BASICS OF CIVIL ENGINEERING- CV0121

Unit – 4

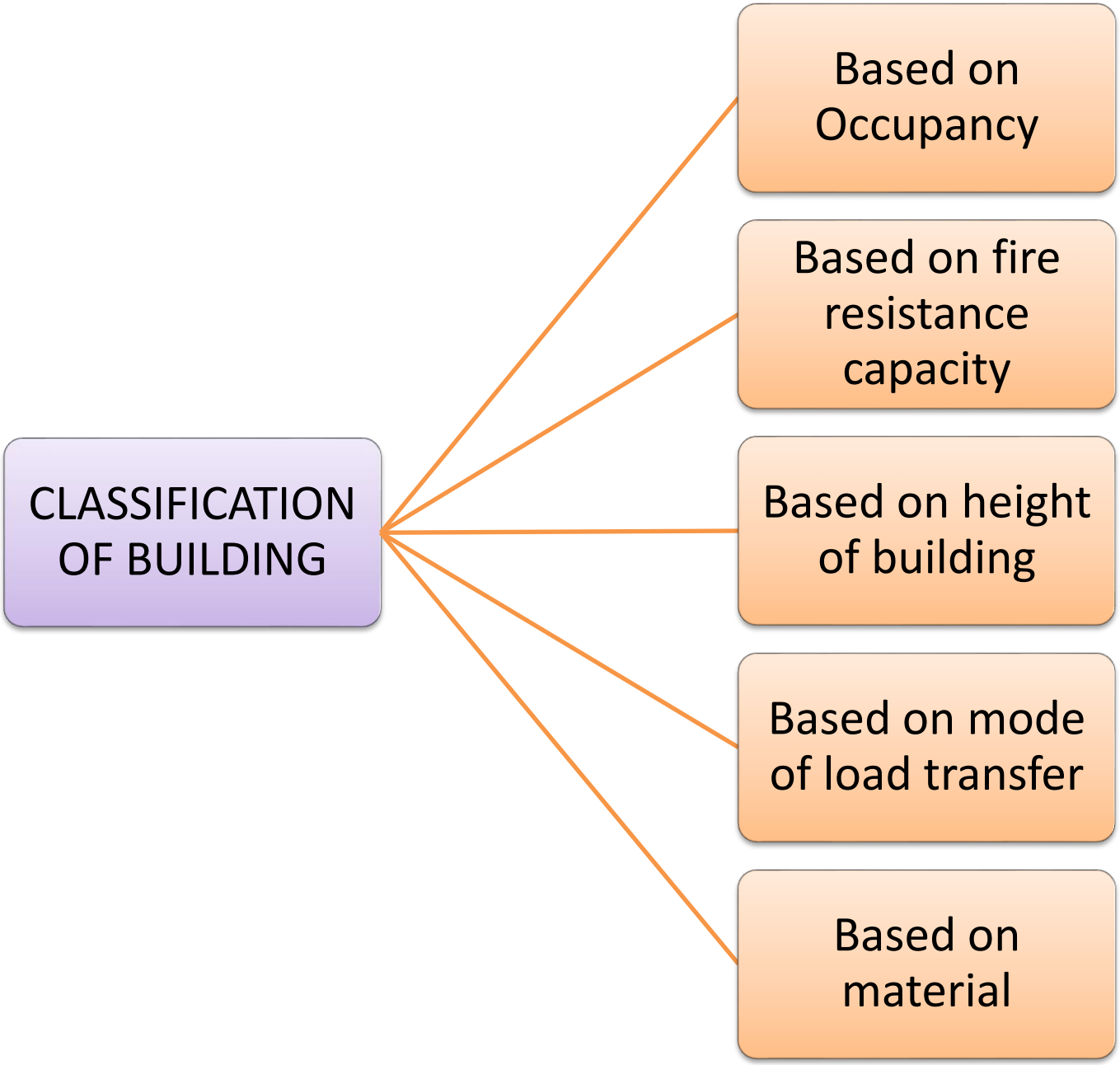
BUILDING PLANNING

CONTENTS

- Classification of buildings
- Type of load acting on building,
- Building component and their function and nominal dimension of residential building
- Introduction to planning
- Principles of planning
- Basic requirements of a building and orientation,
- Types of residential building,
- FSI
- Line plan of residential building and detailed plan (includes window and door opening).

What do you understand by BUILDING?

- A structure (such as a house, hospital, school etc.) with a roof and walls that is used as a place for people to live, work, do activities, store things etc.
- Simply, provide shelter to mankind.


CLASSIFICATION OF BUILDING
Based on Occupancy
Based on fire resistance capacity
Based on height of building
Based on mode of load transfer
Based on material

Classification of Building

I. BASED ON OCCUPANCY:

- Residential building
- Educational building
- Assembly Building
- Institutional building
- Business Building
- Mercantile Building
- Storage Building
- Industrial Building
- Hazardous Building

Residential Building

- Buildings in which sleeping arrangements are provided with or without cooking arrangement. It includes single or multi-family dwelling, apartments, lodgings, hostels, dormitories.

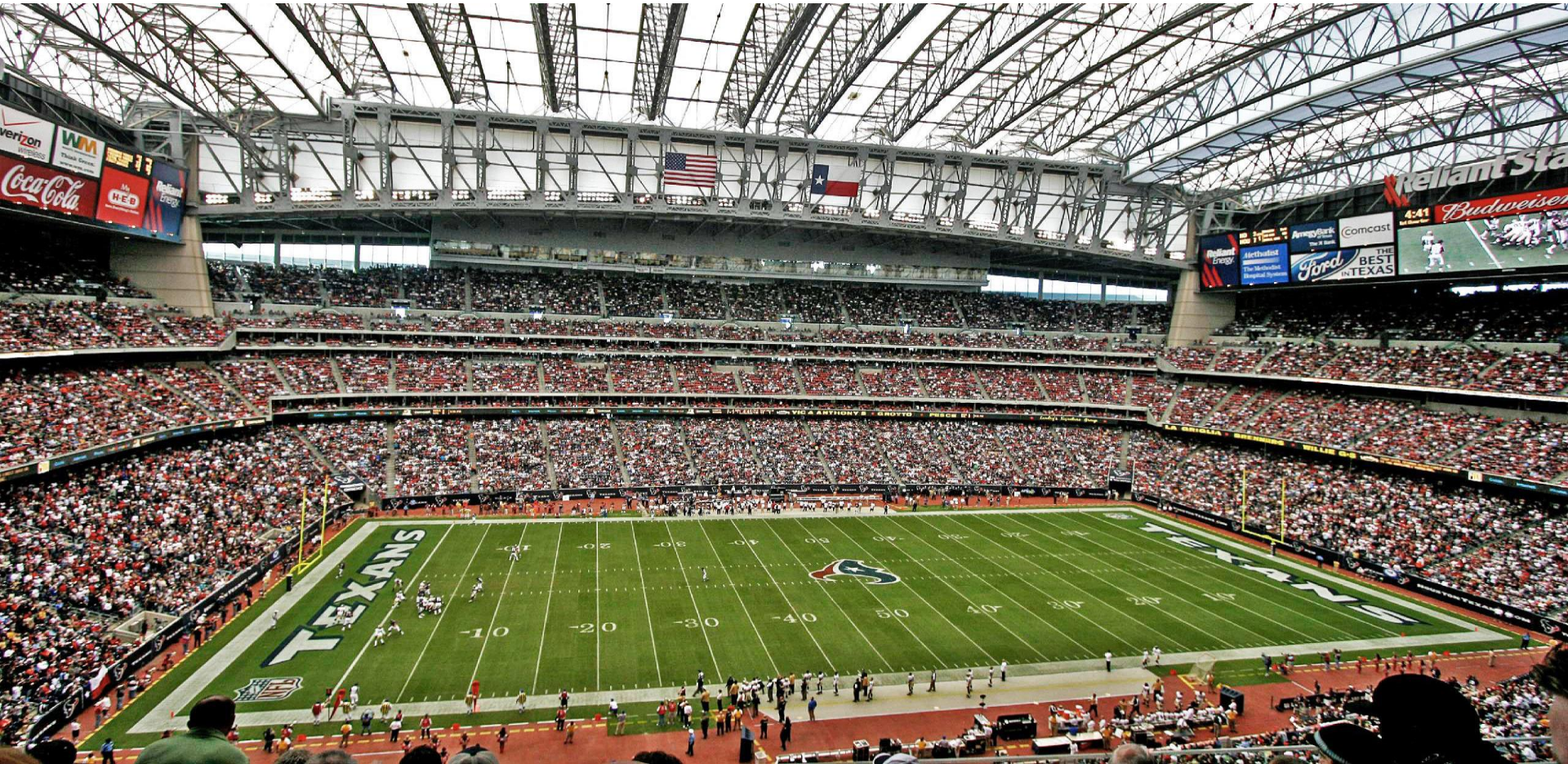
Educational Building

- These include any building used for educational purpose like school, colleges, universities, training institutes etc.

Assembly Building

- These are buildings meant for assembly of a large number of people for amusement, recreation, social, religious, patriotic, civil and similar purposes.

  Ex: Theatres, museums, temples, club, auditoriums, amusement park etc.



Institutional Building

- Ex: Hospital, Nursing Homes, Jails etc.

Business Building

- These are buildings meant for running business. For transactions, keeping accounts and records and similar purposes.

  Ex: Banks, city halls, court houses etc.

Mercantile Building

- These are used as shops, stores, markets, for display and sale of merchandise either wholesale or retail.

Industrial Building

- These are the buildings in which products or materials of all kinds and properties are fabricated, assembled or processed.

Ex: Power plants, refineries, pumping stations, saw mills etc. .

Storage Building

- These are used for the storage or sheltering of goods, wares, vehicles etc. .

  Ex: Ware houses, cold storages, transit sheds, garages etc. .

Hazardous Building

- These buildings are used for the storage, handling, manufacturing or processing of highly combustible or explosive materials or products.
  - Highly explosive materials.
  - Products which are liable to burn with extreme rapidity
  - Products which may produce poisonous fumes or explosions.

Classification of Building

III. BASED ON HEIGHT OF BUILDING:

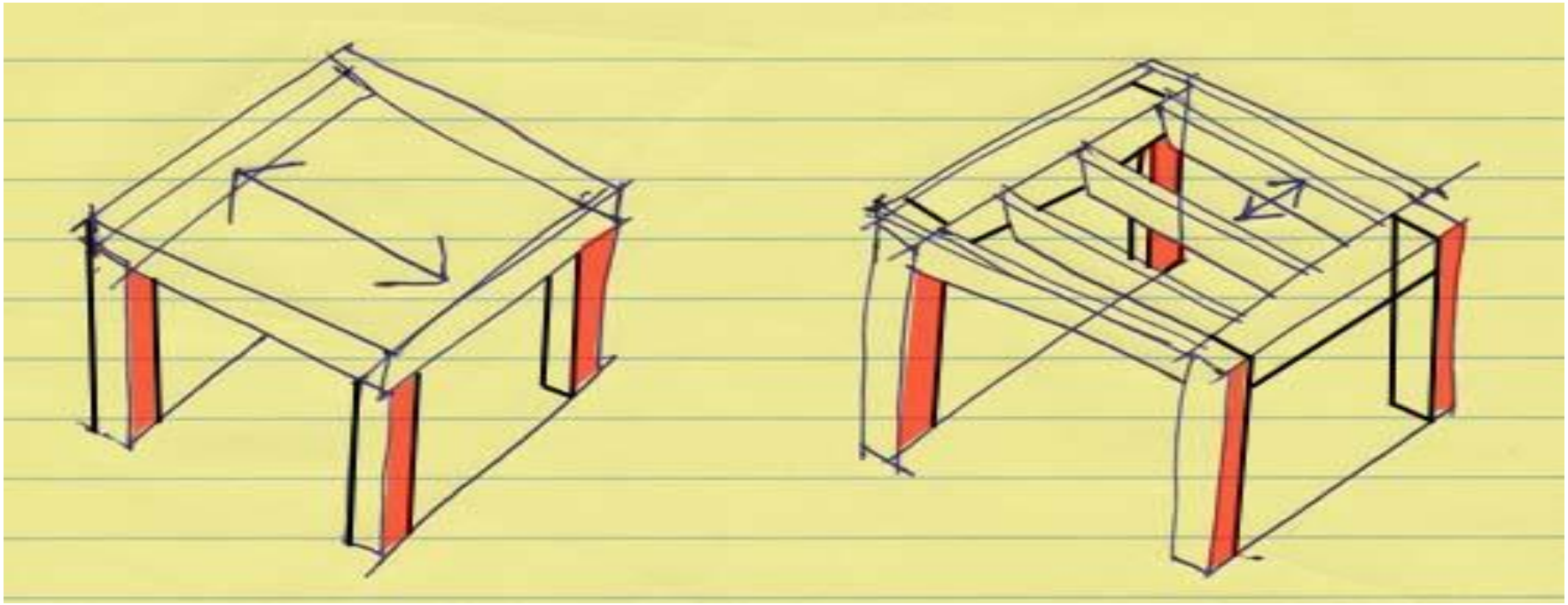
High rise Building : building > 15m

Low rise Building : building < 15m

Classification of Building

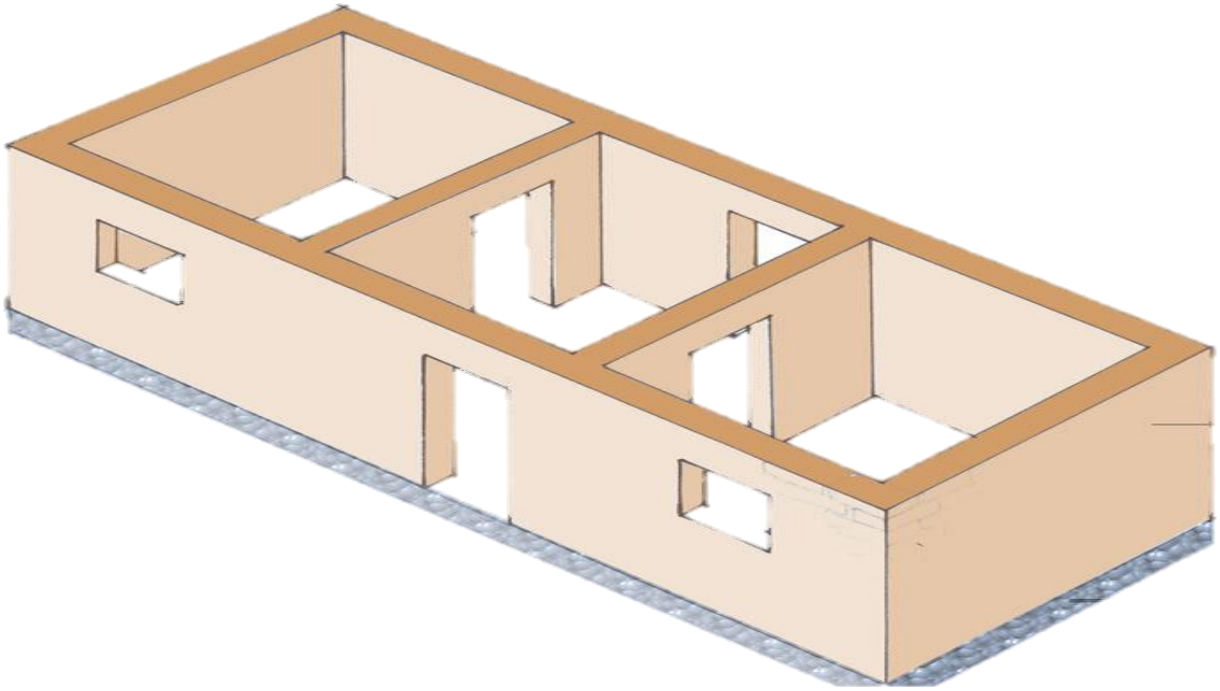
IV. BASED ON MODE OF LOAD TRANSFER:

- Load Bearing Structures
- Framed Structures
- Composite Structures



Load Bearing Structures

- In this type of structures loads from roof slab or trusses and floors are transmitted through walls to the firm soil below the ground.
- This type of structures are adopted where hard strata are available at shallow depth. The structural elements like beams, slabs rests directly on the walls.
- It is adopted for the buildings up to 3 storey construction.

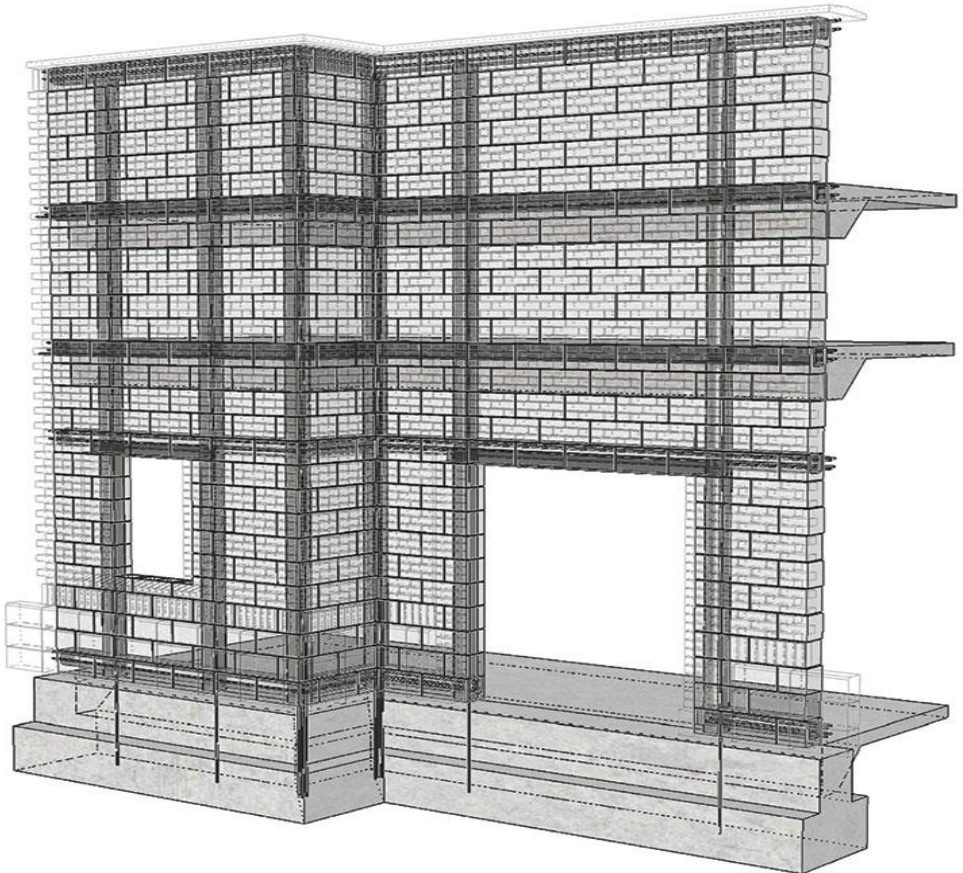


Framed Structures

- It consists of a rigidly connected network of beams & columns.
- The load is transferred from beams to the columns and column intern transfer the load directly to the sub soil through footing.
- Framed structures are suitable for multi-storey building subjected to variety of extreme loads like compressive, tensile torsion, shear along with moment.

Composites Structures

- It consists of column as well as load bearing masonry walls are provided. Floor loads are transmitted to walls and beams.
- The load is transmitted to the ground by columns and load bearing walls through their foundations.



Classification of Building

IV. BASED ON MATERIAL:

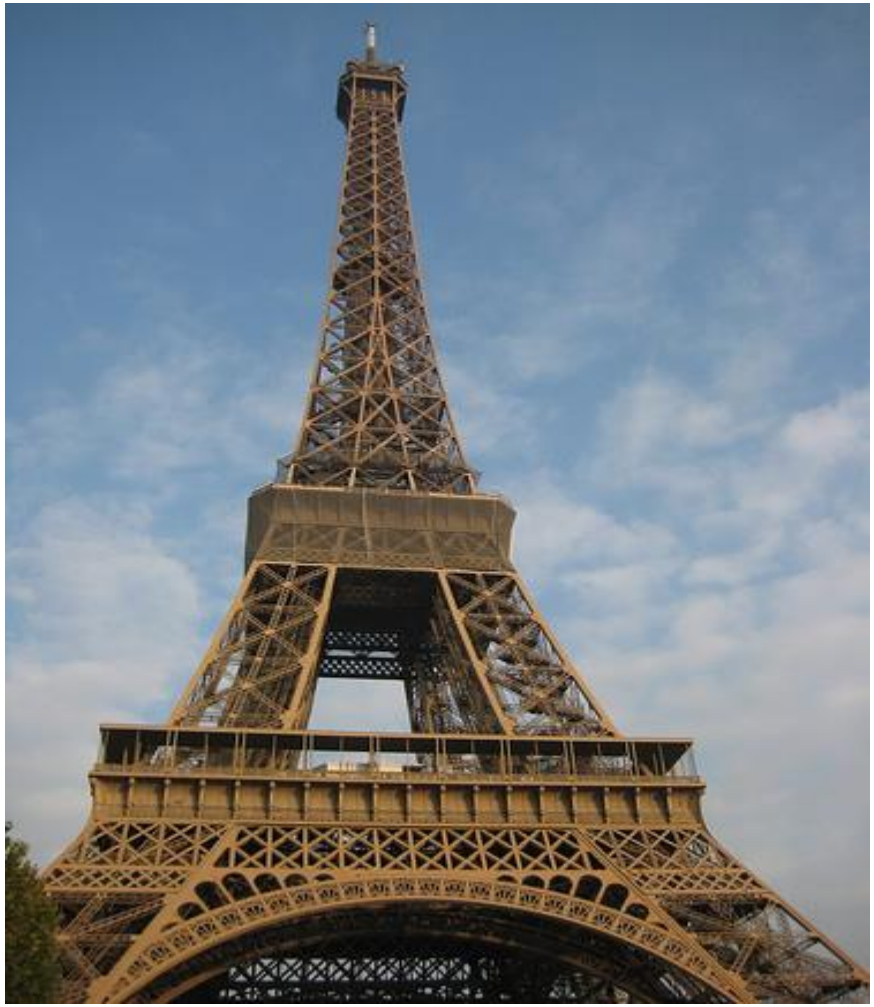
- Earthen Building
- Thatched Building
- Wooden Building
- Masonry Building
- Steel Building
- RCC Building

Earthen building

Thatched building

Wooden Building

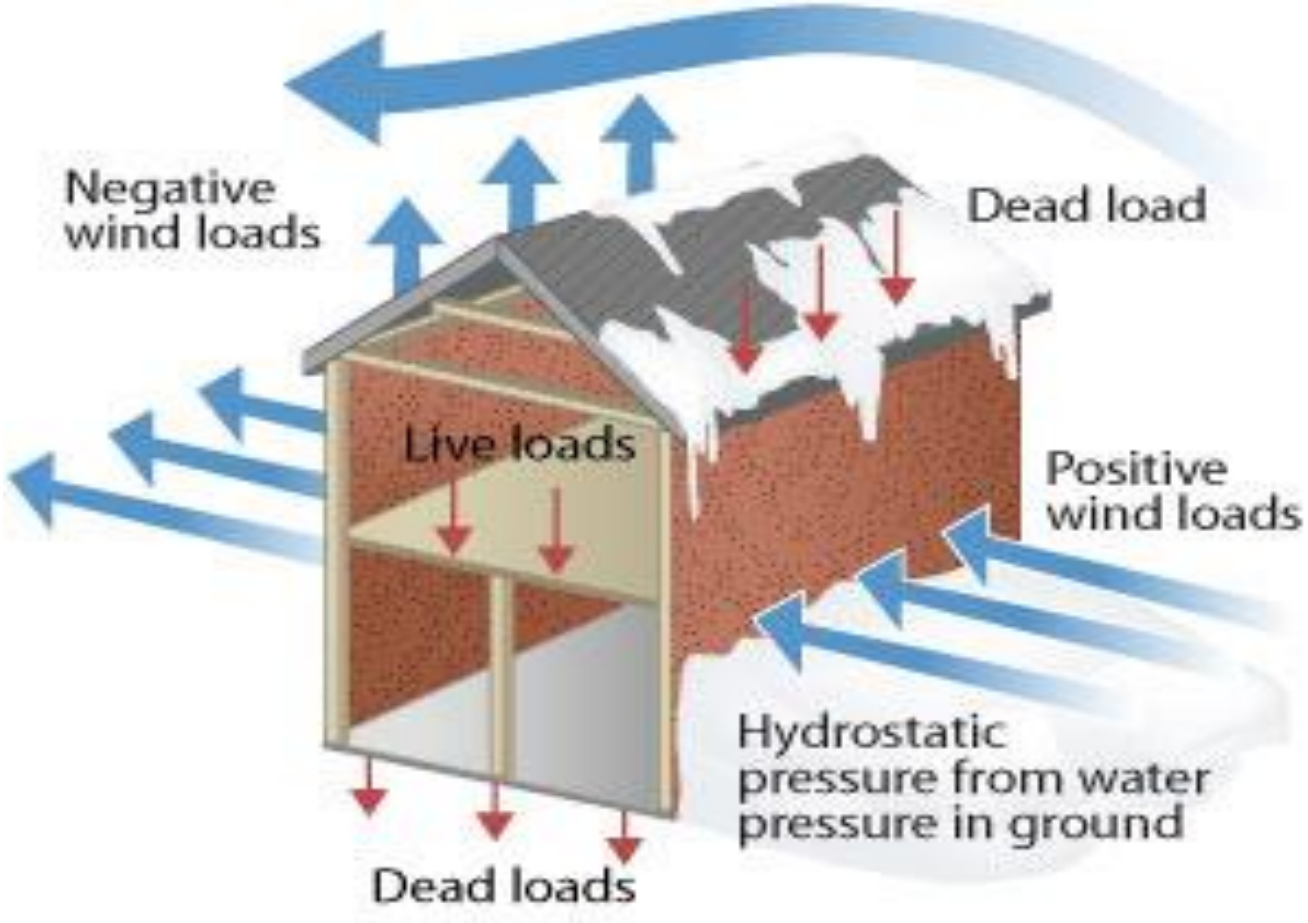
Masonry Building



Steel building

RCC building

LOADS ACTING ON BUILDINGS



Types of Load

- Dead Load
- Live Load
- Wind Load
- Earthquake Load
- Erection Load
- Snow Load
- Settlement Load
- Thermal Load

Types of Load

I. **Dead Load:** Dead load comprises of the weight of all walls, partitions, floors and roofs including all other permanent construction in the building.

I. **Live Load:** Live Loads consist of moving or variable loads due to people or occupants, their furniture, temporary stores, machineries.

I. **Wind Load:** It is considered as basic wind pressure which is equivalent static pressure in the direction of the wind

- Wind pressure = $k.V^2$
- Where,
  k = co-efficient, 0.006
  V= wind velocity
- Wind pressure always acts horizontally in the vertically exposed surface.

IV. **Earthquake Load:** An earthquake load produced waves in every possible direction below ground. As per intensity or scale of earthquake, jerks and shocks are acting on the earth. As per the location of the building in the prescribed zone of earthquake coefficients of earthquake loads are decided.

V. **Erection Load:** All loads required to be carried by the structure or any part of it due to storage or positioning of construction material and erection equipment including all loads due to operation of such equipment, shall be considered as erection loads.

VI. **Snow Load:** Actual load due to snow depends upon the shape of the roof and its capacity to retain the snow. The load due to snow may be assumed to be 2.5 kg/m3 per cm depth of snow.

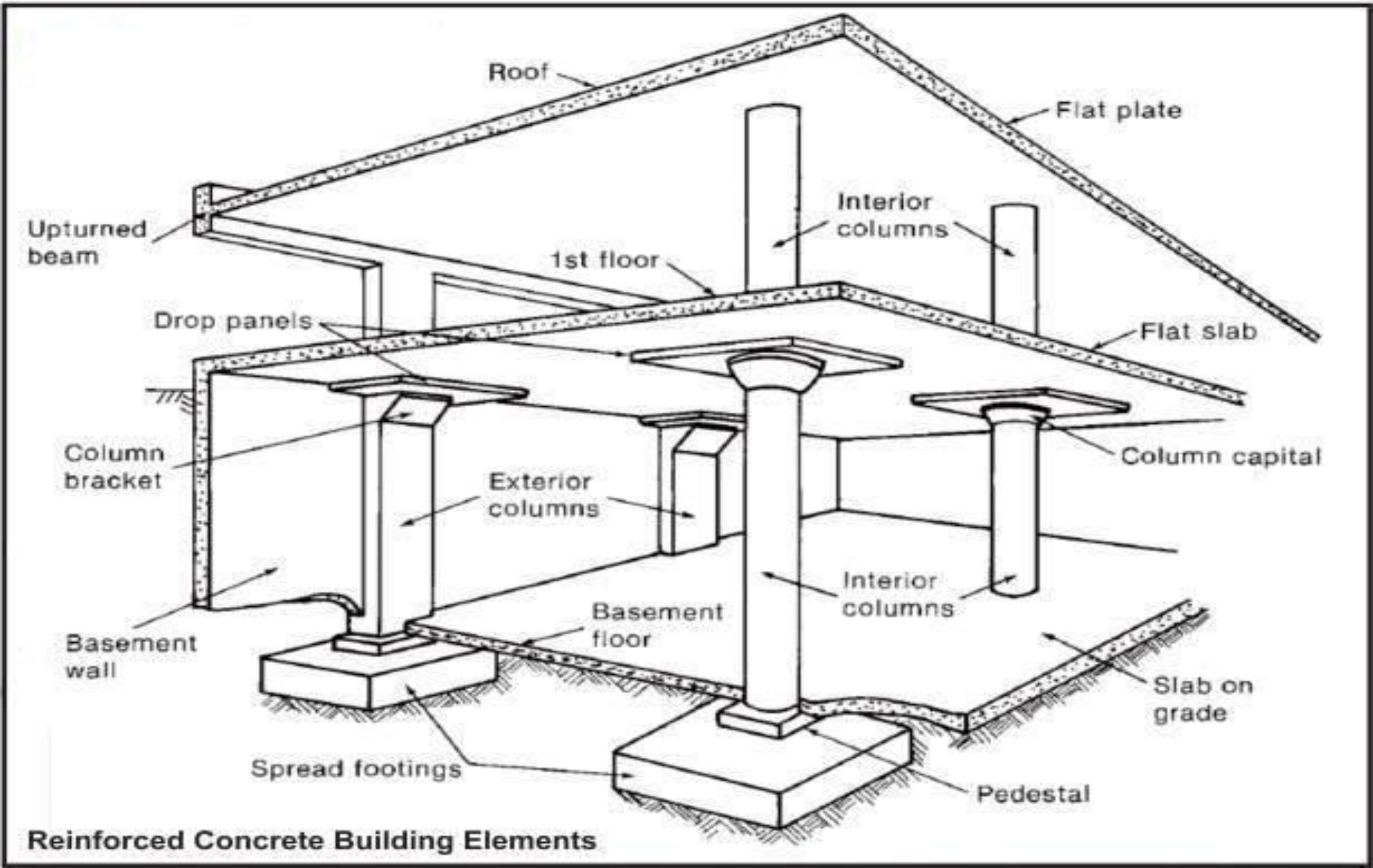
IV. Settlement Load:

- Another condition, producing equivalent effects as of high loads, stems from an uneven settlement of the foundation of the building. The poor soil condition may reduce the support of the foundation.
- Additional load is applied to the building due to uneven settlement, the supported portion of the building carries more load.

V. Thermal Load:

- All building materials expand or contract with temperature change.
- Expansion joints are provided at these points so that the structure is physically separated and can expand without causing structural damage.

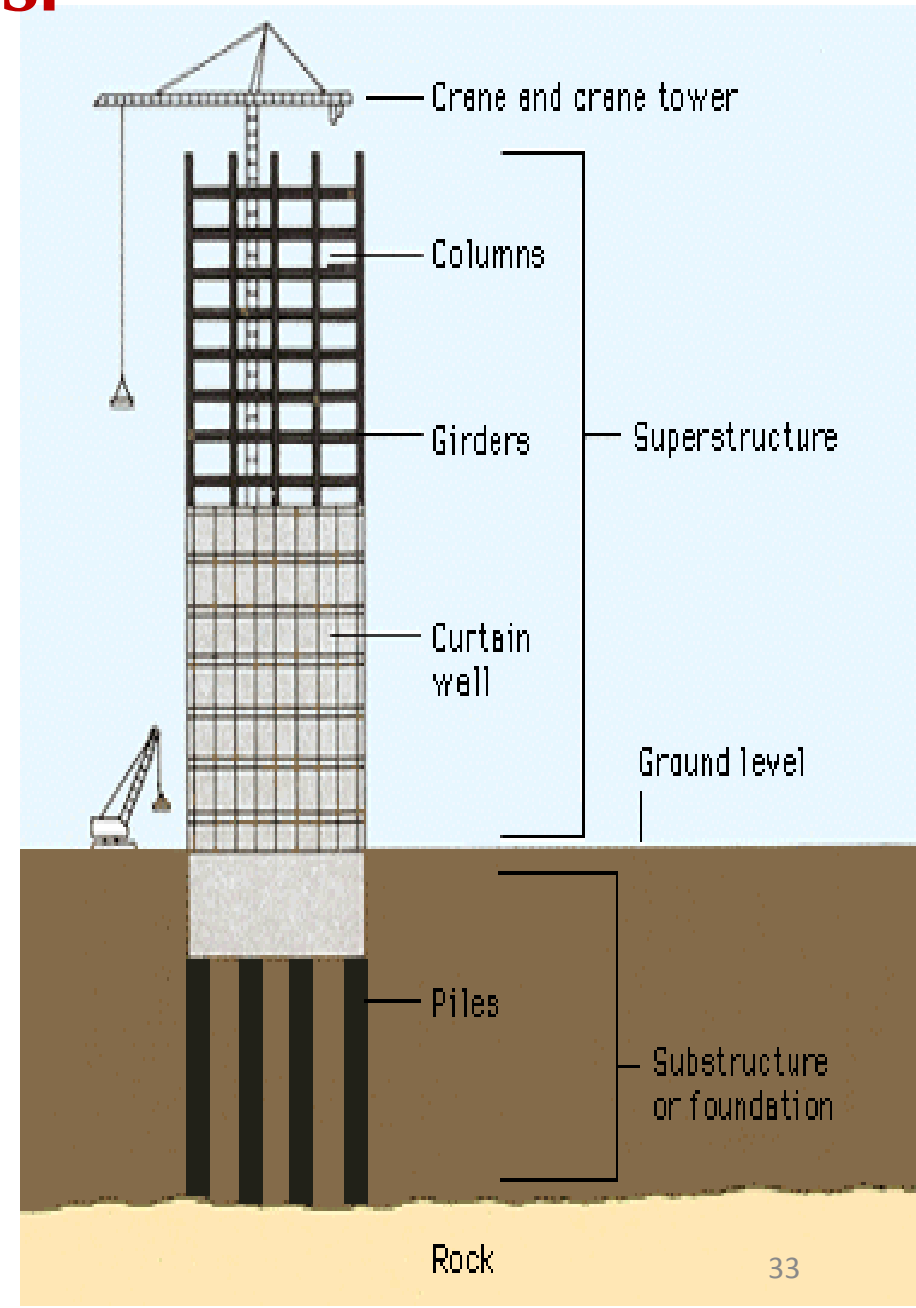
BUILDING COMPONENTS



Basic Building Components:

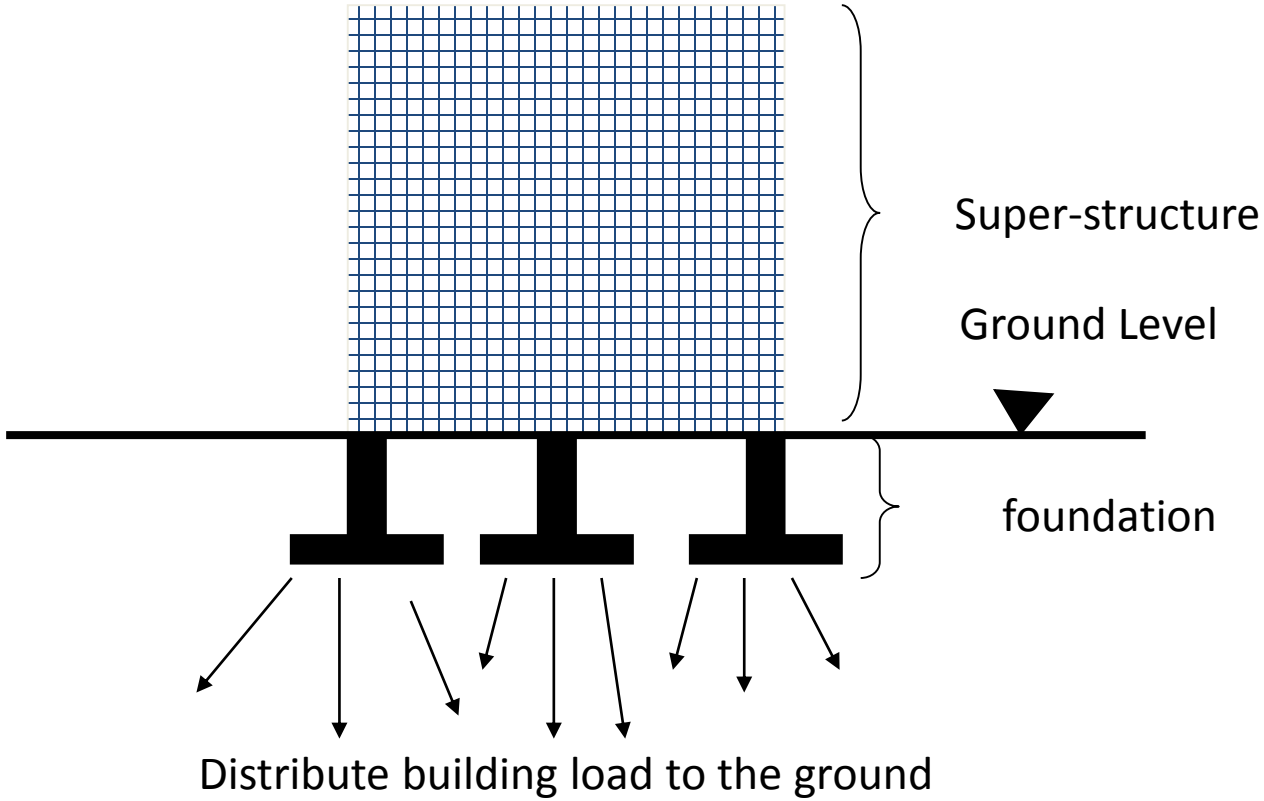
Superstructure

Substructure



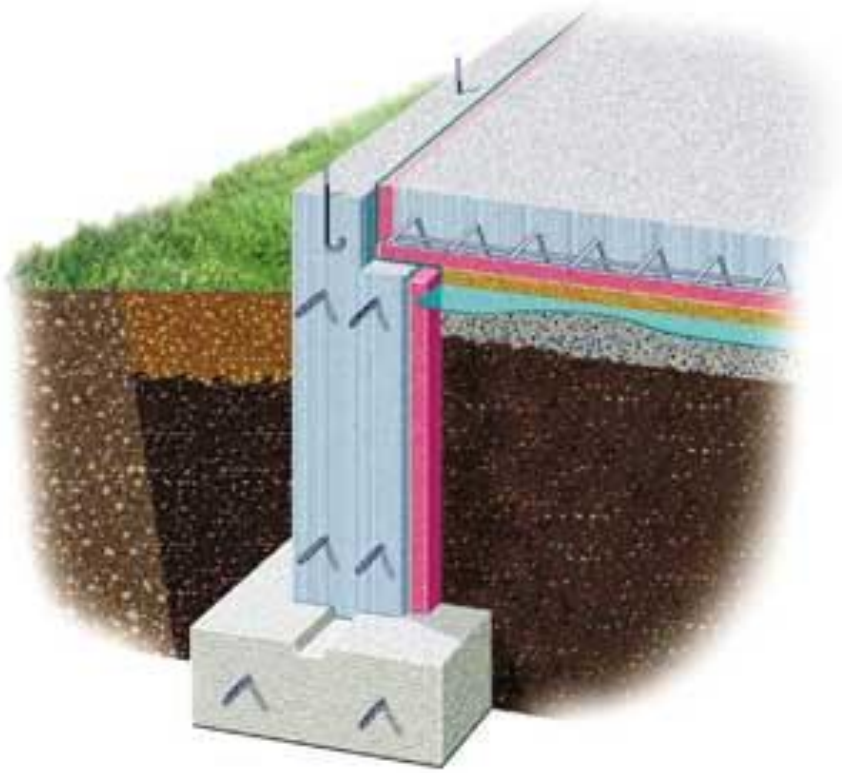
Substructure:

- The substructure is the lower portion of the building, which is located below ground level which transmits the load of the superstructure to the sub soil. it includes **FOUNDATION.**



Foundations

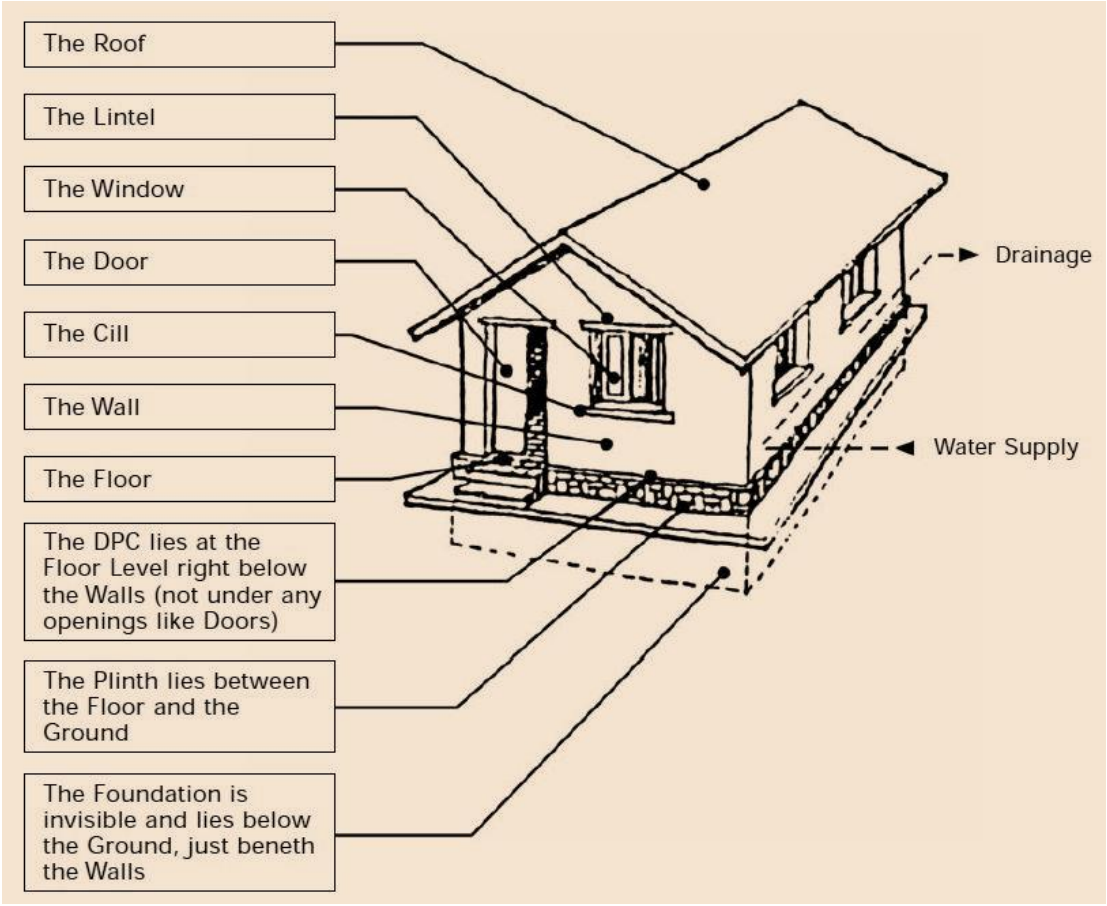
- The basic function of foundation
- To safely transmit the load from building to the subsoil, in such a way that
- Load get distributed over wider area
- Settlement are within permissible limit
- The soil does not fail in shear
- Reduce the load intensity
- Even distribution of load
- Provide level surface



Super Structure:

- The superstructure is that part of the building which is above the ground and which serves the purpose of building's intended use. It includes

  - **Plinth**
  - **Wall and columns**
  - **Beams**
  - **Roofs and slabs**
  - **Lintel and arches**
  - **Chajjas**
  - **Parapet**
  - **Steps and stairs**



Plinth:

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

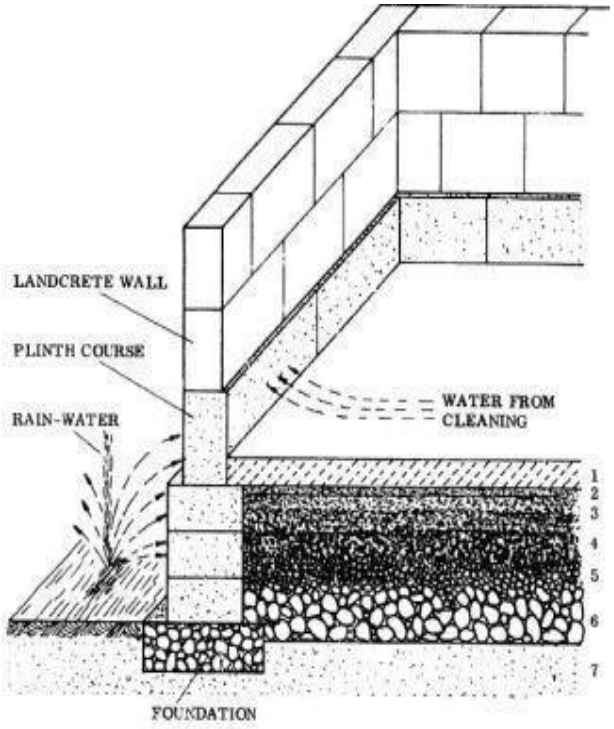
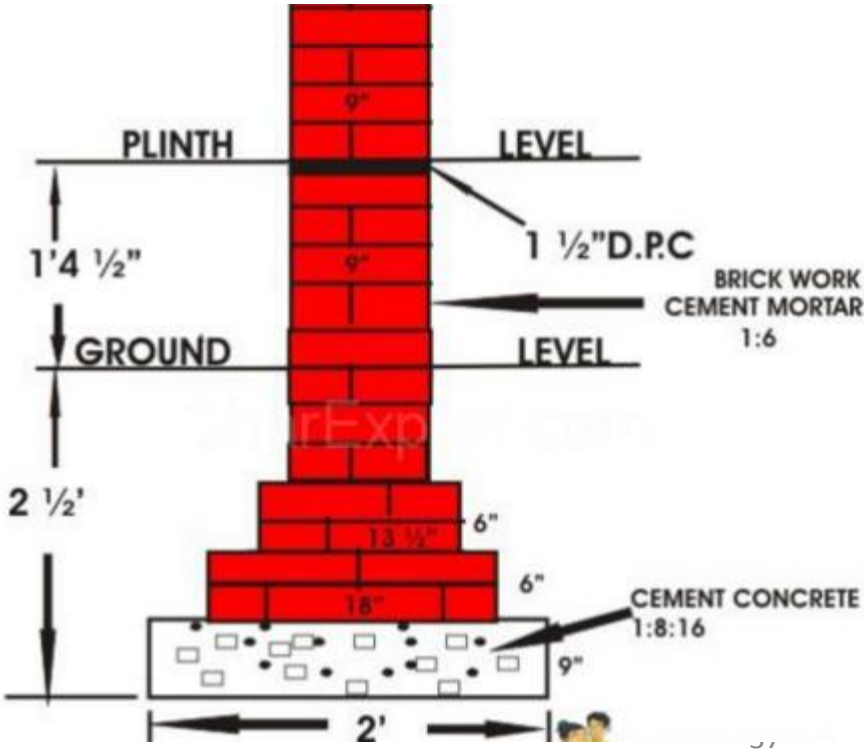


Fig. 1



Wall and columns:

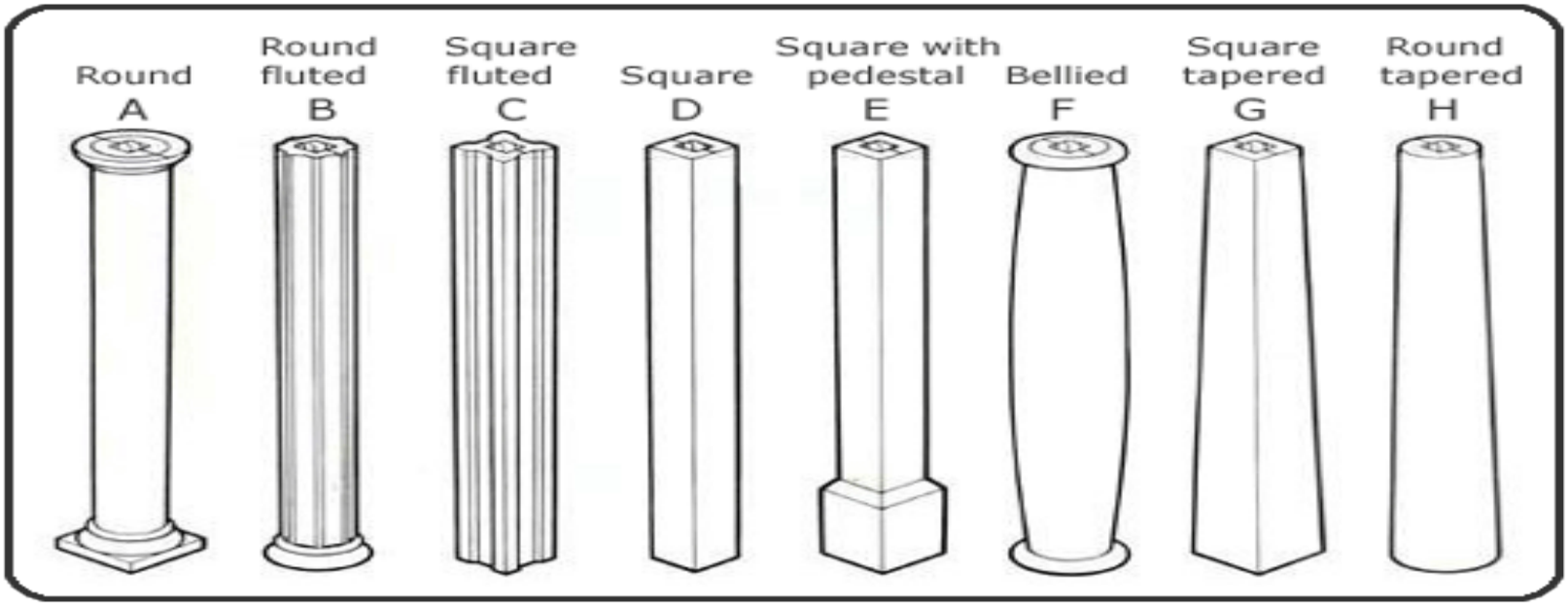
- The walls are building blocks of bricks or stones. They divide the building space into various space into various rooms. They support slabs and beams. They safely transmits the loads coming on them from beams and slabs to the foundation. They provide privacy and protection against heat, cold, rain , noise, dust winds.
- Column are vertical members on which beams and slab /roof is supported They are square, rectangular and circular in shape in C/S .

- **Wall (Masonry)**

Brick Masonry

Stone Masonry

- **Column**

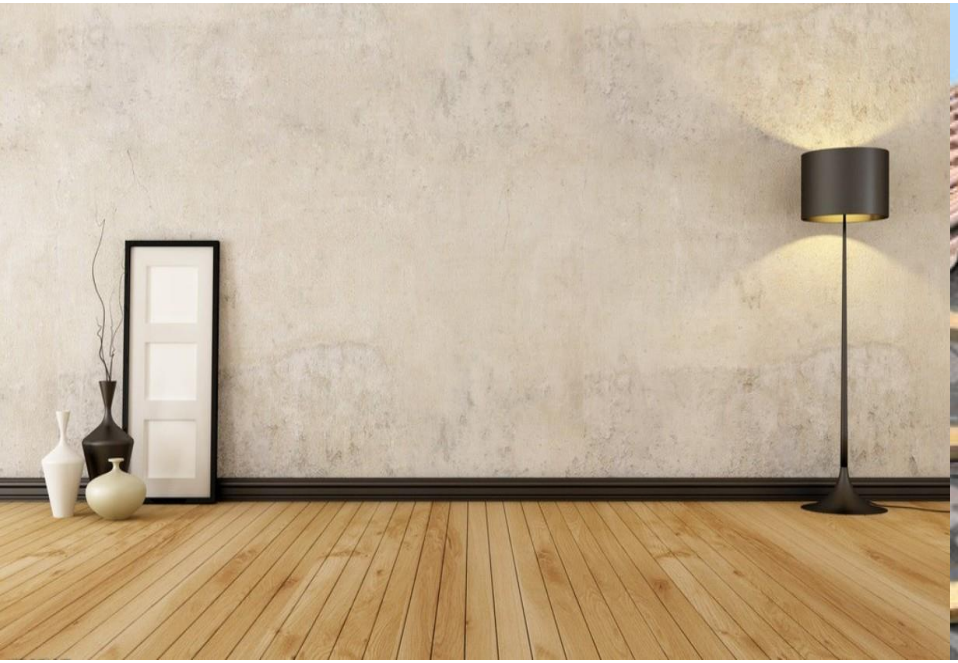


Beams:

- Beams are horizontal members above which the slabs are provided. The beams are instead supported on walls and columns
- They are generally 20, 39, 45, 60 cm thick and deep members as per structural design.

Roofs and slabs (Floor):

- **Floor:** A floor is a plane area to support occupants, furniture's, and equipments.

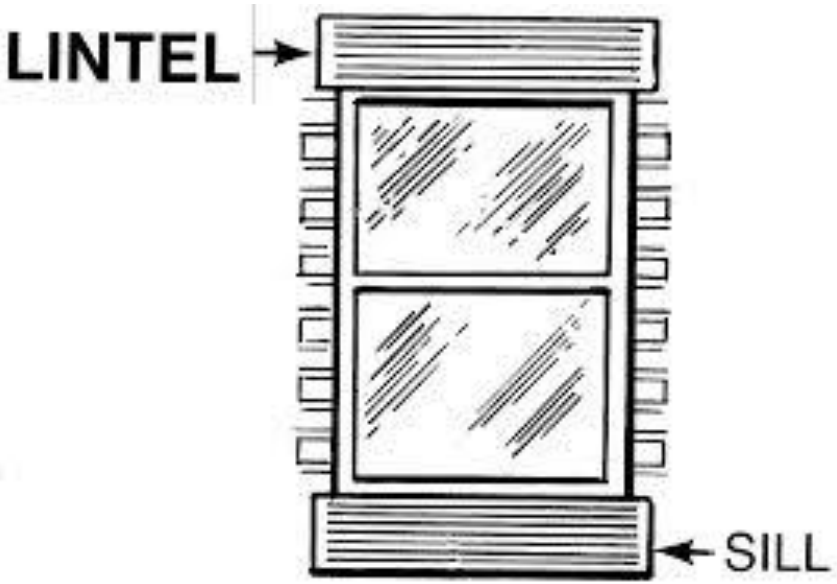


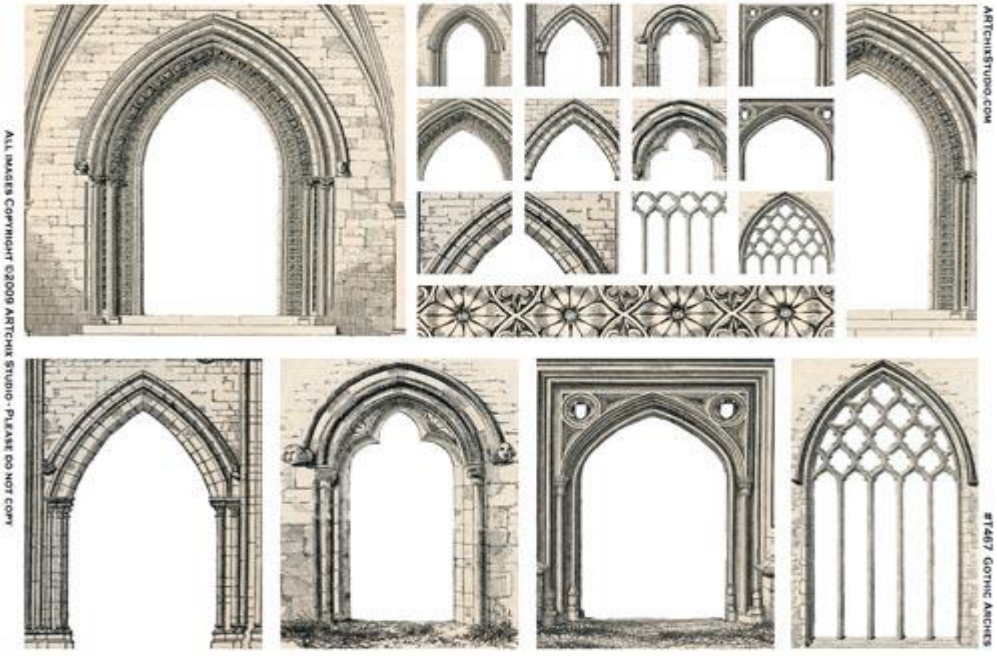
- **Roof:** The upper most part of the building constitutes the roof. The Slab and roof encloses the space and offers protection from rain, heat, snow, wind, sound, fire.

- **Stairs:**

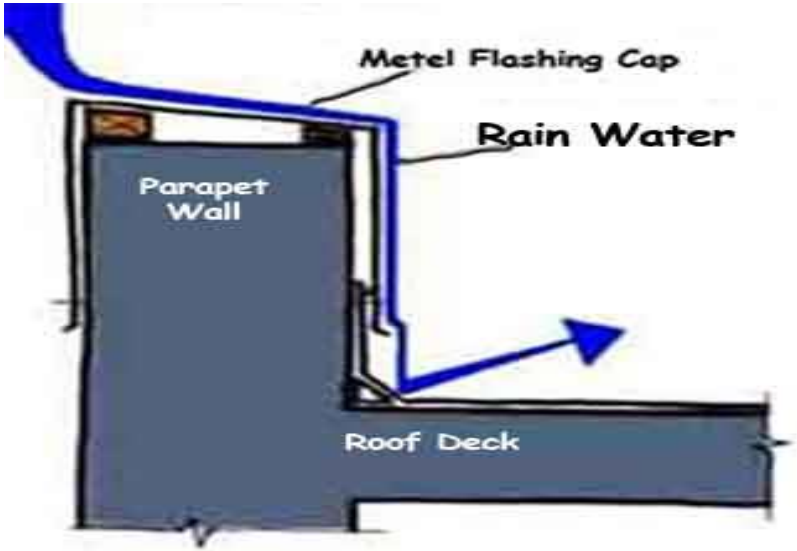
- **Chajja:**

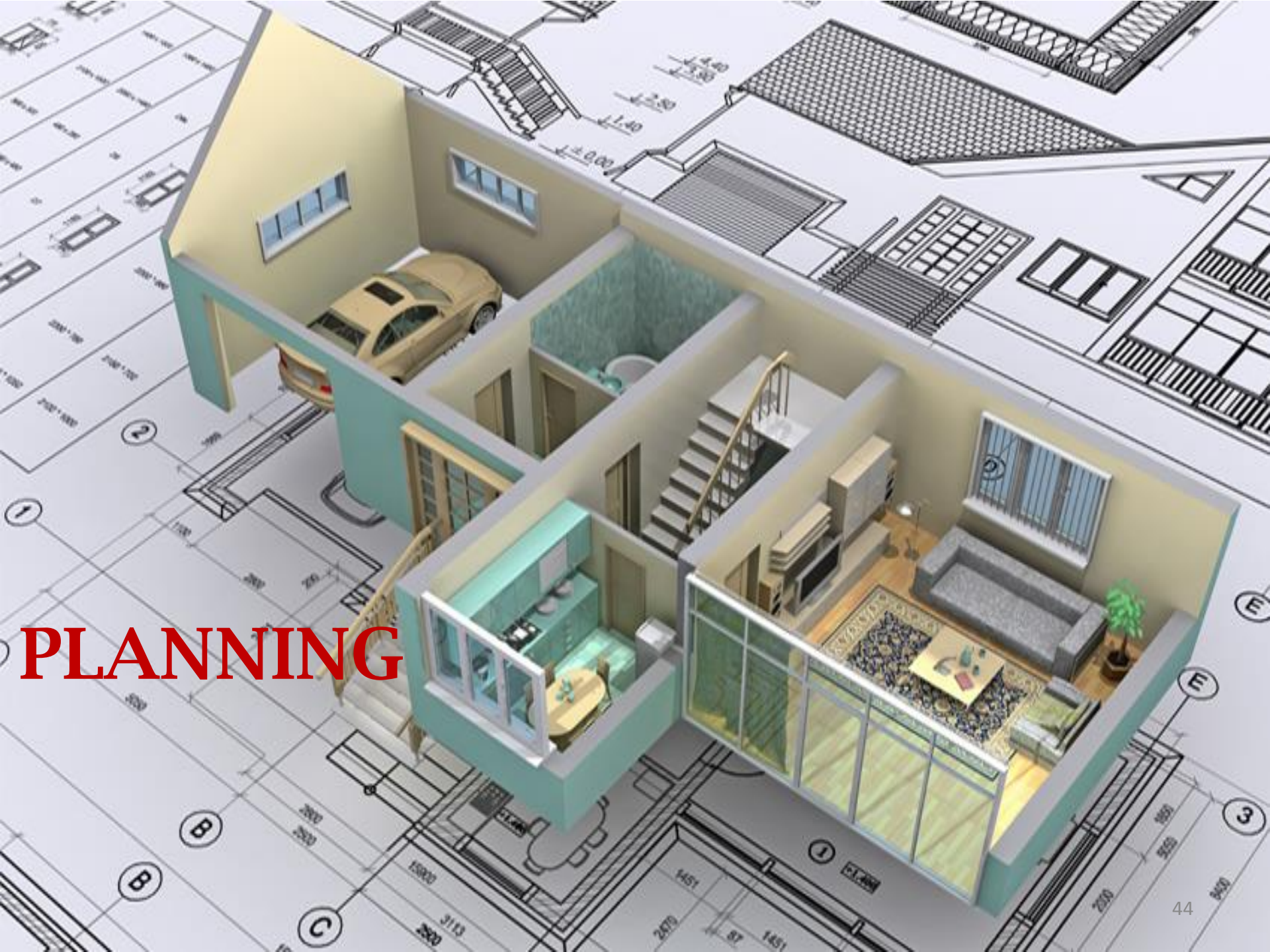
- **Lintel and Arches:**





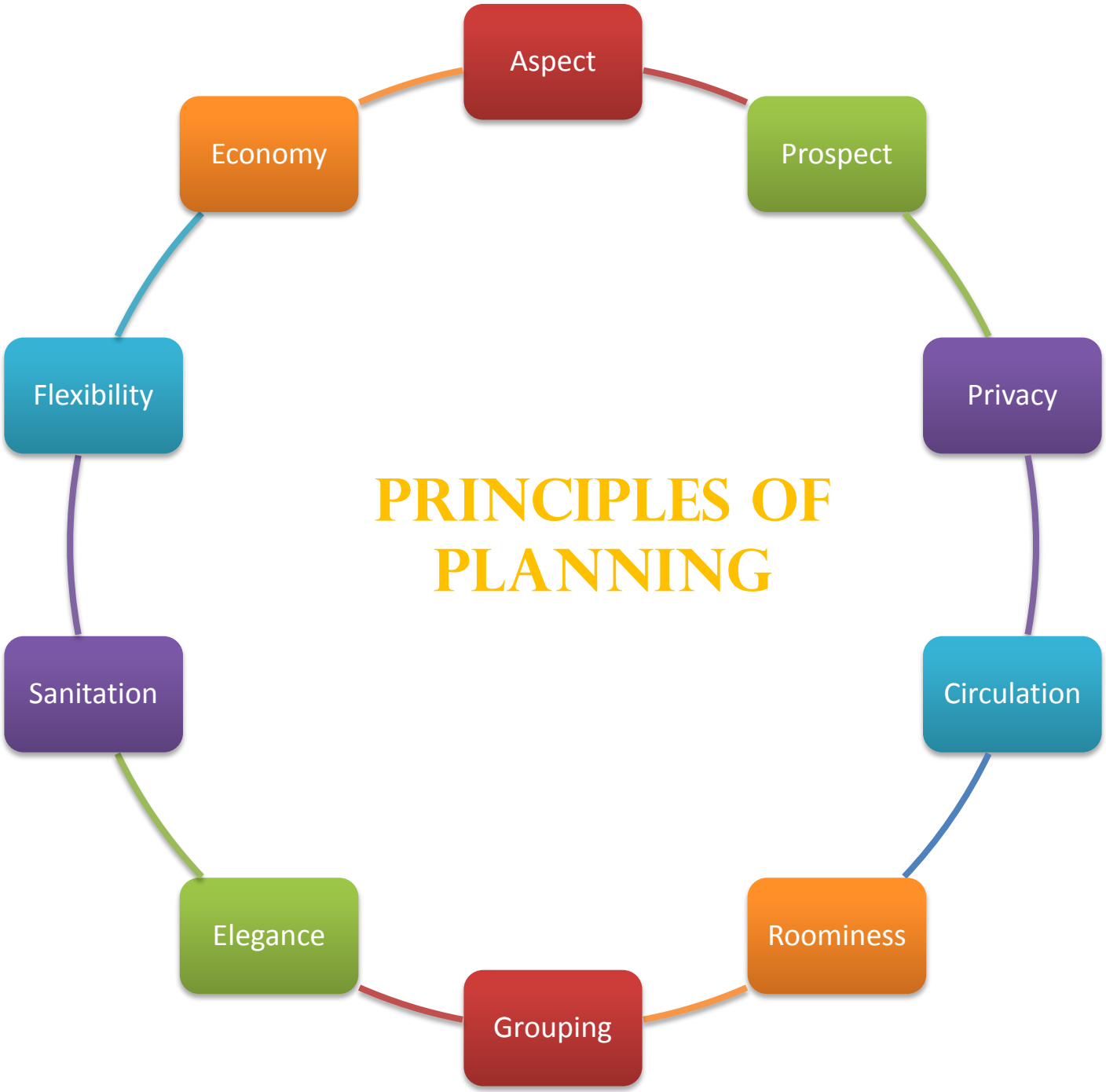
- **Parapet:**




PLANNING

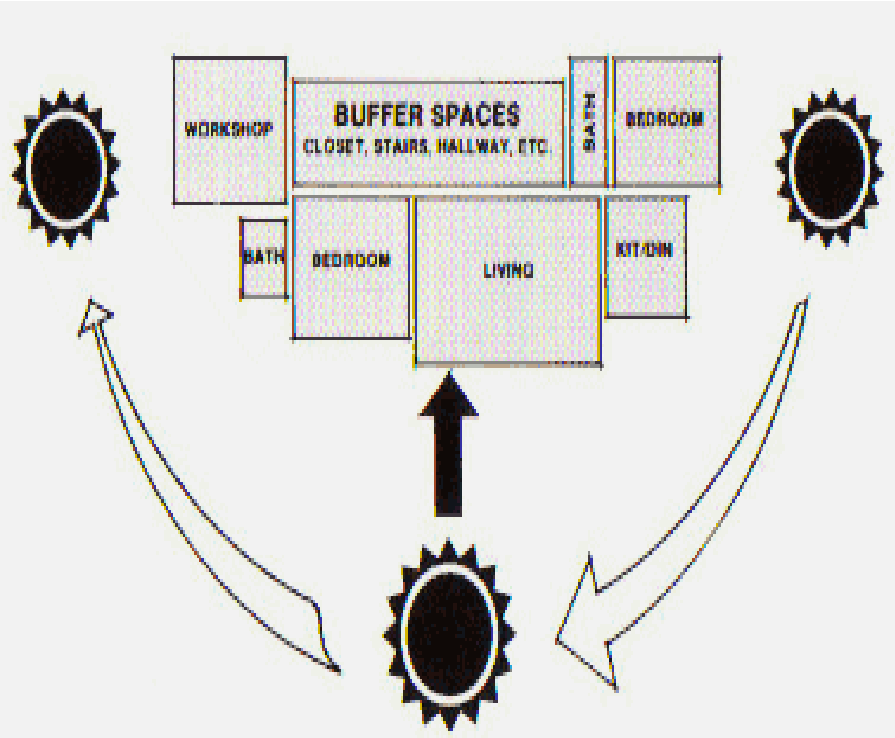
Building Planning

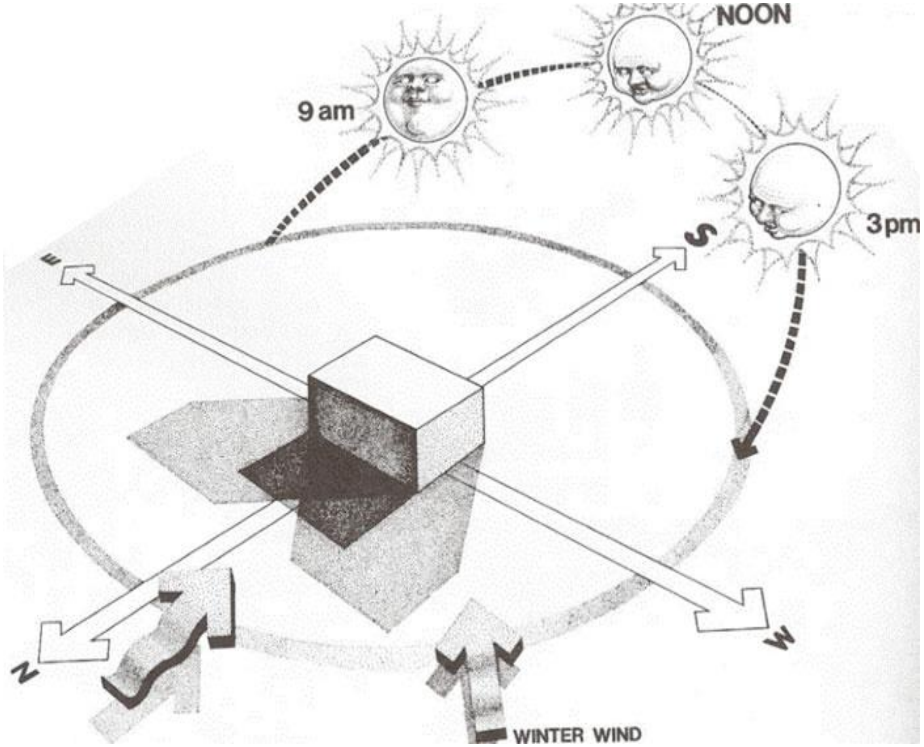
- Arrangement of all the units of a building on all the floors and at all the levels.
- Planning : PURPOSE OF THE BUILDING....???


Aspect
Prospect
Privacy
Circulation
Roominess
Grouping
Elegance
Sanitation
Flexibility
Economy
PRINCIPLES OF PLANNING

Aspect

- Planned arrangement of the doors and windows of the external walls to get sunlight, breeze and a good view of the scenery outside.
- To obtain sufficient sunlight inside the room windows are placed in external walls.
- Proper aspect can take advantage of natural resources which is important for hygienic condition inside the building.





TYPE OF ROOM	ASPECT
Kitchen	E
Dining Room	S
Bed Room	S or SE, or NE
Study Room	SW, W or SE
Store	N
Bath, W.C.	N or NE

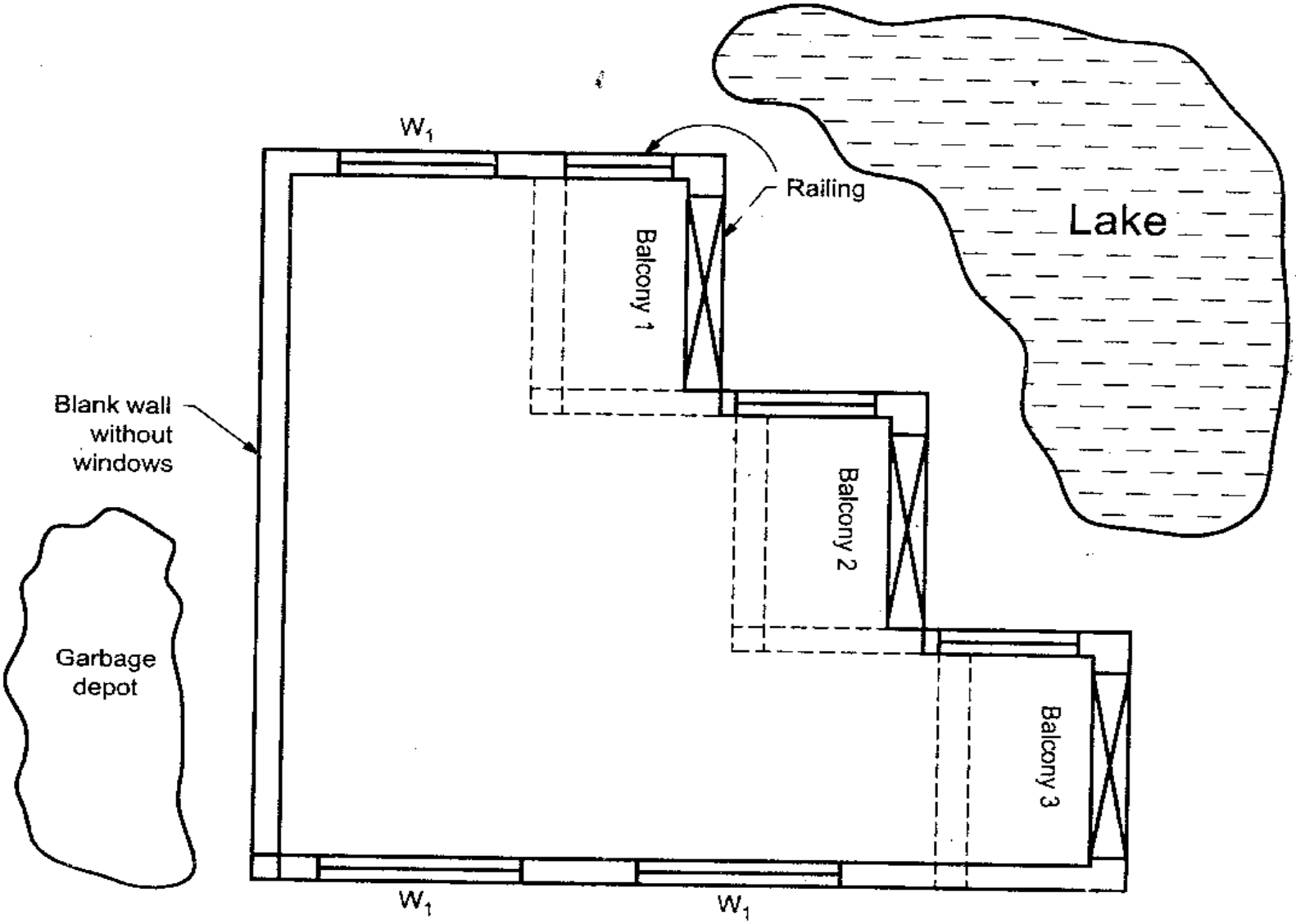

Morning Light
Kitchen Aspect


Bedroom Aspect

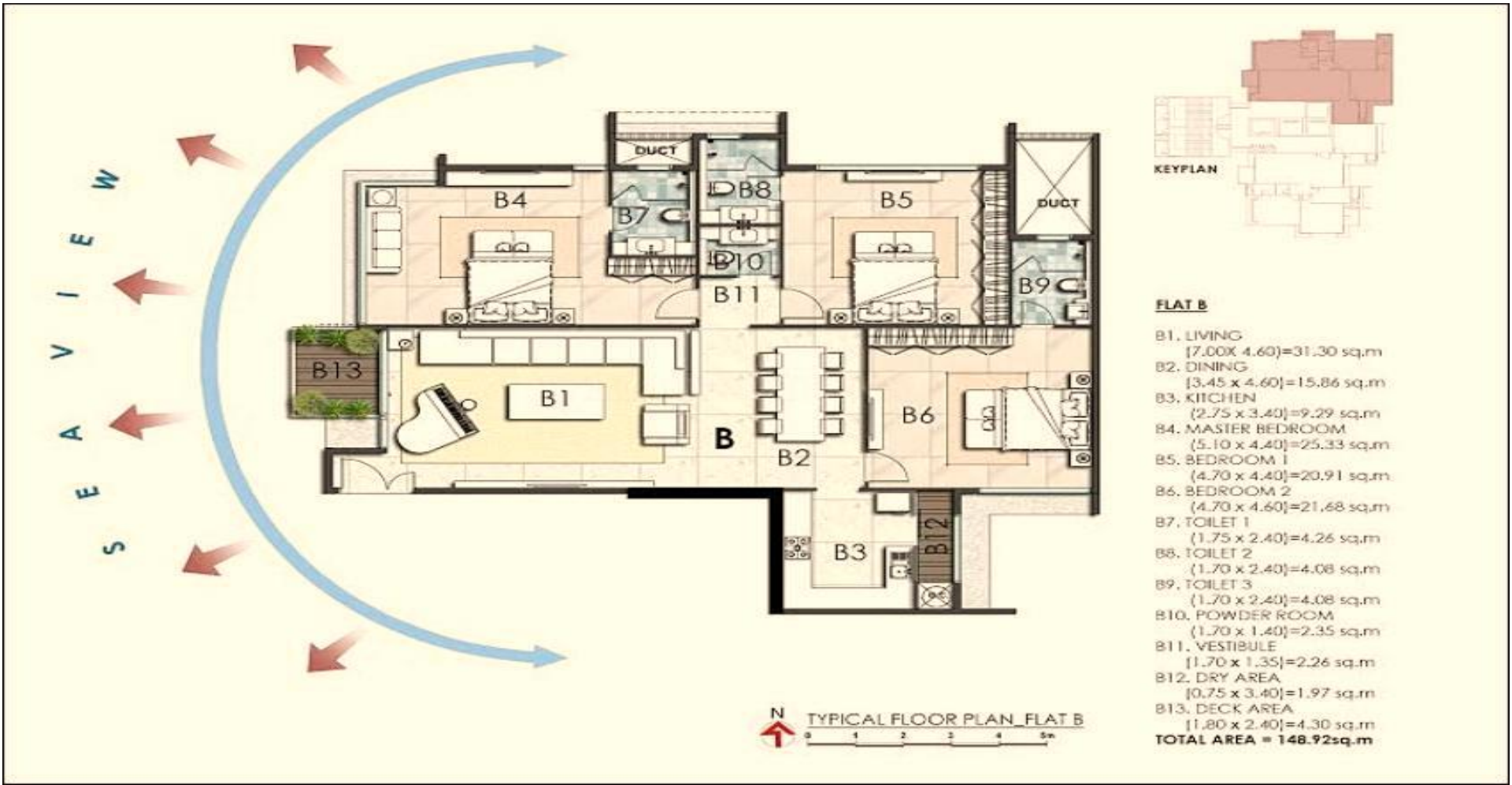
Justify the aspect of building ?????

Even Floor Plan

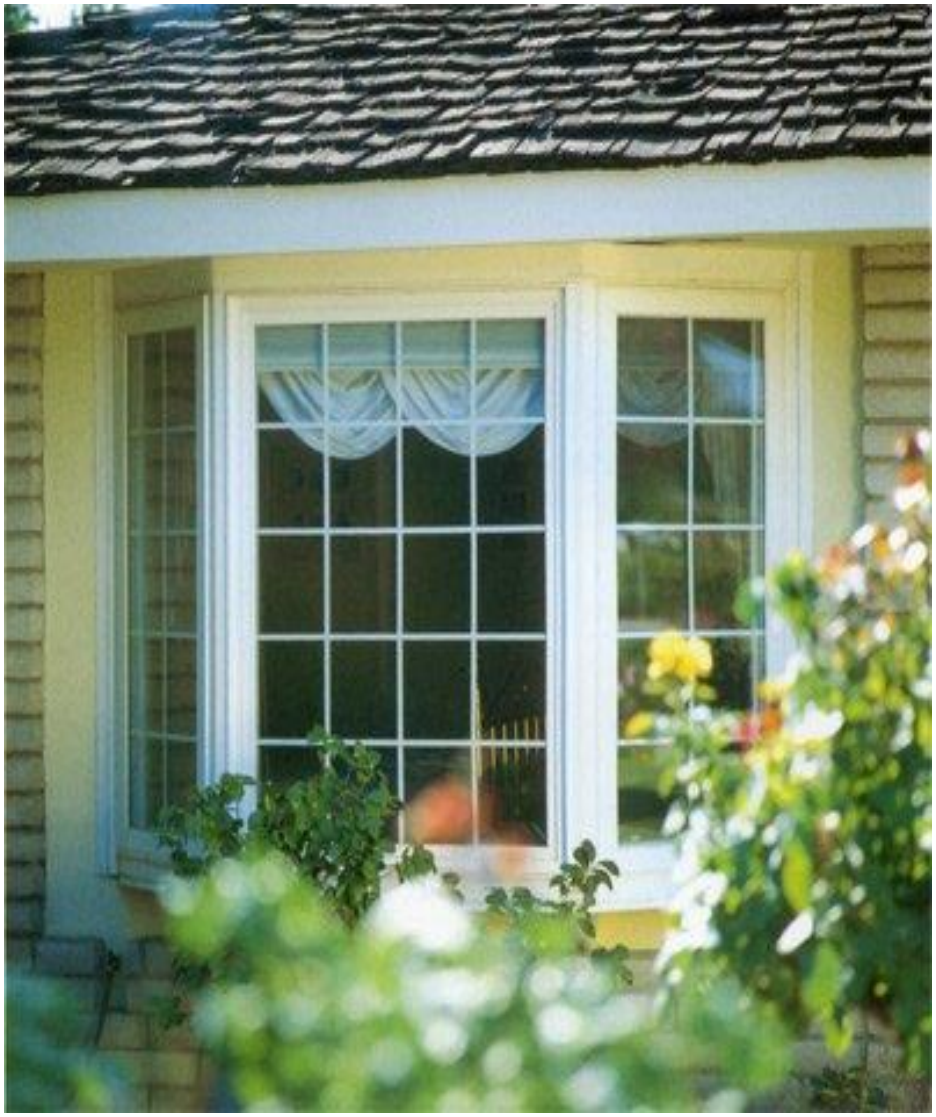
Prospect


W1
Railing
Lake
Balcony 1
Balcony 2
Balcony 3
Blank wall without windows
Garbage depot
W1
W1

- It is related with the views as seen of the outside from doors and windows in the external wall.
- Different rooms of the buildings are placed and located accordingly to the functional utility in such a way that maximum advantage of natural things.



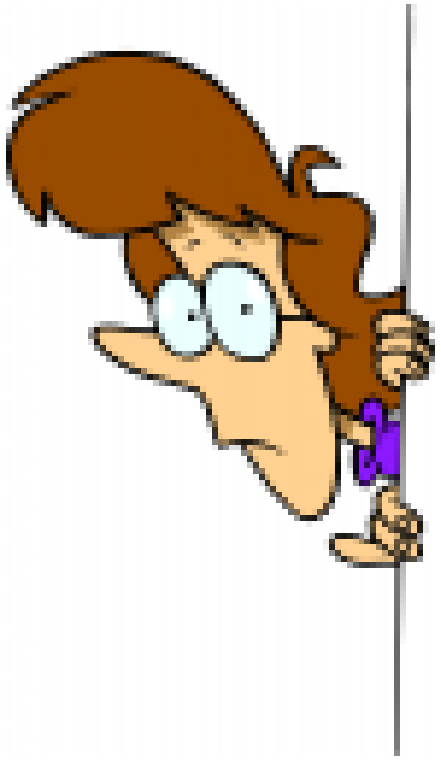
- For pleasant atmosphere view of a garden, hill and a river etc. are good prospect. Towards these objective doors and windows should be provided in the external wall of the building.

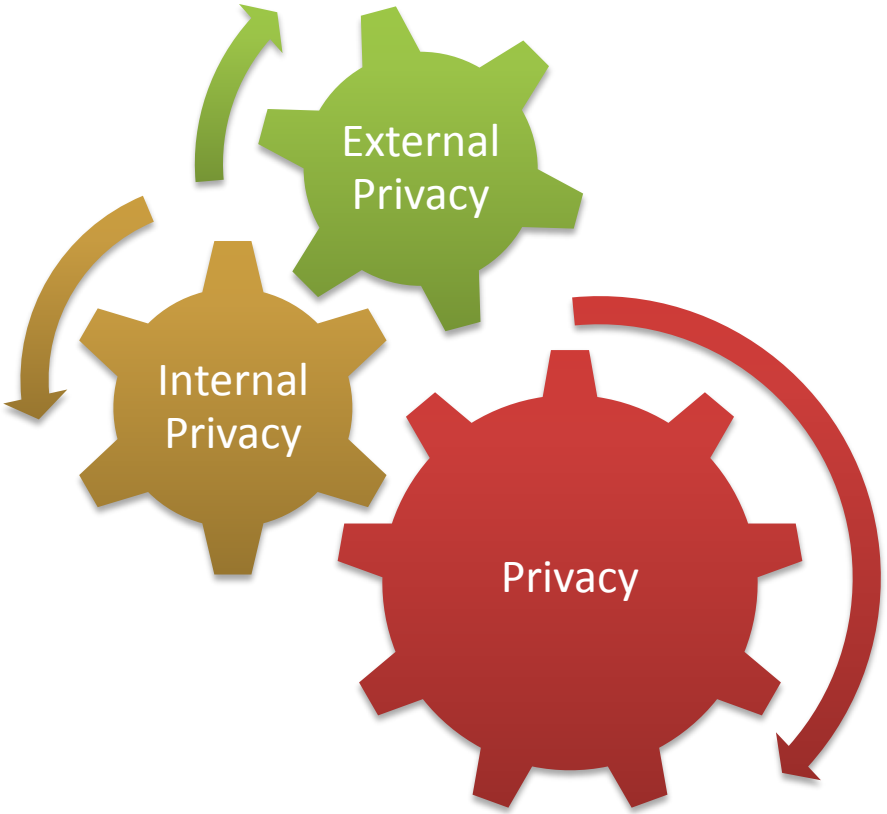


- Undesirable views like a small nallah, slum area, drainage disposal unit, garbage collection centers should be concealed by not providing windows in that direction.

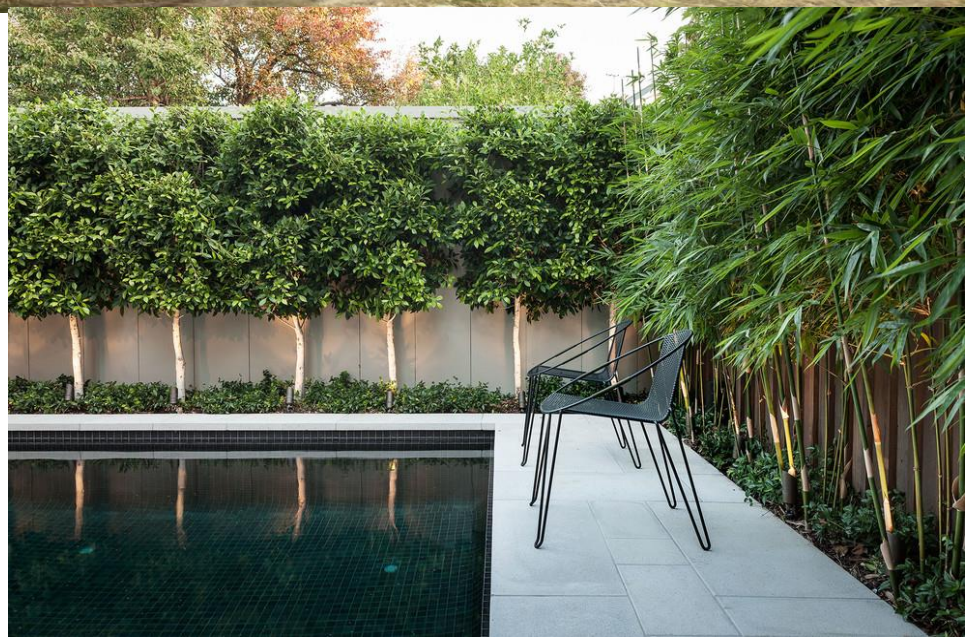
Privacy

- This is very important factor to be considered while planning both residential as well as public building.
- Privacy of one room from another in a building as well as privacy of the whole building with other building should be achieved.

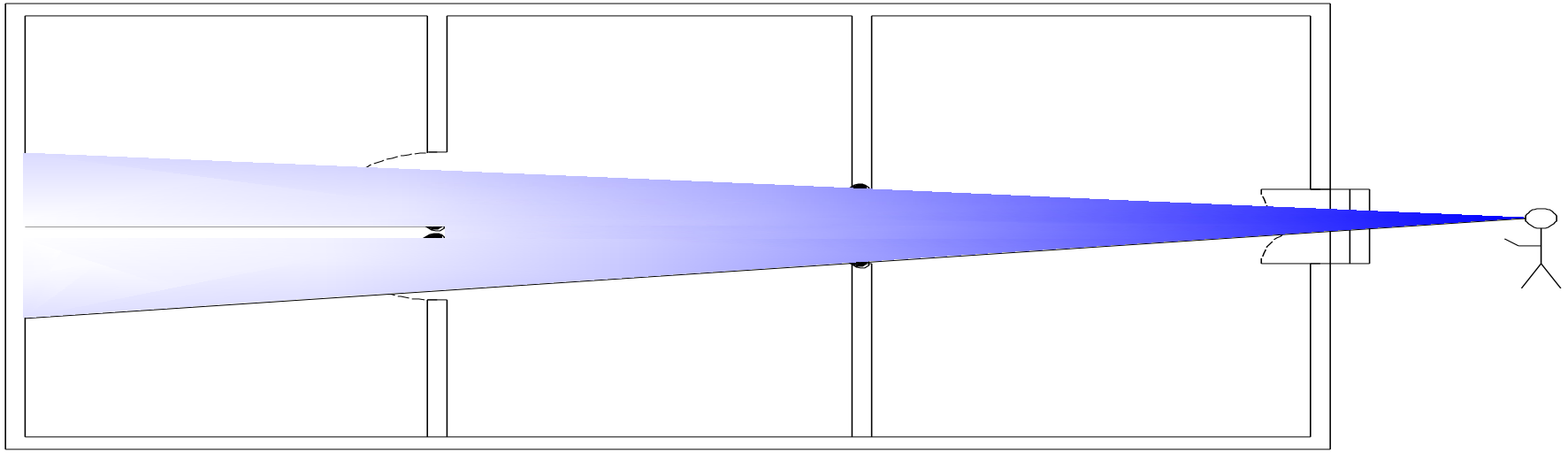


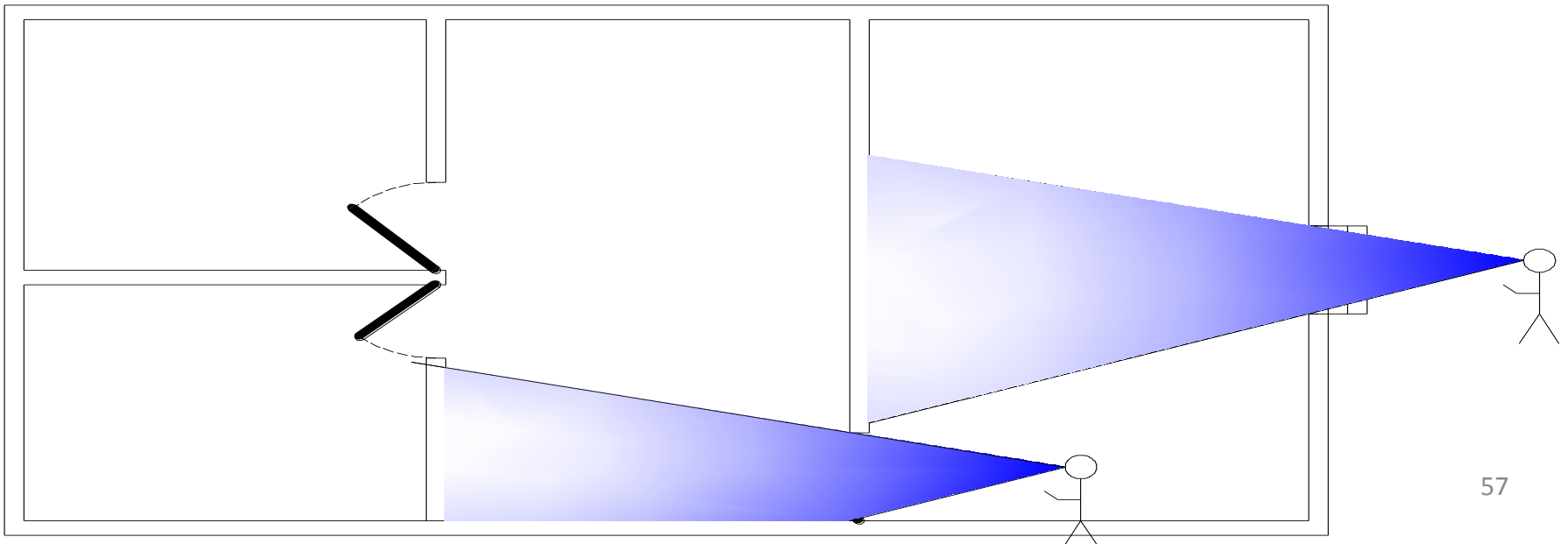


- The **EXTERNAL PRIVACY** of residential building as a whole can be achieved by planting trees, and by providing entrance. Even the compound wall of required height can be constructed to provide privacy of trespassers.



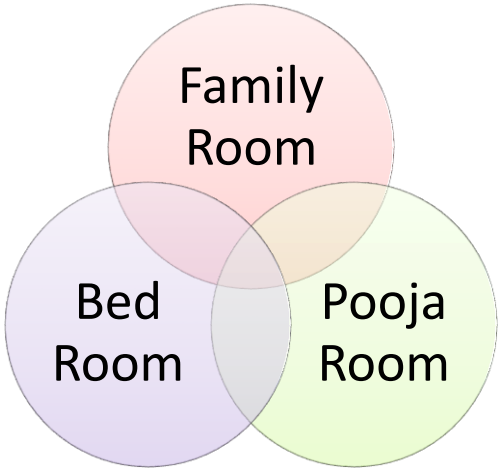
- The **INTERNAL PRIVACY** in different rooms can be achieved by providing doors in such a way that minimum view of room is seen when shutter is opened.

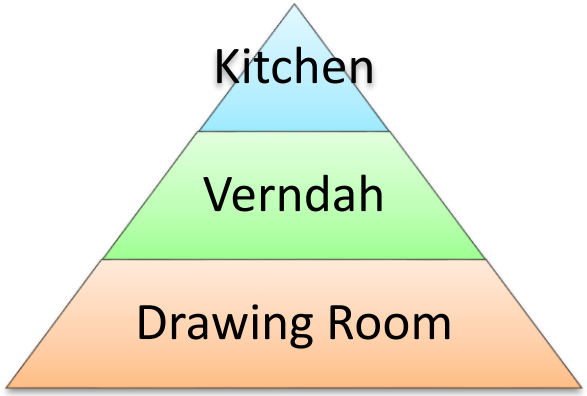


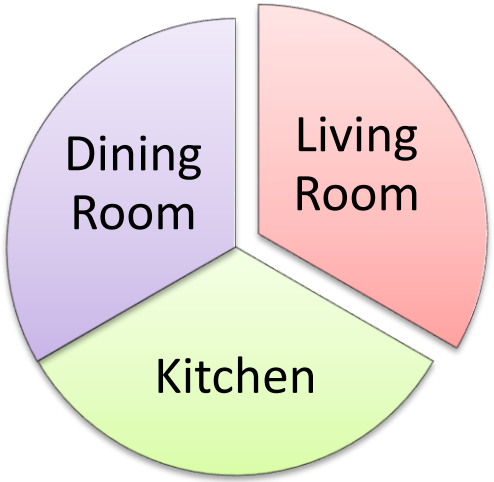


Grouping

- Arrangement of various rooms with respect to their functions to achieve maximum efficiency.








Grouping

Roominess

- Arrangement of getting maximum benefits from the minimum limited dimensions of room.
- A rectangular room is found more convenient as compared to a square room of the same size. Length to width ratio should be 1.2 to 1 or 1.5 to 1 if the ratio is greater it will give a tunnel effect to the room.
- Light colour give effect of more space whereas dark colour makes the room look smaller. Height of ceiling should be low as more height gives a feeling of a cave.


Rectangular Room


Square Room

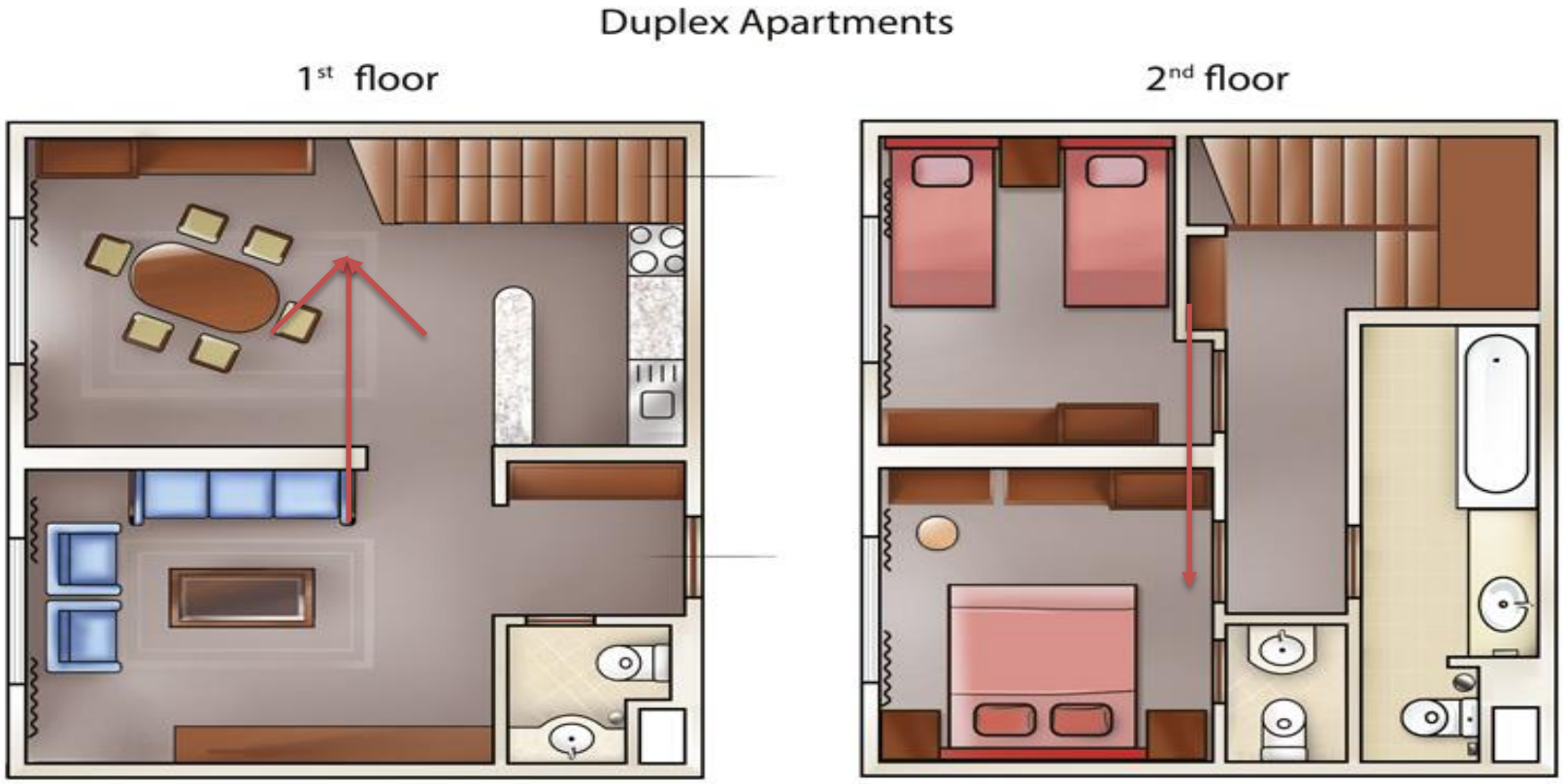

Tunnel effect of Room

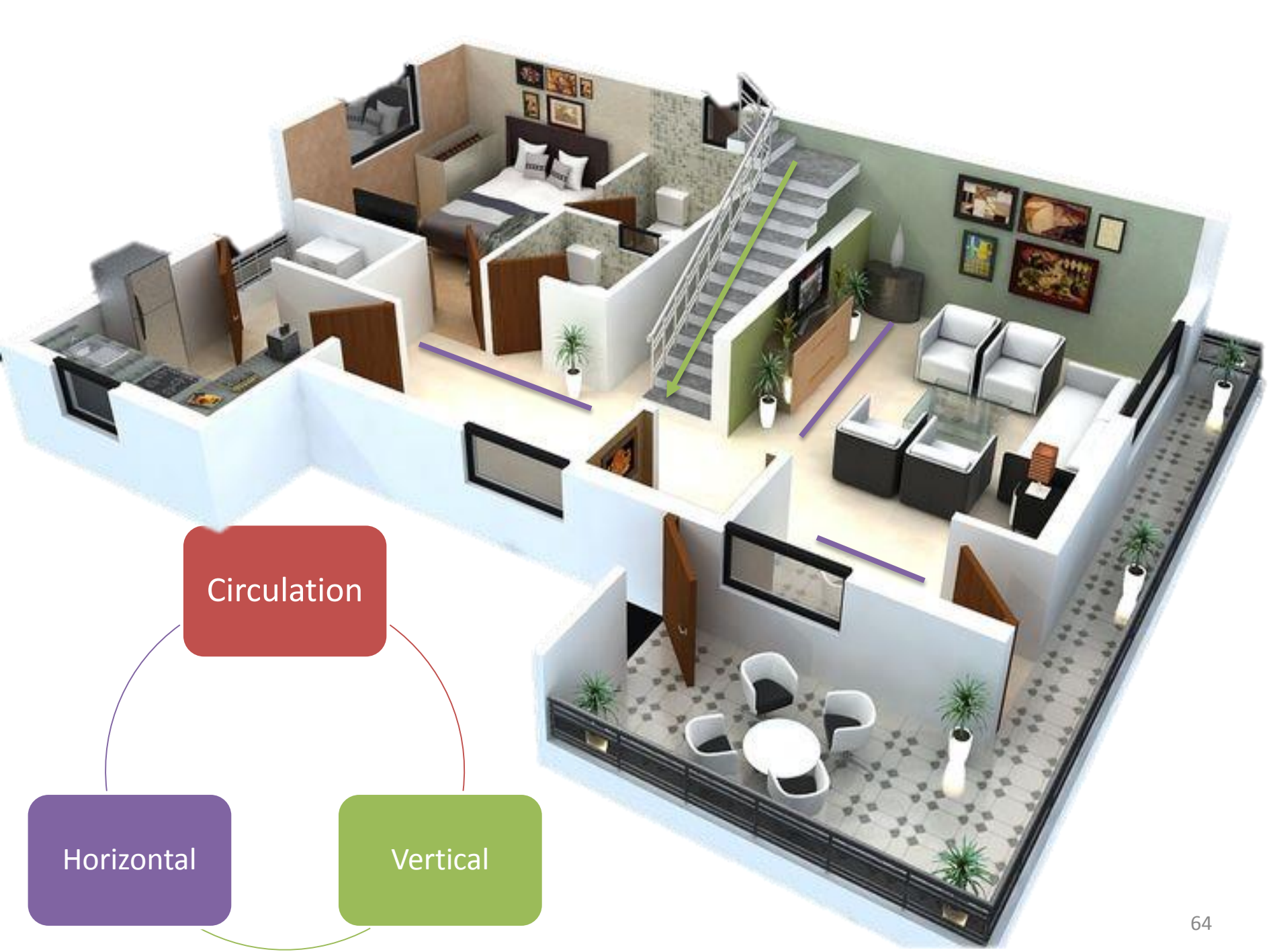
Flexibility

- Flexibility means a room which was planned for one function can be used for another too.
- Study room can be used as a guest room.
- Living room can be used as a dining cum living room.

Circulation

- Circulation is the access into or out of a room. It is the internal movement inside the building and the area earmarked for it.
- Circulation area should be straight, short, bright, lighted .
- It should not affect the privacy of a room nor interfere with the utility space.




Circulation
Horizontal
Vertical

Elegance

- Elegance refers to the planning of elevation and layout of the plan to give an impressive appearance to the building.

Sanitation

- It is provision and upkeep of various components of house to keep inmates cheerful and free from disease.

- Natural
- Artificial

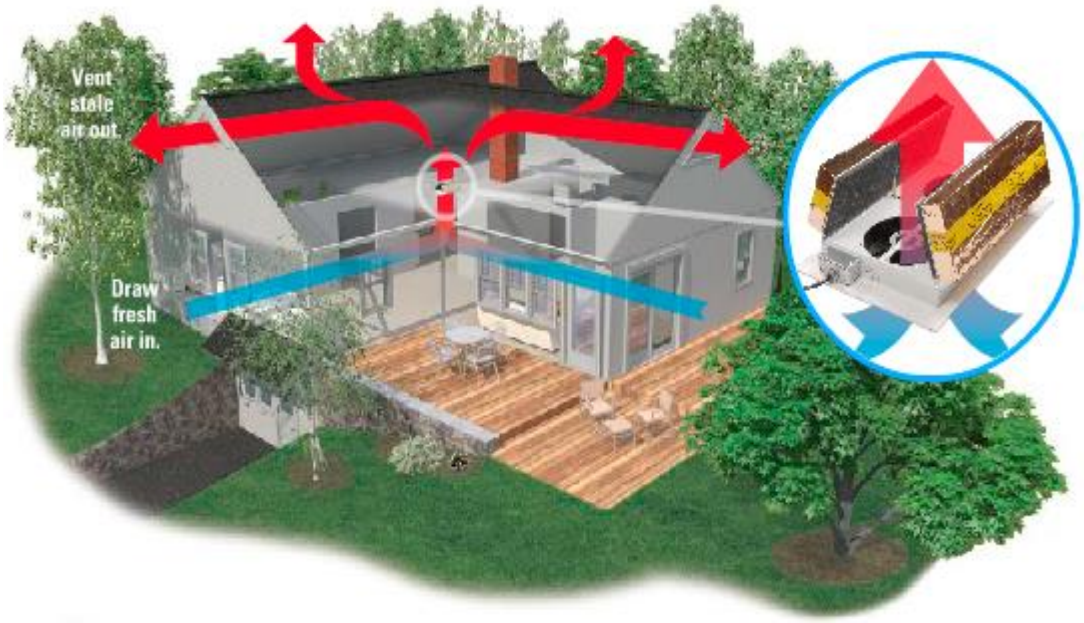
Lighting

Ventilation

- Natural
- Artificial

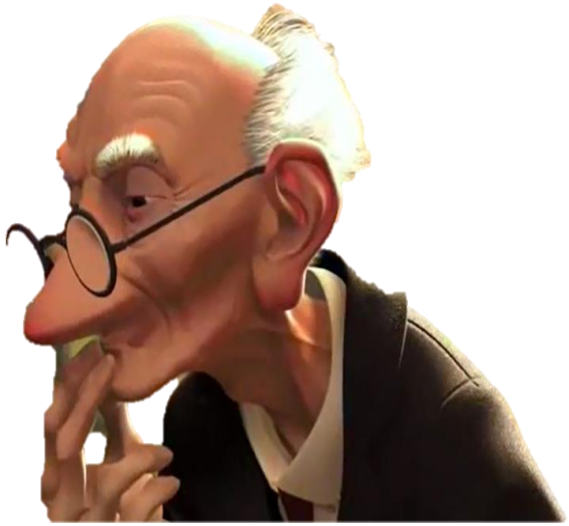
- Dust
- Dampness

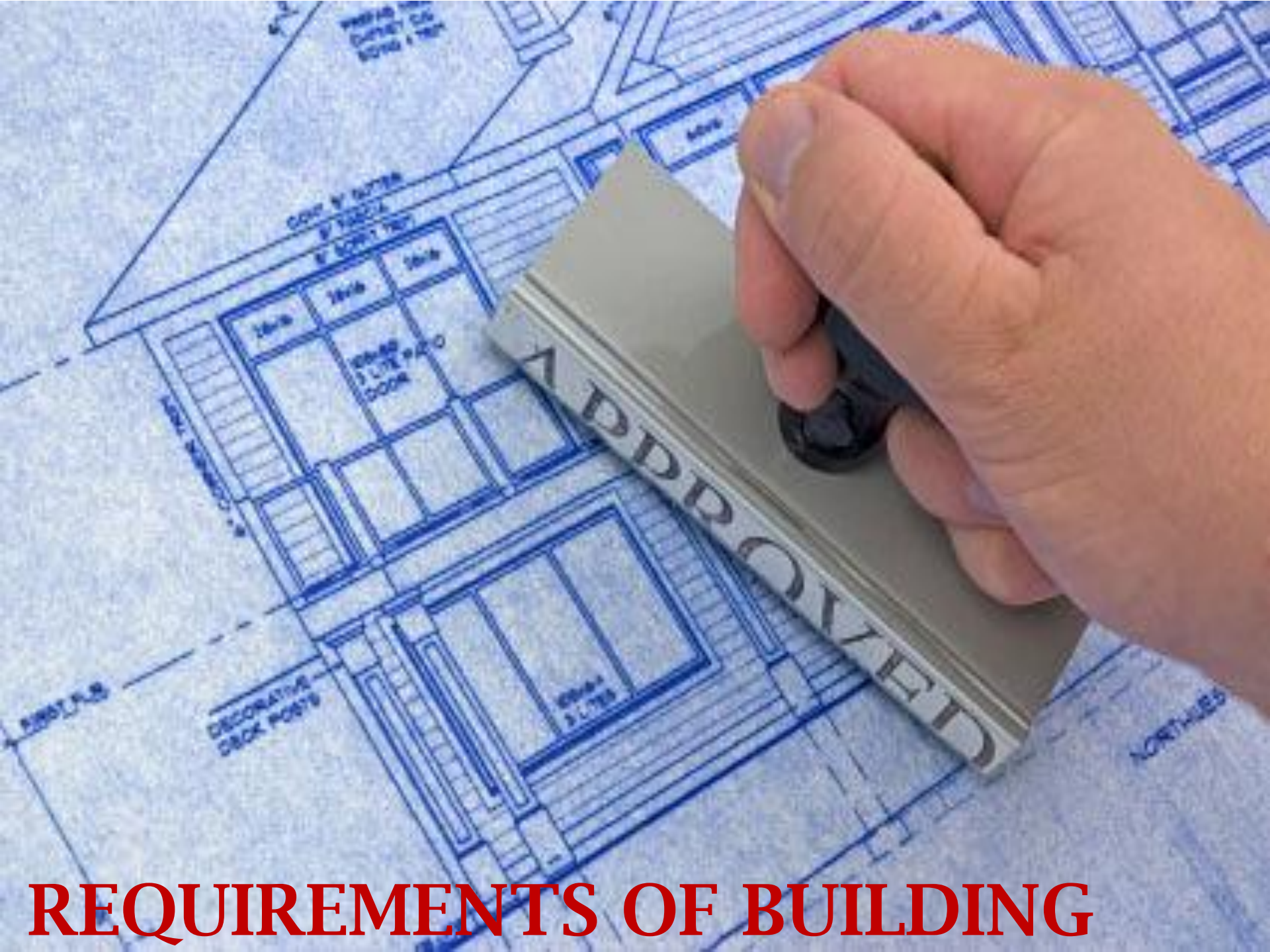
Cleanliness


Vent
stale
air out.
Draw
fresh
air in.

Economy

- Building planning should be carried out in the financial limit of the client.
- It should not be achieved at the cost of stability.
- Only with proper planning and utility of space being maximized (passage being minimized).





REQUIREMENTS OF BUILDING

Basic requirements of Building

- Strength and stability
- Dimensional stability
- Resistance to dampness
- Resistance to fire
- Heat insulation
- Sound insulation
- Protection against termite attack
- Durability
- Security against burglary
- Lighting and ventilation
- Comforts and convenience
- Economy

Strength and stability

- Building should be capable of transferring the expected loads in its life period safely to the ground. Design of various structural components like slabs, beams, walls, columns and footing should ensure safety. None of the structural components should buckle, overturn and collapse.

Dimensional Stability

- Excessive deformation of structural components give a sense of instability and result into crack in walls, flooring etc. All structural components, should be so designed that deflections do not exceed the permissible values specified in the codes.

Resistance to Dampness

- Dampness in a building is a great nuisance and it may reduce the life of the building. Great care should be taken in planning and in the construction of the building to avoid dampness.

Resistance to Fire

- Dampness Regarding achieving resistance to fire, the basic requirements laid down in the codes are:

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

Heat Insulation:

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

Sound Insulation:

- Buildings should be planned against outdoor and indoor noises.

Protection from Termite:

- Buildings should be protected from termites.

Durability:

- Each and every component of the building should be durable.

Security against Burglary:

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

Lighting and Ventilation:

- For healthy and happy living natural light and ventilations are required. Diffused light and good cross ventilation should be available inside the building.

Comforts and Conveniences:

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

Economy:

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

Different Types of Area

- Built Up Area
- Plinth Area
- Floor Area
- Carpet Area

Built Up Area (Covered Area)

- The **area covered** by the building **immediately above the plinth level.**

  COVERED AREA = PLOT AREA – AREA DUE FOR OPEN SPACES

- Doesn't Include: Gate, Compound Wall, Garden, Drainage Culvert, Uncovered Stairs, Pump house, Watchman's Cabin, Electric Cabin, Swimming Pool, Tank, Bench etc.

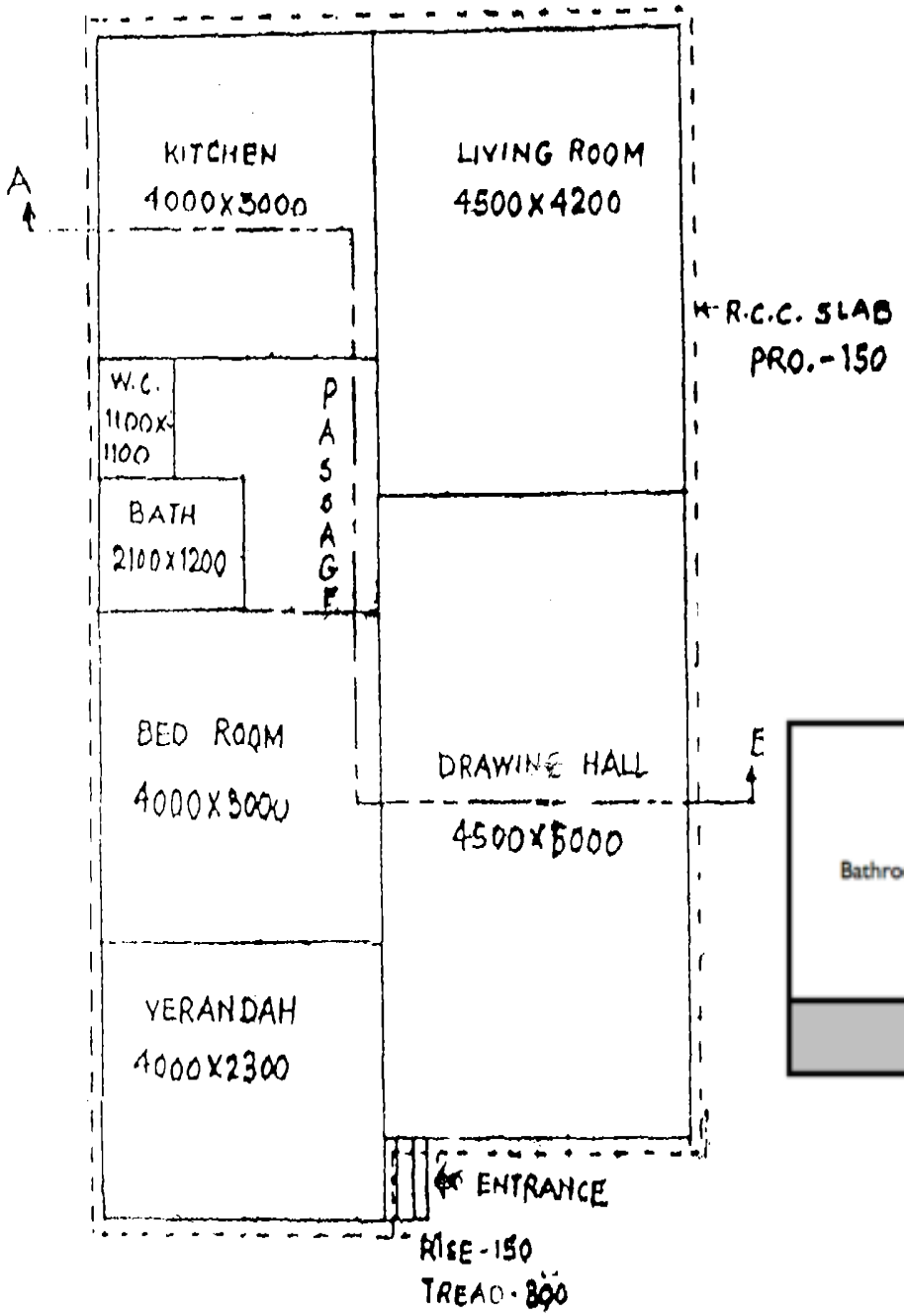
Plinth Area

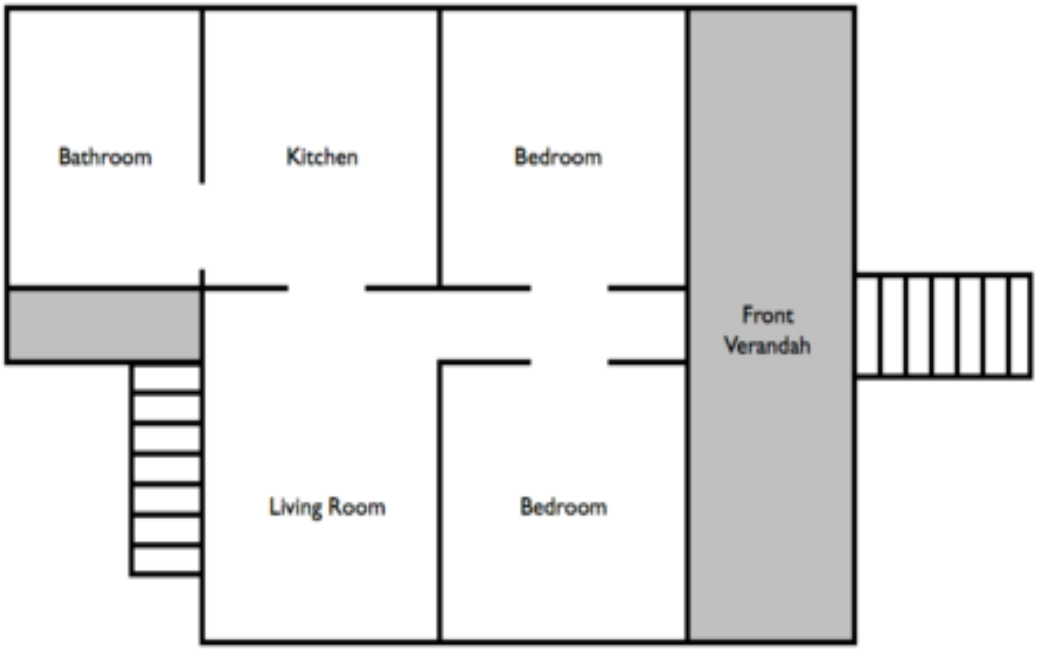
- This is built up covered area measured at the floor level of the basement or any of storey.
- Include: Internal sanitary shaft (do not exceed 2m² in area air conditioning ducts, lifts etc.), porches or other cantilevers, area of barasati and mumty at terrace level.
- Doesn't Include: Area of lofts, Internal sanitary shaft (exceed 2m² in area air conditioning ducts, lifts etc.), uncovered balconies, architectural bands and cornices, vertical sun breakers or box louvers.

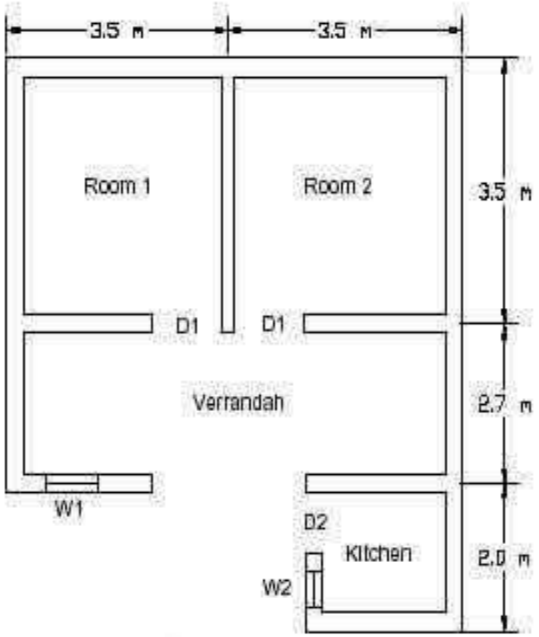
Floor Area

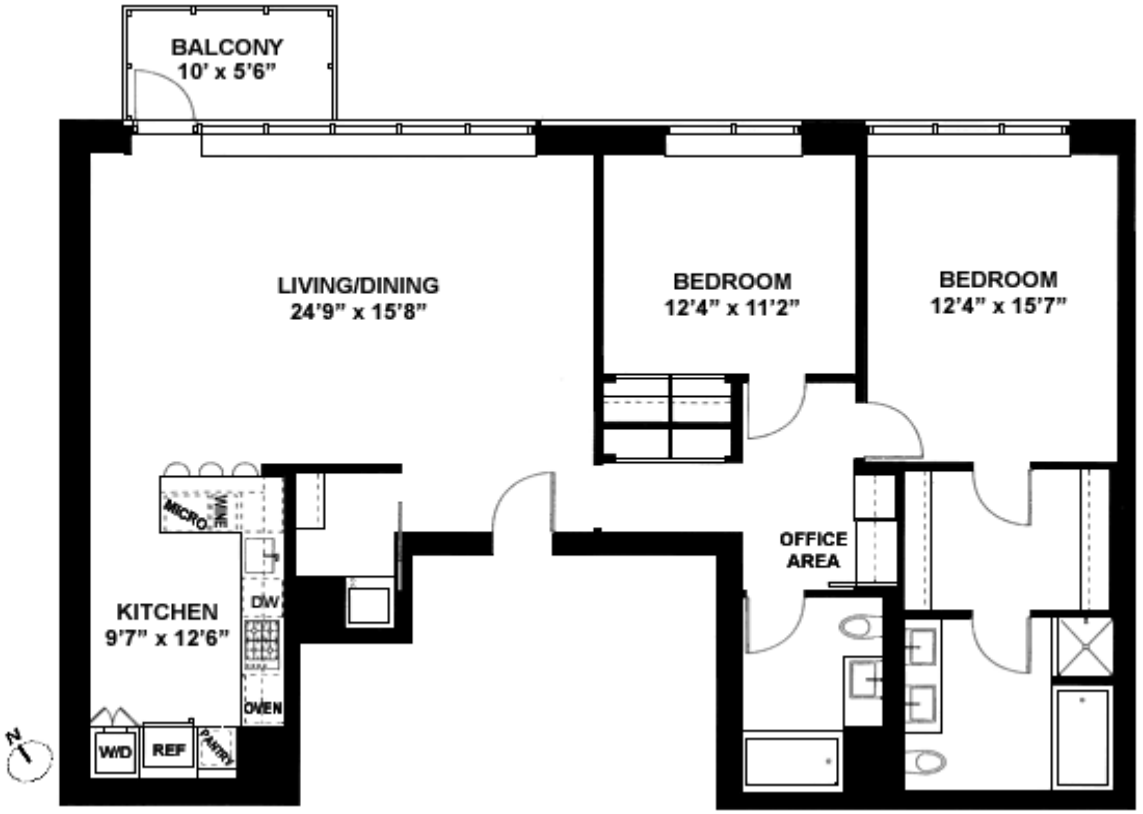
- This is built up covered area measured at the floor level of the basement or any of storey.
- Include: Internal sanitary shaft (do not exceed 2m² in area air conditioning ducts, lifts etc.), porches or other cantilevers, area of barasati and mumty at terrace level.
- Doesn't Include: Area of lofts, Internal sanitary shaft (exceed 2m² in area), uncovered balconies, architectural bands and cornices, vertical sun breakers or box louvers.

SIMPLE LINE PLAN OF RESIDENTIAL BUILDING

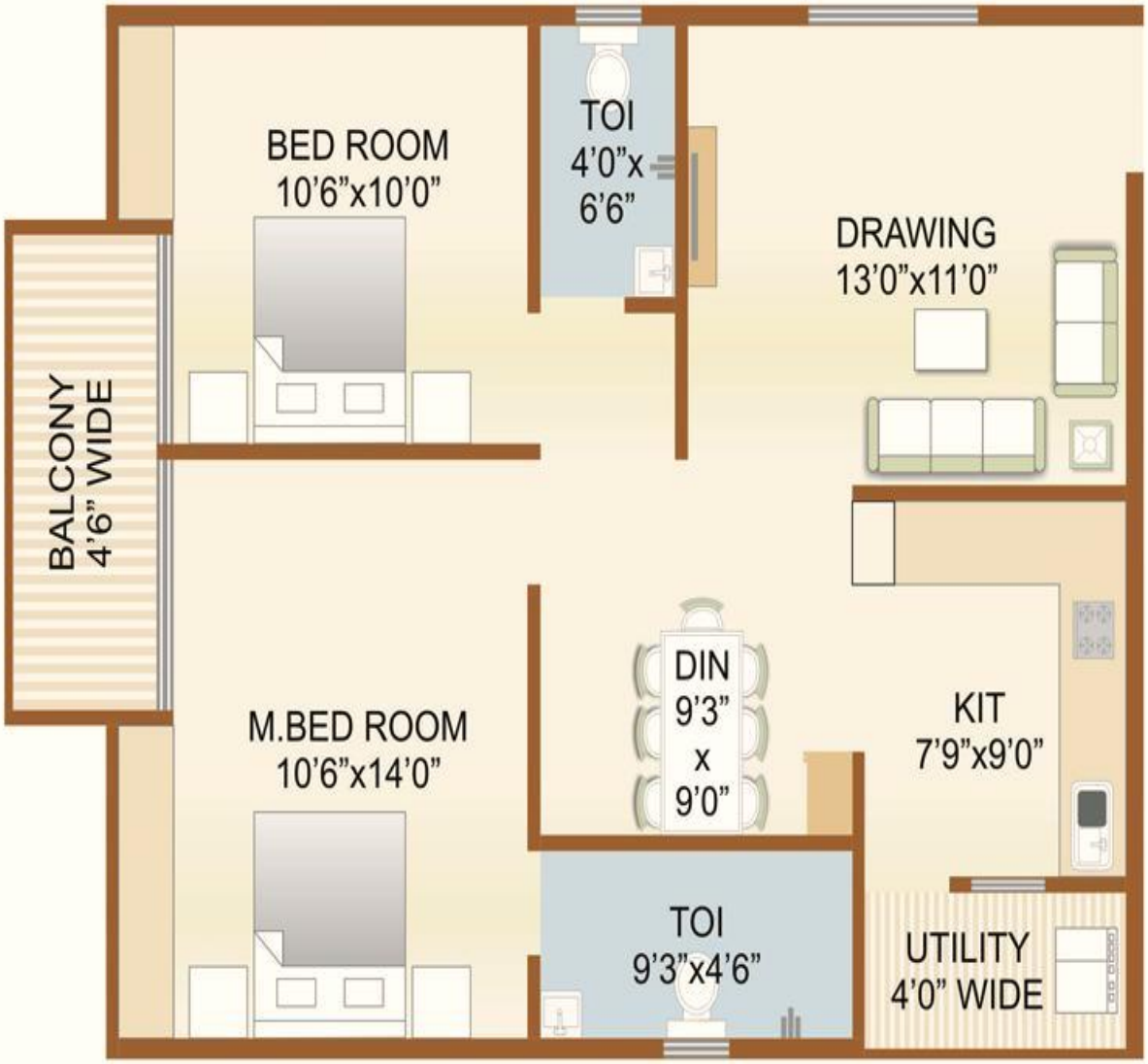


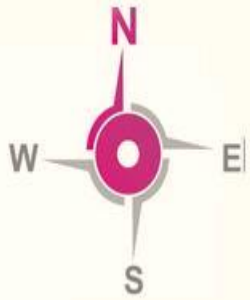






DETAIL PLAN OF RESIDENTIAL BUILDING (Include doors & Windows)





Justify the 2BHK plan of building???