UNIT1-INTRODUCTION

WHAT IS BUILDINGS

Buildings are one of the fundamental needs of humans. We seek shelter and spend our lives in such buildings. The mention of the word building encourages the vision of a place with rooms, walls, etc. In a more general sense,

The definition of a building is a structural construction that is made up of combining different structural elements and using various types of materials, such as – mud, brick, stone, wood, etc.

Any structure that is built with materials and has walls, plinth, roofs, floors, plumbing, foundation, platforms that are fixed, projection or a cornice, balcony, building services or anything that is affixed, or any wall that encloses or at least intend to enclose a specific space or specific land and have display structures of outdoor, we can call a building. For example, houses, shopping malls, schools, etc can be mentioned.

The primary purpose of a building is to provide security and shelter. Buildings serve the role of providing primary security from weather, and security threats along with the roles of helping to store, providing privacy and comfort to live life and work well.

Application Of Building Technology:

Building technology refers to the application of knowledge, techniques, materials, and processes to the design, construction, and maintenance of buildings and other structures. It encompasses a wide range of disciplines and practices aimed at creating safe, functional, and sustainable built environments. Building technology is a multidisciplinary field that draws from various areas, including architecture, engineering, construction management, materials science, and environmental science. Here are some key aspects of building technology:

1.Design and Planning: Building technology starts with the design phase, where architects and designers plan the layout, aesthetics, and functionality of a building. This phase involves creating detailed blueprints and specifications.

2.Materials Selection: Choosing appropriate construction materials is crucial. This includes decisions about structural materials like concrete, steel, and wood, as well as finishing materials such as glass, insulation, and cladding.

3.Structural Engineering: Structural engineers play a key role in ensuring that buildings are structurally sound and can withstand various loads, including gravity, wind, earthquakes, and live loads (e.g., occupants and furniture).

4.Construction Methods: Building technology encompasses various construction methods and techniques, such as traditional construction, prefabrication, and modular construction. The choice of method can impact cost, speed, and quality.

5.Building Systems: Buildings have various systems, including electrical, plumbing, HVAC (heating, ventilation, and air conditioning), and fire protection. Building technology includes the design and installation of these systems.

6.Energy Efficiency: Sustainable building technology focuses on energy-efficient design and construction, incorporating features like proper insulation, energy-efficient lighting, and renewable energy sources to reduce energy consumption and environmental impact.

7.Environmental Considerations: Building technology also addresses environmental sustainability, including the use of eco-friendly materials, water conservation, waste reduction, and the incorporation of green building practices.

8.Building Codes and Regulations: Building technology professionals must adhere to local, national, and international building codes and regulations to ensure that structures meet safety and quality standards.

9.Safety: Safety measures are paramount in building technology to protect workers during construction and occupants once the building is in use. This includes safety training, equipment, and protocols.

10.Maintenance and Renovation: Building technology extends beyond construction to include ongoing maintenance, repair, and renovation to ensure that structures remain safe and functional over time.

11.Technological Advancements: Building technology is influenced by technological advancements, such as Building Information Modeling (BIM), which allows for digital modeling and simulation of building projects, and smart building technologies that enhance comfort, security, and efficiency.

12.Project Management: Efficient project management is essential to keep construction projects on schedule and within budget. Building technology professionals often oversee project planning, budgeting, scheduling, and quality control.

Structure of a building:

The structure of a building generally consists of,

1. Sub-structure (Foundation)
2. Plinth &
3. Super structure.
4.

1. Foundation:

The foundation is the most critical part of any structure and most of the failure is probably due to faulty foundations rather than any other cause. The purpose of foundation is to transit the anticipated loads to the soil.

Purpose:

- To distribute the load of the structure over a large bearing area so as to bring intensity of loading within the safe bearing capacity of the soil lying underneath.
- To load the bearing surface at a uniform rate so as to prevent unequal settlement.
- To prevent the lateral movement of the supporting material.
- To secure a level and firm bed for building operations.
- To increase the stability of the structure as a whole.

2. Plinth:

This is the portion of structure between the surface of the surrounding ground and surface of the floor, immediately above the ground. As per byelaws, the plinth should not be less than 45cm. The basic requirements of plinth area

(a) To transmit the load of the super-structure to the foundation.

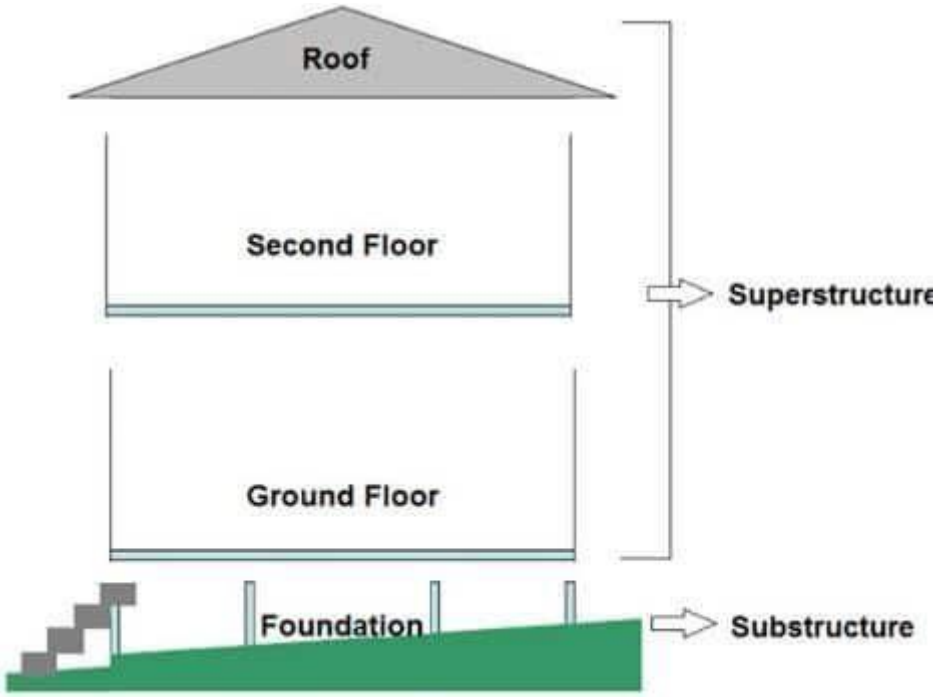
(b) To act as a retaining wall so as to keep the filling portion below the raised floor or the building.

(c) To protect the building from damp or moisture penetration into it.

(d) It enhances the architectural appearance of the building.

3. Super structure:

The superstructure is the portion of a building which is constructed above the ground level and it serves the purpose of structure's intended use. It includes columns, beams, slab upwards including all finishes, door and window schedules, flooring, roofing, lintels, and parapets.



II. Differences between super-structure and sub-structure:

S.no	Superstructure	Substructure
1.	Part of a building that constructed above ground level	Portion of a building that constructed below ground level
2.	It serves the purpose of building's intended use	It transfers loads received from superstructure to supporting soil
3.	Superstructure elements include walls, columns, beams, doors and windows, etc.	Elements of substructure include foundation and plinth.

TYPES OF BUILDINGS

- National Building Code of India (SP7-1970) defines a building as "any structure for what so ever purpose and of what so ever material constructed and every part there of whether used as a human habitation or not and includes foundation, plinth, walls, floors, roofs, chimneys, plumbing and building services, fixed platforms, verandha, balcony, cornice or projection, part of a building or anything affixed there to or any wall enclosing or intended to enclose any land or space and sings and outdoor display structures." Tents, shamianas, tarpaulin, and shelters are not considered as building.
- According to the National Building Code of India (1970) based on occupancy, the buildings are classified as

1. **Residential Buildings**
2. **Educational Buildings**
3. **Institutional Buildings**
4. **Assembly Buildings**
5. **Business Buildings**
6. **Mercantile Buildings**
7. **Industrial Buildings**
8. **Storage Buildings**
9. **Hazardous Buildings.**
10. **Religious Buildings**

1. Group A : Residential Types of Buildings :

These are those buildings in which sleeping accommodation is provided for normal residential purposes, with or without cooking or dining or both facilities can be called a residential building, Buildings of group A are further sub-divided as follows:

(i) Sub-division A-1: Lodging or Rooming Houses

These include any building or group of buildings under the same management, in which separate sleeping accommodation for a total of not more than 15 persons, on either transient or permanent basis with or without dining facilities, but without cooking facilities for individuals, is provided.

A lodging or rooming house is classified as a dwelling in sub-division A-2 if no room in any of its private dwelling units is rented to more than three persons.

(dwelling means houses, apartments are all dwellings)

(ii) Sub-division A-2: One or two Family Private Dwellings

- These include any private dwelling which is occupied by members of a single family and has a total sleeping accommodation for not more than 20 persons.
- If rooms in a private dwelling are rented to outsiders, these should be for accommodating not more than 3 persons.
- If sleeping accommodation for more than 20 persons is provided in any one residential building, it should be classified as a building sub-division A-3 or A-4 as the case may be.

(iii) Sub-division A-3: Dormitories

- These include any building in which group sleeping accommodation is provided, with or without dining facilities, for persons who are not members of the same family, in any one room or a series of closely associated rooms under joint occupancy and single management.
- example, school and college dormitories, students and other hostels and military barracks.

(iv) Sub-division A-4: Apartment Houses (Flats)

- These include any building or structure in which living quarters are provided for three or more families living independently of each other and with independent cooking facilities,
- example, apartment houses, mansions and chawls..

(v) Sub-division A-5: Hotels

These include any building or group of buildings under single management in which sleeping accommodation, with or without dining facilities, is provided for hire to more than 15 persons who are primarily transient, for example hotels, inns, clubs and motels.

2. Group B: Educational Buildings

- These include any building used for school, college, or day-care purposes for more than 8 hours per week involving assembly for instruction, education or recreation
- Educational building signifies the building designs that are made to accommodate primary, secondary, intermediate, and higher education systems. These buildings often include the library, lab, hall room, and various types of living areas for the students, like – hostels and dormitories.
- Educational institutions mostly recognized by and affiliated with boards, universities, or other appropriate authorities.

3. Group C Institutional Buildings

These include any building or part thereof, which is some purposes such a medical or other treatment or care of persons from physical or mental illness, disease or infirmity; care of infants, convalescents or aged persons and for penal or correctional detension in which the liberty of inmates is restricted. Institutional buildings ordinarily provide sleeping accommodation for the occupants.

Buildings under group C are further sub-divided as follows:

(i) Sub-division C-1: Hospitals and Sanitaria

- This sub-division includes any building or group of buildings under single management, which is used for housing persons suffering from physical limitations because of health or age, for example, hospitals, infirmaries, sanitaria and clinics.

(ii) Sub-division C-2: Custodial Institutions

- This sub-division includes any building or group of buildings under single management, which is used for the custody and care of persons such as children, convalescents and the aged, for example, homes for the aged and infirm, convalescent homes and orphanages.

(iii) Sub-division C-3: Penal Institutions

- This sub-division includes any building or a group of buildings under single management, which is used for housing persons under restraint, or who are detained for penal or corrective purposes, in which the liberty of the inmates is restricted, for examples, jails, prisons, mental hospitals, mental sanitaria and reformatories.

4. Group D : Assembly Buildings

These include any building or part of a building, where group of people congregate or gather for amusement, recreation, social, religious, patriotic, civil, travel and similar purpose, for example, theatres, motion picture houses, assembly halls, auditoria, exhibition halls, museunis, skating rinks, gymnasiums, restaurants, aces of wor- ship, dance halls, club rooms, passenger stations and terminals of air, surface and marine public transportation service, recreation piers and stadia.

(i) Sub-division D-1

- This sub-division includes any building primarily meant for theatrical or operatic performances and exhibitions and which has a raised stage, proscenium curtain, fixed or portable scenery or scenery loft, lights, motion picture booth, mechanical appliances or other theatrical accessories and equipment and which is provided with fixed seats over 1000 persons.

(ii) Sub division D-2

- This sub-division includes any building primarily and it is same as like sub-division D-1 but with fixed seats for less than 1000 persons.

(iii) Sub-division D-3

- This sub-division includes any building, its lobbies, rooms and other spaces connected thereto, primarily intended for assembly of people,but which has no theatrical stage or theatrical and/or cinematographic accessories and has accommodation for more than 300 persons.
- example, dance halls, night clubs, halls for incidential picture shows, dramatic, theatrical or educational presentation; lectures or other similar purposes, having no theatrical stage except a raised platform and used without permanent seating arrangement ,art galleries, museums, lecture halls, libraries.
- passenger terminals and buildings used for educational purposes for less than 8 hours per week.

(iv) Sub-division D-4

- This sub-division includes any building primarily intended for use as described in sub-division D-3 but with accommodation for less than 300 persons.

(v) Sub-division D-5

- This sub-division includes any building meant for outdoor as- sembly of people not covered by sub-division D-1 to D-4, for example, grand stands, stadia, amusement park structures, reviewing stands and circus tents.

5. Group E: Business Buildings

- These include any building or part of building, which is used for the transaction of business for the keeping of accounts and records and similar purposes, doctors' and service facilities, that serves less than 100 persons.
- Example barber shops and beauty parlours. City halls, town halls, court houses and libraries should be classified in this group in so far as the principal function of these is transaction of public business and the keeping of books and records.

6. Group F: Mercantile buildings
   - These include any building or part of a building, which is used as shops, stores, markets, for display and sale of merchandise, either wholesale or retail.
   - Office, storage and service facilities incidental to the sale of merchandise and located in the same building should be included under this group.
   - Minor merchandising operations in buildings primarily meant for other uses should be covered by group under which the predominant occupancy is classified.

7. Group G: Industrial Buildings
   - These include any building or part of a building, or structure in which products or materials of all kinds and properties are fabricated, assembled or processed.
   - example, assembly plants, laboratories, dry cleaning plants, power plants, pumping stations, smoke houses, gas plants, refineries, dairies and saw mills.

8. Group H: Storage Buildings
   - These include any building or part of a building, used primarily for the storage or sheltering (including servicing, processing or repairs incidental to storage) of goods, wares or merchandise (except those that involve highly combustible or explosive products or materials), vehicles or animals, for example, warehouses, cold storages, freight depots, transit sheds, store houses, truck and marine terminals garages, hangers (other than aircraft repair hangars), grain elevators, barns and stables.

9. Group J: Hazardous Buildings

   - These include any building or part of a building which is used for the storage, handling, manufacture or processing of highly combustible or explosive materials or products which are liable to burn with extreme rapidity
   - which produce poisonous fumes or explosions; for storage, handling, manufacturing or processing which involve highly corrosive, toxic or noxious alkalies, acids or other liquids or chemicals producing flame, fumes and explosive, poisonous, irritant or corrosive gases; and for the storage, handling or processing of any material producing explosive mixtures of dust or which result in division of matter into fine particles subject to spontaneous ignition.
   - Examples of buildings in this class are those buildings which are used for :

     (a) Storage under pressure of more than 0.1 N/mm² and in quantities exceeding 70 m of acetylene, hydrogen, illuminating and natural gases, ammonia, chlorine, phosgene, sulphur dioxide, carbon dioxide, methyl oxide and all gases subject to explosion, fume or toxic hazard.
     (b) Storage and handling of hazardous and highly flammable

(c) Storage and handling of hazardous and highly flammable liquids or explosive materials other than liquids.
(d) Manufacture of artificial flowers, synthetic leather, am- munition, explosives and fireworks.

Components of a building:

A building is generally made of the following structural components.

(1) Foundation
(2) Plinth
(3) Walls and piers(columns) in super structure
(4) Ground, basement and upper floors
(5) Doors and windows
(6) Sills, Lintels and weather shades
(7) Roofs
(8) Steps and stairs
(9) Finishes for walls &
(10) Utility fixtures

Each of these components is an essential part of a building and requires due to consideration in design and construction for their functional performance. The basic functional requirements of these components discuss in the following paragraphs.

1. Foundation:

The foundation is the most critical part of any structure and most of the failure is probably due to faulty foundations rather than any other cause. The purpose of foundation is to transit the anticipated loads safety to the soil.

Basic requirements:

- To distribute the total load coming on the structure over a large bearing area so as to prevent it from any movement.
- To load the bearing surface or area at a uniform rate so as to prevent any unequal or relative settlement.
- To prevent the lateral movement of the structure.
- To secure a level or firm natural bed, upon which to lay the courses of masonry and also support the structure.
- To increase the suitability of the structure as a whole, so as to prevent it from overturning or sliding against such as wind, rain, frost etc.

2. Plinth:

This is the portion of structure between the surface of the surrounding ground and surface of the floor, immediately above the ground. As per Byelaws, the plinth should not be less than 45cm. The basic requirements of plinth area are,

- ✓ To transmit the load of the super-structure to the foundation.
- ✓ To act as a retaining wall so as to keep the filling portion below the raised floor or the building.
- ✓ To protect the building from damp or moisture penetration into it.
- ✓ It enhances the architectural appearance of the building.

3. Walls and piers in super-structure:

The primary function of walls is to enclose or liquid space. A load-bearing wall in the super structure should satisfy the following requirements.

a) Strength
b) Stability
c) Weather resistance
d) Fire resistance
e) Heat insulation
f) Sound insulation
g) Privacy and security.

4. Ground basement and upper floors:

The main function of a floor is to provide support of occupants, furniture and equipment of a building and the function of providing different floors is to divide the building into different levels for the purpose of creating more accommodation with in the limited space.

The floor should satisfy the following functional requirements.

a) Strength and stability
b) Durability and dampness
c) Heat insulation
d) Sound insulation and fire resistance

5. Doors and windows:

The main function of doors in a building is to serve us a connecting link between internal parts and also to allow the free movement outside the building. Windows are generally provided for the proper ventilation and lighting of a building.

The following are the functional requirements:

a) Weather resistance
b) Sound and thermal insulation
c) Damp prevention and terminate-proofing
d) Fire resistance and durability
e) Privacy and security

6. Sills, Lintels and weather shades:

Windowsills are provided between the bottom of window frame and wall below, to protect the top of wall from wear and tear, the actual frame of door or window is not strong enough to support the weight of the wall above the openings and a separate structural element has, therefore to be introduced. This is known as lintel and is similar to a beam. Weather shades or chajjas are generally combined with lintels of windows to protect from the weather elements such as sun, rain, frost etc.

7. Roofs:

A roof is the uppermost part of the building whose main function is to enclose the space and to protect the same from the effects of weather elements such as rain, sun, wind, heat, snow etc. A good roof is just as essential as a safe foundation. The functional requirements of the roof are as fallows.

a) Strength and stability: Strong and stable enough to take up anticipated loads.
b) Weather resistance: Resistance to wind, rain, sun, snow etc.
c) Heat insulation: Should provide adequate insulation against heat.
d) Sound insulation: Should provide adequate degree of insulation against sound from external sources.
e) Fire resistance: Should offer the adequate degree of fire resistance.
f) Day lighting: Should provide day light in buildings with large floor area i.e., industrial buildings through window in the roof.

8. Steps and stairs:

A stair consist a number of steps leading from one floor to another. The main function of stairs is,

a) To provide means of communication between the various floors for everyday use.
b) To escape from upper floors in the case of fire.

To perform these functions, the stairs should satisfy the following requirements in design and construction.

- Strength and stability: Strong and stable enough to carry the anticipated loads.
- Fire resistance: The stairs should be made of the fire resisting material and they provide safe means of escape in the event of fire.
- Sound insulation: If it is necessary to insulate the stairs from the sound either through the proper design and use of insulating materials or separating stair structure from the building structure.
- Weather resistance: The stairs, if exposed to open air, should offer sufficient resistance to weather elements such as rain, heat etc.
- Comfort and convenience: Proper design and proper location of steps in a building offer several advantages such as comfort and efficiency in vertical movement, natural light and ventilation; safety in emergency etc.

9. Finishes for walls:

The finishes of several types such as pointing, plastering, painting, distempering, decorative colour washing etc applied on the walls. The main functions of these finishes are,

a. Protect structure from the sun, rain, snow etc.
b. Provide a true, even and smooth finished surface and also to improve the aesthetic appearance of the structure.
c. Rectify rather cover, to some extent, the poor or defective workmanship.
d. Cover up the unsound and porous materials used in the construction.

10. Utility fixtures:

These are the built in items of an unmovable nature, which add considerably to the utility of a building and hence termed as utility fixtures. The most common of such built in fixtures are: Cupboards, shelves, smokeless chulas etc. These features are generally provided in the recesses for storing valuable articles, clothes etc. The recesses in wall structure reduce its strength, so they are avoided in the modern construction of houses.

ECONOMY OF BUILDINGS

It refers to the financial and cost-related aspects associated with the planning, construction, operation, and maintenance of buildings. It involves optimizing resources and expenditures to ensure that buildings are cost-effective over their entire lifecycle. Here are key considerations related to the economy of buildings:

1. **Initial Construction Costs:** The most apparent economic aspect of buildings is the cost of their initial construction. This includes expenses related to materials, labour, design, engineering, and permits. Managing and minimizing these costs while ensuring quality construction is critical.
2. **Life Cycle Costs:** The economy of buildings takes into account not only the upfront construction costs but also the long-term costs associated with owning and operating the building. This includes maintenance, repairs, renovations, and eventual decommissioning.
3. **Energy Efficiency:** Buildings consume a significant amount of energy, both in terms of construction materials and ongoing operations. Investing in energy-efficient designs, materials, and systems can lead to substantial savings over the building's life.
4. **Sustainability**: Sustainable building practices can improve the economy of buildings by reducing resource consumption and minimizing environmental impact. Green building certifications, such as LEED (Leadership in Energy and Environmental Design), often come with long-term economic benefits through energy savings and reduced water usage.

5. **Operational Efficiency**: Efficient building operations can reduce ongoing costs. This includes optimizing heating, ventilation, and air conditioning (HVAC) systems, lighting, and other utilities.
6. **Maintenance and Repairs:** Regular maintenance and prompt repairs can extend the lifespan of building components, preventing more extensive and costly damage down the road.
7. **Adaptability and Flexibility:** Buildings that can easily adapt to changing needs and technologies can be more economically viable. This might involve designing spaces that can be reconfigured or repurposed without major structural changes.
8. **Resilience:** Building resilience, particularly in areas prone to natural disasters, can save money in terms of insurance costs and damage repair. This includes using resilient materials and construction techniques.
9. **Location:** The location of a building can significantly impact its economic performance. Accessibility to transportation, amenities, and the local labor market can affect both construction and operational costs.
10. **Financing and Financing Costs:** How a building project is financed, including interest rates and terms of loans or investments, can significantly affect the overall economy of the building.
11. **Market Factors:** Economic factors such as supply and demand in the real estate market, rental rates, and property values can influence the financial performance of a building, especially for commercial and residential properties.
12. **Regulatory Compliance**: Compliance with building codes and regulations is crucial. Failing to meet these standards can result in fines and additional costs for retrofits or corrections.
13. **Technological Advancements:** The adoption of new technologies, such as smart building systems and energy management software, can enhance the efficiency and economy of building operations.

Optimizing the economy of buildings involves a holistic approach, considering both short-term and long-term financial aspects. It requires careful planning, efficient design, ongoing management, and a focus on sustainability and resilience to ensure that buildings remain cost-effective and valuable assets over their lifespans.

DESIGN PRINCIPLES OF BUILDING PLANNING:

The basic principles of building planning in respect of residential buildings are:

(1) FLOOR AREA RATIO (FAR)

- FAR is the ratio of the total covered area of all floors in a building on a certain plot and to the area of the plot
- .The Floor Area Ratio, describes the relationship between the size of a plot and the amount of floor space it contains. For example, a 50' x 100' lot (5,000 sft) with a single-story 50' x 50' building (2,500sft) has a floor area ration of 0.5. If a building with the same size footprint had 4 stories, the FAR would increase to 2. Higher FARs tend to indicate more urban (dense) construction and is used by local governments in zoning codes

(2) FLOOR SPACE INDEX (FSI):

- It is the ratio of built up area inclusive of walls of all the floors and to the area of the land on which the building stands.
- Total floor area including walls of all floors Floor Space Index = Plot Area / Building Unit

(3) ROAD SIDE MARGIN:

Width of Proposed Roads (mts.)	Minimum Road Side Margin (mts) Remarks
Road up to 9mts. and less.	3.00
More than 9 mts and up to 12 mts.	4.50
More than 12 mts and up to 18 mts.	6.00
More than 18 mts and up to 40 mts.	7.50

(1)For the existing built up area the margins requirement may be relaxed on merits of individual Case subject to other regulations. (2) Minimum side Margin shall be provided as per regulation no.12.4.1(A) (ii).

(4) THE AREA OF ROOMS:

Bed rooms, living rooms, drawing room, dining room (min) ....9.4 sqmts

Kitchen and store rooms (min) 5.45 sq mts

Bathrooms and dressing rooms ...1.85 – 4.5 sqmts

Water Closet (WC); Urinal rooms .0.89 – 1.1 sqmts

(5). HEIGHT OF ROOF: Roof height on each floor is 2.7 mts (min) and for bath room and WC is 2.1 mts (min)

(6). AREA OF DOORS, WINDOWS & VENTILATORS:

This shall be 1/6th to 1/10th of the floor area of the room. In addition, every room should have ventilator.

(7) STAIR CASE:

The stair case shall have area not more than 12 sq mts. The pitch shall be in the range of 30o to 45o and flight shall have steps neither < 3 nor > 12. Minimum width of stair shall be 900 mm.

(8) LIFT: This shall be provided for buildings having more than 3 floors excluding the ground floor.

(9) SEPTIC TANK: shall be provided as per number of floors / rooms

(10) HEIGHT OF COMPOUND WALL: The maximum height of compound

(11)PARKING SPACE: Parking spaces for cars required for cinemas, shopping areas and offices located in central areas are to be allocated as per National Building Code.

Principles of Building Planning

When we first start to plan a new building construction work to begin we definitely need to remember some basic principles of building planning. Some of the basic principles of planning of a building construction are given below.

1. An engineer or architect should prepare the building plan according to the demand, economic status & taste of the owner and also the purpose of the building is to be built whether residential, commercial etc.

2. The design of the building should be compatible with the surrounding structures & the weather.

3. Sufficient air and sunlight should be allowed to the building for healthy building environment.

4. Privacy must be maintained especially in residential building planning.

5. Proper security system should be introduced for safety and reliability.

6. Fire safety alarm and firefighting materials should be provided within the range of the

inhabitants of the proposed building structure.

7. The value of the structure should be maintained in building plans.

8. Follow the associated building codes closely for proper building construction.

Importance of planning of building

Planning is a crucial phase in the construction and development of buildings, and its importance cannot be overstated. Effective planning lays the foundation for a successful project and impacts various aspects of the building's functionality, safety, efficiency, sustainability, and cost-effectiveness. Here are some key reasons why planning is essential in the construction of buildings:

1. **Optimal Resource Allocation:** Planning helps allocate resources efficiently, including materials, labour, and finances. Proper resource management ensures that the project stays within budget and is completed on time.
2. **Risk Mitigation**: Thorough planning allows for identifying potential risks and challenges early in the process. This enables proactive measures to be taken to mitigate these risks, reducing the likelihood of costly delays and disruptions during construction.
3. **Safety:** Planning includes safety measures and risk assessments. By addressing safety concerns during the planning phase, builders can create a safer working environment and ensure that the final structure meets safety standards for occupants.

4. **Functionality and Purpose**: Planning ensures that the building's design and layout align with its intended purpose. Whether it's a residential, commercial, industrial, or institutional building, careful consideration of functionality and space allocation is critical.
5. **Compliance with Regulations:** Building codes, zoning laws, environmental regulations, and other legal requirements must be considered during planning. Compliance with these regulations is essential to avoid legal issues and costly modifications later in the construction process.
6. **Environmental Sustainability:** Planning allows for the integration of sustainable design principles, such as energy efficiency, use of eco-friendly materials, and waste reduction. Sustainable building practices can reduce long-term operational costs and minimize environmental impact.
7. **Efficiency and Productivity**: An efficiently planned project minimizes wasted time and resources. Efficient processes and workflows, along with clear project timelines, can boost productivity and keep the project on schedule.
8. **Quality Assurance:** Planning includes specifications for materials and construction methods. This ensures that the building is constructed to high-quality standards, reducing the likelihood of defects and the need for costly repairs or renovations later.
9. **Cost Control:** Careful planning helps control costs by defining the scope of work, estimating expenses accurately, and identifying potential cost-saving opportunities.
10. **Aesthetics and Design**: Planning allows for the exploration of architectural and design options, ensuring that the building's aesthetics align with the desired style and appearance.
11. **Community and Neighborhood Integration**: In urban planning, the design of buildings can impact the overall character and integration of structures within a community or neighborhood. Thoughtful planning contributes to harmonious urban development.
12. **Time Savings:** While planning may seem time-consuming, it ultimately saves time by streamlining the construction process, reducing delays, and minimizing the need for rework.
13. **Long-Term Value:** A well-planned building is more likely to retain its value over time, making it a wise investment for owners and stakeholders.

In summary, planning is essential for ensuring that a building project is completed successfully, on time, within budget, and in compliance with safety and regulatory standards. It is a critical phase that sets the course for the entire construction process and the future life of the building.

GROUPING:

- We know that every apartment in a building has got a definite function and there is some inter-relationship of sequence in between them. Grouping consists in arranging various rooms in the layout plan of the building in such a manner that all the rooms are placed in proper co-relation to their functions and in proximity with each other.

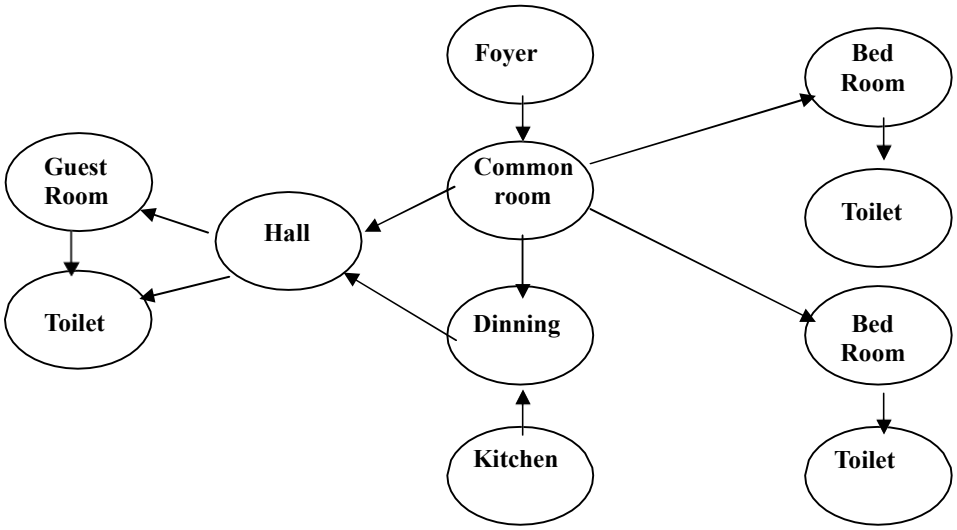
- The basic aim of grouping of the apartments is to maintain the sequence of their function according to their inter-relationship with least interference. For instance in a residential building dining room should be close to the kitchen. The kitchen on the other hand, should be kept away from drawing room or living room to avoid smoke or smell from kitchen spreading in these rooms.

- The water closet should be located away from the kitchen. Main bedrooms should be so located that there is independent and separate access from each room towards the water closet directly or through other un-important rooms. In case of office buildings, hospitals etc., administrative department should be located centrally for convenience and economy in the cost of providing services. Thus the concept of grouping plays a very important role in planning of buildings of all types.

Grouping consist in. arranging the layout in typical fashion so that all the rooms are placed in proper correlation of their functional in due proximity with each other .It is the disposition *of* various rooms in new of their relative and co-ordination, between them.

In residential buildings,

1. Dining room should be closer to kitchen
2. Kitchen should be away from living room to avoid smell and smoke.



CIRCULATION:

Circulation means internal through fares or access providing in a room or between rooms on the same floor. Passage, halls and lobbies perform the function of circulation on the same floor. Such provisions are termed as horizontal circulation. On the other hand, stairs, lifts, ramps etc., which serves the purpose of providing means of access between different floors get covered under the category of the term vertical circulation.

Following aspects should be kept in view to achieve good circulation:

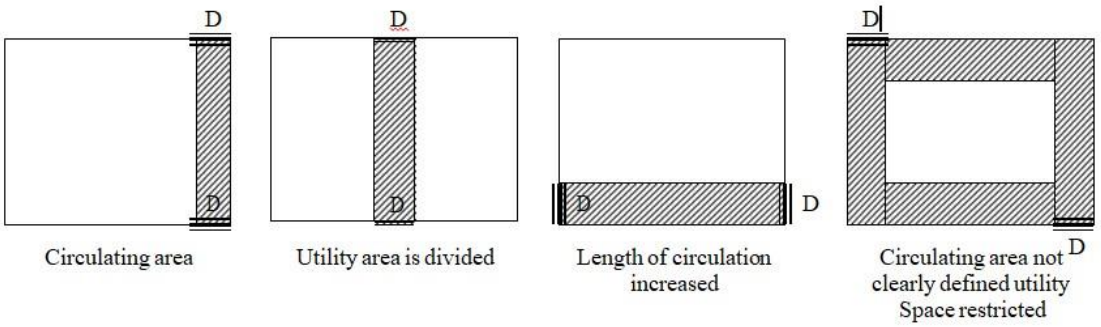
(a) For comfort and convenience, all passages, corridors, halls etc., on each floor should be short, straight, well ventilated and sufficiently lighted.
(b) The location of entrance passages and staircase which serve as link between various rooms and floors, need careful consideration right at the initial stage of planning.
(c) In a multi-storied building, the staircase, which perhaps serve the only unfailing means of vertical circulation, should be planned paying due regard to the size of tread and riser, width of stair and landing, light and ventilation etc. Staircase should be also located that they do not intro-due upon privacy of any room or cause disturbances in the horizontal circulation.
(d) Toilets should be planned near the staircase block for easy accessibility.

There are two types of circulation,

1. Horizontal Circulation
2. Vertical Circulation

1. **Horizontal Circulation:** It is the circulation on the same floor i.e. it may be between rooms. e.g.- These are passage, corridor, halls and lobbies and linking of various blocks of apartment. Area of horizontal circulation may be consists of 20% to 25% of the total building area.
2. **Vertical circulation:** It nothing but the movement of upward and downward movement... There are normally stair cases. For multi storage structures electric lifts are provided, still stair are necessary if there is any electric fail, or the escape exist for fire disaster. E.g.: Stair case, lift, ramp, Escalators etc.

Area of vertical circulation is about 8% to 10 % of total area.



VII. Sanitation:

- The term sanitation covers not only sanitary convenience like water closet, urinals, bath rooms, wash basins etc., but also proper and adequate lightning ventilation and facilities for general cleaning of the building. From hygienic considerations, all parts of the building should be well ventilated and lighted.
- The lighting of the interior of the building may be done by natural lighting, assisted natural lighting or by artificial lighting. Uniform distribution of light in necessary, especially in offices, schools, factories and other similar buildings where number of persons work in the same premises and each individual has to work at specified place.
- For ensuring sun light for greater length of time it is desirable to provide vertical windows. For proper lighting the area of windows in a room should not be less than 1/10th of the floor area which may be increased to 1/5th for buildings like schools, offices, workshops, factories etc.

For sanitation we must provide proper light and ventilation facilities for general cleaning and sanitary conveniences to mention hygienic condition of the building. Light is primary significance. Sunlight destroys the disease causing germs. There is also the valuable health giving properties of ultra violet rays in clear sun light.

Ventilation: Good ventilation is an important factor to comfort in buildings. Ventilation is the change of air in a room. For living more sunlight, less over crowing and fresh air is necessary for a house.

Requirement of space and air required

Type of person	Space, m^3	Air, m^3
Adult	8.5	20 – 30
Child	5.67	20 – 30

Main function of ventilation is

1. To maintains the quantity of air inside the building at certain level.
2. To provide thermal environment which will aspect in maintain the heat balance of the body.
3. To cool the structure of the building when the inside temperature is above outdoor.
4. To remove toxic gases, body odors, bacteria, smoke etc. from air inside the room.
5. During winter workers in factory and industrial plants from excessive heat, dust, moisture and supply fresh air for breathing

Types of ventilation:

1. Natural ventilation, air through windows, roof ventilation
2. Mechanical ventilation: A.C, Fans etc.

Illumination:

Light divided in to two types. 1. Natural light
2. Artificial light

For all types of buildings good lighting is a must.

1. It helps in promoting different activities in the building, safety, creating pleasing atmosphere in different parts of the building.
2. When illumination is sufficient, there is less tension in brain, heart rate is normal, visual sense is greater. 3. If illumination is not sufficient, children bring their books closer to eyes which in turn affect eye sight.
4. But more illumination is also harmful. Glaring of light is also harmful to sight.

Following methods are adopted to reduce Glaring.

Natural light are three types:

a. Direct lighting
b. Indirect lighting
c. Combination of semi direct and indirect lighting

a. **Direct lighting:** By diffusing the light through frosted glass. If diffusion is perfect, light will be uniform and shade less.

b. **Indirect lighting :** By use of Indirect lighting: A beam of light is directed to the wall, floor or ceiling and from there by reflect to other parts of the room

Floor reflection	-	10 % to 20% of light
Wall reflection	-	35 % to 55 % of light
Ceiling reflection	-	65 % to 80 % of light

Similarly reflection fraction of diffusion of colors

S.no	Colour	% of light reflection
1	Dark White	85
2	Dark Light Yellow	75
3	Dark Green	65
4	Dark Blue	55
5	Dark Grey	30
6	Dark Red	13
7	Dark Blue	8
8	Dark Green	7

c. **Combination of Semi direct and Indirect lighting**. A luminous bowl allows some of the light to be diffused to be diffuse downward and some to be throws on the ceiling for reflection.

Artificial lighting:

Due to effective planning no artificial lighting is required in day time. But if recommended illumination is not reached, artificial lighting is necessary.

1. Direct lighting
2. Indirect lighting
3. Semi direct and indirect lighting