UNIT : 10
ELEMENTS OF BUILDING CONSTRUCTION

M.S Patel Department of Civil Engineering
CSPIT - Charusat

TOPICS TO BE COVERD

10.1

- Types of building, Design loads, Building components (super structure, substructure),Principle of planning, Basics requirements of a building planning
- Types of residential building, Line diagram, Site plan, Layout plan and Key plan

10.2

- Basic architectural plan development from line diagram for residential building.

Building

- Buildings serve several needs of society – primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work.
- A building is a structure with a roof and walls standing more or less permanently in one place, such as a house or factory.
- Buildings come in a variety of sizes, shapes and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons

Types of Building

- Classified as follows:-

1. Based on occupancy (purpose served by building)

2. Based on structure (acc. to structural system)

Based on occupancy

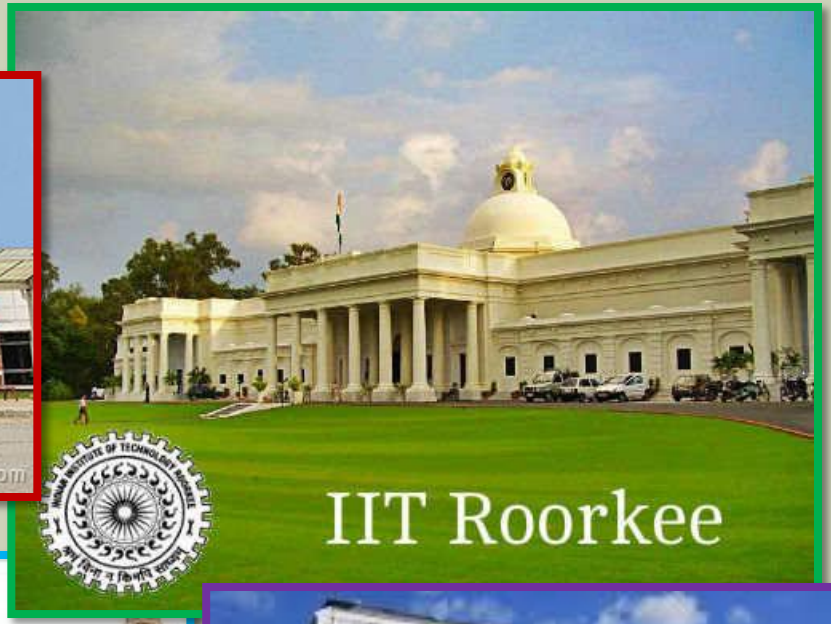
As per National Building Code of India , building are classify as :

A. Residential buildings

- **E.g. Bungalows, Flats, Row houses, Villas, Cottages etc.**

B. Educational buildings

- **E.g. Schools, Colleges, Universities, Training institutions, Libraries etc.**



C. Institutional buildings

- **Buildings are dealing with health care, physical & metal diseases, care of infants or aged persons. E.g. Hospital, Old age home, Orphanages, mental hospital, Prisons, Jail etc.**

D. Assembly buildings

- **Includes building where group of people assemble or gather. E.g. Assembly hall, Auditorium, Cinema halls, places of worship etc.**

E. Business buildings

- **Includes building which is used for transaction of business, keeping of accounts & records, etc. E.g. Banks, Offices, Lunch counters, etc.**

F. Mercantile buildings

- **Includes building which is used as Shops, Stores, Markets, etc.**

G. Industrial buildings

- **Includes building in which products of all kinds are fabricated, assembled or processed. E.g. Factories, Workshops, Laboratories, Dairies, etc.**

H. Storage buildings

- **Includes building which are primarily meant for storage of goods, products, vehicles, etc. E.g. Cold storages, ware houses, godowns, hangars, garages etc.**

I. Hazardous buildings

- **Includes building which are used for storage, handling, manufacturing of material which are combustible or liable to burn/explode and prove to be hazardous etc. E.g. Paper mill, Cloth mill, Fire crackers factory etc.**

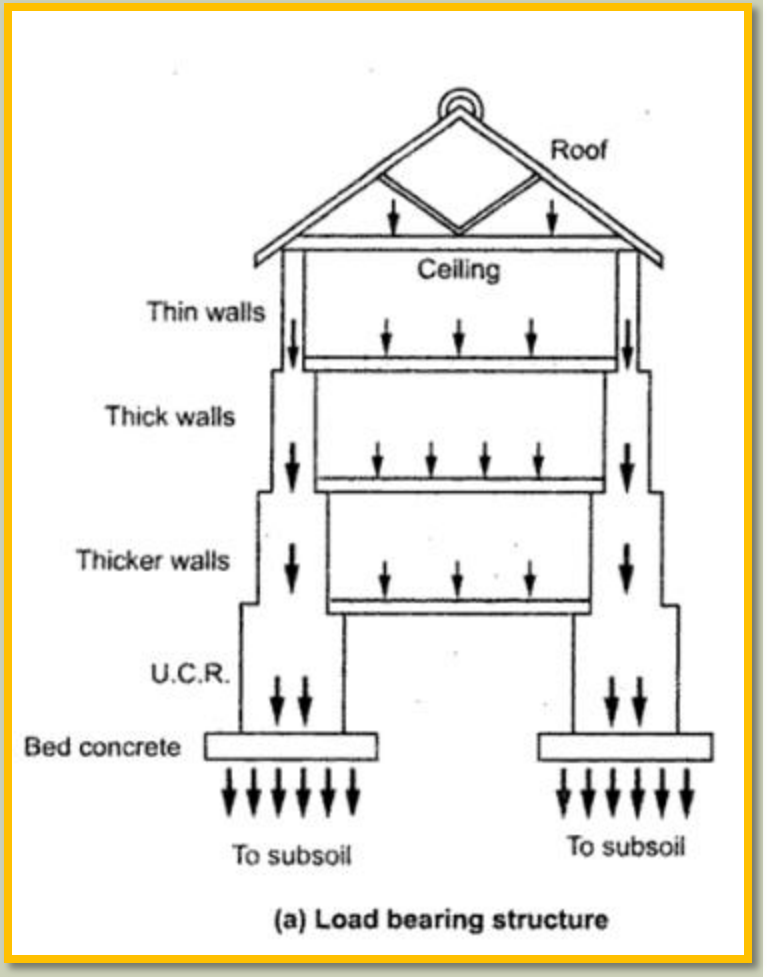
Based on Structure

Acc. to structural system there are three types of buildings:

1. Load bearing structure
2. Framed structure
3. Composite structure

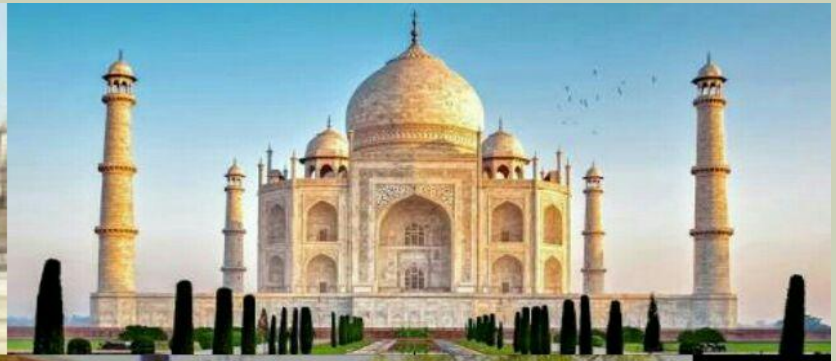
Load Bearing Structure

- Loads from the roof slab and floors are transmitted through walls to the firm soil below the ground.
- Wall of upper storeys will have less thickness than the wall of lower storeys.
- Consequently the carpet area reduces on ground floor as compare to upper floor.
- It is adopted where hard strata is available at shallow depths.
- Suitable for simple building of 2 store.
- Wall - Stone, Brick or Blocks, bound together with cement or lime mortar.
- Beam & Slab – RCC can be used.



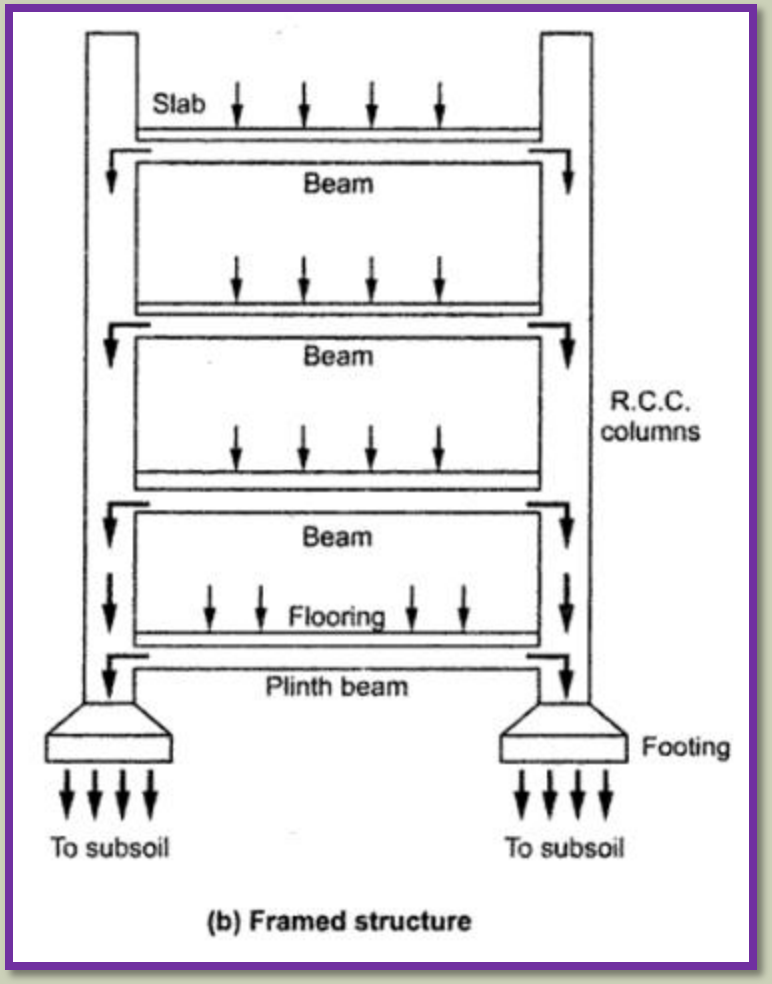
Thickness of arrows and number of arrows indicate Load Intensity

Load Bearing Structure

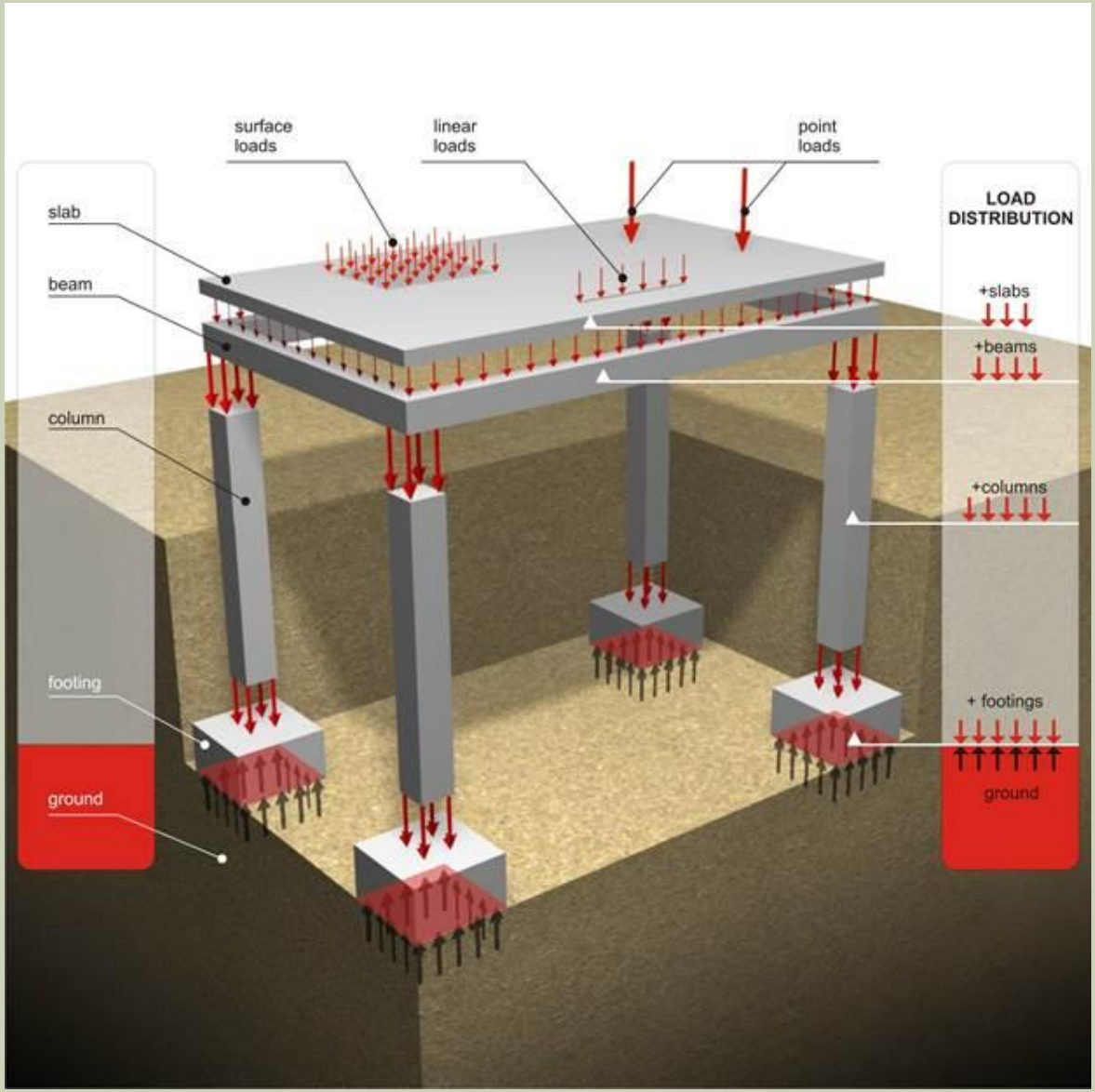

RCC Framed Structure

- Consist of skeleton of cross-beams, main beam, column, plinth beam, footing.
- Load from floor is transferred to Cross beam – Main beam (connected rigidly to col.) – Column – Footing – ultimately all the load is taken by the soil
- Used in multi storey building
- Open space in skeleton to be filled by the bricks / blocks
- Equal amount of carpet area is available on each floor.



(b) Framed structure

Thickness of arrows and number of arrows indicate Load Intensity



Transferring of load in Framed Structure

RCC Framed Structure

Composite Structure

- Construction of large spans buildings like workshops, ware houses, it is not desirable to strictly follow only one type of system (i.e. Load bearing/Framed structure)
- Here exterior walls are load bearing type & intermediate supports are in form of RCC columns. Thus it form composite structure.

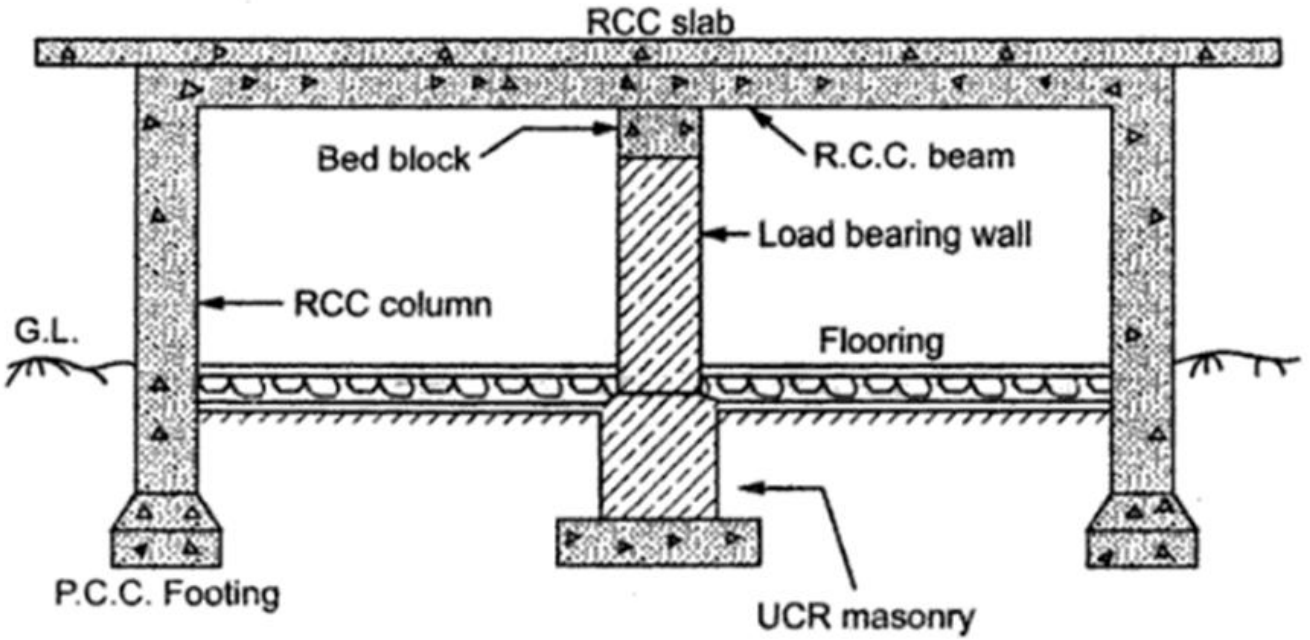


Fig. 10.4 Composite structure

Difference between Load bearing structure and Frame structure

	Load bearing structure	Framed Structure
1.	It is a structure comprising of slabs, beams and load bearing walls.	It is a structure comparising of slabs, beams and columns.
2.	Loads from the slab/roof or trusses and floors are transmitted through walls to the sub-soil below the ground through their foundations.	Loads from the slabs are transferred to the beams and beams rest over columns and whole load of the structure is transferred to the sub-soil below the ground through columns and their footings.
3.	In this structure all the walls are load bearings walls and bear loads and rest on foundations.	In this structure all the walls may or may not be partition walls and do not bear loads and rest on plinth beams.
4.	For up to three storey, residential buildings are constructed as load bearing structure.	Generally all multistored and high-rise buildings are constructed as framed structure.
5.	It requires good bearing strata like rocks, sandy soil, gravelly soil, etc. at a shallow depth.	It requires good bearing strata like hard murram or rocks at a greater depth.
6.	Load bearing walls are constructed of bricks or stones.	Columns, beams and slabs are constructed of R.C.C. and walls are constructed of bricks.
7.	Thickness of walls reduces from ground floor to first floor and so on.	Thickness of walls remains same from ground floor to top floor.
8.	Carpet area at lower floors will be less compared to upper floors.	Carpet area is almost same for all the floors.
9.	All the walls are constructed of bricks or stones and the slabs are constructed (casted) separately on the walls.	All the columns, beams and slabs are connected rigidly and are constructed monolithically.
10.	Construction time is more.	Construction time is less.
11.	Construction cost is low.	Construction cost is high.
12.	Life of structure is less.	Life of structure is more.

Design Loads

- A structure is designed considering the following loads:

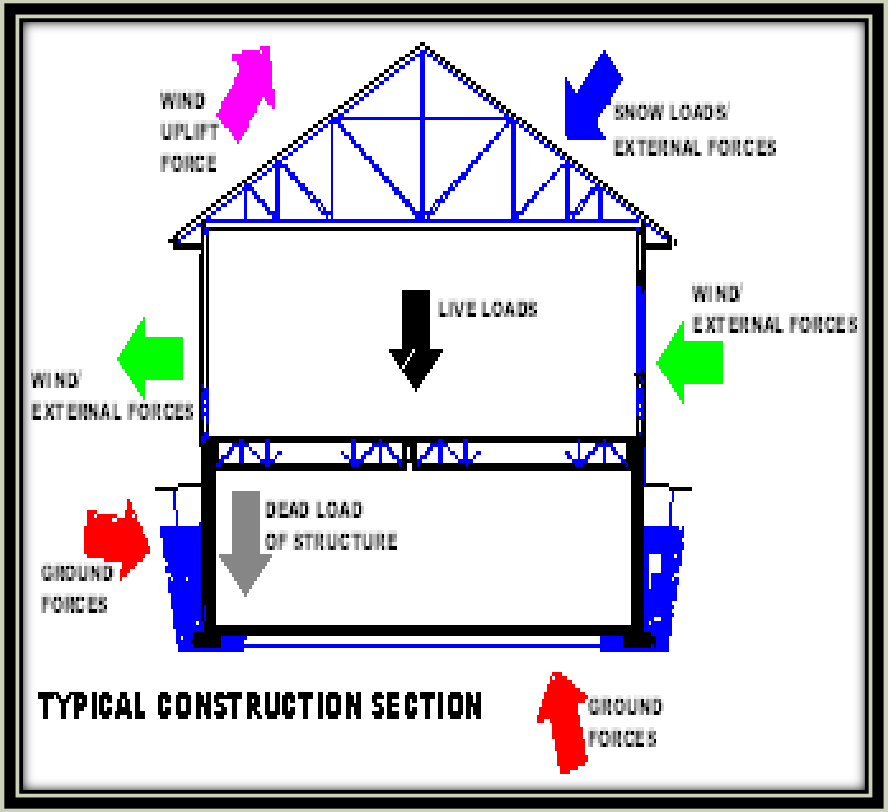
1. Dead Load (DL)
2. Live Load (LL)
3. Wind Load (WL)
4. Earthquake Load (EL)

LOAD

Dead Load

Live Load

Wind Load



Rain Load

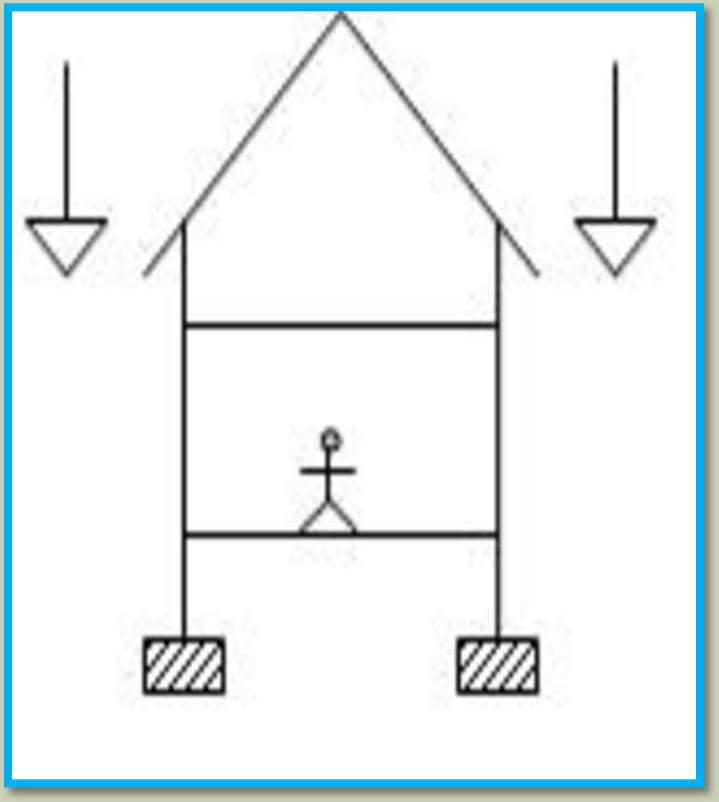
Snow Load

Earthquake Load

Anything which exerts pressure or thrust on a structure is termed as Load.

Dead Load

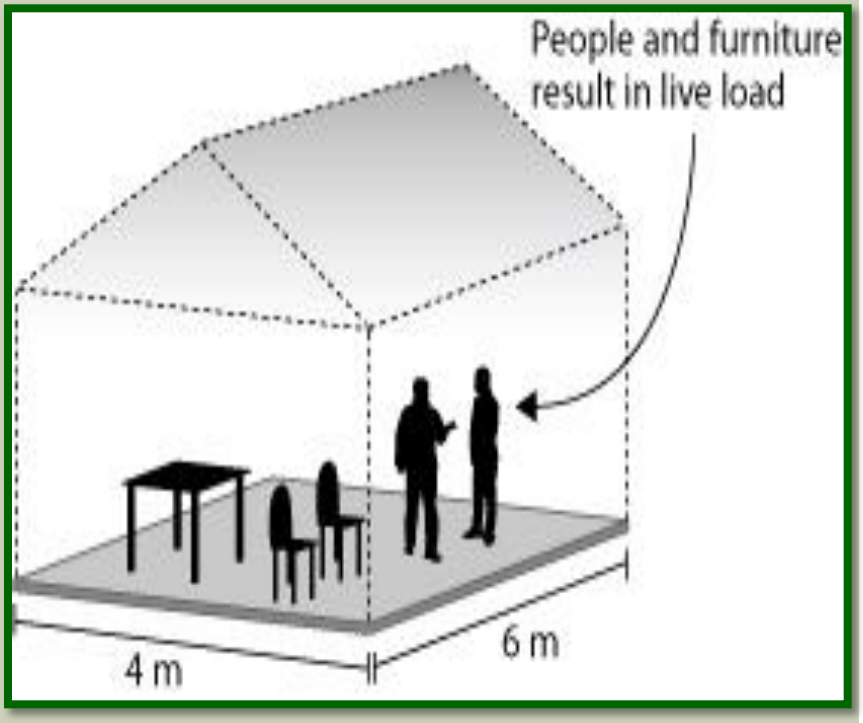
- It is **permanent , immovable and nontransferable** load of structure.
- **Walls , floors , roofs, partitions , ceilings , water tanks** and weights of all other permanent constructions or structures and fixtures are included in dead load.



LIVE LOAD

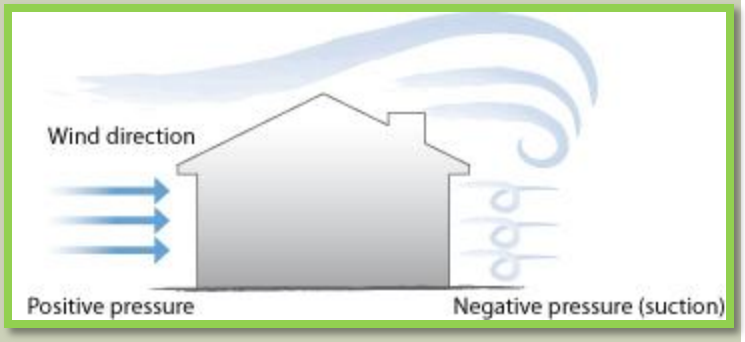
• It is **movable, temporary and transferable load** on the floor and hence it is variable.

• Weight of everything superimposed on, or temporarily attached to, a structure (**people, machinery and equipment, furniture, appliances, etc**.) but Not that of the material utilized in its construction or of anything permanently attached to it.




PERMANENT
LOADS
(dead)
wall
floor
IMPOSED
LOADS
(live)
humans
furniture

WIND LOAD



• In case of **Tall Buildings**, the effect **due to wind** should be taken into consideration.

•It is expressed in terms of basic wind pressure (P) which is an static pressure in the direction of wind.

$$P = K*V^2$$

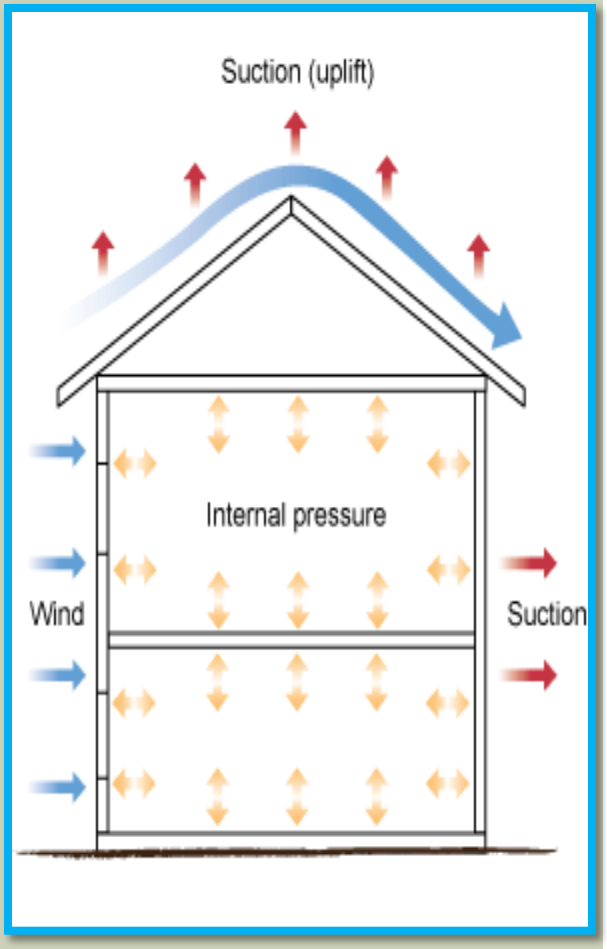
Where, P = Wind pressure (kN/m^2)

K = Coefficient depending on wind velocity, size & shape of structure.

V = Wind Velocity (km/hr)

•If height of a building is less than 3 times its effective width, the wind load can be neglected.

H = 3*b < neglect WL



EARTHQUAKE LOAD

•The random Earthquake causes shaking of the ground, which causes the whole structure to vibrate.

•Earthquake load is calculated as under:-

Earthquake force = m*α

= W/g *α

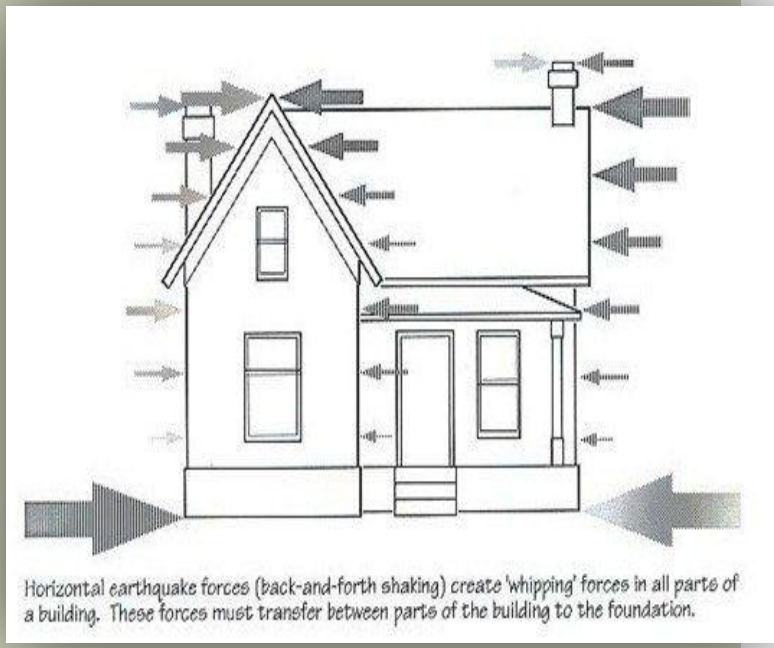
Where, m= mass of bldg.

W= total weight of structure

g= gravitational structure

α= acceleration due to EQ

- Although, it may get damaged but would not collapse until earthquake is of beyond the limit.



Horizontal earthquake forces (back-and-forth shaking) create 'whipping' forces in all parts of a building. These forces must transfer between parts of the building to the foundation.

Building Components

Building Components

Super Structure

- Plinth
- D.P.C
- Wall & Columns
- Floors
- Beams
- Roofs & Slabs
- Lintel, Chajjas
- Doors, Windows
- Parapet
- Steps, Stairs
- Coping

Sub Structure

Foundation

Building Component and their Functions

Building Component	Functions
Foundation **1. Wall foundation** **2. Column Footing**	• Transmit the loadd. • Support the super structure • Provides stability • Prevent the effect of expansion and contraction of sub soil
Plinth	• Assists in transmiting loads from superstructure to to substructure (foundation) • Protects building from moisture • Prevent the entry of rainwater, dust, insects, soil, bacterua, termite in bulding
wall	• Suppoer beam and slab. • Transmits the loads • Cover the building sides • Provide partition, privacy and safety • Provides pretection against heat, cold, rain, noise, fire, dust, wind etc

Building Component	Functions
Floor	• Provide a plane surface for occupants, furniture, and equipment
Roof	• Enclose the space • Offers protection from rain, heat, snow, wind fire, sound etc.
Door	• Permits exit and entry for buildings • Provides safety and privacy • Permits light and ventilation
Window	• Provide light and ventilation • Gives exposure to external views
Step	• Provides access in building from GL
Stair	• Provides vertical circulation among floors in building

Building Component	Functions
Lintel and Arch	• Supports the loads og wall portion above opening
Sill	• Support the window opening
Beam	• Absorbs and transmit the loads coming from slab of building
Weather shed (Chajja)	• Protects from rain, sun, heat
Parapet	• Enclose the terrace

Definition of Building Component

Building Component	Defination
Foundation	• It is a structure below the G.L. • It is the lowest part of building
Plinth	• It is the portion of the building above ground level upto the finished flooer level • It is the lower most part of superstructure of a building
wall	• The walls are constructed by use of bricks, stone, concrete blocks etc bonded together with mortar.
Column	• It is an isolated vertical load bearing member of small section of brick or stone masonry or concrete.
Stair	• It is comprised of series of steps to connect the different floors of building
Parapet	• Low height, thin wall provided above slab to enclose terrace

Building Component	Defination
Roof/Slab	• It is the upper most part of building to cover the space below
Door	• It is a frame and shutter of wood, steel, glass, aluminum, or a combination of all material, secured in a opening made in the wall from finished floor level to lintel level.
window	• It is a frame and shutter of wood, steel, glass, aluminium, or a combination of all material, secured in a wall opening from sill level to lintel level
ventilators	• It is a small window secured in a wall at a greater height.
floors	• The floor constructed at the plinth level is called ground floor. • The floor of each storey above GL are known as upper floor. Top most floor is called terrace.

Building Component	Definition
Lintel	• It is defined as horizontal structural member provided across the opening of door and windows.
Arch	• It is defined as the structure constructed of wedge shaped blocks of stones or bricks joined together with mortar and provided acress opening
Sill	• It is defined as the horizontal structural member provided below the window opening
Beam	• It is defined as the horizontal structural member provided below the slab and rested above walls and column
Chajja	• It is the small slab provided at lintel level above door, window, ventilator or opening and verndah. • Projection on outside of external walls

Building Components and Nominal dimensions

Building Component	Nominal dimensions
Depth of foundation	• ≥2T+ 30
Width of foundation	• 2T+ 30
Plinth height	• 30, 45, 60, 75, 90 cm.
Wall thickness **Partition wall** **Load bearing**	 • 10, 15 cm • 20, 30, 40 cm.
Sill height	• 70 cm finished floor length
Sill thickness	• 0.07 m to 0.10
Lintel height	2.0 m from FFL
Lintel length	• Width of opening + min 10 cm on both side
Lintel thickness	• 10 to 15 cm

Building Component	Nominal dimensions
Door width	• 0.80 m , 0.90, 1.0 ,1.20 m
Door height	1.80m , 2.0, 2.10 m
Window width and depth	• 0.60, 0.75, 0.90, 1.0, 1.2, 1.5, 1.8 m
Chajja prejection	• 30, 45, 60, 75, 90 cm
Chajja thickness	Tapers from 0.10 m to 0.07
Column size **Column type** **Brick, RCC**	• Square: 20x20, 30x30 cm • Rectangular: 20x30 cm • Circular: 20φ, 30 φ cm
Column footing	Min pit size 1.0x1.0x1.0 m below GL
Depth of beam	• 30, 45, 60 cm
Width of beam	• Generally equal to width of wall, if raised upon walls otherwise 30, 45, 60 cm

Building Component	Nominal dimensions
Slab thickness	• 0.10, 0.12, 0.15 cm
Parapet wall thickness	10 cm
Parapet height	• 1.0 m (min), 1.30 m (max)
Steps	• ***No of Risers*** $= \frac{Height\ of\ ceiling + Slab\ thickness}{Riser\ Height}$ • ***No of the treads = No of Risers – 1*** • ***For the residential building:*** ***Riser Height = 15 to 20 cm*** ***Tread Width = 25, 30, 35 cm*** ***Width of steps = min 1.0 m***

Types of Residential building

1. **Detached building – Bungalow**
2. **Semi Detached building – twin bungalow**
3. **Row Houses**

Types of Residential building

1. **Detached building – Bungalow:**

- An individual have margin on all the four sides of the building in detached building.

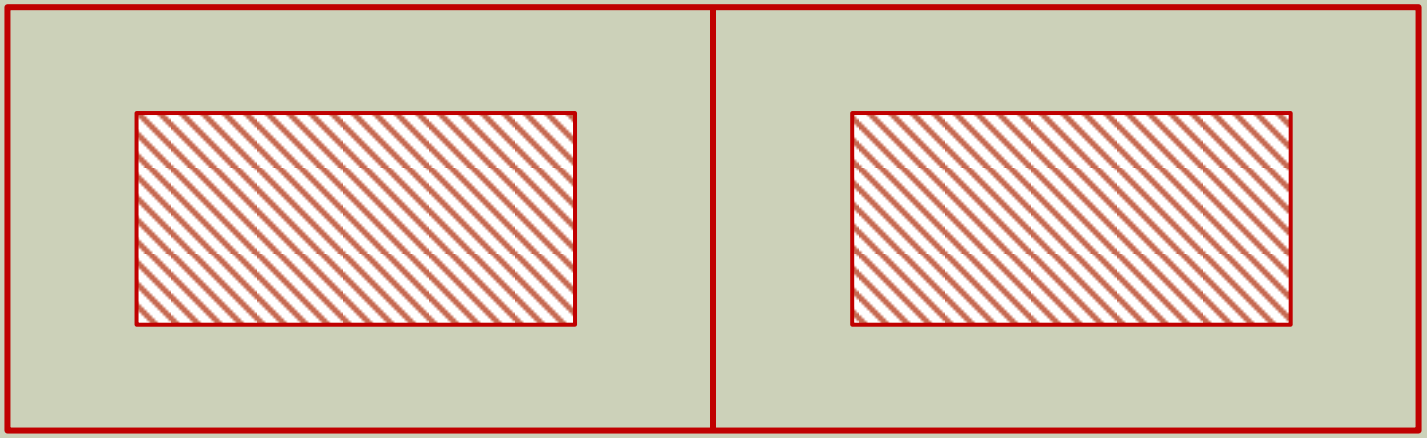
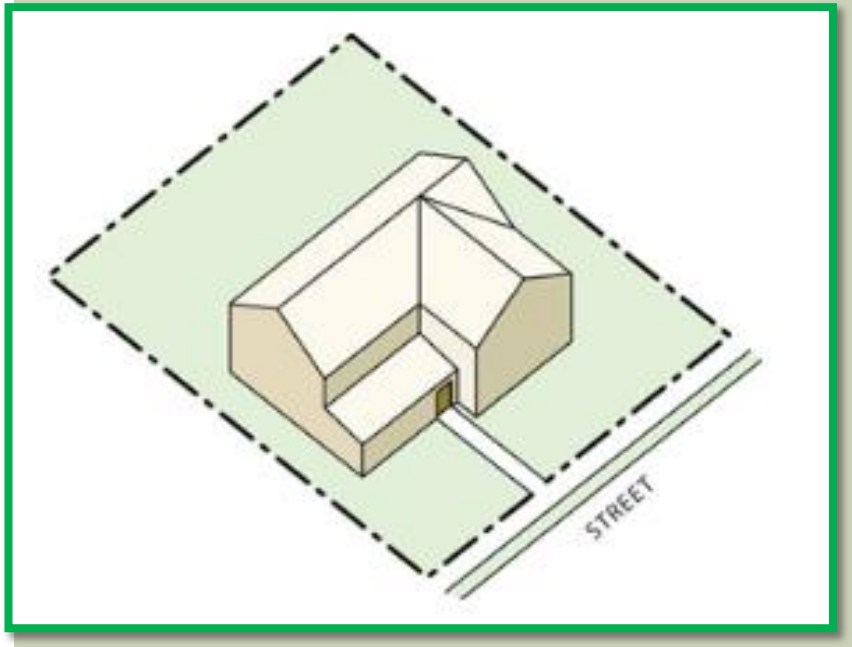


Figure: Detached building – Bungalow

Detached building – Bungalow:



Types of Residential building

2. Semi- Detached building – Bungalow:

- An individual have margin on front back and any one side.
- There are three margins.
- One wall at the center plot is common wall in semi detached building.

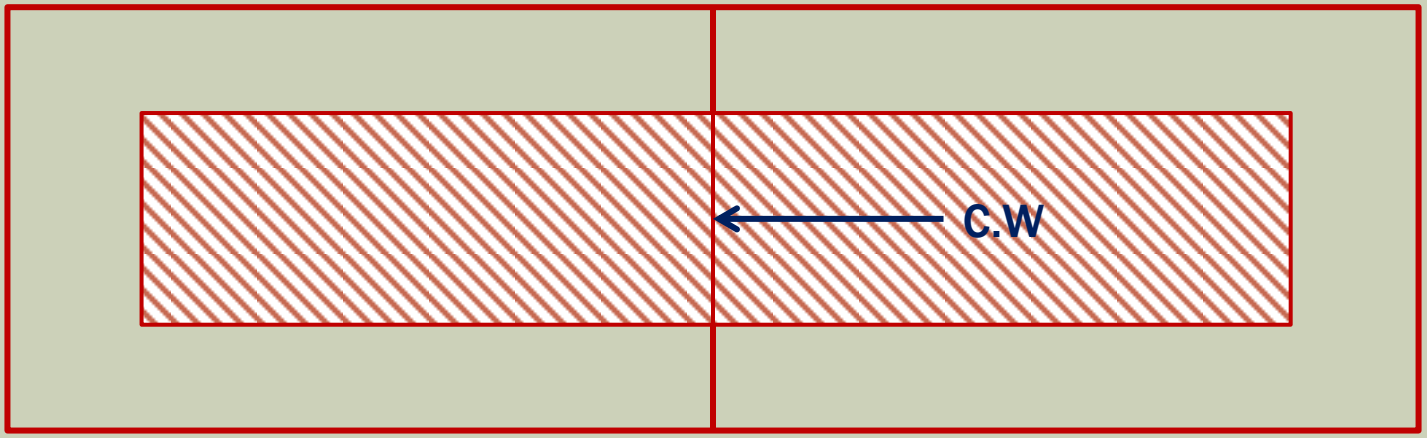
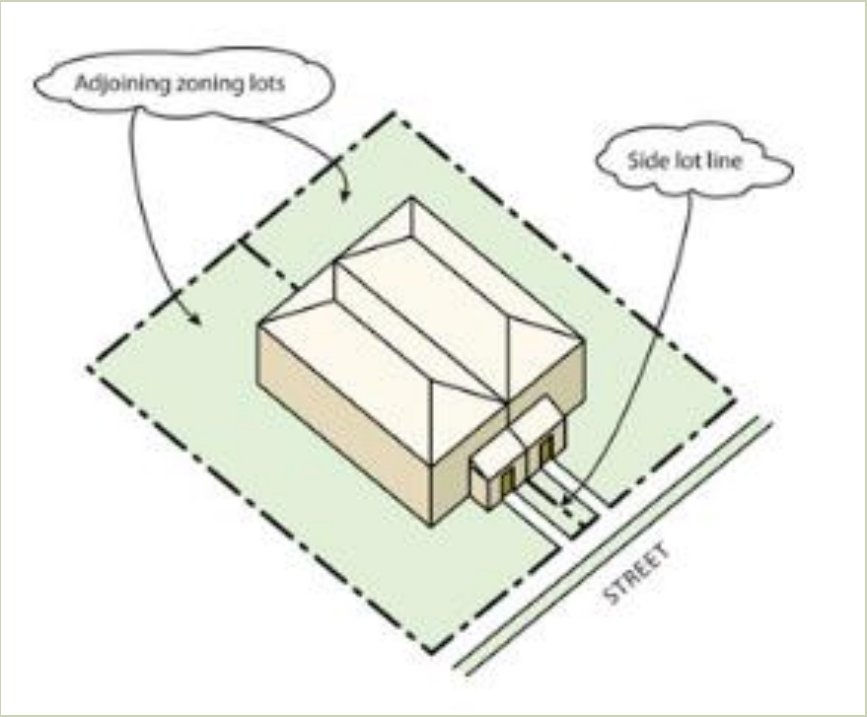


Figure: Semi - detached building – Bungalow

Semi- Detached building – Bungalow:



Types of Residential building

3. Row House:

- In case of row house there is common wall on the sides.
- There is a small verandah in front of street road and back margin.
- Only first and last unit in row can get one side margin

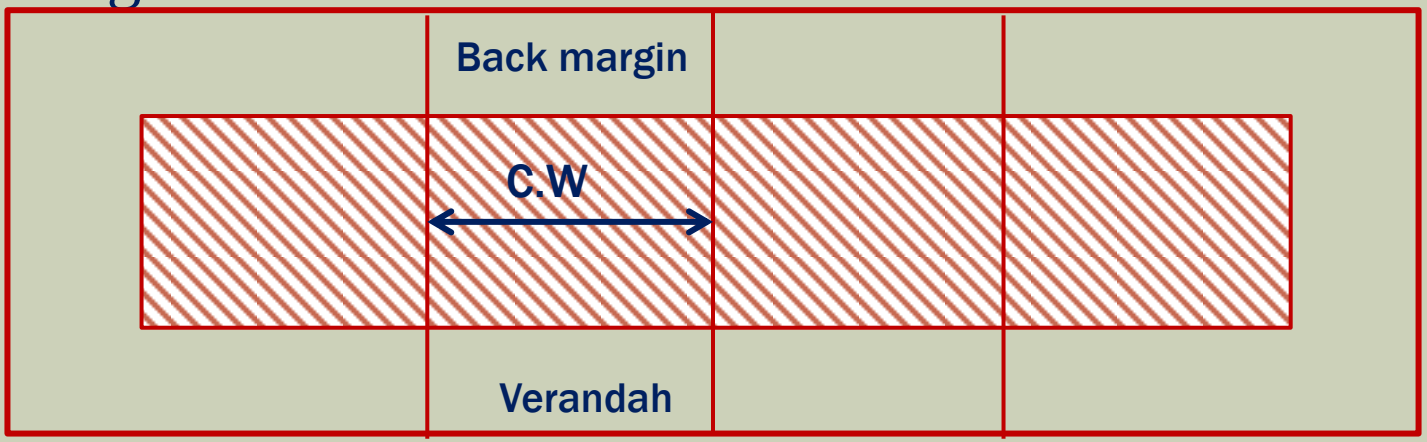
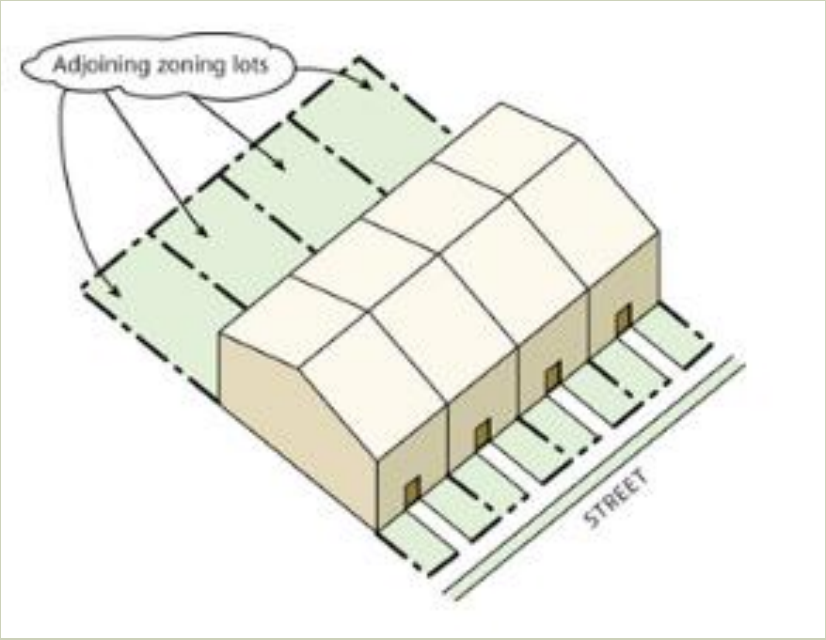
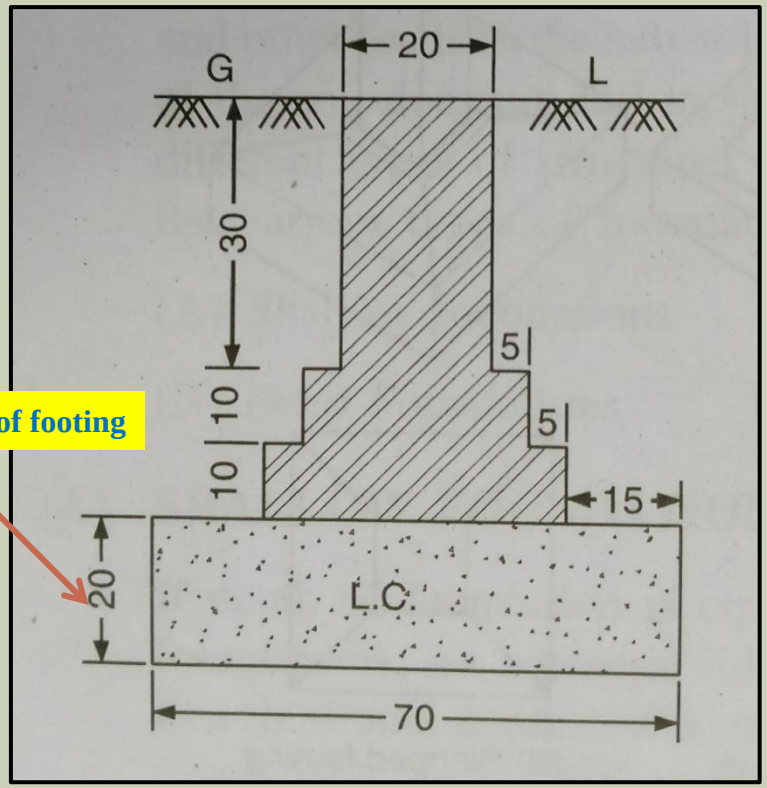


Figure: Semi - detached building – Bungalow

Row House:

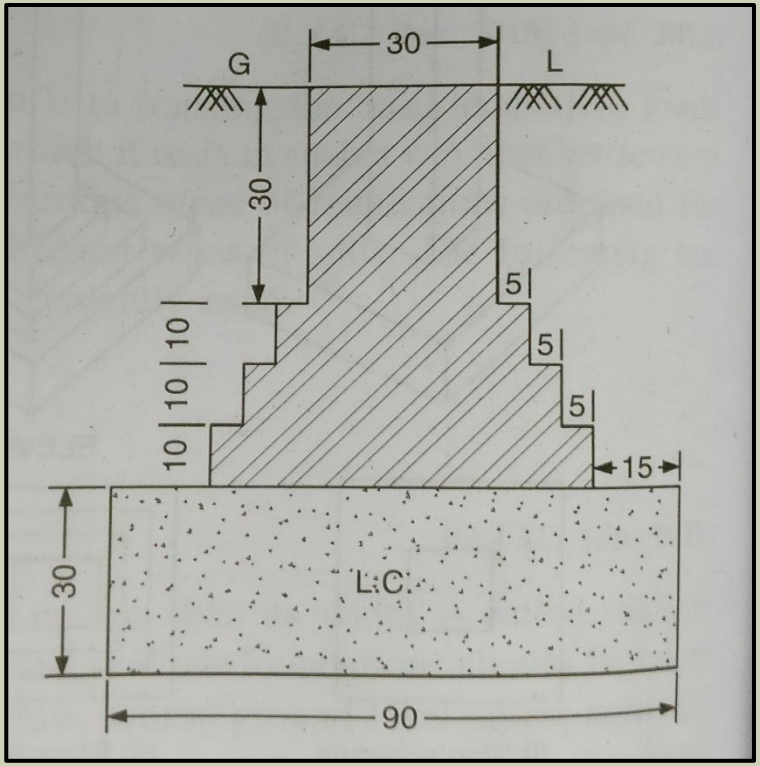


Typical wall Footing for 20cm, 30 cm and 40 cm



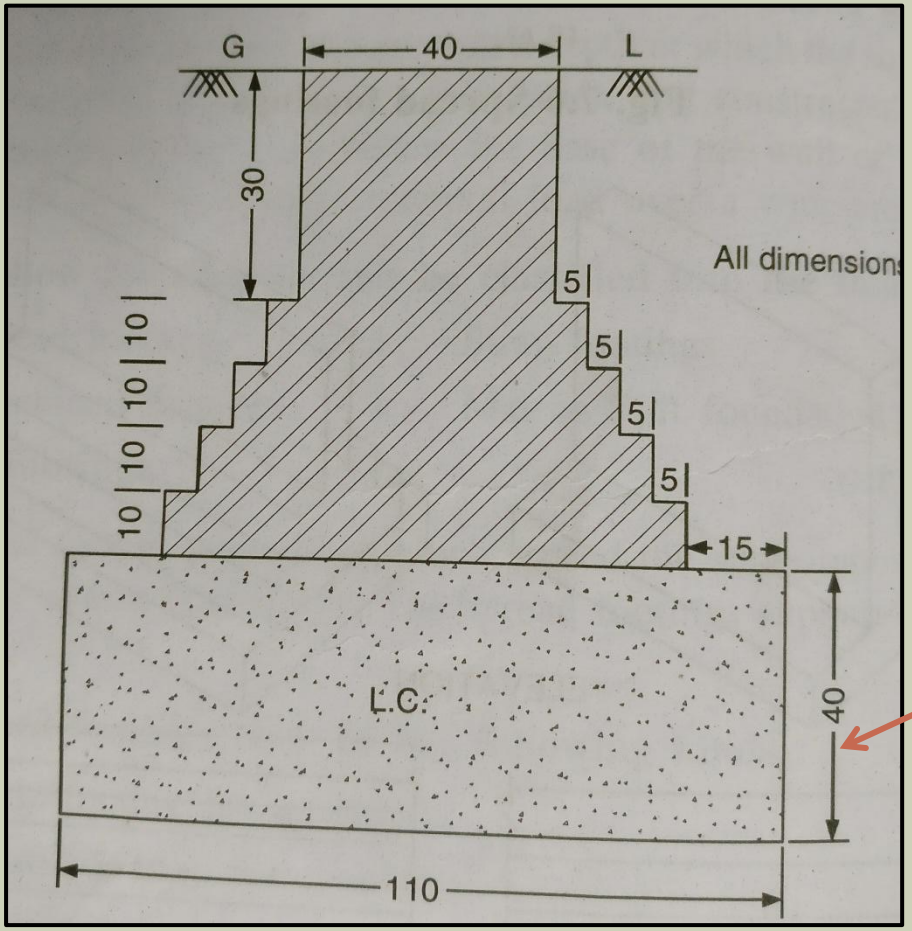
Thickness of footing

20 cm thick wall footing



30 cm thick wall footing

Typical wall Footing for 20cm, 30 cm and 40 cm



40 cm thick wall footing

Sub Structure

It is that part of a building which is below the ground surface or level.

Super Structure

It is that part of a building which is above the ground surface or level.

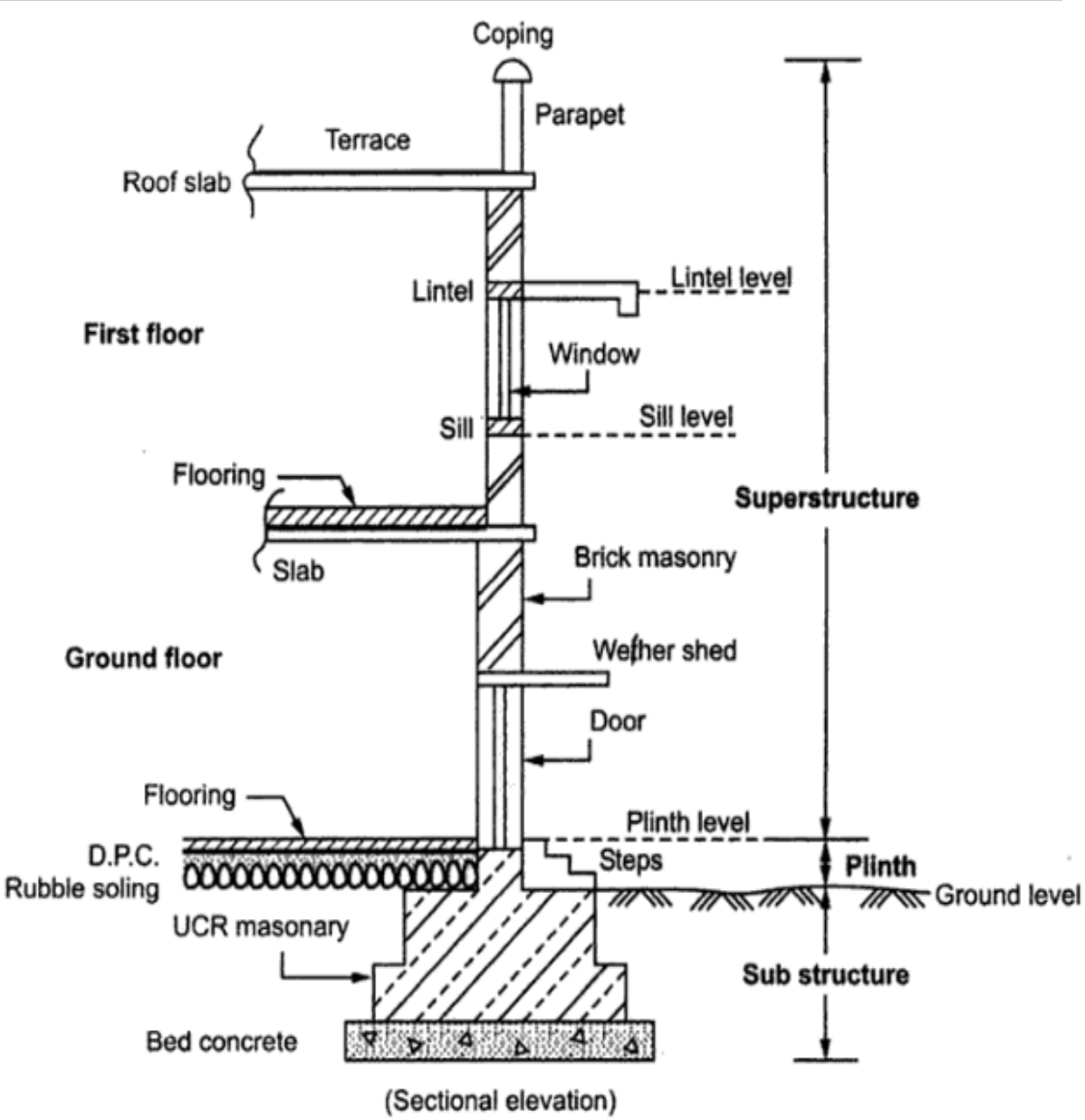
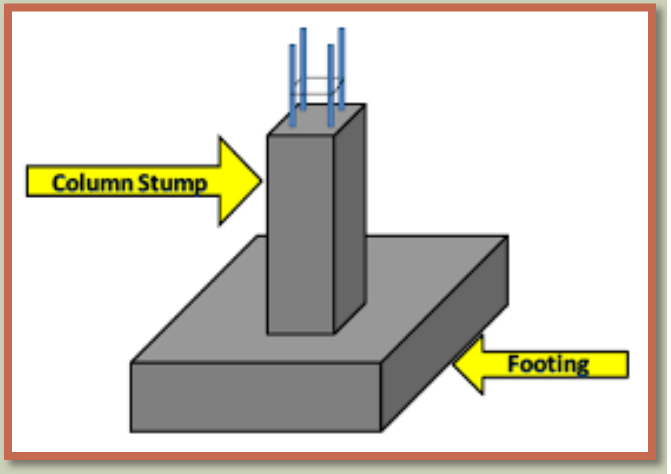
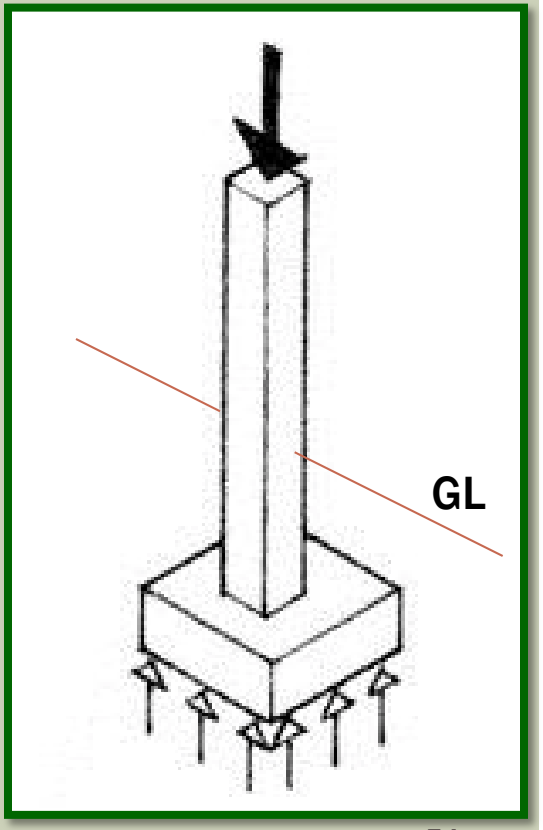


Fig. 9.1 Important parts of a structure

Sub Structure

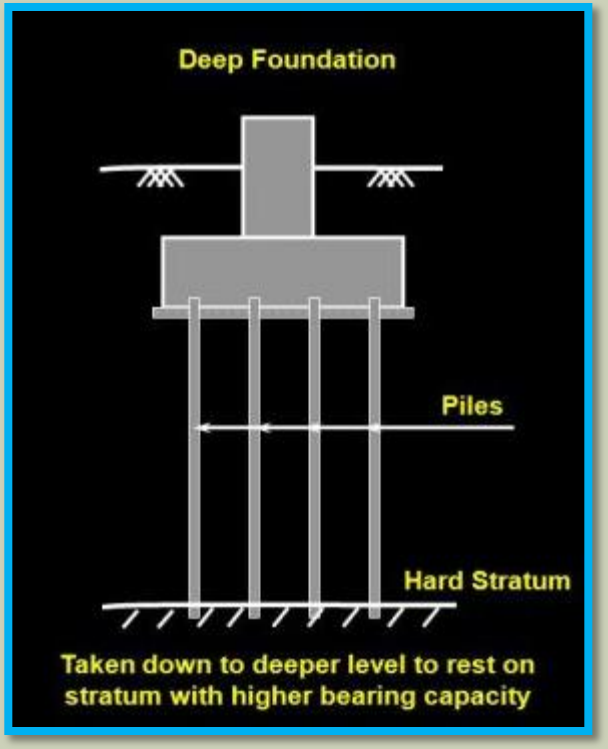
- It is that part of a building which is below the ground surface or level.
- Sub structure transmit the load of superstructure to the sub-soil.
- Soil immediately below the base of the foundation is called sub-soil.
- The lower most portion of the foundation which is in direct contact with the sub-soil is known as footing.
- The basic function of sub- structure is to transmit the dead loads, super-imposed loads (L.L),W.L from building to the soil on which building rests.





Foundation

- The basic function of foundation is to transmit the super structure load to the soil.
- Various types of foundations are used for different types of structures on different types of soils.
- The 2 type of foundations are generally used.
  - Shallow Foundation
  - Deep

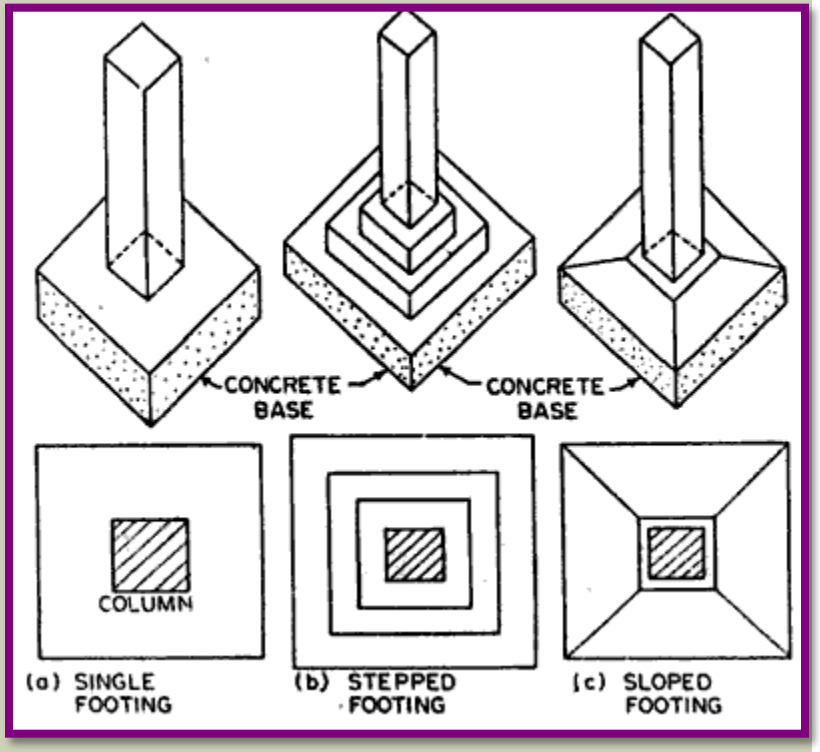


Types of Shallow Foundation

- If the depth of foundation (D) is equal to or less than its width (B) is called **Shallow foundation**.

$$D \leq B$$

- Types of shallow foundation:
  1. Spread footing
  2. Combined footing
  3. Strap footing
  4. Mat or Raft footing



Spread Footing:

- The spread footings are those which spread the superimposed load of wall or column over a large area.
- Its support either a column or a wall.

SINGLE FOOTING

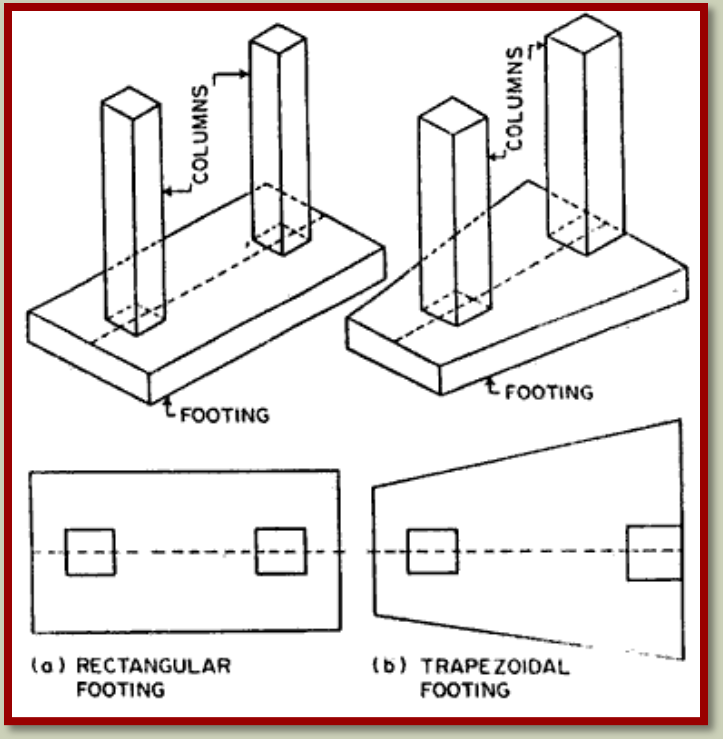
STEPPED FOOTING

Combined Footing:

- A spread footings which supports two or more columns is termed as combined footing.

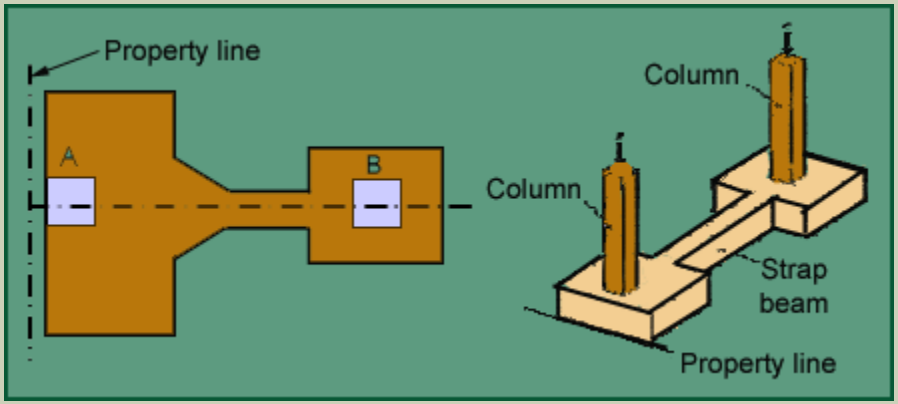
- Combined footings may be of the following kinds:
  a. Rectangular combined footing
  b. Trapezoidal combined footing

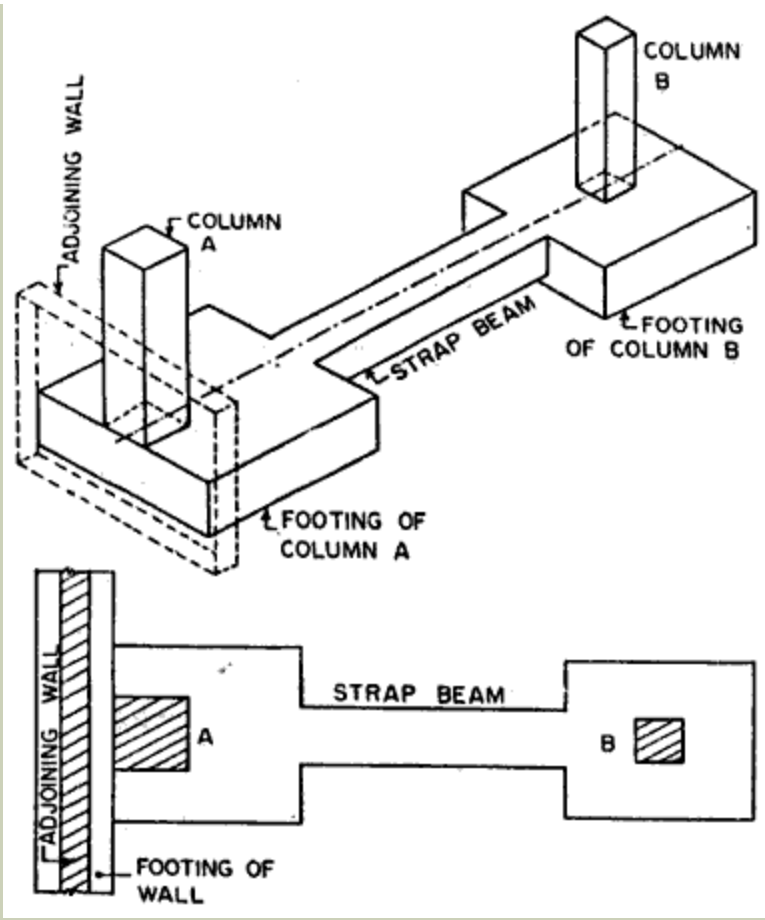
- These footing are constructed of reinforced concrete.



Strap Footing:

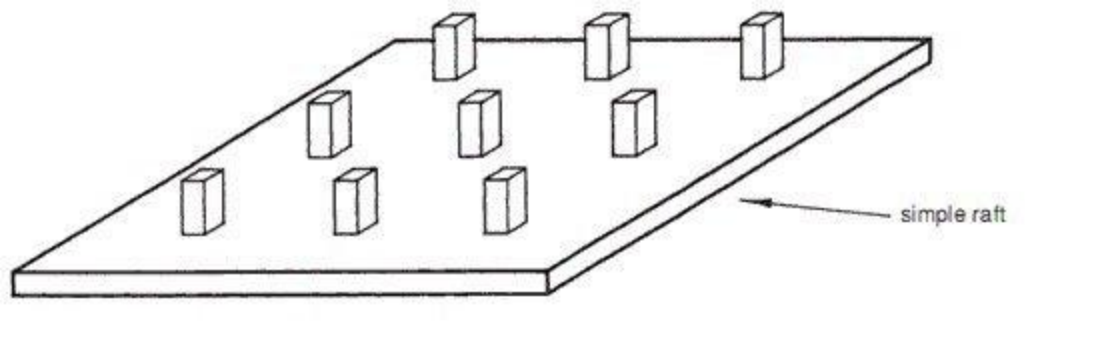
- A strap footing consists of two or more footings of individual columns, **connected by a beam**, called a strap.





Mat or Raft Footing:

- A raft or mat is a combined footing, which covers the entire area below the whole building & supports all the walls and columns.



Types of Deep Foundation

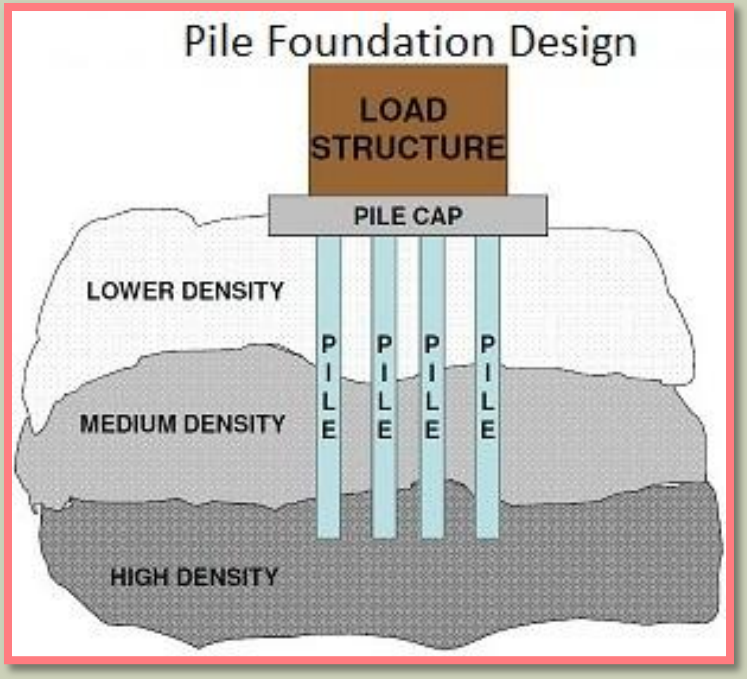
- If the depth of foundation (D) is equal or greater than its width (B) is called **Deep foundation**.

$$D \geq B$$

- Types of deep foundation:
  1. Pile foundation

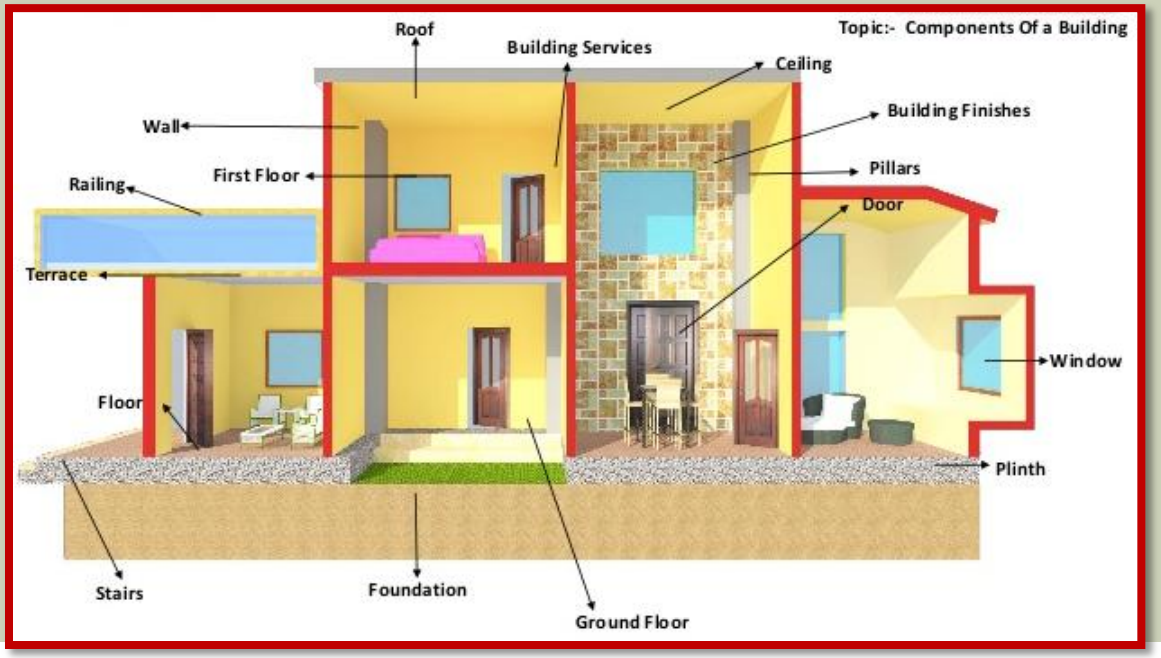
Pile Foundation:

- Pile foundation is that type of deep foundation in which loads are taken to a greater depth by means of vertical members which may be of timber, concrete or steel.



Super Structure

1) **Plinth** – The portion of the wall between ground level & ground floor level is known as plinth.
   - At the top of plinth a damp proof course is provided.
   - Function of the plinth is to keep the ground floor above ground level, free from dampness.
   - For residential buildings- more than 300mm & 450mm in general.
   - It is required that plinth level is at least 150mm above the road level, so that connections to underground drainage system can be made.



2) **Walls and Columns** – The function of walls and columns is to transfer the load of the structure vertically downwards to transfer it to foundation.

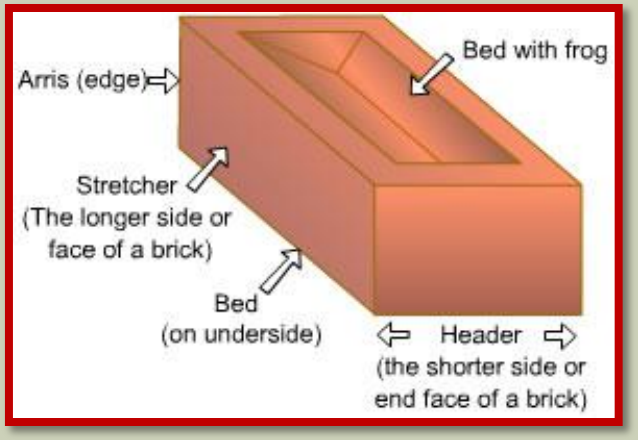
Apart from this wall perform following functions also:

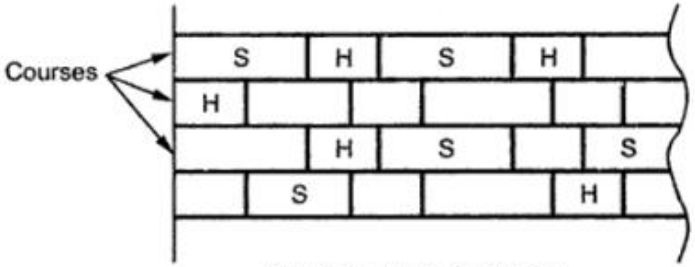
- It encloses building area into different compartments & provide privacy.
- Provides safety from thief and insects
- Keep building warm in winter & cold in summer

- Classification of wall

(i) Load bearing (20cm ,30cm,40 cm)- Carry super imposed loads in addition to their own weight.

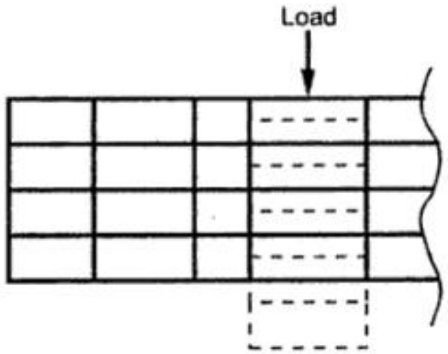
(ii) Non-load bearing (Partition wall – 10cm)- Only carry their own weight.





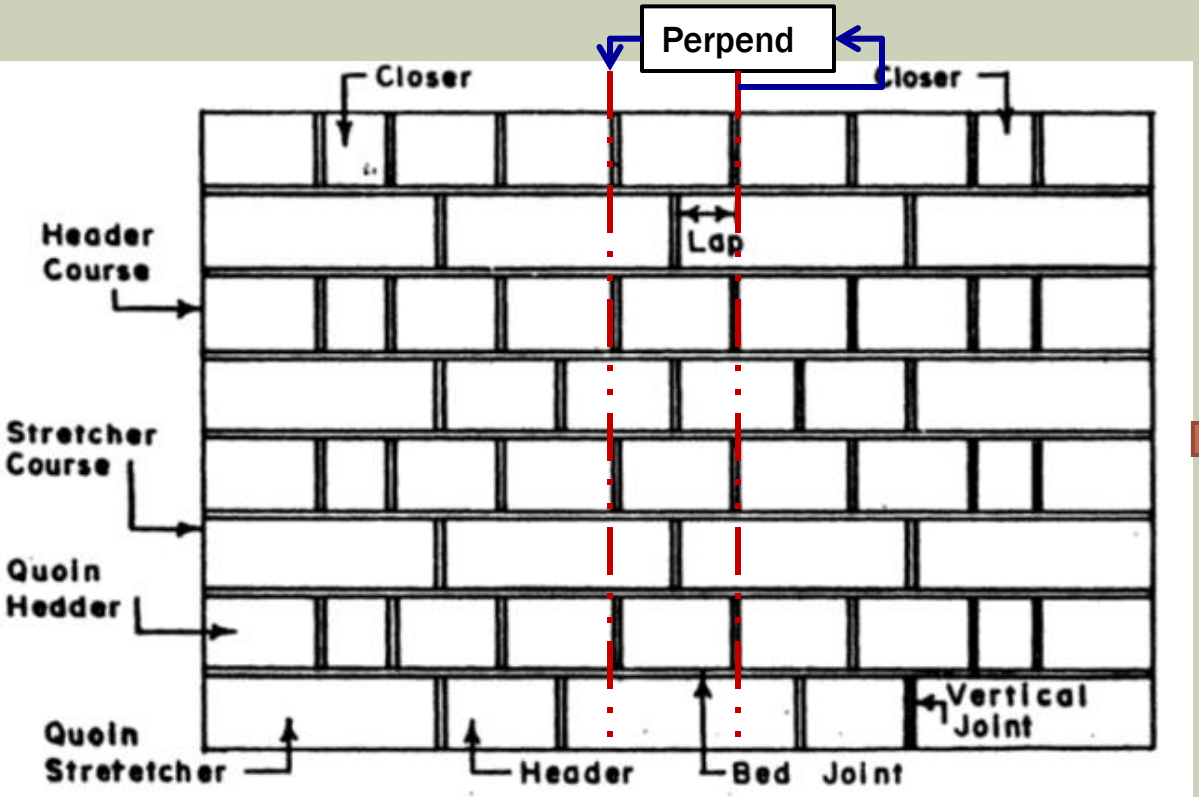
(Alternate headers and stretchers for proper load sharing/distribution)

(a) Staggered vertical joints - correct construction



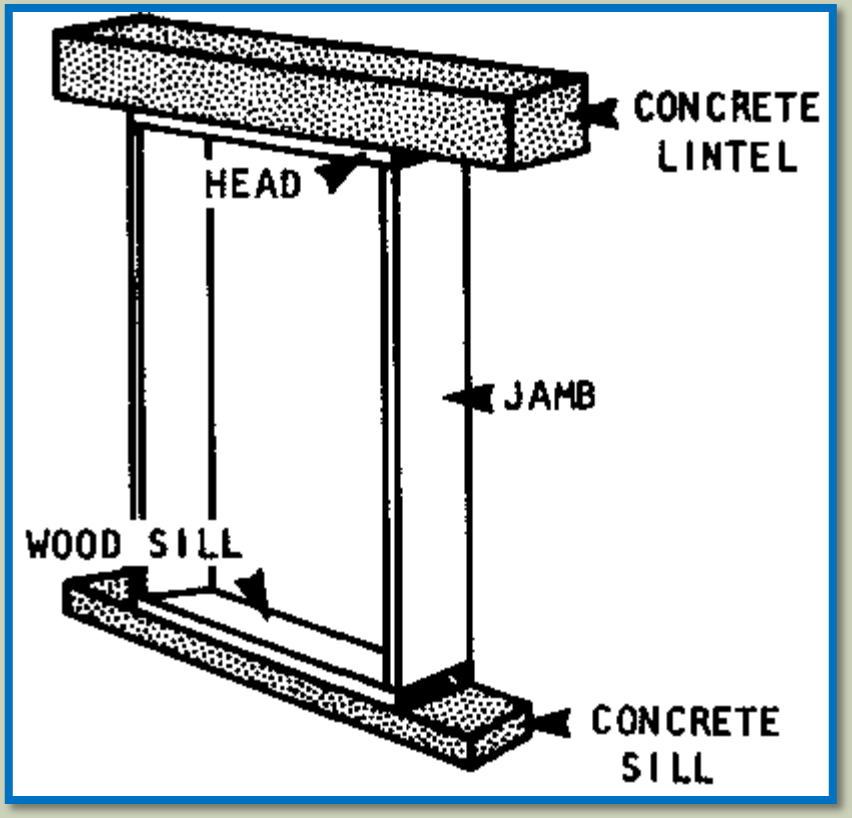
(Load is not shared by other bricks and other layers)

(b) Vertical continuous joints - wrong construction

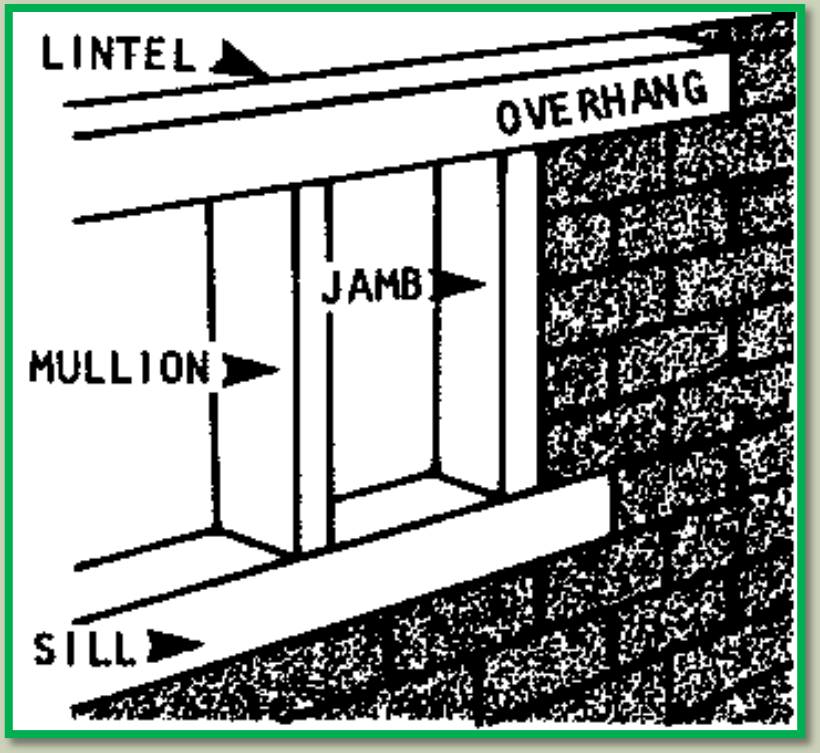


Elevation of masonry wall

3) **Sill** – A window frame should not be directly placed over masonry. It is placed over 50mm to 75mm thick plain concrete course provided over the masonry. This course is called as **sill**.

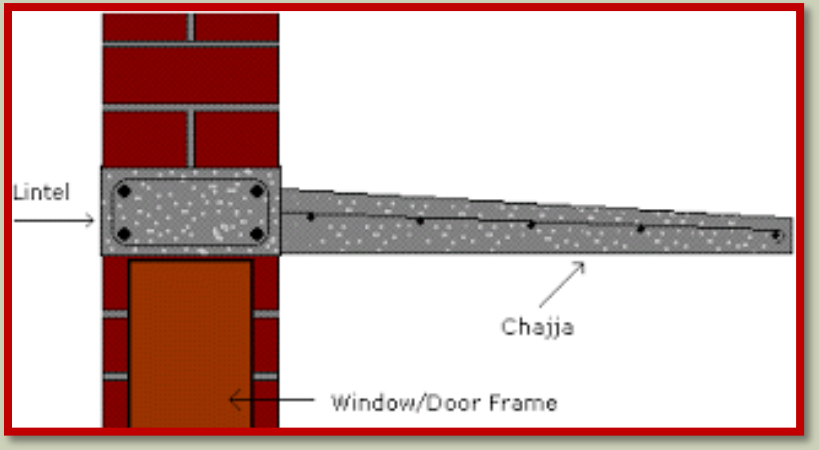


4) **Lintels** – **Lintels** are the R.C.C. or stone beams provided over the door and window openings to transfer the load transversely so as to see that door or window frame is not stressed unduly. The width of lintels is equal to the width of wall while thickness to be provided depends upon the opening size.



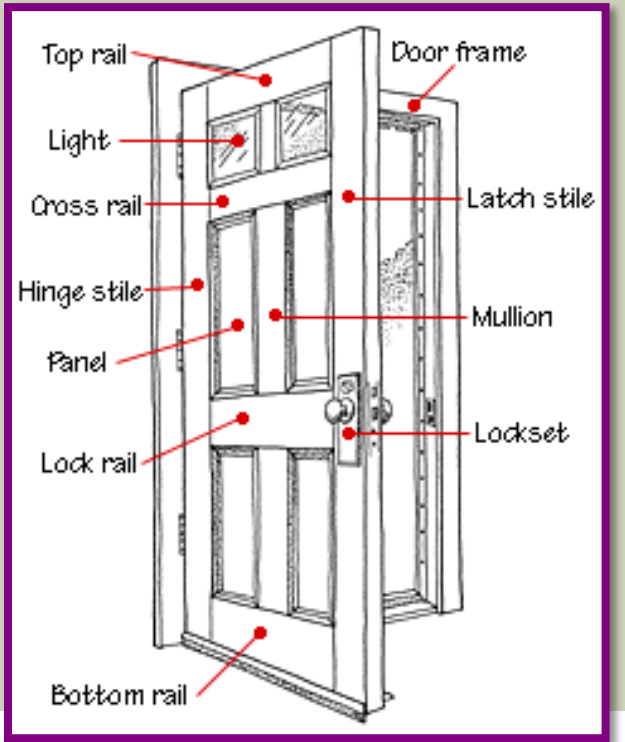
5) **Chejja** – **It is a small slab provided at a lintel above doors , window, door & verandah on outside of external walls.**

Chejja is the projection given outside the wall to protect doors and windows from the rain. They are usually made with R.C.C. In low cost houses stone slabs are provided as chejjas. The projection of chejja varies from 600 mm to 800 mm.



6) **Doors** – The function of a door is to give **access to different rooms** in the building and to deny the access whenever necessary. Number of doors should **be minimum** possible. The size of the door should be of such dimension as will facilitate the **movement of the largest object** likely to use the door.

- Generally adopted sizes of doors:
  - External door = 1.0 x 2.0 m to 1.1 x 2.0 m
  - Internal door = 0.9 x 2.0 m to 1.0 x 2.0 m
  - Bath & WC door = 0.7 x 2.0 m to .80 x 2.0 m



7) **Window** – The Windows are provided to get **light and ventilation** in the building. They are located at a **height of 0.75 m to 0.9 m** from the floor level. In hot and humid regions, the window area should be **15 to 20 percent** of the floor area.

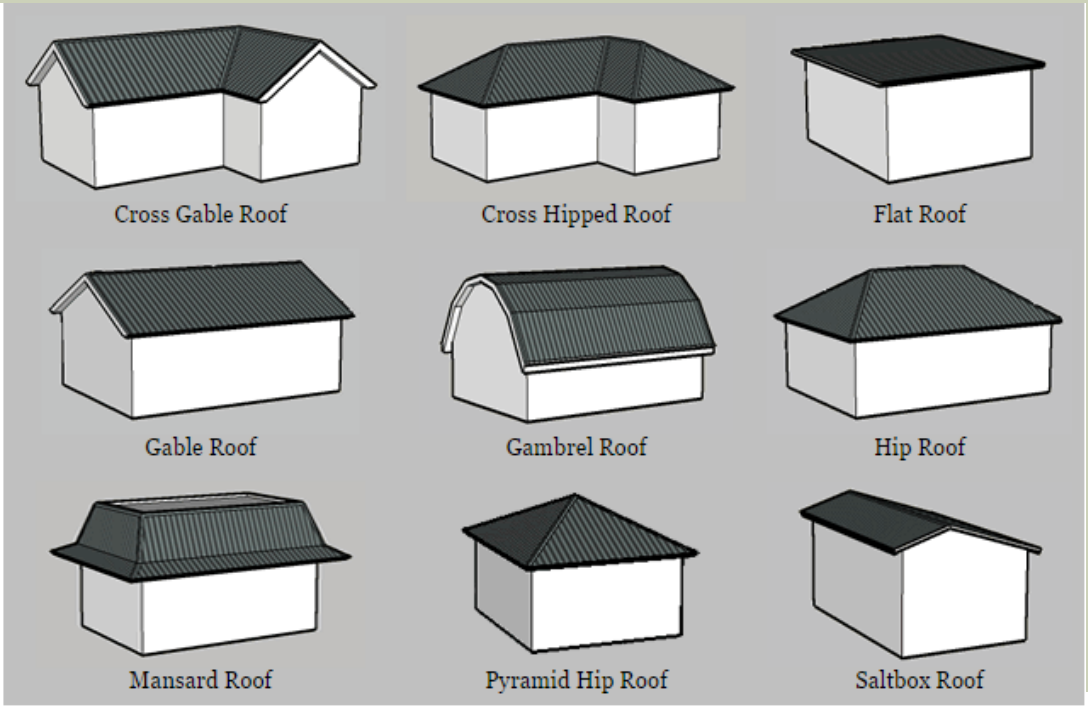
8) **Floor** – The Floors are the important component of a building. They give working/useful area for the occupants.

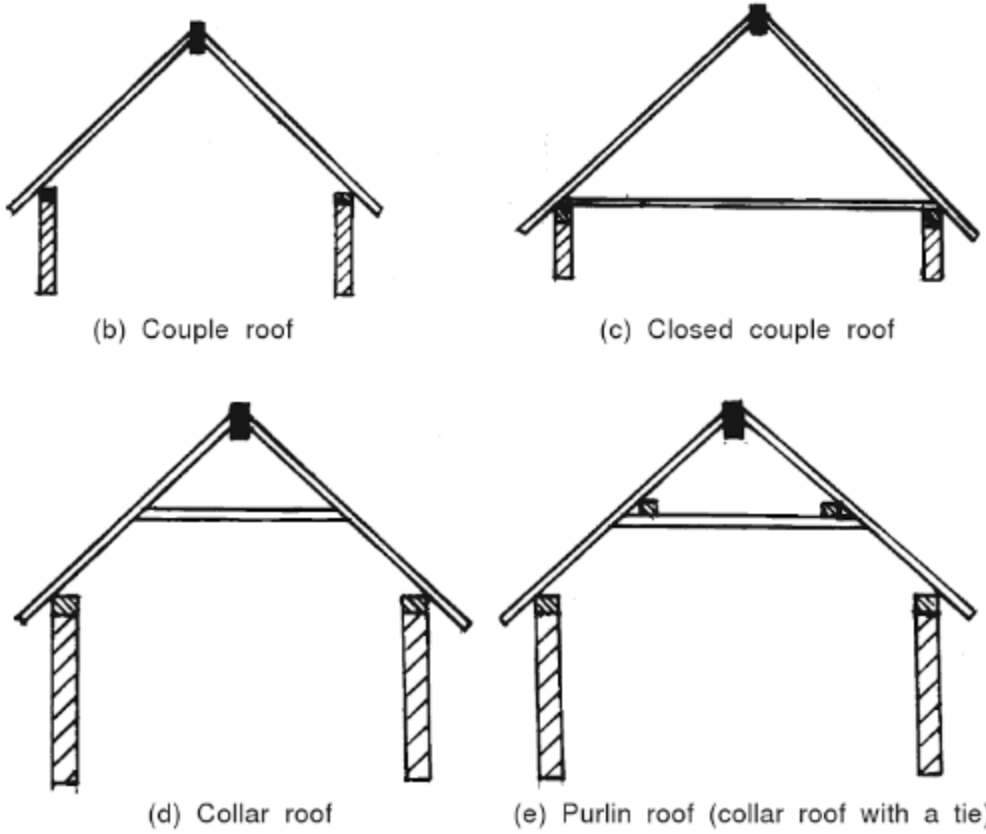
- The ground floor is prepared by filling brick bats, waste stones, gravel and well compacted with not less than 100 mm sand layer on its top.
- A lean concrete **of 1 : 4 : 8 (**cement: fine aggregate: coarse aggregate), 100 mm thick is laid.
- On this a damp proof course may be provided.
- Then floor finishing is done as per the requirement of the owner.

9) **Roof** – **The Roof is the top most portion of the building which provide top cover to the building.**

Sloping roof like tiled and A.C. sheet give leak proof cover easily. But they **do not give provision** for the construction of **additional floor**.

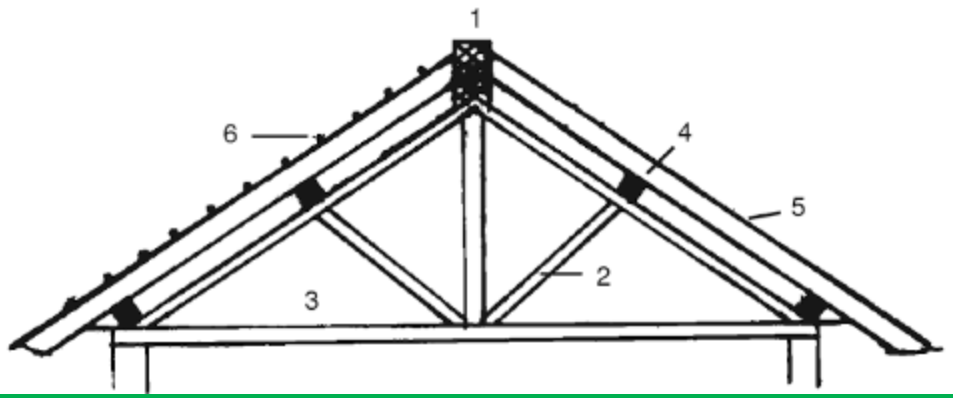
Flat roofs give **provision for additional floors**. Terrace adds to the comfort of occupants. Water tanks can be easily placed over the flat roofs.





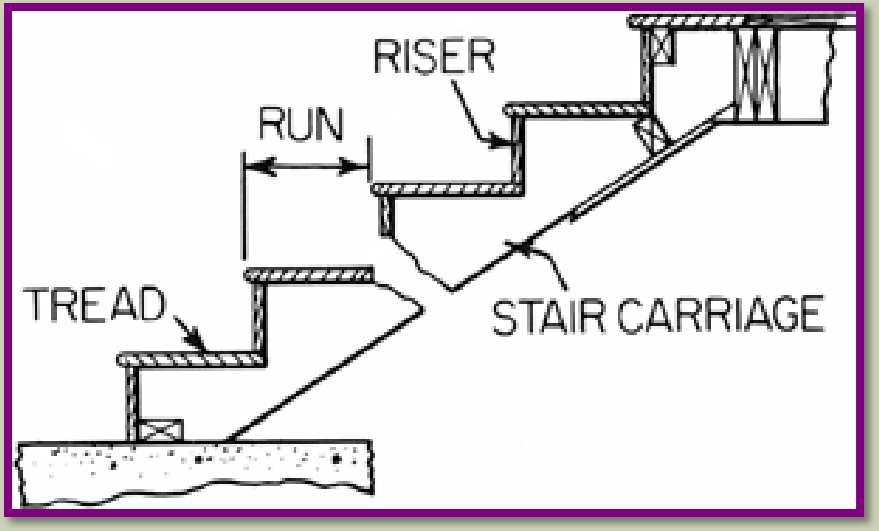
Type of Sloping roof

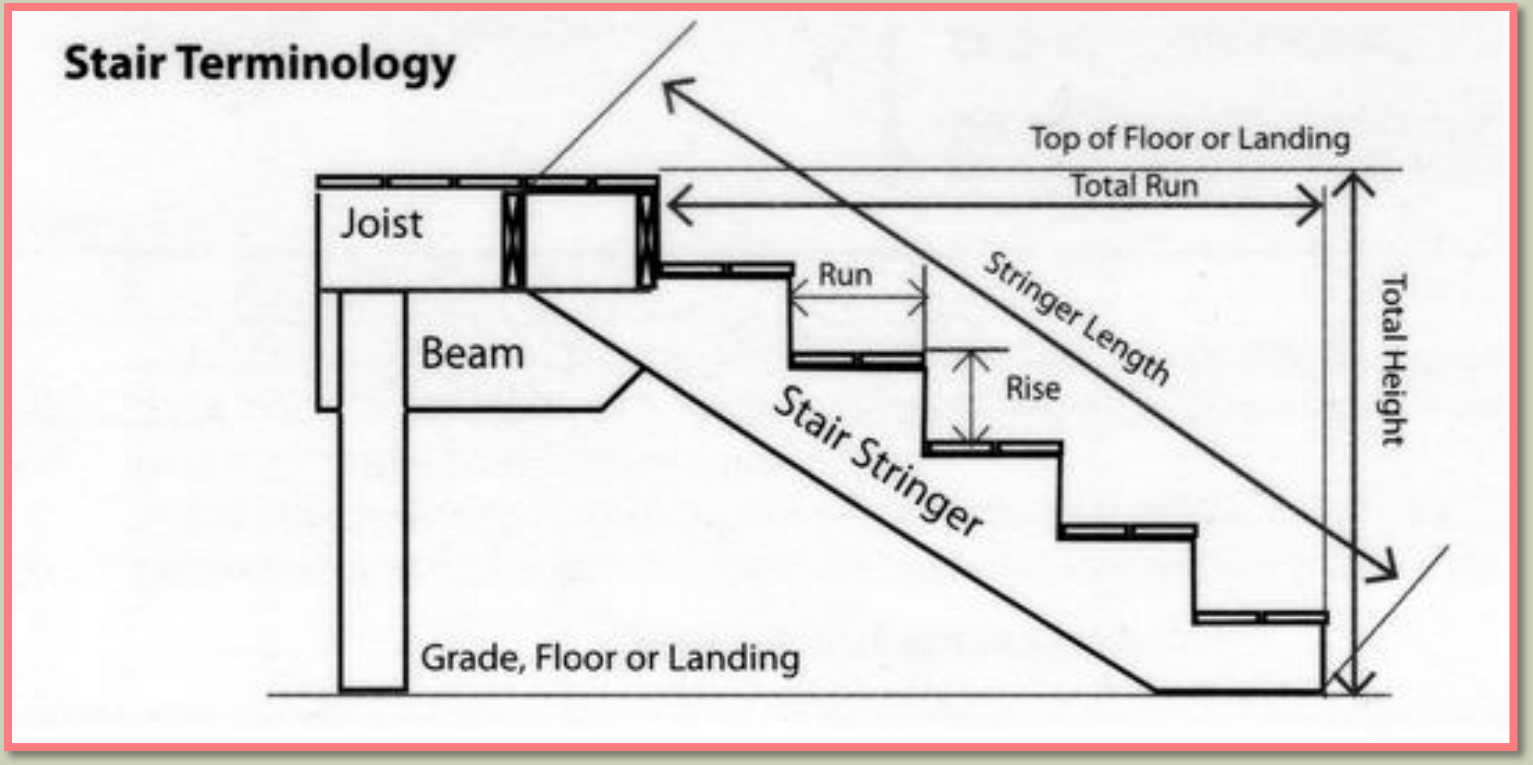
King-Post Truss used in sloped roof

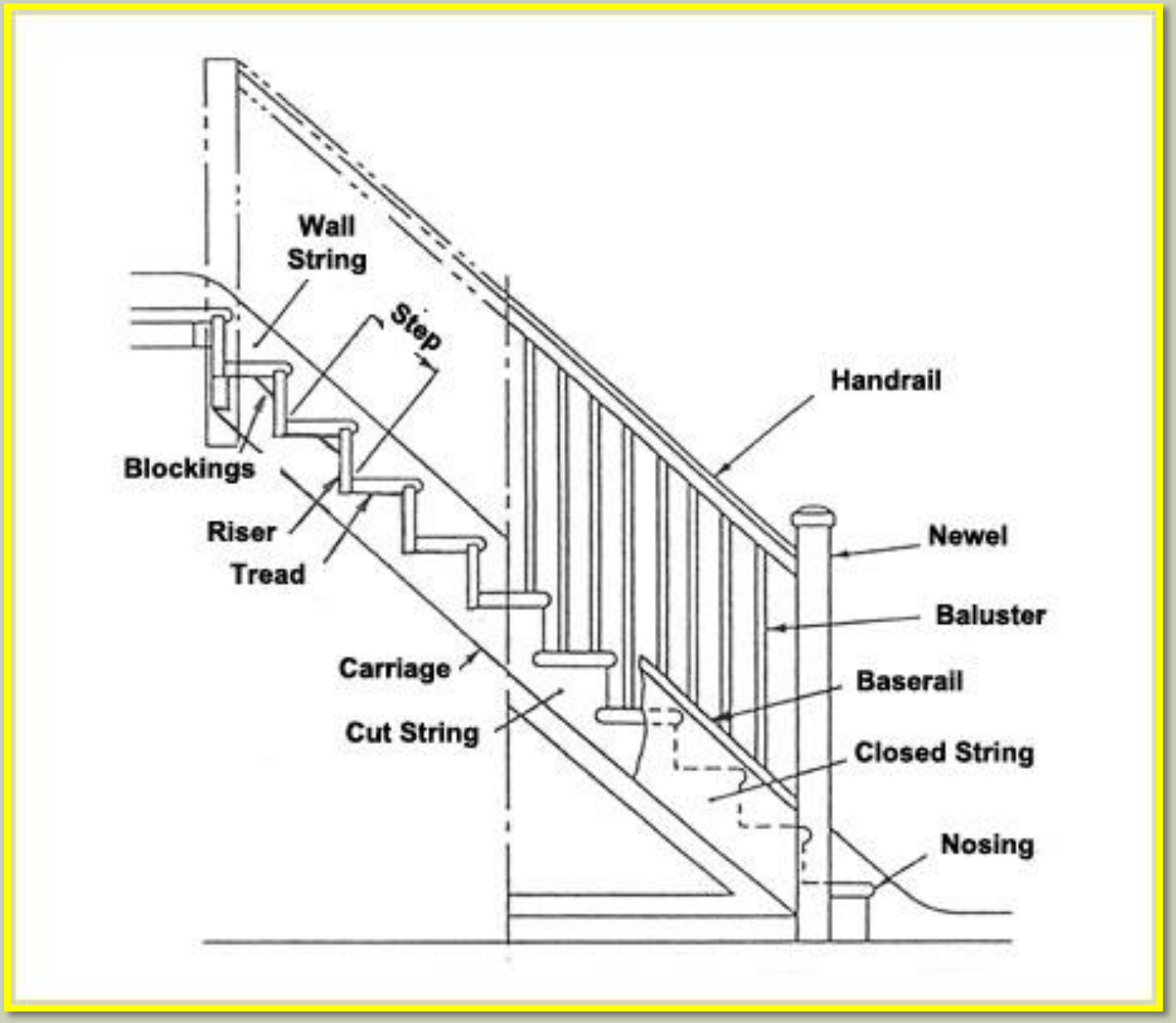


10) Step, Stairs – The Steps give convenient access from ground level to ground floor level.

- **250 to 300 mm wide and 150 mm rise is ideal size for steps.**
- **Number of steps required depends upon the difference in the levels of the ground and the floor.**




Stair Terminology
Top of Floor or Landing
Total Run
Joist
Run
Stringer Length
Total Height
Beam
Rise
Stair Stringer
Grade, Floor or Landing



Elements of Stairs

INTRODUCTION TO BUILDING PLANNING

It is grouping and arrangement of components of building in a systematic manner so as to form a homogeneous body with a comprehensive look out to meet its functional purpose.

Planning of building depends on:

- ***Human habitation & their requirements***
- ***Component parts, sizes and inter-relationship***
- ***Topography and shape of plot***
- ***Climatic condition***
- ***Location and neighbourhood***

PRINCIPLES OF PLANNING

ASPECT: PRINCIPLES OF PLANNING

- Placement of different rooms of house in accordance with our activities at different hours of day by keeping in view the direction of **sun** and **wind**.

- A room which receives light & air from particular direction is said to have **'aspect'** of that direction.

- Rooms should get enough sunlight and air, which gives
  - Cheerful atmosphere
  - Comfort
  - Hygienic condition

- **Each room of residential building should have particular aspect because certain rooms need morning sun where as other rooms do not need light at all.**

ASPECT: PRINCIPLES OF PLANNING

Room	Recommended aspect	Influencing factor
Bed	SW-W-NW	To receive plentiful of breeze in summer
Kitchen	E and rarely NE	To receive morning sun which is germicidal. It purifies air. It should be well illuminated and cool in afternoon.
Dining	SE-S-SW	Proximity of kitchen. It should be cool.
Drawing	SE-S-SW-W	Adequate natural lighting during winter, obviate sun during summer
Reading	N-NW	Light from north being diffused and evenly distributed and cool
Store	NW-N-NE	Dark and cool

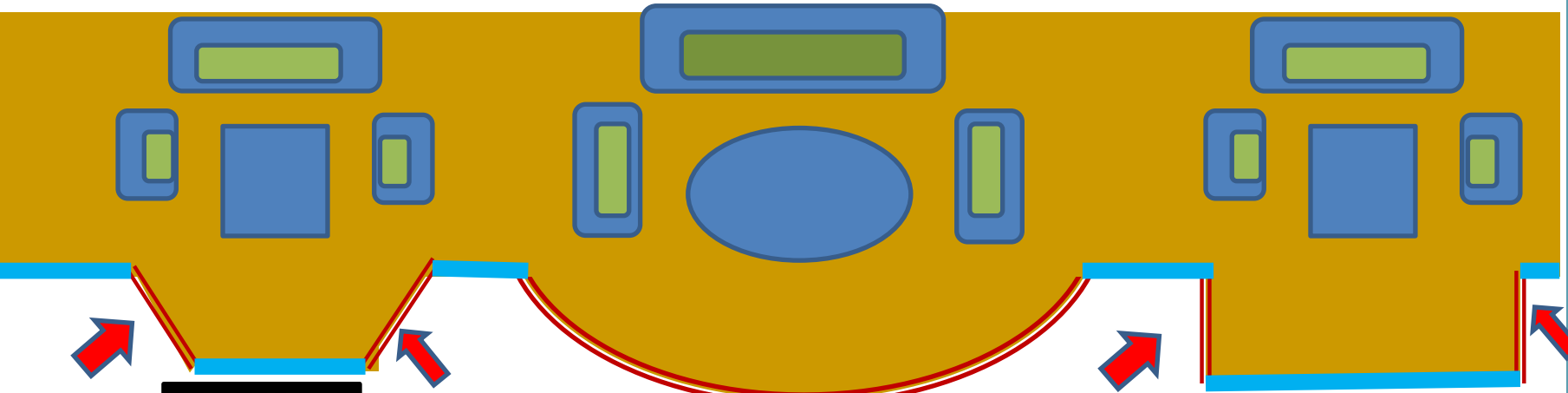
ASPECT: PRINCIPLES OF PLANNING

ASPECT PROSPECT PRIVACY GROUPING ROOMINESS ELEGANCE CIRCULATION FLEXIBILITY

SANITATION FURNITURE REQUIREMENT ECONOMY

PROSPECT: PRINCIPLES OF PLANNING

- It refers as how a **building will look** if it is viewed from outside, and placement of opening in the front wall to give aesthetic appearance.
- It is determined by view as desired from certain rooms of house
  - View of the garden or a nearby hill
- At the same time, it is naturally intended to conceal some undesirable views



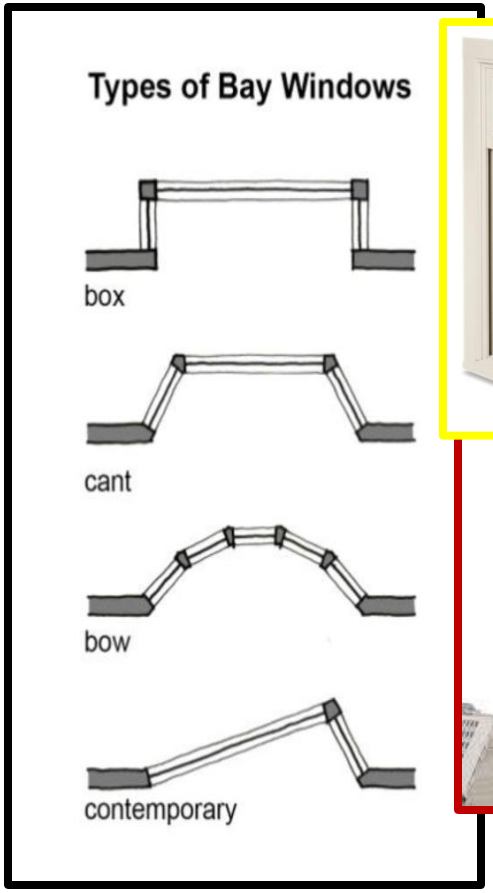
PROSPECT: PRINCIPLES OF PLANNING

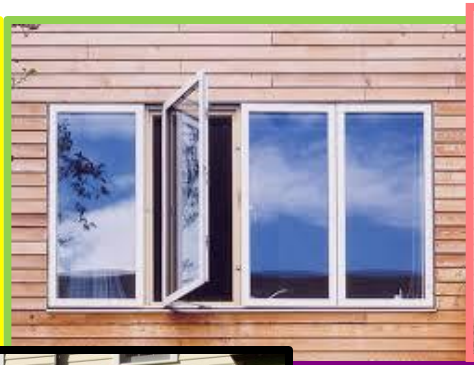
ASPECT **PROSPECT** PRIVACY GROUPING ROOMINESS ELEGANCE CIRCULATION FLEXIBILITY

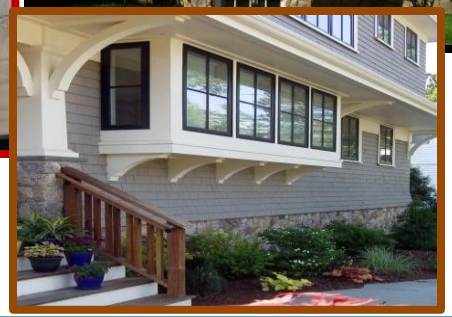
SANITATION FURNITURE REQUIREMENT ECONOMY

PROSPECT: PRINCIPLES OF PLANNING

VARIOUS TYPES OF PROJECTING WINDOWS FOR PROSPECT







ASPECT **PROSPECT** PRIVACY GROUPING ROOMINESS ELEGANCE CIRCULATION FLEXIBILITY SANITATION FURNITURE REQUIREMENT

PRIVACY: PRINCIPLES OF PLANNING

- This is **one of the essential** and **important principle** of planning.
- There should be **privacy** in individual room as part and a building as whole from other building.
- Privacy can be of
  - Sight (bath, w/c)
  - Sound (confidential discussion, study room)
  - Both sight and sound (bed room)

PRIVACY: PRINCIPLES OF PLANNING

- It broadly classified in two categories i.e.
  - **Internal privacy**
  - **External privacy**

- In residential building privacy can be achieved by **arrangement of rooms and by the arrangement of doors**.

- In residential building privacy of study room and bed room must be maintained.

PRIVACY: PRINCIPLES OF PLANNING

- **Internal privacy** : **It is privacy within building**, it can be achieved by
  - ✓ Correct positioning of doors and openings of shutters
  - ✓ Proper grouping of rooms
  - ✓ Providing buffer area between bed room and other rooms
  - ✓ Vertical segregation of rooms i.e., by providing drawing, dining, kitchen, toilet at GF and bed and toilet at FF

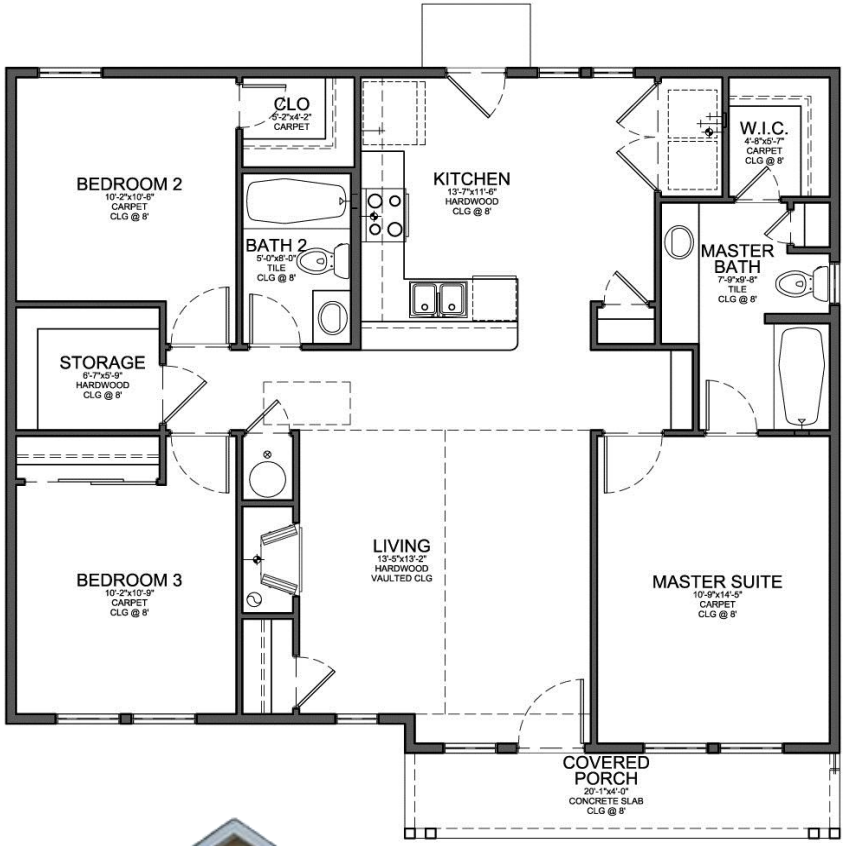
PRIVACY: PRINCIPLES OF PLANNING

- **External privacy** : It is **privacy of whole building with reference to surroundings (buildings and road)**
- It can be achieved by
  - ✓ Compound wall to a height of 1.35 to 1.5 m
  - ✓ Planting trees along compound wall (acts as sound & sight barrier)
  - ✓ Providing screen walls, curtain walls and dwarf wall on verandah

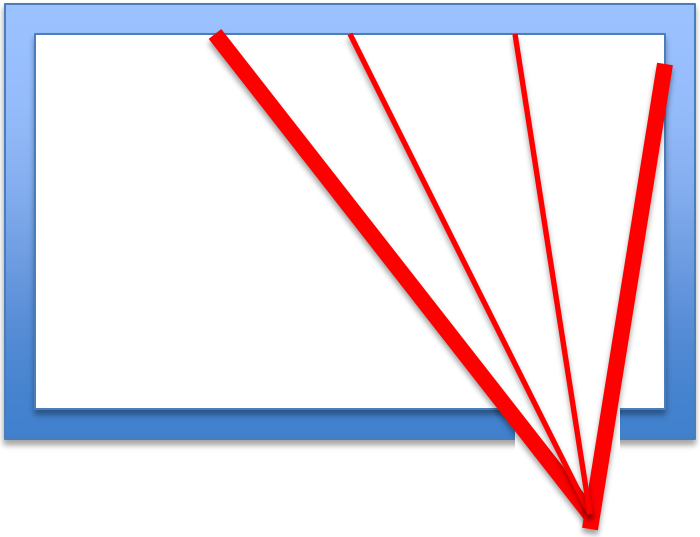
PRIVACY

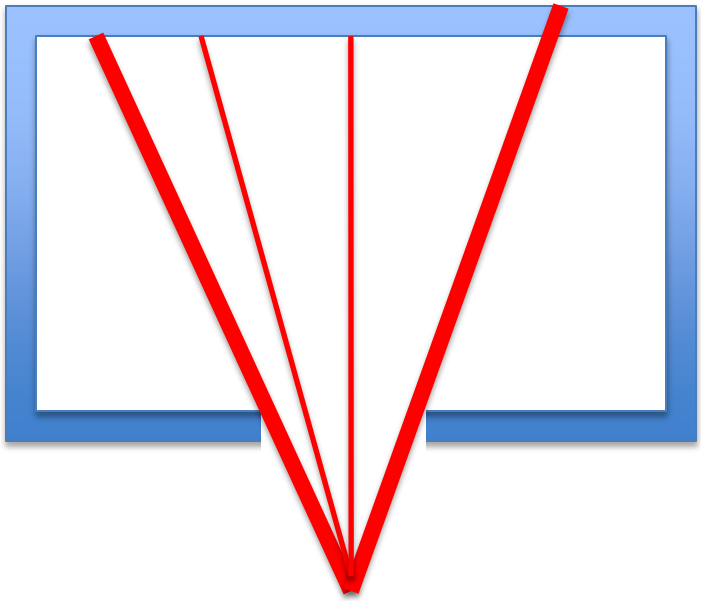
Privacy of the building can be achieved by **providing windows at higher level than the adjoining road or ground as well as by growing plants and trees** around the building.

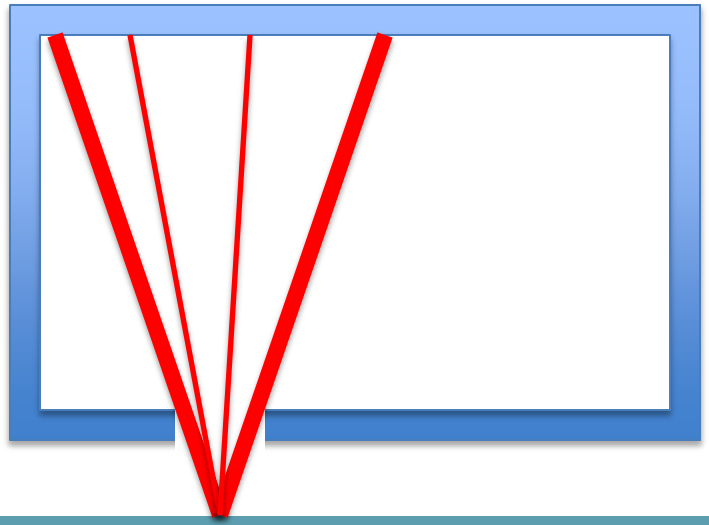
Privacy inside a room can be achieved by providing **door on one side of the longer wall** so that minimum portion of the room is visible.



PRIVACY







Position of doors from privacy point of view

GROUPING: PRINCIPLES OF PLANNING

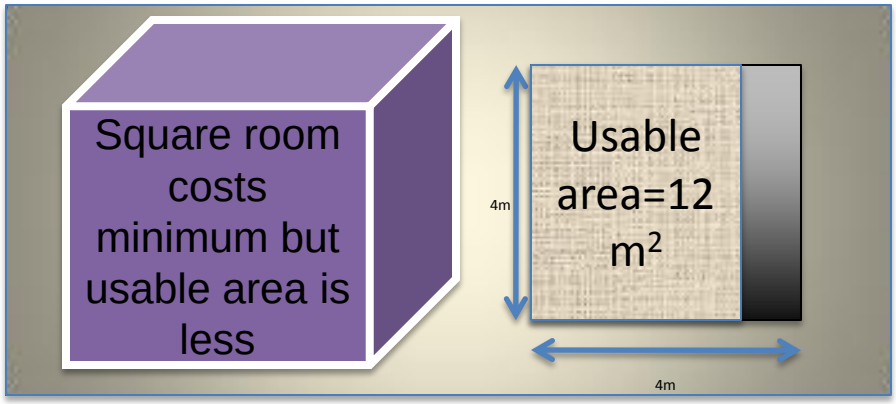
- **Grouping** is **arrangement of different rooms with reference to their functions**, it improves comfort, privacy and convenience and minimises circulation

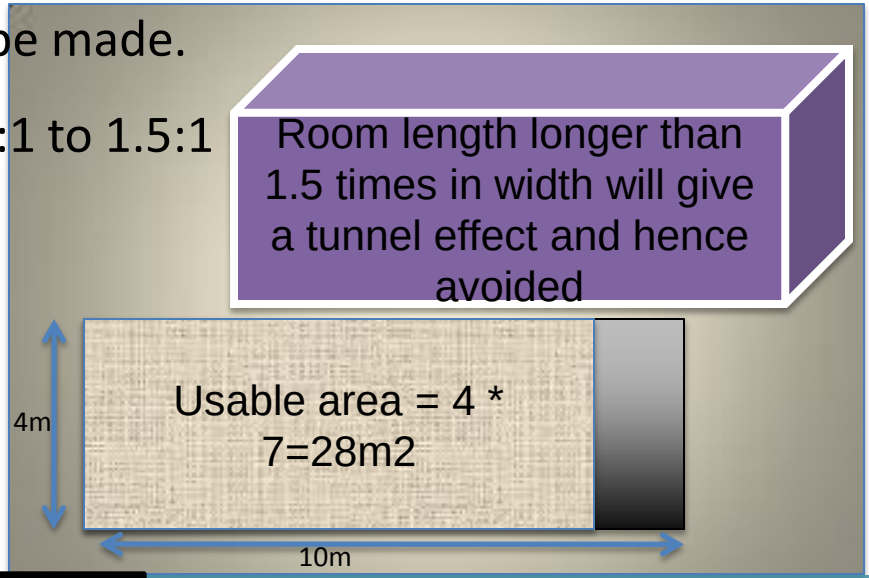
- Points to be considered
  - ✓ Verandah adjacent to drawing room
  - ✓ Dining room close to kitchen
  - ✓ Bed room, toilet and dressing room grouped together
  - ✓ Bath and w/c should be nearer to each other
  - ✓ Staircase should be easily accessible from all rooms
  - ✓ w/c should be away from dining, psychological feeling of being away from insanitary place

- It is observed that grouping leads to saving in unnecessary movements, proper correlation, easy control and overall economy.

ROOMINESS: PRINCIPLES OF PLANNING

- **Roominess** is feeling created after a room is well-furnished with all permanent furniture as spacious and well-planned.
- It is the **effect** derived from **space of the room** i.e **its length , width and height.**
- The room dimension should be such that **maximum use of a room** having **minimum possible dimension** can be made.
- A length width ration should be 1.2:1 to 1.5:1



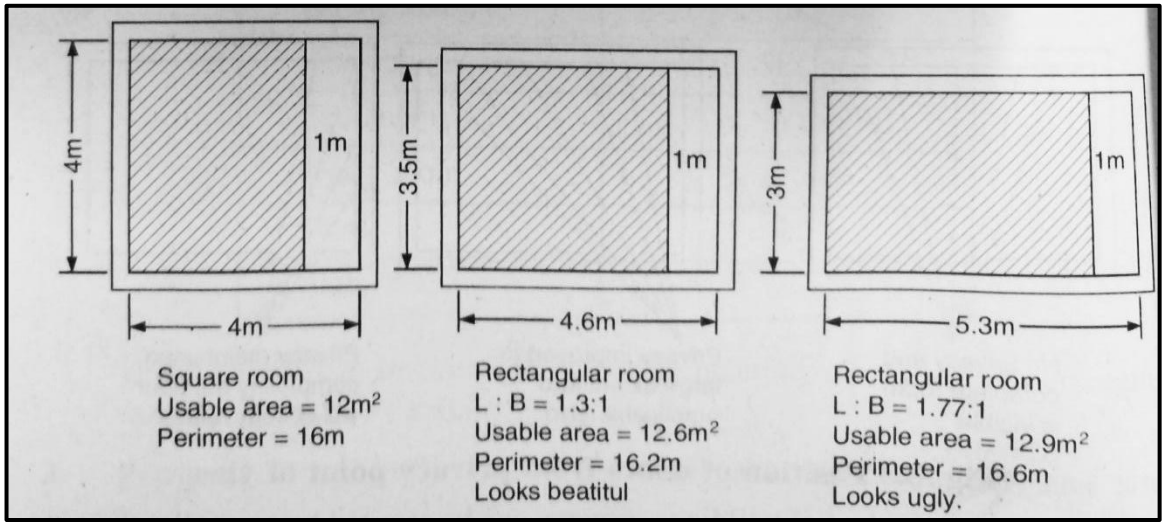


ASPECT PROSPECT PRIVACY GROUPING **ROOMINESS** ELEGANCE CIRCULATION FLEXIBILITY

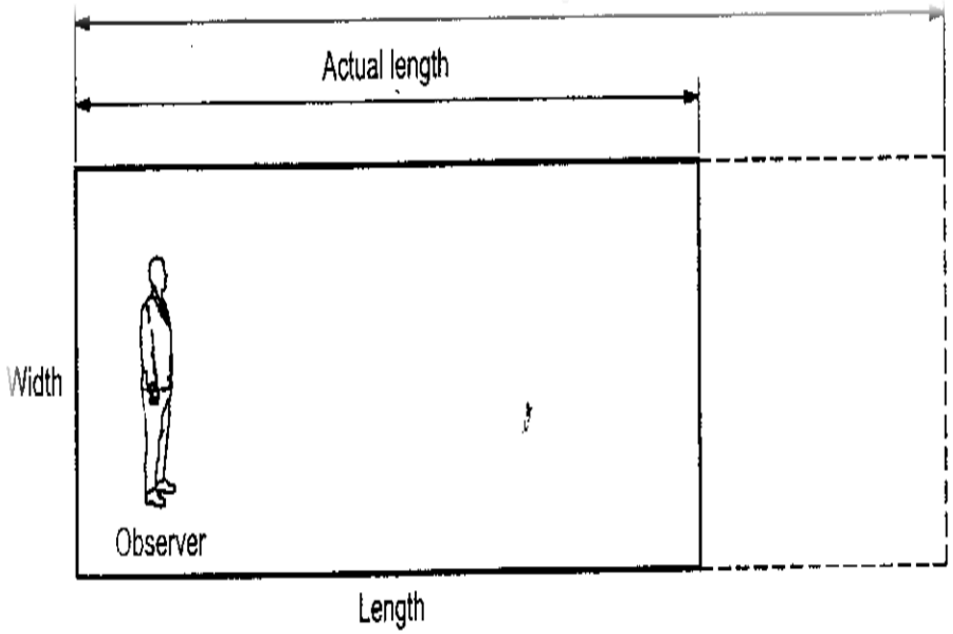
SANITATION FURNITURE REQUIREMENT ECONOMY

ROOMINESS: PRINCIPLES OF PLANNING

- Max use of a room with min possible dimensions
- Rectangular room gives better outlook compare to square room of same floor area.
- Length/breadth ratio of 1.2 to 1.5 is desirable
- When it exceeds 2, it creates tunnel like feeling
- Similarly height also plays imp role in effect of roominess
- Room should have all proportional dimensions
- Light colours create effect of more space
- Light and dark colour for different walls of same room will reduce effect of less width and more length
- Utility of room can be increased by providing self, cupboards etc

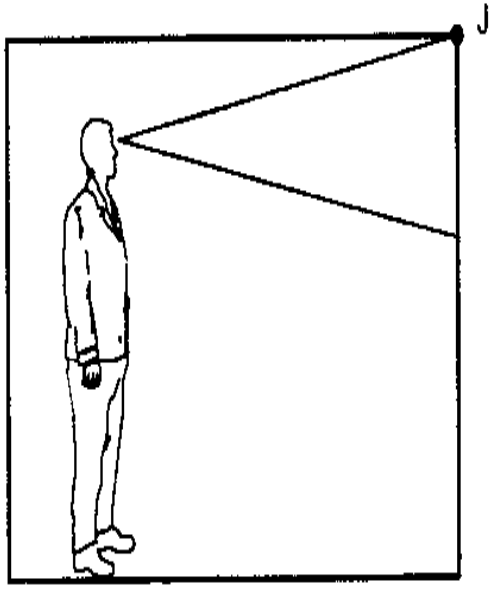


Roominess

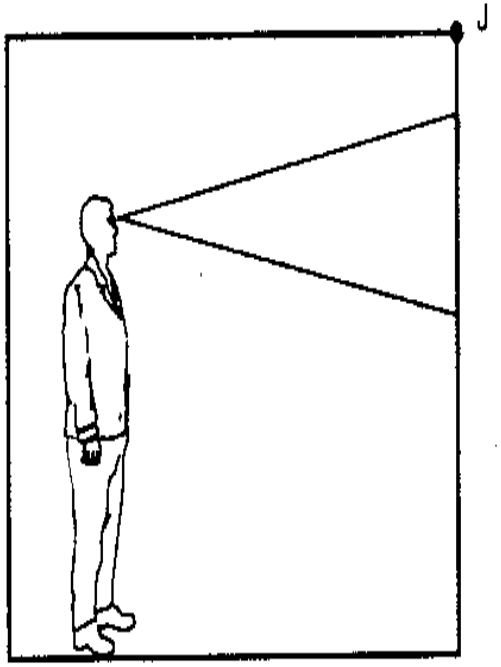


Length > 2 x width – Tunnel effect

Roominess : Tunnel Effect

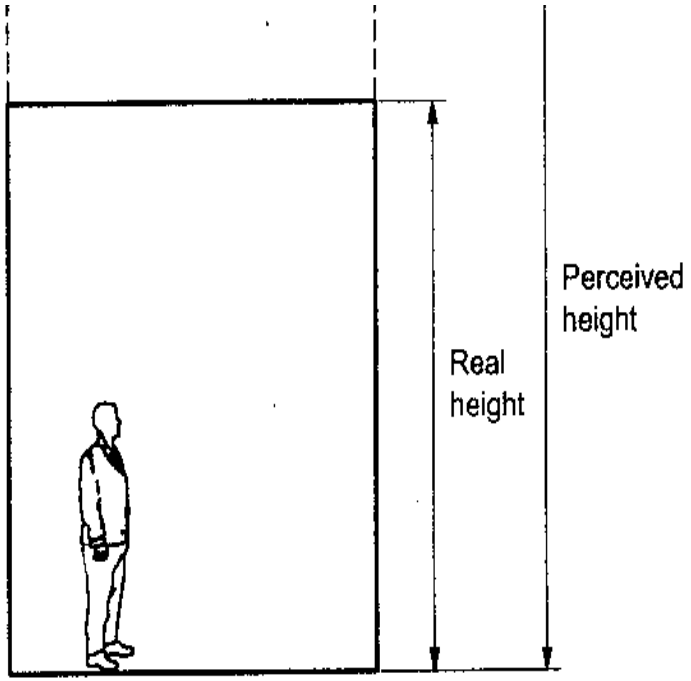


Low ceiling
Junction of ceiling
and wall (J) visible.
Cramped feeling



High ceiling
Junction of ceiling
and wall (J) not visible.
Easy feeling

Roominess : Chimney Effect



Chimney effect

ELEGANCE : PRINCIPLES OF PLANNING

- **Elegance** is **grand appearance** of a building, mainly owing to the elevation which in turn depends on plan
- It is the **architectural effect produced by the elevation**. It depends upon proportion of width and height of the building, position of doors and windows and choice of material and color scheme.
- It is used to indicate the architectural effect produced by elevation.

Depends on

Elevated site
Architecture
Neighbourhood
Conformity with nature
Nativity
Adjoining building and relative placement

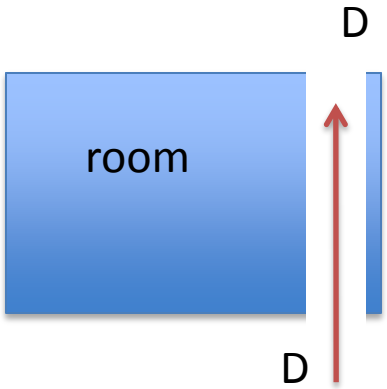
- A better elegance can be obtained by
  - ✓ Superior building materials for facing – like paint, glass, timber, polished stones – granite, marble, mosaic etc.
  - ✓ Providing projections – like sunshades, balconies, porch etc.
  - ✓ Providing corner windows etc

ASPECT PROSPECT PRIVACY GROUPING ROOMINESS **ELEGANCE** CIRCULATION FLEXIBILITY SANITATION FURNITURE REQUIREMENT ECONOMY

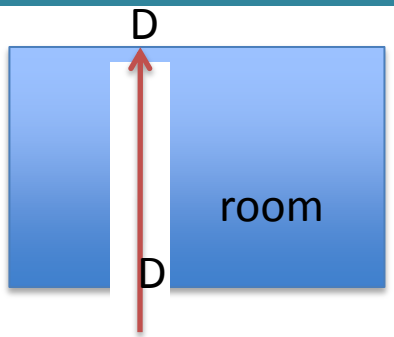
CIRCULATION : PRINCIPLES OF PLANNING

- **Circulation** is used to mean the link between the various rooms and floors of building.
- Circulation area shall be **straight, short, bright, lighted both day and night, well ventilated and free from obstructions**
- It should **not affect privacy** nor **interfere with utility.**
- It is of two types
  - **Horizontal – circulation within same floor:** verandah, passages, corridors, lobbies, halls
  - **Vertical – circulation between different floors:** stairs, lifts
- The ratio between **circulation space to utilization space** should be around **1:4** for economical planning.
- For **vertical circulation** about **8 to 10%** of floor area of building is considered to be adequate.

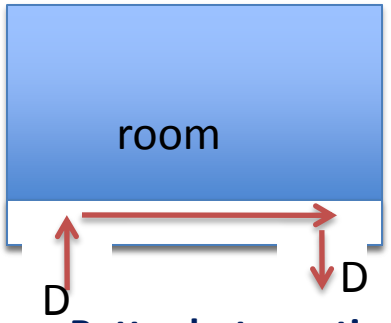
CIRCULATION : PRINCIPLES OF PLANNING



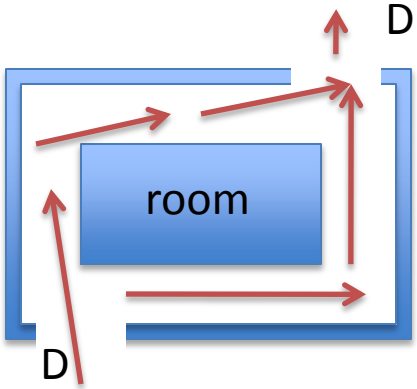
Best case



Waste is less but space is divided so less useful

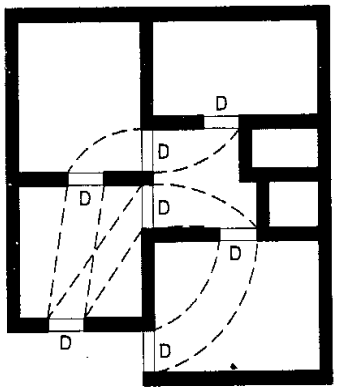


Better but practically not possible

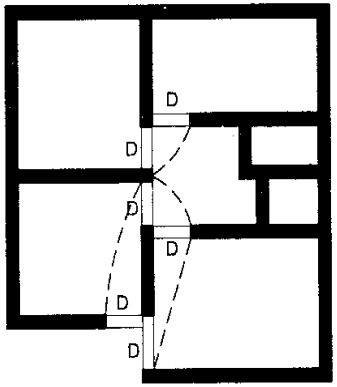


Poor case useful space is very little

Circulation

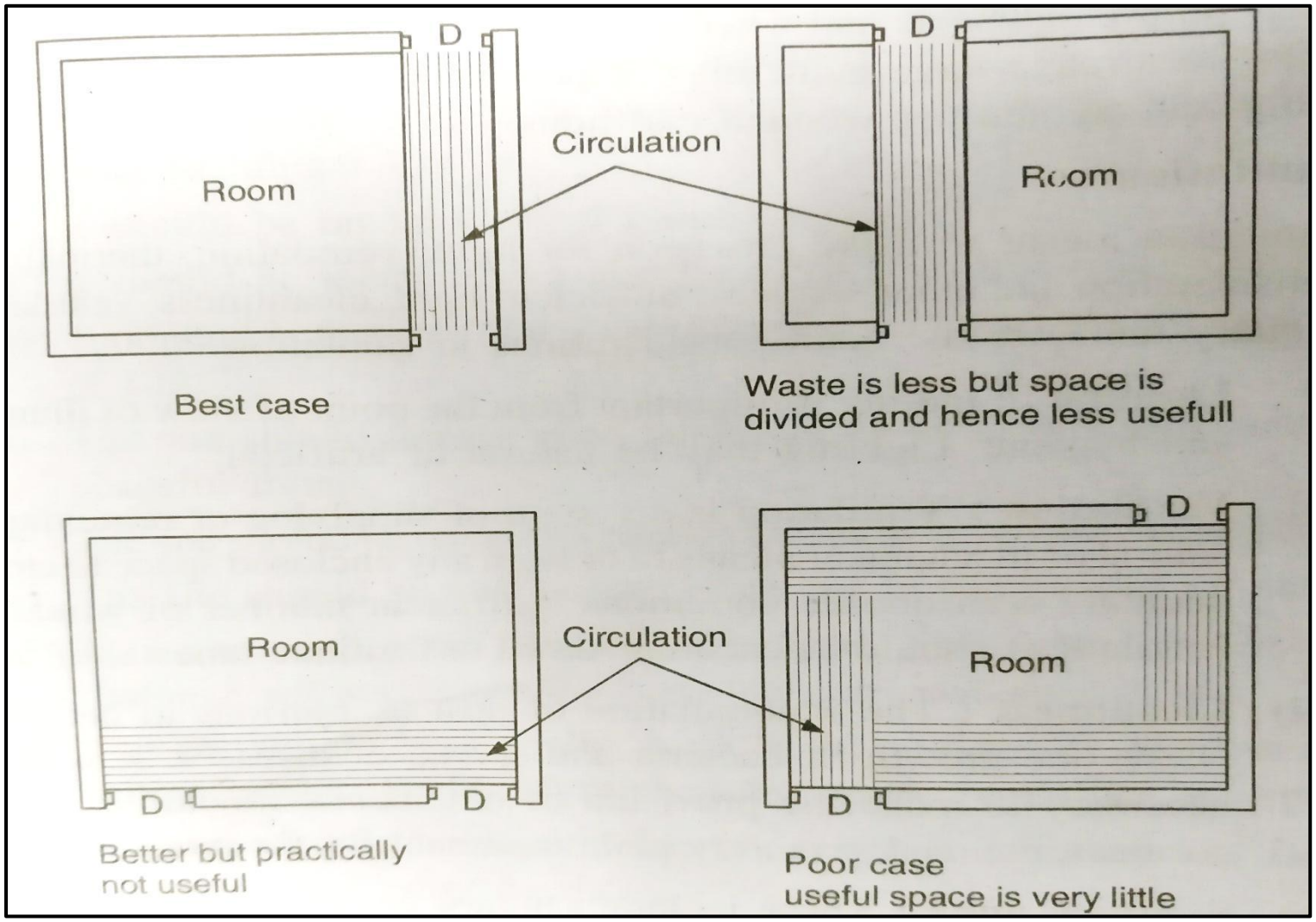


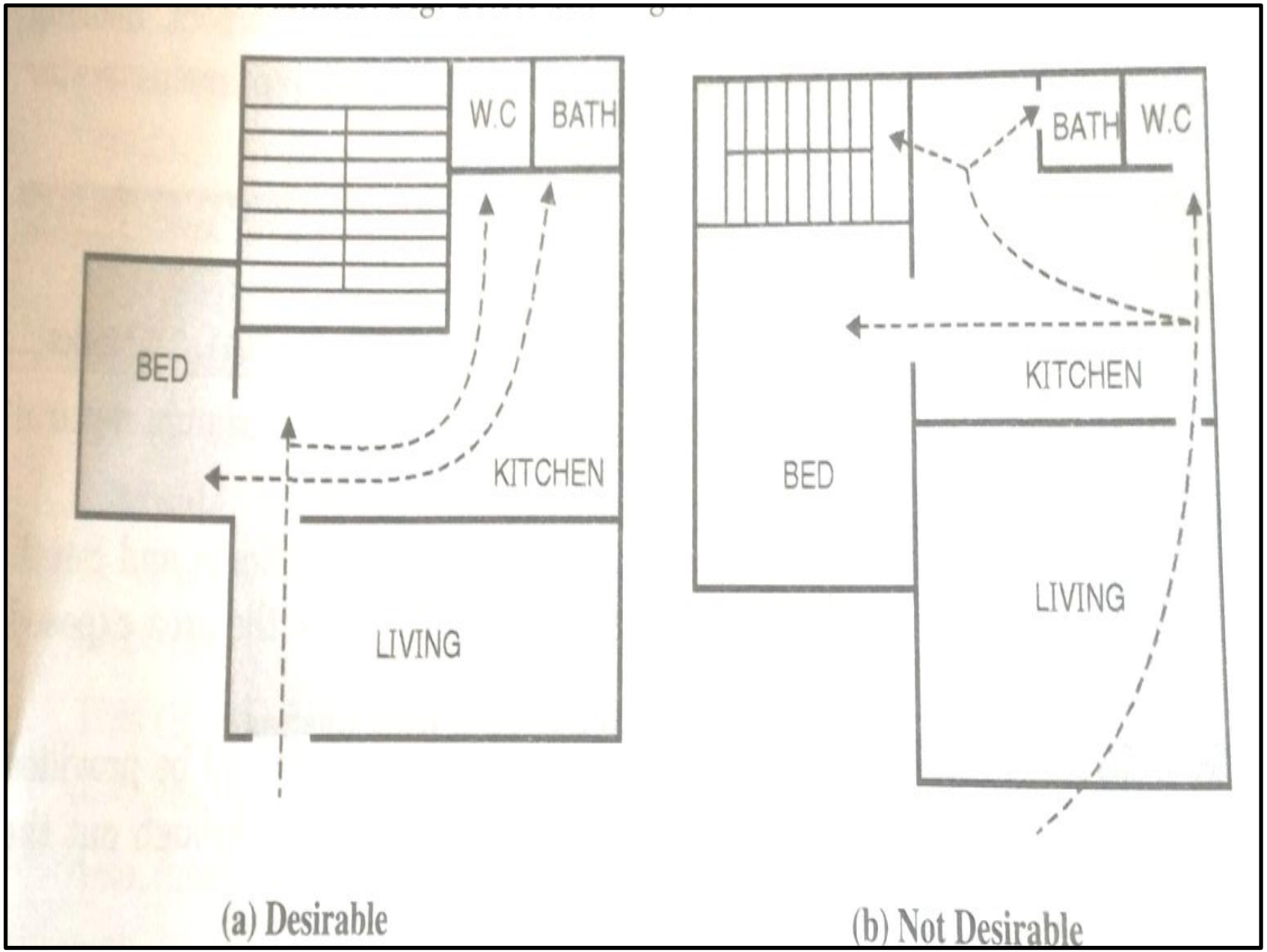
Wrong placement of doors.
Dotted lines show movements of persons. Thus there is difficulty in placing furniture. It will come in the way. Also large space wasted in circulation



Correct placement of doors.
See the minimum space lost in circulation shown by dotted lines. Also rooms are not divided by circulation.

Circulation





(a) Desirable

(b) Not Desirable

FLEXIBILTY: PRINCIPLES OF PLANNING

- **Flexibility** means that a room which is planned for one function be used for other, if so required.
- Present and future requirement of a family change as the family expands.
- It means planning the rooms in such a way which though designed for specific purpose may be used for other purpose when desired.
- It is ease with which a room designated for a particular activity can accommodate more load temporarily or may supplement activity of another room
  - ✓ As drawing room used as guest bed room
  - ✓ Kitchen as additional dining room etc.

SANITATION :PRINCIPLES OF PLANNING

- **SANITATION** is provision and upkeep of various components of house to keep inmates **cheerful and free from disease.**
- Factors influence sanitation are
  - **Lighting**
  - **Ventilation**
  - **Cleanliness**
  - **Sanitary Units**

SANITATION : PRINCIPLES OF PLANNING

- **Lighting :** natural sunlight or artificial
  - Intensity of natural light is affected by pollutants like smoke, dirt, dust, gases and clouds
  - Min window area = 1/7th floor area (hot-humid climate)
  - Min window area = 1/10th floor area (dry climate)

SANITATION : PRINCIPLES OF PLANNING

- **Ventilation** **is** a system of supplying or removing air by natural or mechanical means to or from any enclosed space to create and maintain comfortable condition

Basic requirements in ventilation

- ✓Sensation of comfort
- ✓Reduction in humidity
- ✓Removal of heat
- ✓Proper supply of oxygen
- ✓Reduction of dust

Sufficient no of windows and ventilations accommodate to facilitate renewal of fresh air

- **Orientation of building and location of windows help in providing proper ventilation**

SANITATION : PRINCIPLES OF PLANNING

- There are **two methods** of ventilation

  - **Natural** : Suitable for houses and flats, achieved by designing windows and ventilators opposite to each other

  - **Artificial** : Necessary if room is to be occupied by more than 50 persons or where space per occupant is less than 3 m^3, it is achieved by **exhaust system** of supply system.

SANITATION : PRINCIPLES OF PLANNING

❑ Cleanliness:

- ➢ Dust:
  - ✓ Creates health problems
  - ✓ Makes surfaces dull
  - ✓ Floors shall be smooth, impervious, non-absorbing, uniformly sloping

- ➢ Dampness (wetness):
  - ✓ Root cause of infection
  - ✓ Walls and floors shall be damp-proof
  - ✓ Kitchen, bath and w/c shall be drained off quickly

SANITATION : PRINCIPLES OF PLANNING

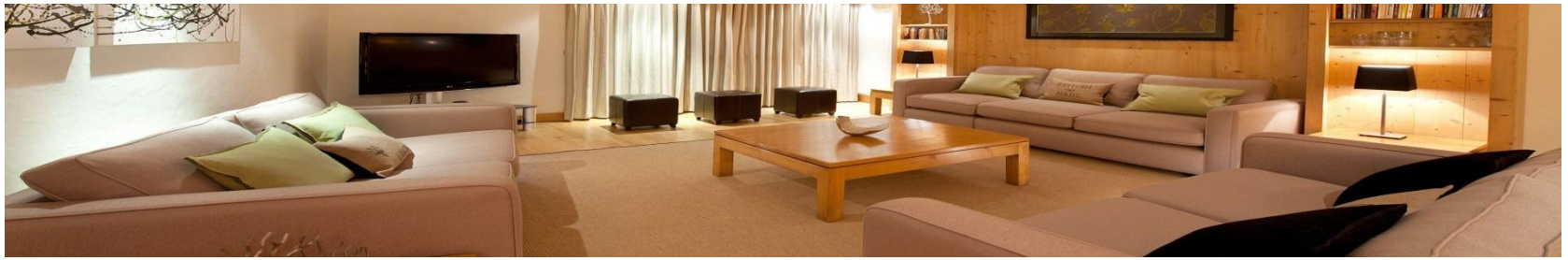
- **Sanitary Units:**
  - ✓ These includes provision of WC, Bath rooms, Urinals, Toilets, etc.
  - ✓ WC and Bath rooms should be provided with dadoes so that they can be cleaned regularly.

FURNITURE REQUIREMENT PRINCIPLES OF PLANNING

❑ FURNITURE REQUIREMENT :

Planner should know how much space is needed by each function.

- ➢ Room sizes can be completed on basis of
  - ✓ permanent furniture to be used
  - ✓ It's dimensions and arrangement
  - ✓ Clearance for circulation



ASPECT PROSPECT PRIVACY GROUPING ROOMINESS ELEGANCE CIRCULATION FLEXIBILITY

SANITATION FURNITURE REQUIREMENT ECONOMY

ECONOMY: PRINCIPLES OF PLANNING

- **ECONOMY** may be not considered as planning but considered as a factor.
  - Building should have min floor area with max utility
    - ✓ It should be not achieved at the cost of strength
    - ✓ Only with proper planning and utility of space being maximized (passage being minimized)

Can be achieved by

- ✓ **Simple elevation**
- ✓ **Providing small portion for balconies, lobbies**
- ✓ **Reducing storey height**
- ✓ **Reducing no of steps of stairs**
- ✓ **Standardization of sizes of various components and materials**

Basic Requirements for Building Planning

- Basic requirements for building planning are:

1) **Selection of site**
2) **Building bye-laws**
3) **Orientation of building**
4) **Requirements of a building**
5) **Functional requirements of a residential building**

1) Selection of site:

Following points should be kept in mind while selecting the site:

- It should be on **fairly level ground**.
- Located on a **developed or fast developing locality**.
- Site should have **good landscape** so as to promote healthy & peaceful living.
- Site should be on an **elevated land** so as to have **easy surface drainage**.
- Well connected **by roads, by-pass, service lanes**.
- Services such as **water, electric supply, drainage sewers, telephone lines**, etc. are available at site.
- Site should be nearby facilities like **School, Hospitals, Shopping center, Post office, Transportation**, etc.
- Site should be away from **quarries, industries, factories, noisy location**.

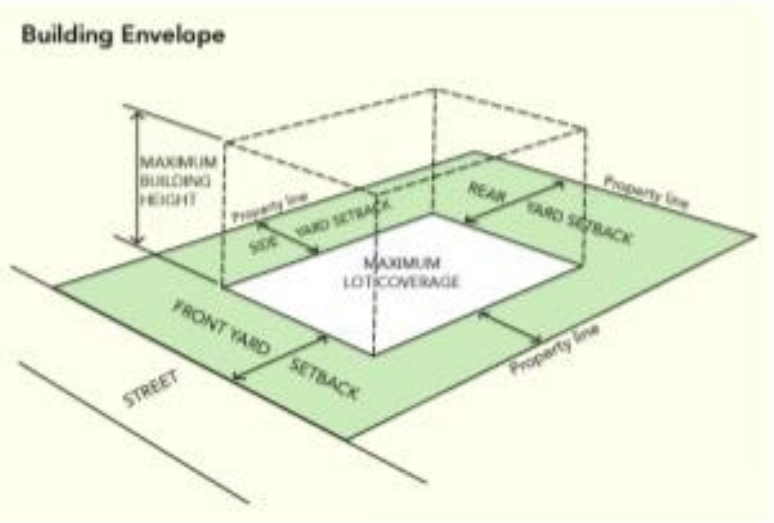
2) Building Bye - laws:

- Building bye – laws are defined as **standards & specifications designed for construction of buildings** in area.
- **Before planning** of building one must have **knowledge** of **"Bye - Laws"**
- Bye – laws are framed by **State Government / Municipal Corporations/ Municipal Committee** keeping in mind the recommendation of **National Building Code IS 1253-1967** .
- **Plans** of proposed buildings are to be **prepared as per the bye-laws** which are **checked & approved** by the **local authority**.
- Bye-laws **differ** from **state to state.**
- Avoids **random development** & provide **health, comfort and society** to user.
- **Build up Area**: Area cover by building immediately above the plinth level i.e. (G.F)

Build-up Area = Plot area – Area due for open spaces

Open Space Requirement

- Set back line (Front building line) is the line up to which we can extend our construction.

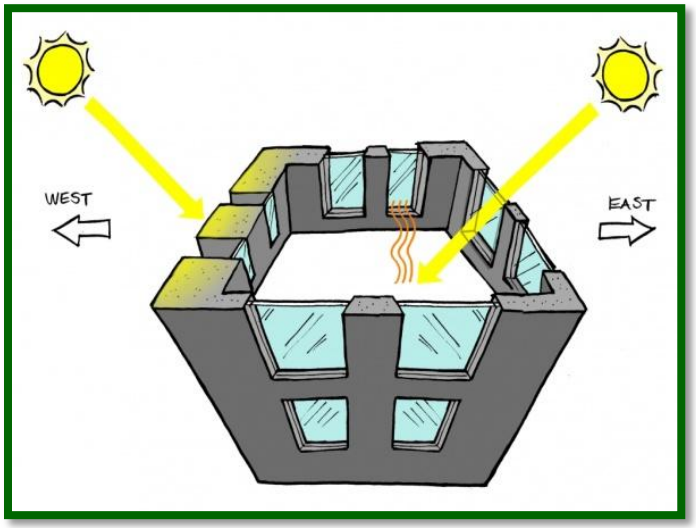


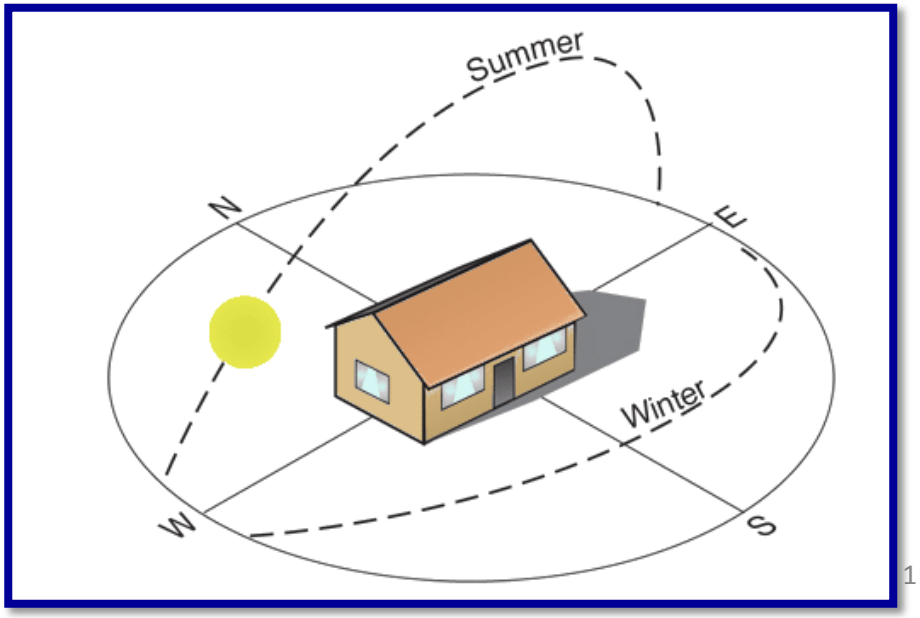
Type of residential building	Plot size sqm	Frontage m
Detached building	Above 250	Above 12
Semi- detached building	125-250	8- 12
Row type building	50-125	4.5 - 8

Open Space Law for Residential Building

3) Orientation of building:

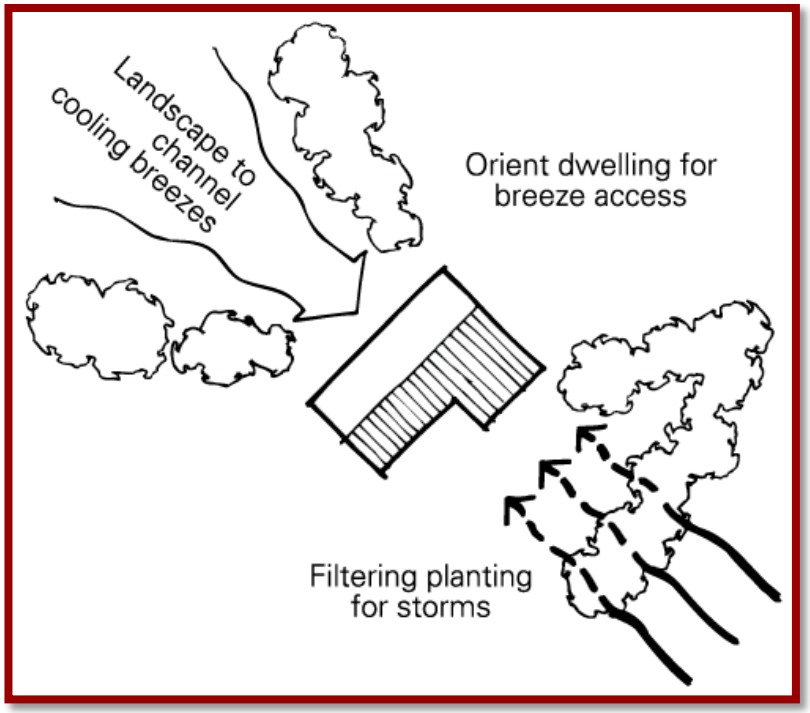
- Orientation means **giving proper direction** to building, to get the natural resources such as air, sun light, rain etc. to great extent.
- **Direct sunlight, wind and rainfall** its intensity and type of surroundings are taken into **consideration** while deciding orientation of the building
- The **long walls** of the building should be placed towards **north and south**.
- The **short walls** should be placed towards **east and west.**

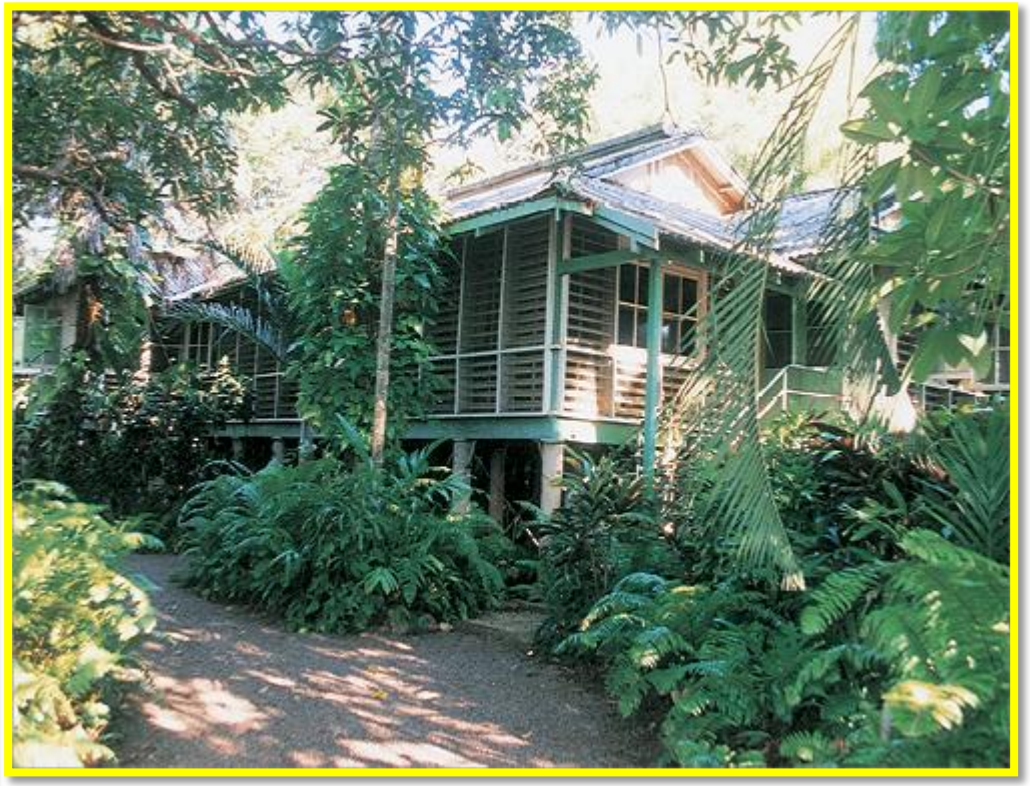




- If building is surrounded with **grass or trees or vegetation**, it will help in **reduction of temperature inside** the building.

- Building should usually be oriented in **south-west direction** to catch the **breeze** which blows in summer in that direction.





4) Requirements of building:

- Building should be **durable & stable** to take up the loads
- Strong enough to **withstand the impacts of atmosphere, environment and earthquake**
- Provide **maximum living & working comforts**
- Sufficiently **ventilated & free from dampness**
- **Grouping of rooms** should be planned so as to ensure **circulation & optimum utilization of space**
- **No. of doors & windows** should be sufficient & located in such a way that **provide enough light and air**
- Building should be **safe from fire hazards**

5) Functional Requirements of Residential Building:

Residential building can be divided into three major area:

- **Living Area**: This area is for general use. Include **living room or drawing room**. Hence planned near entrance.

- **Sleeping Area**: Area provided for **sleeping & relaxing purpose**. Include **bed room**. They should be located so as to maintain privacy.

- **Service Area**: Area includes **kitchen, dining room, bath room, W.C**, etc.