projects.

C) COMPOSITE STRUCTURE

- This structure combines both **load-bearing walls** and **framed structural elements** in the same construction.
- Both walls and frames participate in **load sharing**.
- The structural design is a **hybrid** approach.
- May involve RCC frames with some load-bearing masonry walls.
- **Applications**:
  - Used in **retrofitted buildings**, where an existing load-bearing structure is upgraded with a frame for strength.
  - Seen in some **institutional and residential buildings** where economy and flexibility are both considered.

Advantages:

- Balances the **economy of load-bearing systems** and the **strength/flexibility of framed systems**.
- Can be an effective solution during **rehabilitation or extension** of existing structures.

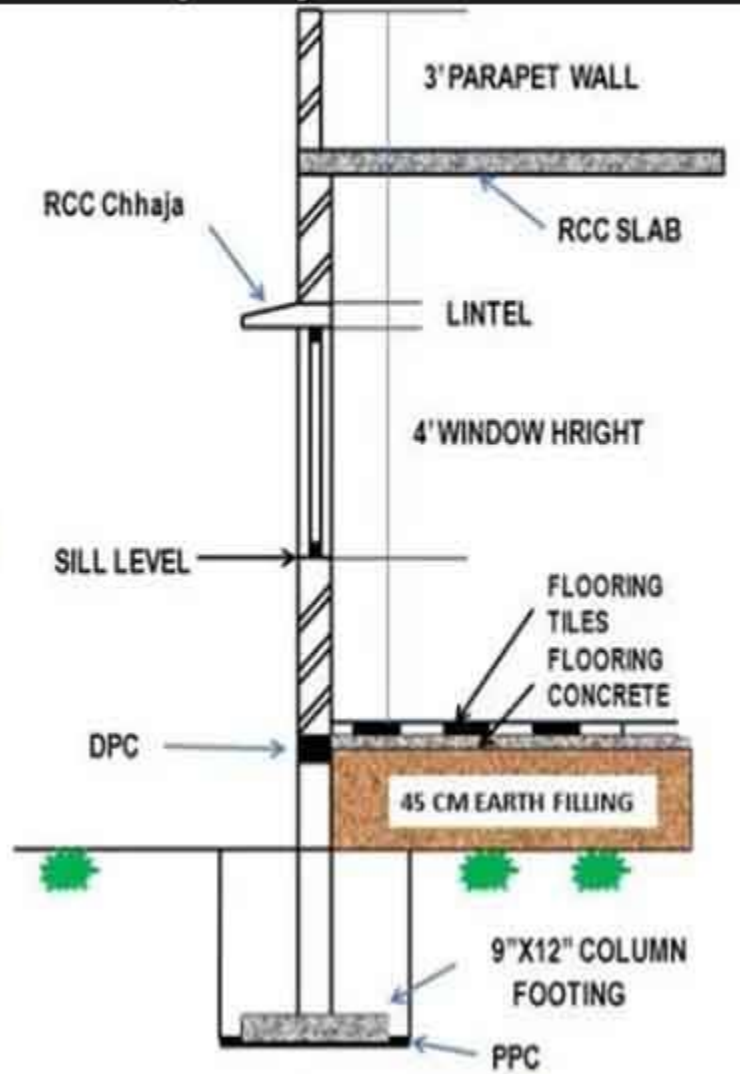
Limitations:

- Requires **careful coordination** between structural elements.
- More complex in terms of design and construction planning.

Feature	Load Bearing Structure	Framed Structure	Composite Structure
Structural Support	Walls	Beams & Columns	Walls + Frame
Internal Layout Flexibility	Limited	High	Moderate
Construction Cost	Low (for small buildings)	Higher	Moderate
Suitable Height	Low-rise	High-rise	Medium-rise / Mixed-use
Earthquake Resistance	Poor to moderate	Good	Varies (depends on design)
Use in Retrofits	Rare	No	Common

Basic Components of Building Structure

Building Elements | Basic Components | Sub Structure | Super Structure



BUILDING COMPONENTS AND THEIRS FUNCTIONS

A. Substructure

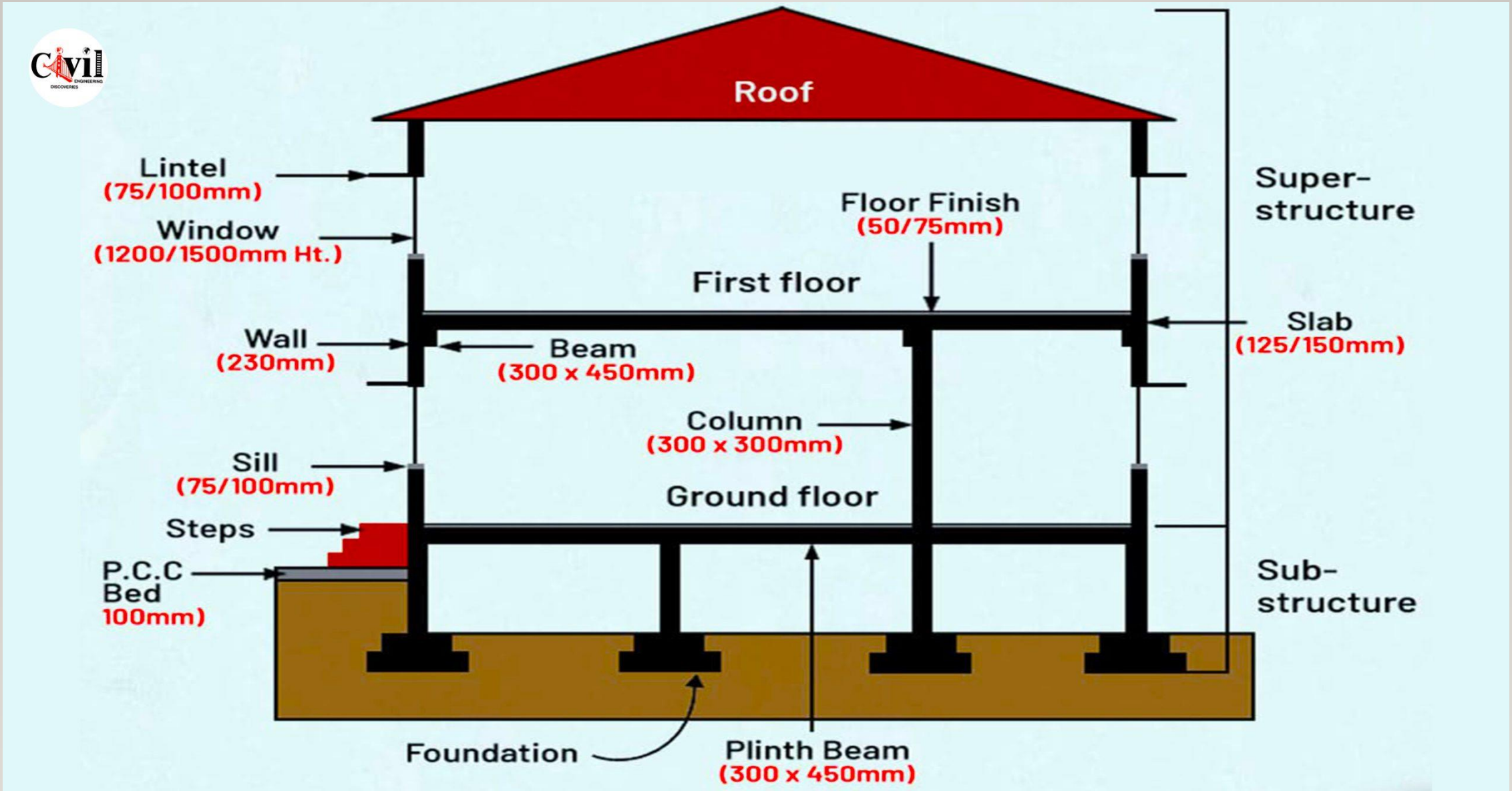
The **substructure** is the part of a building constructed **below ground level**, which transmits the entire load of the building to the earth.

i) Foundation:

- Transfers building loads to soil.
- Provides stability and prevents differential settlement.
- Types: Shallow (spread footing, mat), Deep (pile, caisson).

ii) Plinth:

- The portion of the structure **between ground level and floor level**.
- Acts as a transition between the foundation and superstructure.
- Raises the building above ground level to prevent water seepage.
- Distributes load uniformly over the foundation.
- Improves building aesthetics and cleanliness.


Roof
Lintel
(75/100mm)
Window
(1200/1500mm Ht.)
Floor Finish
(50/75mm)
First floor
Super-
structure
Slab
(125/150mm)
Wall
(230mm)
Beam
(300 x 450mm)
Column
(300 x 300mm)
Sill
(75/100mm)
Ground floor
Steps
P.C.C
Bed
100mm)
Sub-
structure
Foundation
Plinth Beam
(300 x 450mm)

B. SUPERSTRUCTURE

This is the **above-ground portion** of the building, which includes all visible and usable parts.

1. Walls

- Enclose space and provide privacy and security.
- Support structural loads (in load-bearing construction).
- Act as a barrier against wind, rain, and noise.
- Contribute to thermal and sound insulation.

2. Partition Walls

- Divide internal spaces without carrying structural loads.
- Enhance space utilization and interior privacy.
- Can be removed or relocated in framed structures.

3. Cavity Walls

- Improve thermal insulation by providing an air gap.
- Prevent dampness by stopping moisture penetration.
- Reduce heat loss in cold regions or heat gain in hot climates.

- **4. Sill**
  - A horizontal member at the bottom of a window opening.
  - Protects the wall from water entry.
  - Distributes load from the window frame to the wall below.
- **5. Lintel**
  - A horizontal beam placed above door or window openings.
  - Transfers the load from the wall above to the sides of the opening.
  - Prevents cracks and structural failure at the openings.

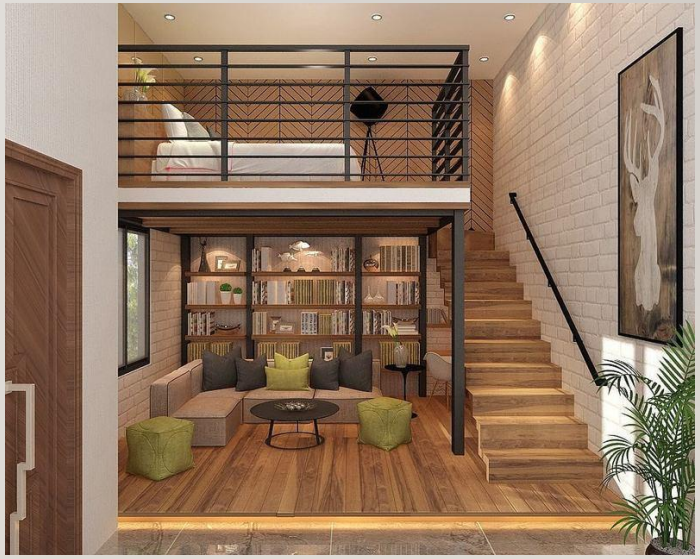
6. Doors

- Allow entry and exit into and between rooms.
- Provide privacy, security, and ventilation.
- Serve as a barrier against weather and noise.

7. Windows

- Provide natural light and ventilation.
- Allow external view and aesthetic appeal.
- Assist in temperature regulation and smoke egress.

- **8. Floors**
  - Provide a level surface for users to walk on.
  - Distribute live loads (people, furniture, etc.) to beams or load-bearing walls.
  - Offer thermal insulation and fire resistance (depending on material).
- **9. Mezzanine Floor**
  - Intermediate floor between two main floors.
  - Provides extra usable space (storage, office, etc.).
  - Often semi-permanent and used in industrial or commercial buildings.



- **10. Roof**
  - Covers the top of the building.
  - Protects against weather elements (rain, sun, snow, etc.).
  - Adds insulation and enhances the architectural look.
- **11. Beams**
  - Horizontal structural members that transfer loads from slabs to columns or walls.
  - Resist bending forces and ensure stability of the floor system.

12. Columns

- Vertical structural elements that transfer loads from the beams/floors to the foundation.
- Bear compression loads and maintain structural integrity.

13. Parapet Wall

- Low protective wall along the edge of a roof, terrace, or balcony.
- Prevents falls and provides wind protection.
- May serve as a boundary for rooftop utilities.

Thank You