

UNIT I

Overview of the course, basic definitions, buildings-types-components- economy and design principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation consideration of the above aspects during planning of building

OVER VIEW OF Course:

Building or housing is the most fundamental need for humankind. It shelters us. When we see or hear the “Building” word, we imagine that a building is tall and has a roof, walls, rooms, etc. However, in a broader sense, the definition of a building is structurally constructive based on bricks, sands, types of cement, water, concrete, metal, etc.

What is Building?

The building is a kind of structure which is built with materials and including with foundation, plinth, walls, floors, roofs, chimneys, plumbing, and building services, fixed platforms, veranda, 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. For example, houses, factories, shopping malls, hospitals, etc.

A building aims to give shelter along with security. Other purposes such as buildings serve several needs of society primarily as shelter from the weather, security, living space, privacy, to store belongings, supplied electricity, and to comfortably live and work.

Types of Buildings

Buildings may be load-bearing masonry buildings, RCC, or steel-framed structure buildings. There are many different types of Buildings. Such as-

- Residential houses,
- Schools, Colleges & Universities,
- Hospitals,
- Factories, Workshops,
- Mosques, Churches, Temples,
- Malls etc.

Basic Components & Parts of Buildings

Building components or parts are essential materials for building construction. All buildings are built with the same components such as foundations, walls, floors, rooms, and roofs. Buildings need to decorate or renovate with paints, plasters, supplied electricity, and doors and windows fittings, fencing, and external other works to finish accurately. All these works are called Building Service.

A building has three basic requirements and components. They are -

- Foundation
- Plinth
- Superstructure

A brief description of these basic parts of a building is given below.

Foundation

Foundation is the most critical work of building construction. A load of buildings depends on the foundation which is the strength of buildings. It is one kind of substructure. Foundations can be divided into two categories such as Shallow and Deep Foundations. The words shallow and deep indicate the depth of foundation in the soil. Shallow foundations are used for small and light buildings e.g. a small or medium-size houses, small shopping centers, etc., and deep foundations are used for heavy and large buildings e.g. tall buildings, huge shopping malls, large hospitals, and universities, etc. Generally, shallow foundations can be made in the depth of as little as 3ft (1m), and deep foundations made at depth of 60-200ft (20-65m).

There are various types of foundations in building construction.

- Strip Foundation (shallow foundations)
- Footing Foundation (shallow foundations)
- Pad Foundation (shallow foundations)
- Grillage Foundation (shallow foundations)
- Raft Foundation (shallow foundations)
- Pile Foundation (deep foundations)
- Pier Foundation (deep foundations)
- Cassion Foundation (deep foundations).

All these foundations work to make columns, walls, rooms, and living spaces. Depends on different types of foundations, workers use various amounts of building materials, for example, in beam work, workers make pile foundations.

Functions of Foundations:

- Load distribution
- Provide firm and level surface
- Protection against soil movement
- Reduction of load intensity
- Reduction of differential settlement
- Safety against sliding and overturning
- Safety against undermining

Plinth

The plinth is that part between the surrounding ground surface and floor space immediately above the ground of a building. Plinth resists entry of rainwater and insects inside the building. General plinth height is 45, 60, 75, 90, 120 cm.

Superstructure

The Superstructure is constructed above the underground level. The location between the underground level and the ground level is known as the plinth. In this structure, walls and rooms are constructed and transfer loads from the upper part to the substructure. In this part, a building has the following components:

Floor Structures

It is an important element of building construction. It is located at the lower level surface of a room. Floors can decorate in various ways. Floors are here to move around e.g. walking from one room to another room.

Roof Structures

It is located at the upper-level surface of a room. Depends on the weather, roofs can be different categories such as- blue roof, cold roof, collar roof, fabric roof, a domestic roof, domestic roofing, fiber cement, flat roof,

green roof, pitched roof, mono-pitched roof, warm roof, shell roof, metal roof, roof tiles, skillion roof, etc. Most of the time, flat roofs, domestic roofs, and fiber cement roofs are used in building constructions.

Lintel, Sunshade & Parapet

Lintel beams are provided near openings to bear the load coming from the superstructure above the door or windows. Lintels can be steel lintels, reinforced brick lintels, stone lintels, timber lintels, etc.

The sunshade is one kind of slab, which is made on the top of windows and doors. It protects the doors and windows from rain and the heavy heat of sunlight. Based on their position, sunshades can be Internal, External, and Inter-pane. Internal Sun-shading is protecting from solar radiation and balance useful daylight availability; for example- curtains and Venetian blinds, roller blinds, pleated blinds, blackout blinds, etc. External shading can be horizontal, vertical, or egg-crate devices. External Sunshades are considered better to protect the building from weather or climate changes. Sunshades maintain a comfortable indoor temperature and minimize the solar radiation and coolness of the weather, which dramatically affect building energy performance.

The parapet is a low wall constructed above the roofline that usually spans around the perimeter of a building. A parapet wall can be constructed around balconies or at the edge of terraces and stairs.

Door & Windows

Doors provide a connecting link between rooms, allowing free movement from room-to-room. Windows are opening provides in walls. Doors and windows provide lighting, smooth sound of outside places, and ventilation. Undoubtedly, both provide security and privacy. Different buildings have different sizes of doors; for example -Residential area's doors are completely different from industrial buildings' doors. There are different types of doors that engineers and architecture used in buildings construction.

Considering Material Used

- 1.Wooden Door
- 2.Metal Door
- 3.UPVC Door

Considering the Mechanism & Usage

- 1.Sliding Door
- 2.Composite Door
- 3.Swinging Door
- 4.Revolving Door
- 5.Folding Door

There are also different types of windows such as:

- Fixed
- Pivoted
- Double Hung
- Sliding
- Casement
- Sash
- Louvered
- Metal
- Bay
- Corner window

- Dormer window
- Gable window
- Lantern
- Skylight

Walls & Columns

The walls are building blocks of bricks or stones. They divide the building space into various support space slabs into various beams and rooms. They safely transmit the loads coming on them from beams and slabs to the foundation. They provide privacy and protection against heat, cold, rain, noise, dust winds. Walls can be Brick masonry walls and Stonemasonry walls.

Columns are vertical members along which beams and slab /roof is supported. The shape of the columns can be square, rectangular, and circular.

Building Finishes works

The concluding appearance of a building depends on such works. Such as:

- Plastering and pointing
- Kitchen setup
- Painting walls
- Furnishing wooded doors & woodwork
- Oiling & painting grillwork & metal-work.
- Positioning & maintenance of lifts & stairs works

Building Services

There are other building services after the construction, which are also counted as components of building construction. Such as- water supply, electricity supply, drainage, and sanitation supply, internal closets' and cupboards' services.

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Building Planning

Building Planning is the arrangement of various components or units of a building in a systematic manner so as to form a meaningful and homogeneous structure to meet its functional purpose.

The arrangement of the various rooms in the building is known as Planning of Building.

Building planning is a graphical representation of what a building will look like after construction. It is used by builders and contractors to construct buildings of all kinds. Building planning is also useful when it is essential to estimate how much a project will cost and for preparing project budgets building planning is also useful.

The basic objective of planning the building is to arrange all the units of the building on all floors at a given level according to their functional requirements. By doing this, one can make the best use of space available for building.

In building planning, privacy can be obtained by judicious planning of the building with respect to grouping, the position of doors and windows, mode of the hanging of doors, location of entrance and pathways, drives, etc. sometimes, provision of lobbies, corridors, screens, etc.

Factors Affecting to Building Planning

Followings are the factors affecting the planning of the building,

1. Function of building e.g. residential, industrial, public, commercial etc.
2. Shape and size of the plot
3. Topography
4. Climatic condition
5. Building by-Laws etc.

Principles of Building Planning

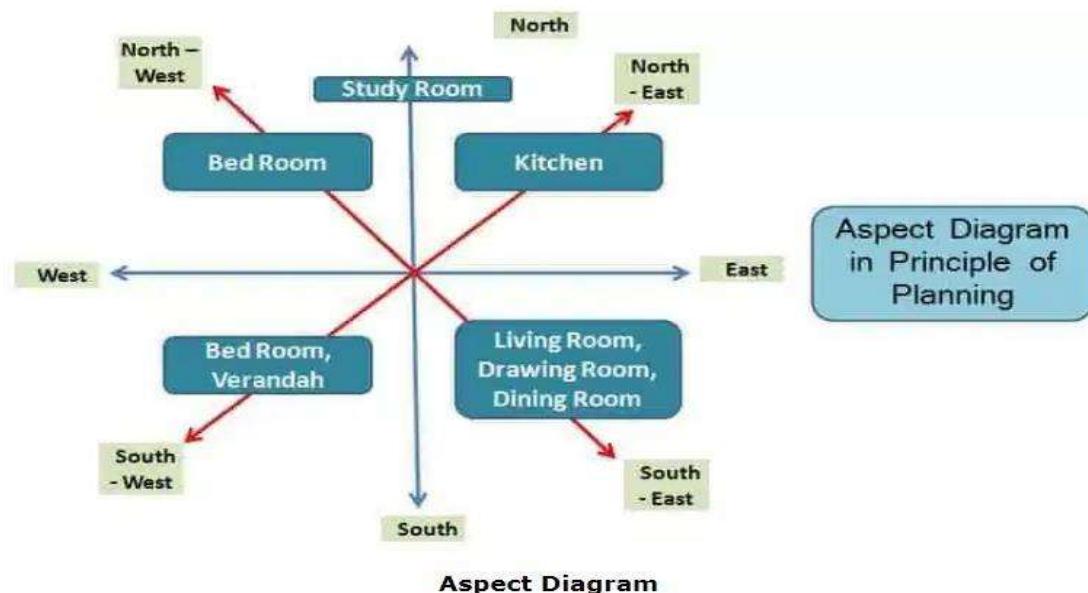
These principles are not as rigid as laws of nature, certain deviations from these principles are necessary and inadequacies in them are to be met with by an individual. Basic principles of building planning

1. Aspect
2. Prospect
3. Furniture Requirements
4. Roomines
5. Grouping
6. Circulation
7. Sanitation
8. Elegance
9. Privacy
10. Flexibility
11. Economy
12. Practical Consideration

1. Aspect

Aspect is the positioning of rooms in buildings with respect to 4 directions in such a way that the occupants of buildings would enjoy the natural comforts like sunshine, breeze, scenery, etc. to the maximum possible extent. A room receiving light and air from any particular direction is said to have the aspect of that

direction. All the rooms of a dwelling need a particular aspect. Some necessary aspects of commonly constructed rooms are listed below:



1. Living Room: It should have a southern or south-east aspect. The sun is towards the south during winter and north during summer which will provide sunshine during winter and cooler during summertime.
2. Bedroom: It should have a west or south-west aspect, as the breeze required particularly in summer would prevail from this side.
3. Kitchen: It should have an eastern aspect so as to admit morning sun refresh and purify the air.
4. Gallery or Verandah: It should be north or north-east aspect.
5. Classroom, Reading Room: It should be laid with the north aspect as light received from the north will be diffused and evenly distributed.

2. Prospect



Aesthetic Appearance

Prospect in building planning is the view desired by the occupants of the building from certain of the house. Prospect is dictated by surrounding peculiarities good or bad of the selected site like a flower garden or garbage dumps, It demands the disposition of doors and windows -like aspect. However, a good layout should not be disturbed for the sake of good prospects only.

Certain projecting windows or a blind face of the bay with window openings at sides would help for concealment of inside views of a building.

3. Furniture Requirements

Furniture is a functional requirement of a room. A living room, drawing room, kitchen, classroom, office room, laboratory, hospital room, etc. all have their own furniture requirements.

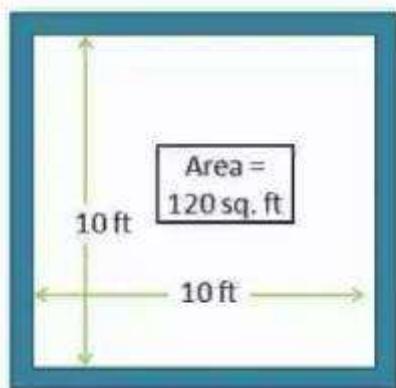


Proper Furniture Placement

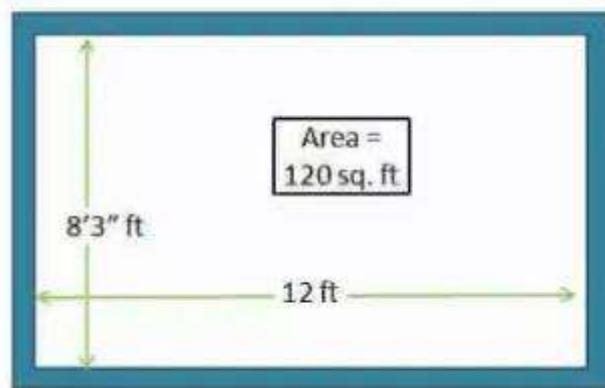
A room should have enough space to accommodate all the furniture required for the maximum number of people without overcrowding.

4. Roominess

Roominess is obtained by getting the maximum benefit from the minimum dimension of a room without cramping the plan. By using every nook and corner of the building advantage roominess is derived.



1. Square Room



2. Rectangle Room

In residential buildings, considerable storage space is required for various purposes which are provided by making space for wall cupboards, lofts, wooden shelves, etc.

A rectangular room is more useful than a square room in the same area.

The length and breadth ratio of a good room should be between 1.2 to 1.5. A ratio more than that creates a bad effect. A small room should not be made unnecessary too high.

5. Grouping

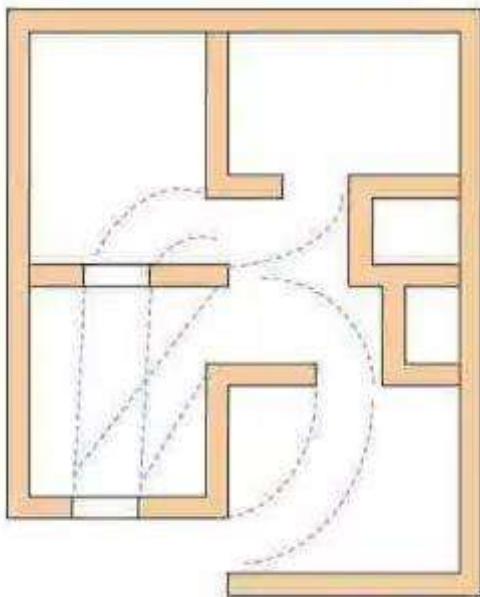
Grouping in building planning means setting different rooms of a building according to their inter-relationship of invitation and transition. The rooms arranged in the layout in a proper correlation of their functions and in due proximity with each other.

Grouping in Residential Building Plan

- The dining room should be close to the kitchen.
- The kitchen should be kept away from the main living room.
- Main bedrooms should have independent and separate access from each room towards the sanitary units.
- In an office building, hospitals, etc. the administrative department should be located centrally for convenience and economy of services.

6. Circulation

Access or internal connection between rooms on the same floor or between floors is known as circulation. Circulation between rooms of the same floor is called horizontal circulation like- passages, corridors, halls, etc. Circulation between various floors is known as vertical circulation, like - stairs, lifts, etc.



Horizontal Circulation should be independent, short, and straight not invade the property of any room. All the passages should be well ventilated and lighted.

Stairs should also be well lighted and ventilated and properly planned in regard to width, rise, and tread. Stairs should not have winder steps.

7. Sanitation

Sanitation of building not only associated with urinals, bath-rooms, wash-basins, sinks but also the overall lighting and ventilation. All the parts of a building should have well lighting and ventilation to maintain good hygienic conditions. This could be done in a natural way or in an artificial way (air condition).

Necessary provision to facilitate the cleaning of the building be installed. Washing closets, lavatories, urinals, bathrooms like sanitary conveniences should be installed adequate in number in relation to the occupant load.

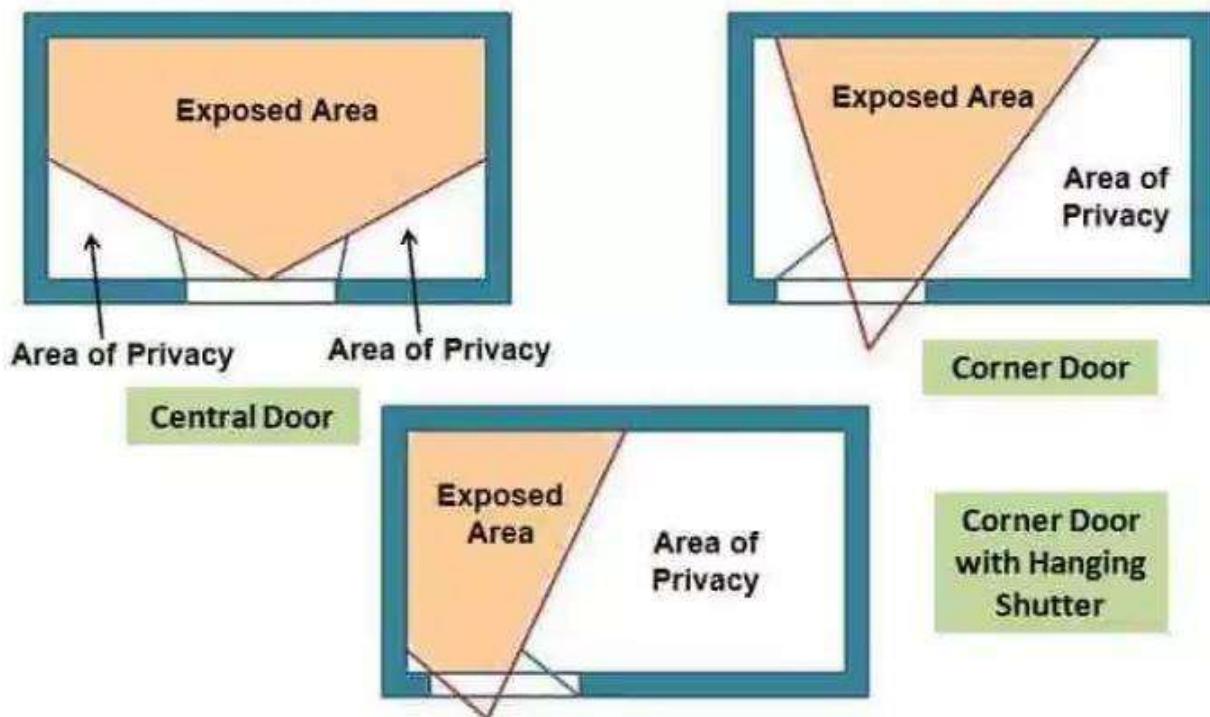
8. Elegance

Elegance is the overall effect produced by elevation and general layout of the plan of a building. To get good elegance of a building it is better if elevation is developed first and then the plan is adjusted accordingly.

Selection of site or open plot for the construction of building greatly affects the elegance. Building located in depression will give bad elegance whereas building on an elevated spot gives an impressive appearance. Buildings located on backward sloping upwards ground give good elevation & elegance.

9. Privacy

Privacy is an important part of building planning. Privacy may be from one part to another of the same building or could be from neighboring buildings, streets, etc.



In residential buildings, every room should have certain privacy which can be secured carefully planning the entrance, path-ways, and drives.

Proper grouping of rooms, good positioning of doors and windows, lobbies, or screens can give required internal privacy. Toilet rooms, bedrooms, w.c. and urinals should have absolute privacy.

10. Flexibility

Flexibility means planning the rooms in such a way that though originally designed for a specific purpose, may be used for other purposes also when desired. For designing houses for middle-class families or other buildings where the economy is the main consideration flexibility should always be considered.

If large space is needed in a certain time a house to accommodate the gathering. It can be obtained by removing a removable partition wall or curtain between the room and the dining room. Alternatively, an open yard, garden, or verandah can also be provided.

11. Economy

The economy is a major factor in building planning. To fit the proposed scheme within the limitations of the resources and funds certain alterations and omissions in the original plan have to make. But while considering the economy, the required strength and durability of the structure should not be compromised.

Some simple economy achieving approaches in buildings are,

- Simple elevation, dispensing of porches, lobbies, etc.
- Steeper rise to the stair, wider steps in the stair.
- Reducing the story height to a bare minimum.
- Standardization of sizes of various components and materials.

12. Practical Consideration

Besides all the Principles of planning discussed, the following practical points should be additionally considered,

1. The strength, stability, convenience, and comfort of the occupants of the building, should be considered first.
2. Provisions for future extensions without dismantling should be made in the planning.
3. The building should be strong and capable to withstand the likely adverse effects of natural agencies (earthquake, flood, storm, etc.)
4. Elevation should be simple yet attractive. Too many porches may give good elevation for some time, but in the end, simple designs fit better for generations.
5. The larger size of the room should always be considered as far as possible as it can be shortened by providing partitions but smaller rooms cannot be enlarged easily.

Essential Elements of Planning of Residential Building

The followings are the required elements for the planning of the residential building,

1. Integrated Design

Landscape and architectural designs should be integrated with all project design disciplines in order to enhance the building performance and aesthetics. Enhancing performance and functional objectives that impact building orientation, massing, space adjacencies, material selections and assemblies.

2. Performance Measures and Functional Objectives

Planning shall ensure that the design supports quality-based performance measures for customer satisfaction, energy consumption, and reduced operation and maintenance. It should also identify all expectations and establish alternative features that support attainment.

3. Environmental Sensitivity

The natural setting of the site, its contour lines, and vegetation shall be viewed as assets to be preserved in the design as much as possible. In settings including historic buildings and other infrastructure, adjoining historic properties, or nearly located historic properties that will not be affected by construction.

4. Urban Context

Design facilities and orientation must be consistent with existing and planned development patterns and nearby uses. The exterior of the building should be consistent with existing local design guidelines as per standards. Where appropriate, the project team should help to develop design guidelines for the project and neighboring undeveloped sites

Grouping • Grouping means the arrangement of various rooms in the building for the convenience of user. It minimizes the circulation and at the same time improves the comfort. A dining room should be close to kitchen, while sanitary be away from kitchen, but convenient to bed rooms.

Functional Requirements for Adequate Ventilation

A ventilating system should be capable of supplying fresh air inside a room and also removing the used air to outside. The factors that govern the operation of the ventilating system are the temperature of the air, humidity, and purity of the air.

The rate of air change depends on the number of persons inside, room temperature, nature of the work, etc. Air change per hour is the volume of air entered into a room in one hour with respect to the total volume of air.

The minimum air change required per hour is two and the maximum 60, but the optimum air change rate is five to six per hour.

Types of Ventilation

Natural Ventilation

In natural ventilation, the air change takes place through doors, windows and air holes in a natural way without the intervention of any external source. The natural ventilation depends on location of the building, its orientation, wind direction, velocity of air, outside temperature, etc. For effective ventilation in the natural way, the following points should be kept in view:

1. The height of the room should be sufficient
2. The size, number, and location of doors and windows should be effectively decided
3. The inlet and exhaust should not be obstructed in any way

Mechanical Ventilation

In this system of ventilation, external systems are installed. These include exhaust fans, air conditioners, and inlet fans. In this process, not only the air movement but the temperature and humidity of the air are controlled. As such, the stay in the room is more comfortable.

However the initial cost of installing the equipment makes the system slightly costly. The main mechanical systems are:

1. Exhaust fans
2. Inlet fans
3. Combined exhaust and inlet fans
4. Air conditioners

Functional Requirements for Effective Building Ventilation

1. The number of air changes should be the optimum. It should be sufficient to provide comfort. If the number of air changes is less, it may cause suffocation to the inhabitants.
2. The air supplied inside the room should be fresh, pure and free from dust, dirt and bacteria.
3. To have proper wind effect, the outlet openings should be on the top near the roof level while the inlet openings should be near the floor level.
4. The room humidity should be maintained at the correct level.
5. The temperature inside should be maintained properly taking into account the outside temperature.

Thus it can be seen that for creating a healthy and comfortable living conditions inside, effective ventilation of buildings is to be maintained.