University of Global Village (UGV), Barishal

Constructional Supervision Details

Content of Laboratory Course

Program: B.Sc. in CE

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BASIC COURSE INFORMATION

Course Title	Constructional Supervision Details
Course Code	CE 0732-3104
Credits	01
CIE Marks	30
SEE Marks	20
Exam Hours	2 hours (Semester Final Exam)
Level	5th Semester

Constructional Supervision Details (Reinforcement Checking)

COURSE CODE: CE 0732-3104 **CREDIT:01**

TOTAL MARKS:50

CIE MARKS: 30

Semester End Exam Hours 2 **SEE MARKS: 20**

Course Learning Outcomes (CLOs): After completing this course successfully, the students will be able to-

CLO 1 **Understand** concepts of Structural Design of Reinforced concrete members.

CLO 2 **Analyze** various structural components of buildings/bridges.

CLO 3 **Develop** intellectual communication skills through working in groups in performing the laboratory experiments/field supervisions and by interpreting the experimental results.

CLO 4 **Generate** the detailing of various structural components of buildings and bridges.

SL	Content of Course	Hrs	CLOs
1	Reinforcement Binding of building column	5	CLO1
2	Reinforcement Binding of beam	5	CLO3
3	Reinforcement Binding of Two-way slab	10	CLO2, CLO4
4	Reinforcement Binding of Foundation	10	CLO1, CLO3
5	Field Supervision (Two-way Slab)	10	CLO1
6	Field Supervision (Foundation)	10	CLO3
7	Field Supervision (Steel building)	10	CLO1
8	Field Supervision (Beam and Column)	10	CLO1
9	Practice, Review/Reserved Day, Lab Report Assessment, Self study	7	CLO3
10	Lab Test, Viva, Quiz, Overall Assessment, Skill Development Test (Competency)	8	CLO2, CLO4

Text Book:

1. Design of Concrete Structures by Arthur H. Nilson, David Darwin, Charles W. Dolan (Mc Graw Hill) – 13th edition.
2. Design of Concrete Structures by Arthur H. Nilson – 7th edition.
3. Design of Reinforced Concrete by Jack C. McCormac, Russell H. Brown – 9th edition
4. Design of Prestressed Concrete Structures by T. Y. Lin and Ned H. Burns
5. Design of Modern Highway Bridges by Narendra Tally
6. Bangladesh National Building Code (BNBC)-2012
7. AASHTO LRFD Bridge: Design Specifications 2012

ASSESSMENT PATTERN

CIE- Continuous Internal Evaluation (30 Marks)

SEE- Semester End Examination (20 Marks)

SEE- Semester End Examination (40 Marks) (should be converted in actual marks (20))

Bloom's Category	Tests
Remember	**05**
Understand	**07**
Apply	**08**
Analyze	**07**
Evaluate	**08**
Create	**05**

CIE- Continuous Internal Evaluation (100 Marks) (should be converted in actual marks (30))

Bloom's Category Marks (out of 100)	Lab Final (30)	Lab Report (10)	**Continuous lab performance** (30)	Presentation & Viva (10)	External Participation in Curricular/**Final Project Exhibition** (10)
Remember/**Imitation**	05		05	02	Attendance 10
Understand/**manipulation**	05	05	05	03	
Apply/**Precision**	05		05		
Analyze/**Articulation**	05		05		
Evaluate/**Naturalisation**	05	05	05		
Create	05		05	05	

Couse plan specifying content, CLOs, teaching learning and assessment strategy mapped with CLOs

Week	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	Reinforcement Binding of building column	Lecture, discussion, Experiment	Quiz, Lab Test	CLO1
2-3	Reinforcement Binding of beam	Oral Presentation, Project Exhibition	Lab Report Assessment, viva	CLO3
4-5	Reinforcement Binding of Two-way slab	Presentation, Field visit	Skill Development Test	CLO2, CLO4
6-7	Reinforcement Binding of Foundation	Lecture, discussion, Experiment, Demonstration	Quiz, Lab Test	CLO1, CLO3
8-9	Field Supervision (Two-way Slab)	Oral Presentation, Project Exhibition	Lab Report Assessment, viva	CLO1
10-11	Field Supervision (Foundation)	Presentation, Field visit	Skill Development Test	CLO3
12-14	Field Supervision (Steel building)	Lecture, discussion, Experiment	Quiz, Lab Test	CLO2, CLO4
15	Field Supervision (Beam and Column)	Presentation, Field visit	Skill Development Test	CLO3
16	Practice, Review/Reserved Day, Lab Report Assessment, Self study	Lecture, discussion, Experiment	Quiz, Lab Test	CLO2, CLO4
17	Lab Test, Viva, Quiz, Overall Assessment, Skill Development Test (Competency)	Presentation, Field visit	Skill Development Test	CLO3

Building Components I

Week 1-2

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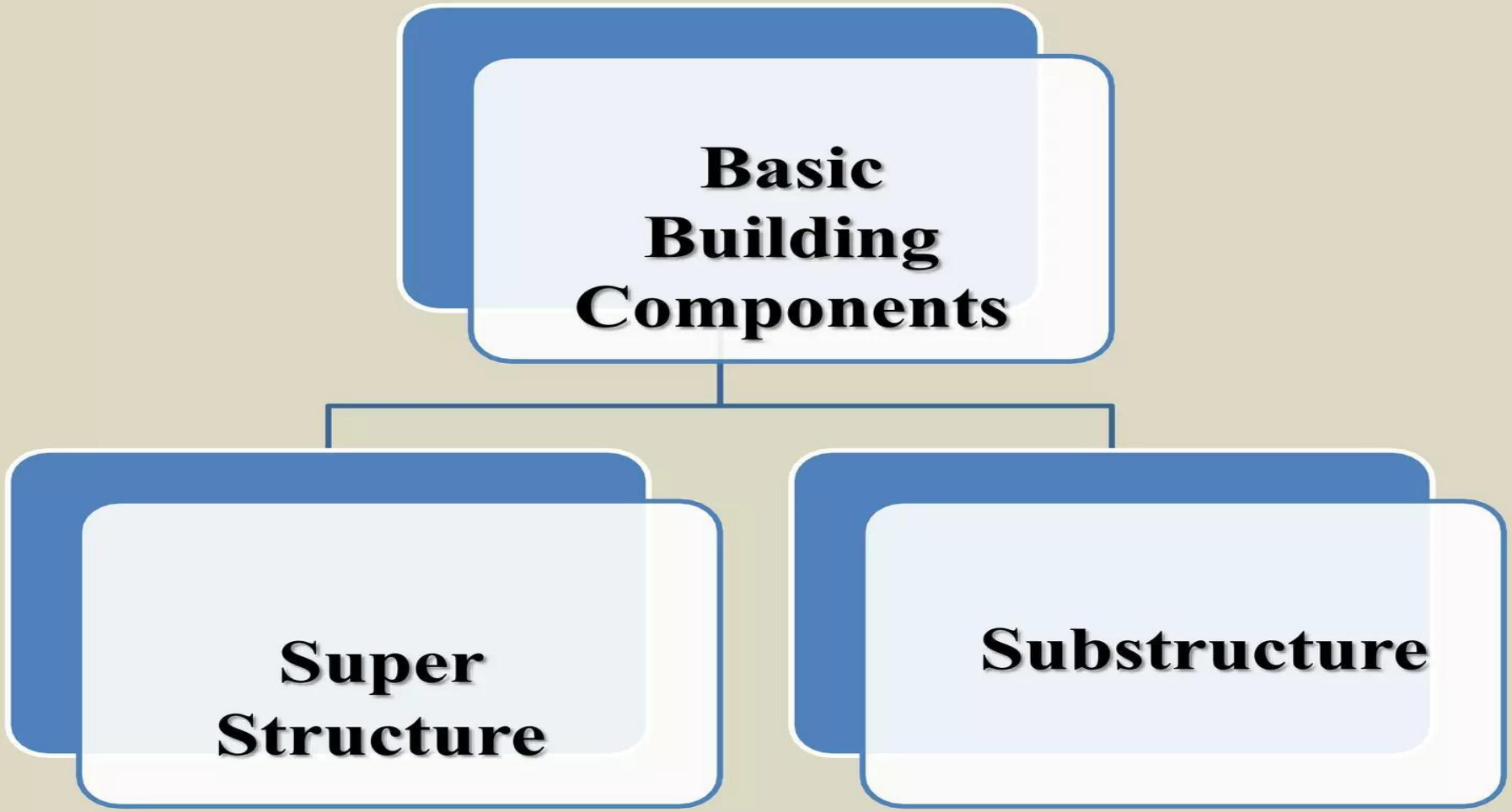
Common Building Components



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***
- ***Arches***
- ***Roofs and slabs***
- ***Lintel and arches***
- ***Chajjas***
- ***Parapet***
- ***Steps and stairs***

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
- Foundations

Nominal Dimensions Of Building Components

Building component	Nominal Dimension
Plinth (Height)	30,45,60,75,90 cm
Wall thickness Partition wall Load bearing wall	 10 cm 20, 30,40 cm
Lintel (thickness)	15 cm
Chajja Projections	30,45,60,75,90 cm
Slab thickness	0,1 to 0.15 m
Parapet wall thickness	10 cm
Parapet height	1 m
Door width	0.8, 0.9, 1.0, 1.2 m
Door height	1.8, 2.0, 2.1 m
Sill height	0.07 to 0.1 m
Lintel height	2.0 m from floor level

Nominal Dimensions Of Building

Building components	Nominal dimensions
Column size	Square 20 x 20, 30 x 30 cm Rectangular 20 x 30 cm Circular 20Φ , 30Φ
Column footing	1x 1 x 1 m below ground
Depth of beam	30, 45, 60 cm
Steps	No of risers= Height of Ceiling + Slab thickness/ Riser Height
	No of treads= No of risers-1
Riser height	15 to 20 cm
Tread width	25,30,35 cm
Width of steps	Minimum 1 m

Foundation

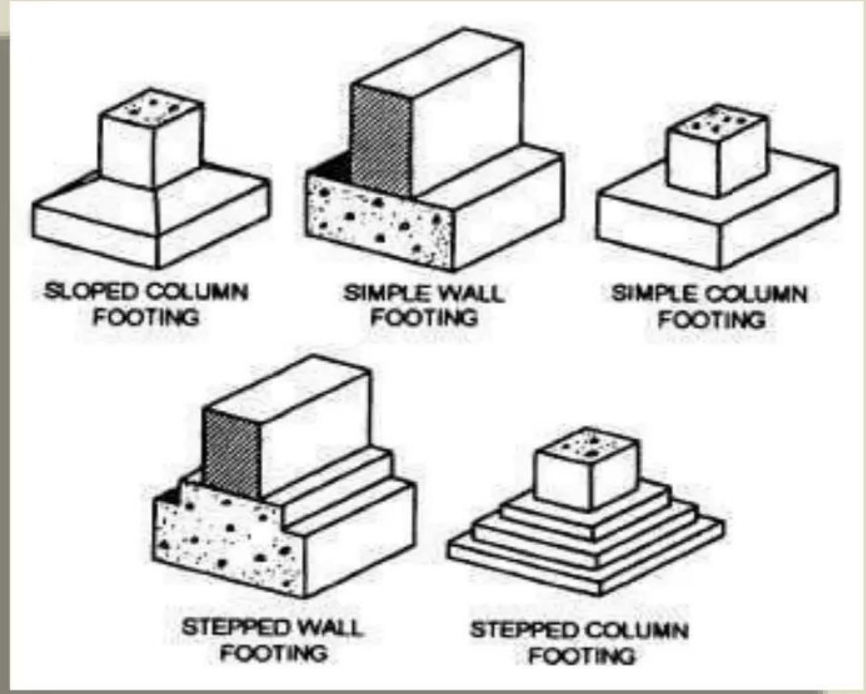
- The basic function of foundation
- To Transmit the load from building to the subsoil, in such a way that
- settlement are within permissible limit
- the soil does not fail in shear
- Reduce the load intensity
- Even distribution of load
- Provide level surface

Types Of Foundation

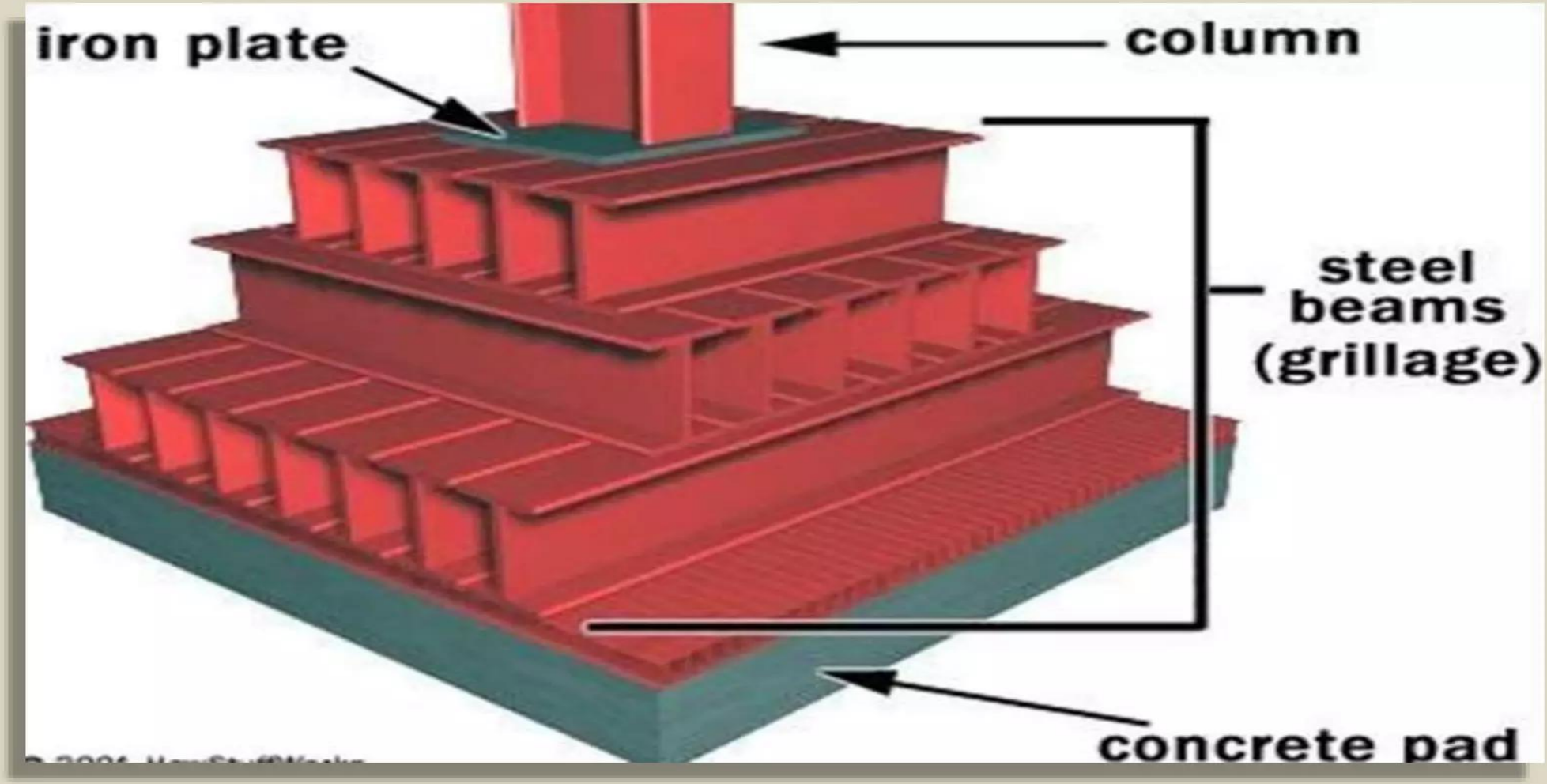
- Foundations may be broadly classified as
- (a) shallow Foundation
- (b) Deep foundation
- (a) Shallow Foundation
  - Spread footing
  - Combined footing
  - Strap Footing
  - Mat Foundation or Raft Foundation

Types of Foundation

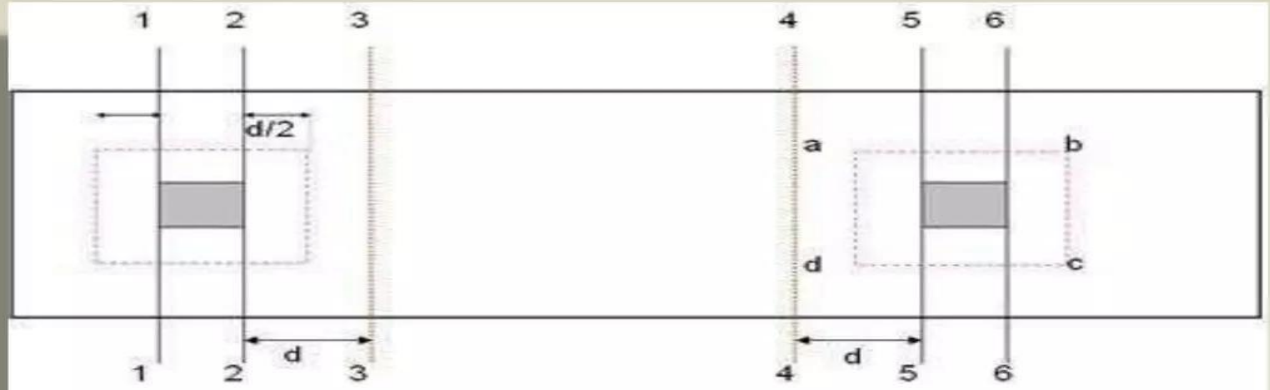
- **Spread Footing:-** Spread footings are those which spread the super-imposed load of wall or column over larger area. Spread footing support either column or wall
- It may of following kinds
- Single footing for column
- Stepped footing for a column
- Sloped footing for a column
- Wall footing without step
- Grillage foundation



Grillage Foundation



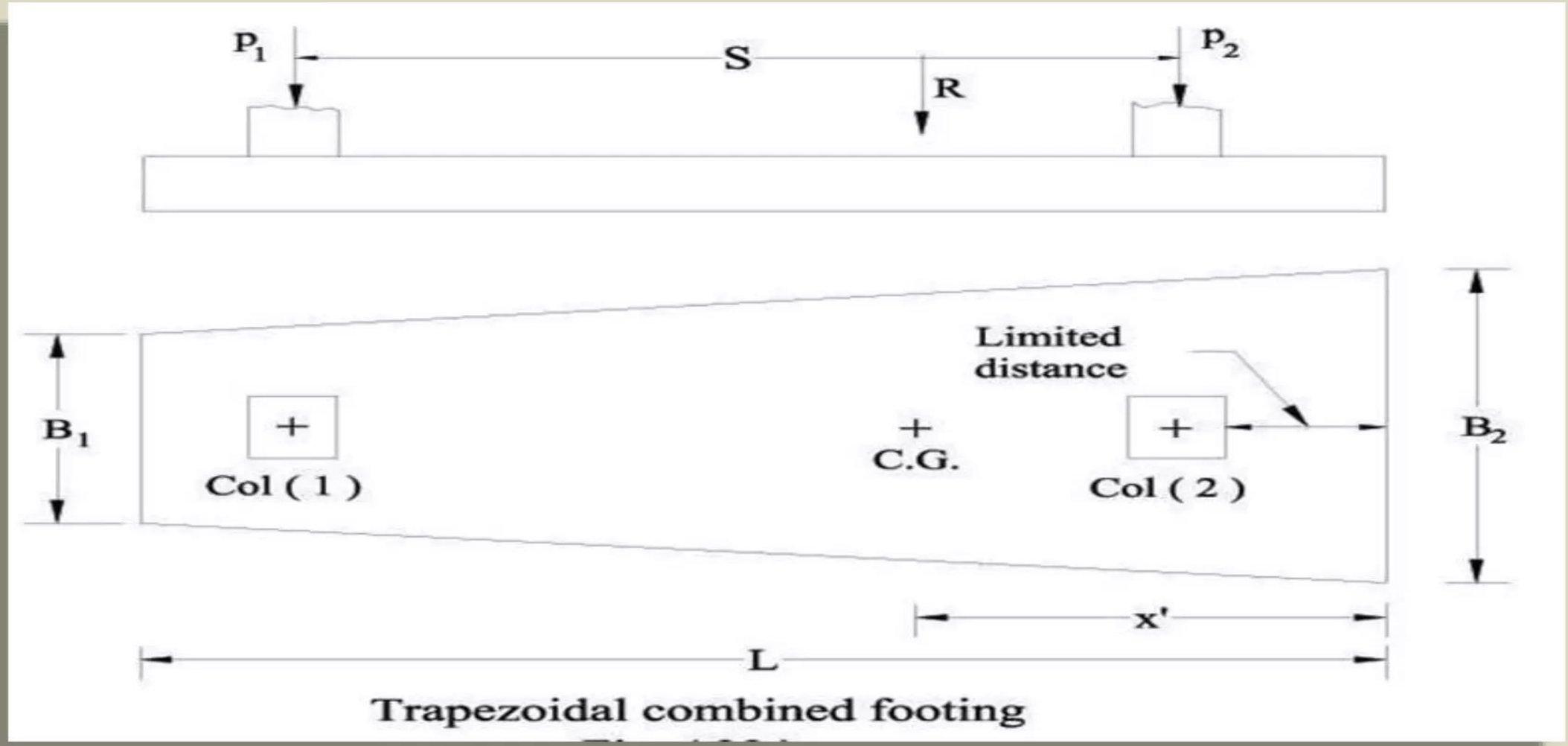
- **Combined Footing:** A spread footing which supports 2 or more columns is termed as combined footing. The combined may be of following kinds
- Rectangular combined footing
- Trapezoidal combined footing
- Combined wall footing



Section 1-1, 2-2, 5-5, and 6-6 are sections for critical moments
Section 3-3, 4-4 are sections for critical shear (one way)
Section for critical two way shear is abcd

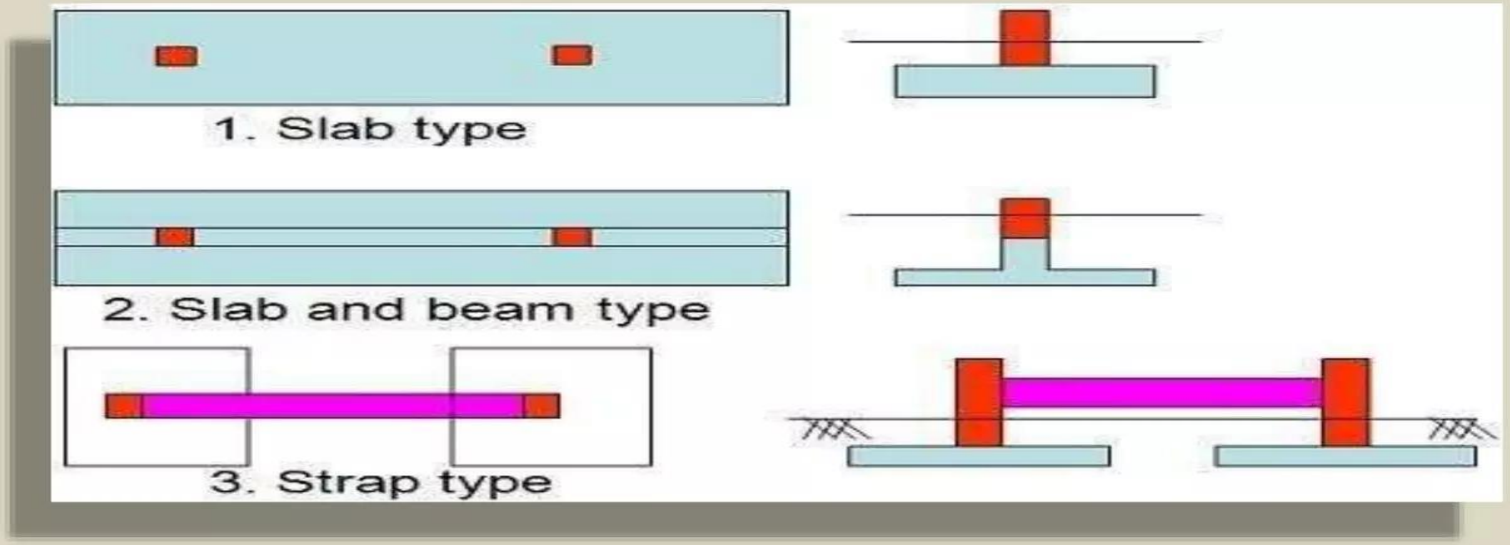
CRITICAL SECTIONS FOR MOMENTS AND SHEAR

Trapezoidal Footing



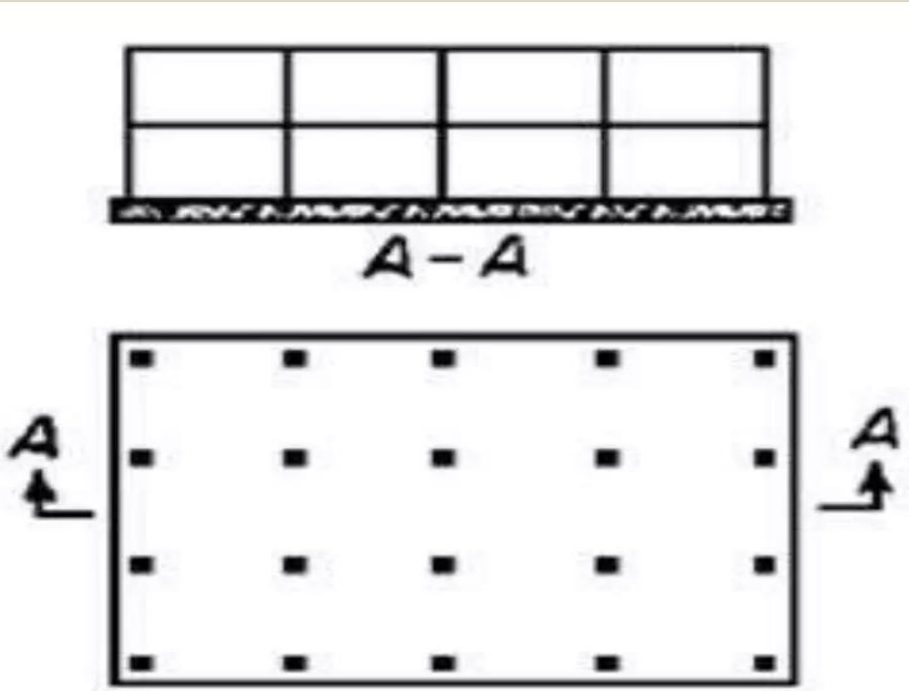
Trapezoidal combined footing

- **Strap Footing:** If a Independent footing of two columns are connected by a beam, it is called a strap footing. A strap footing may be used where the distance between the column is so great that trapezoidal footing becomes quite narrow. The strap does not remain in contact with soil and does not transfer any pressure to the soil.

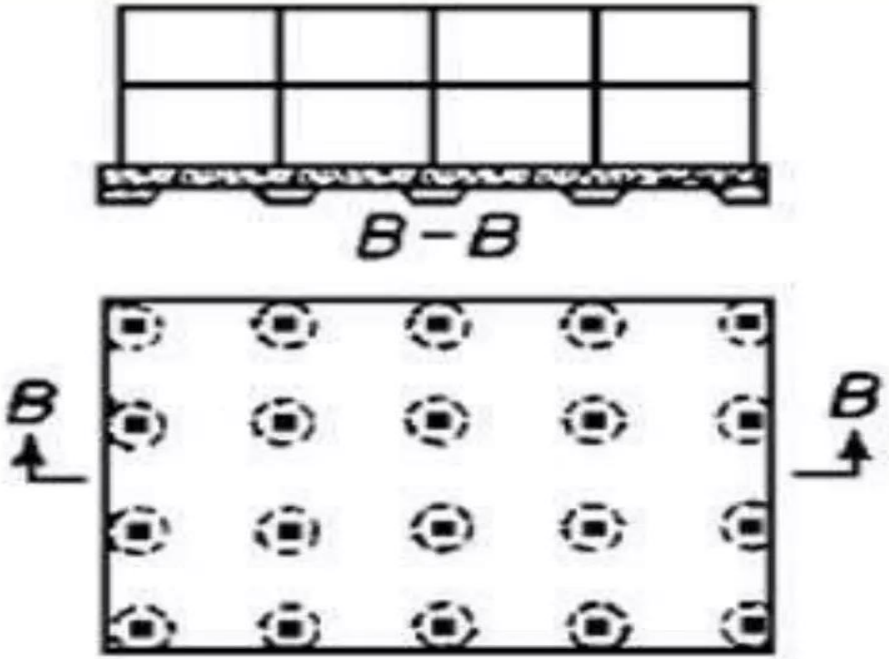


- **Raft Foundation:-** A raft Foundation is a combined footing that covers the entire area beneath a structure and support all the wall and column.
- They are used in areas where the soil masses contains compressible lenses or the soil is sufficiently erratic so that differential settlement would be difficult to control

Raft Foundation



Flat plate



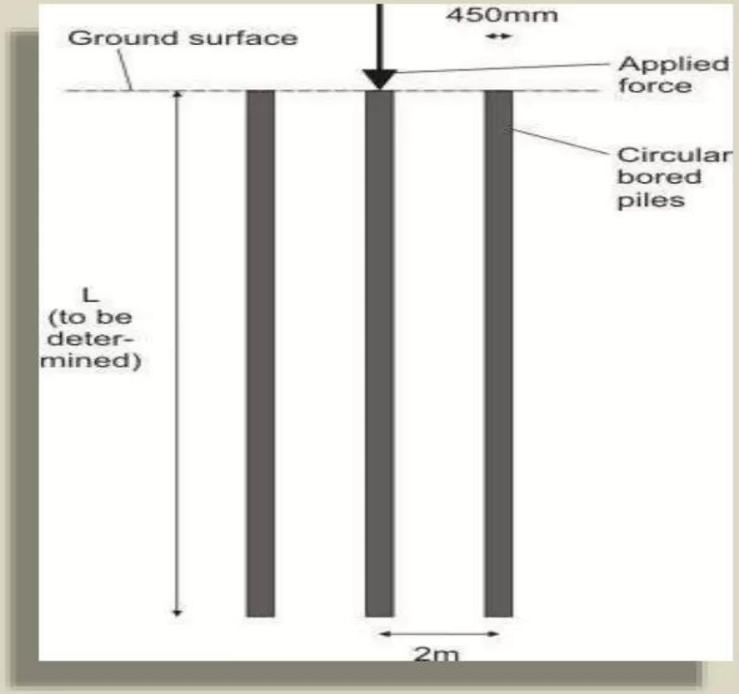
Flat plate thickened
Under columns

Raft Foundation

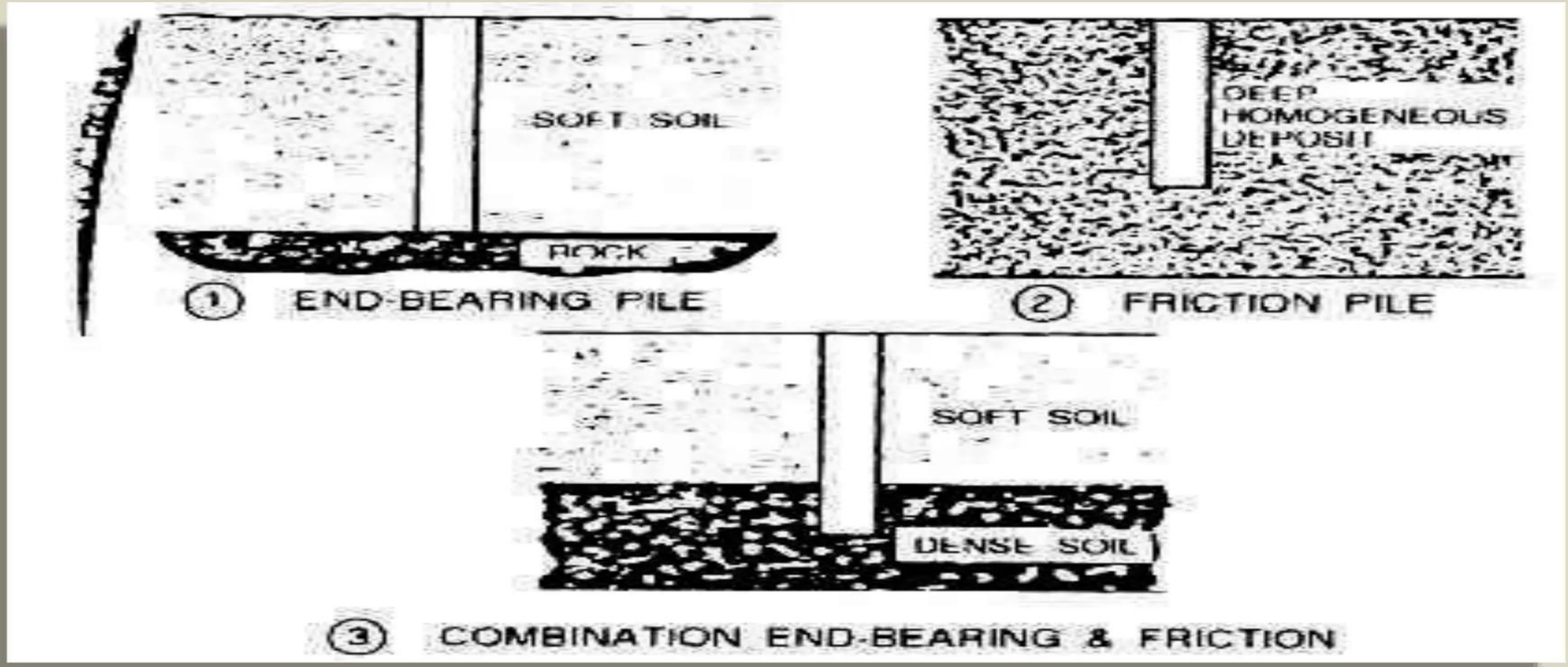
Deep Foundation

- Deep foundation may be of following types
- Pile foundation
- Pier
- Well or caissons

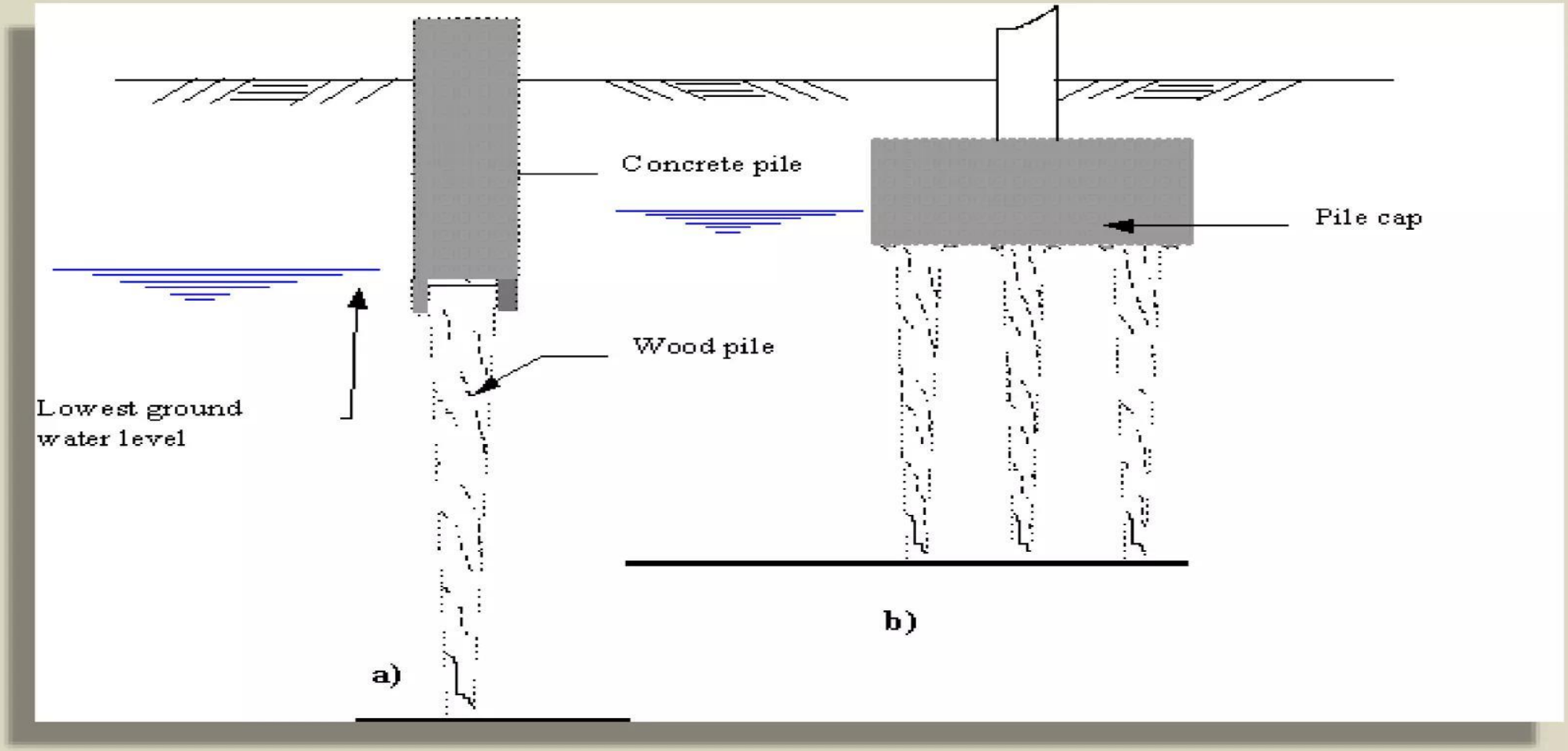
- **Pile Foundation:-** Pile Foundation is that type of foundation in which the loads are taken to a low level by means of vertical members which may be timber, concrete or steel. Pile foundation may be adopted when no firm bearing strata is available and the loading is uneven.
- Piles may be of following types
- End bearing piles
- Friction Pile
- Compaction pile



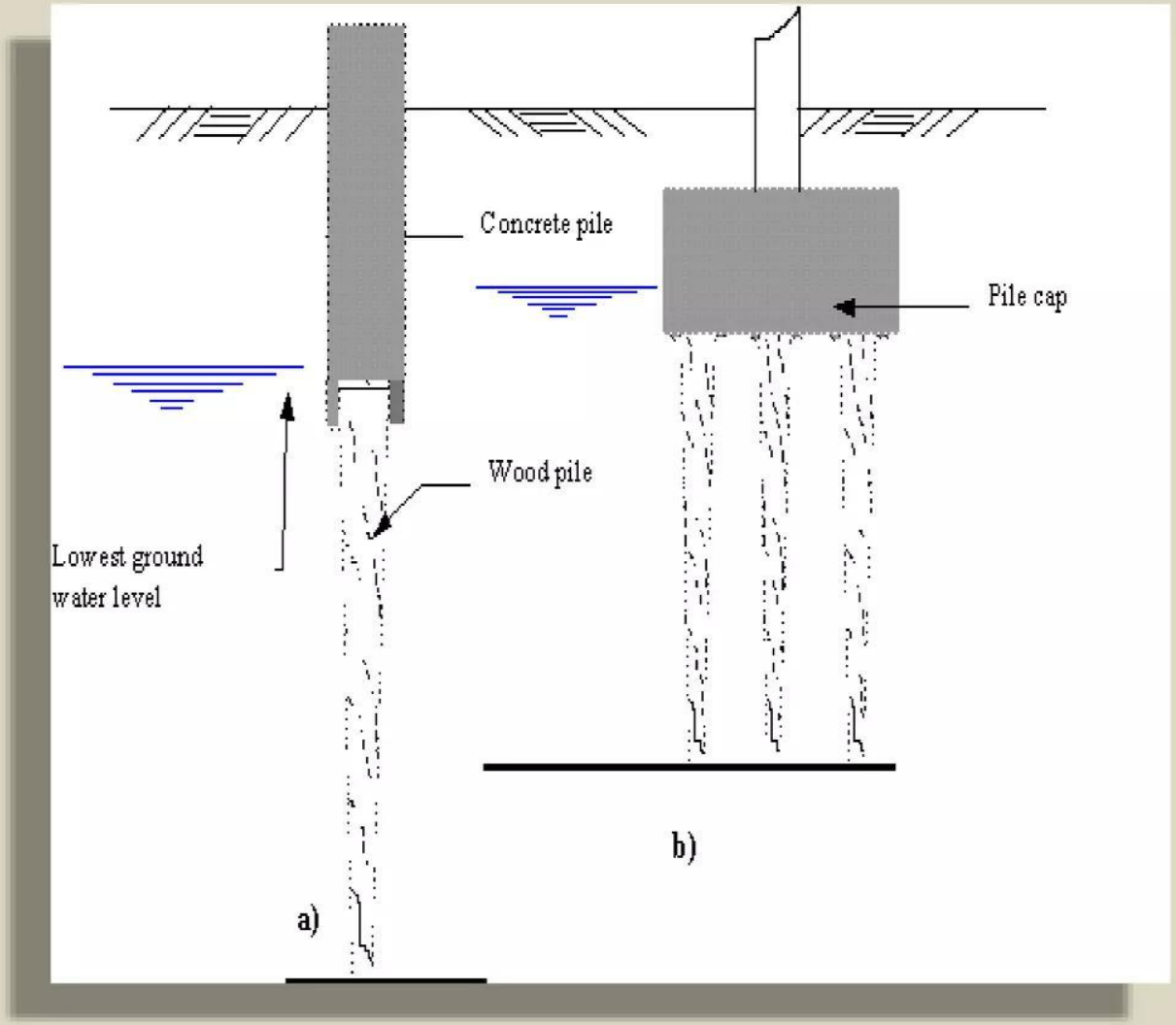
Types of Piles

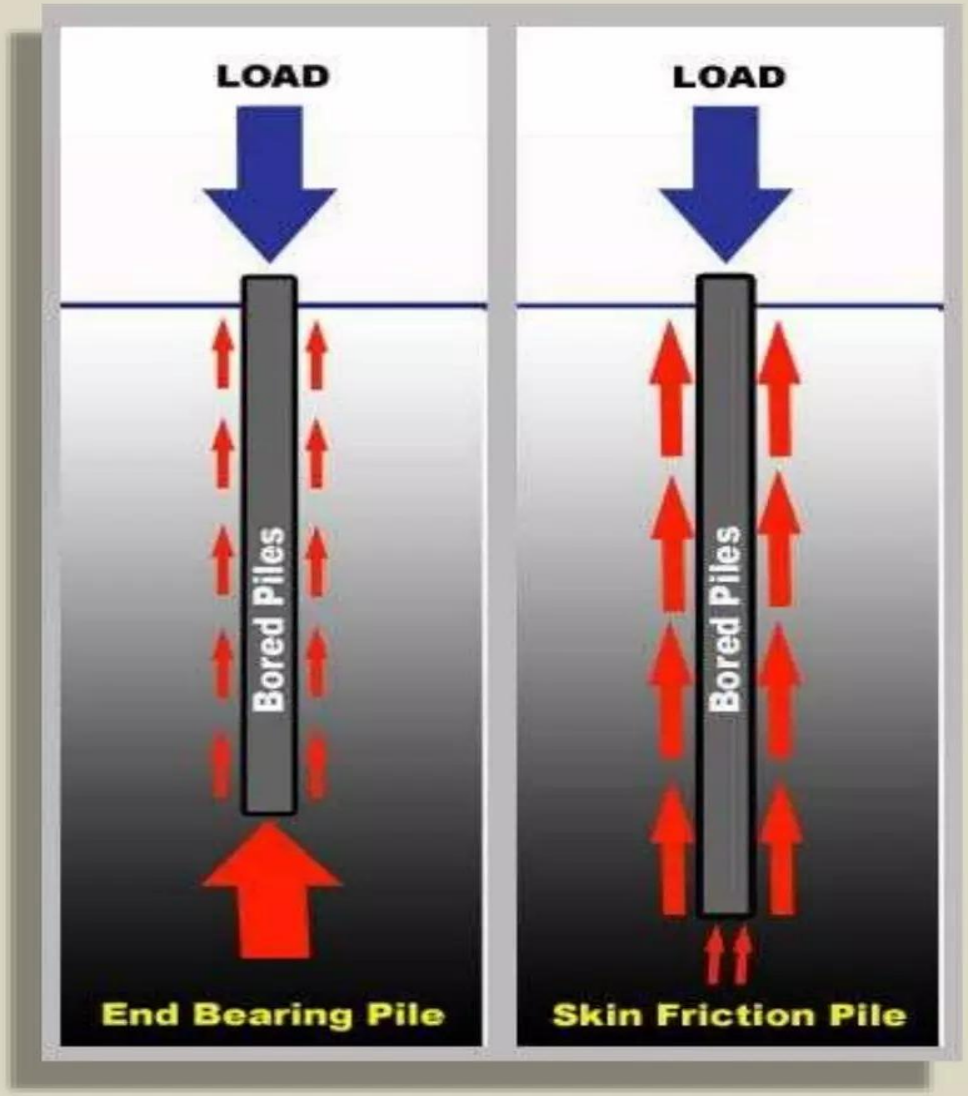


Compaction Pile

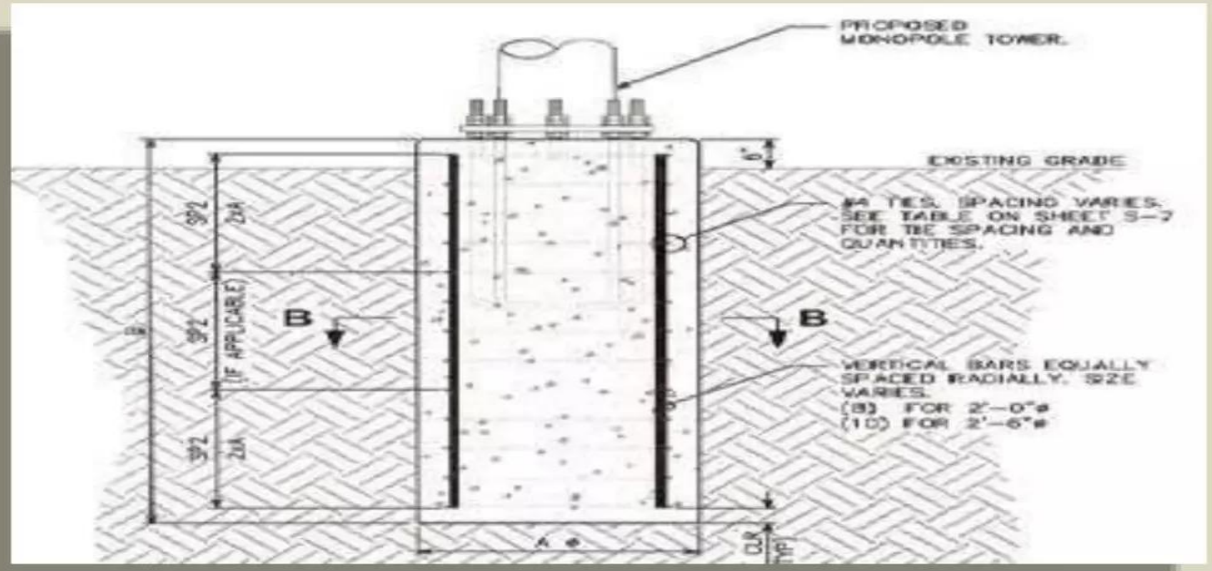


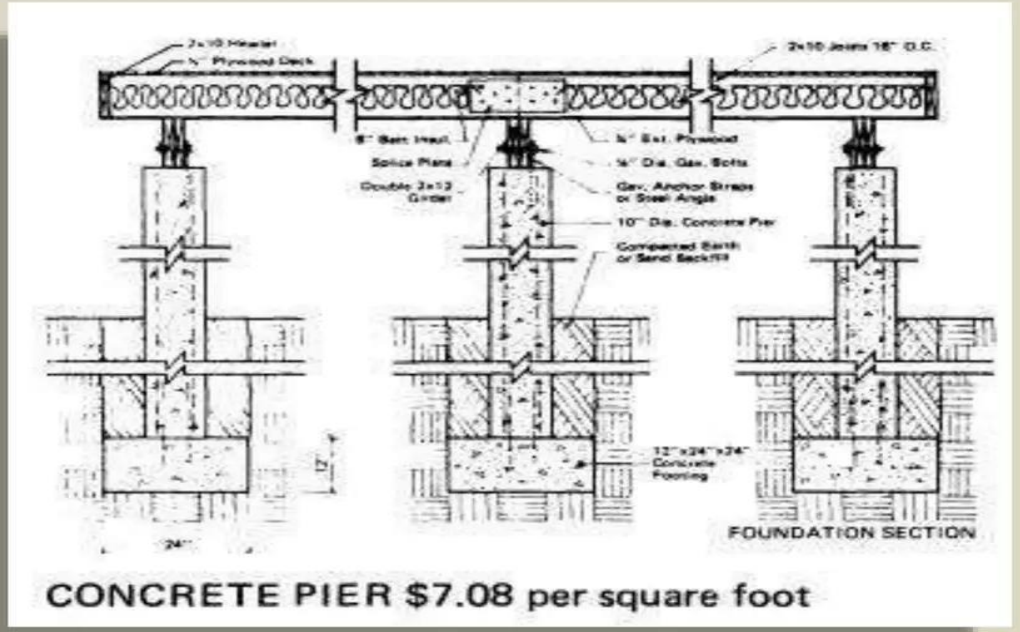
Piles


Concrete pile
Pile cap
Wood pile
Lowest ground
water level
b)
a)


LOAD
Bored Piles
End Bearing Pile
LOAD
Bored Piles
Skin Friction Pile

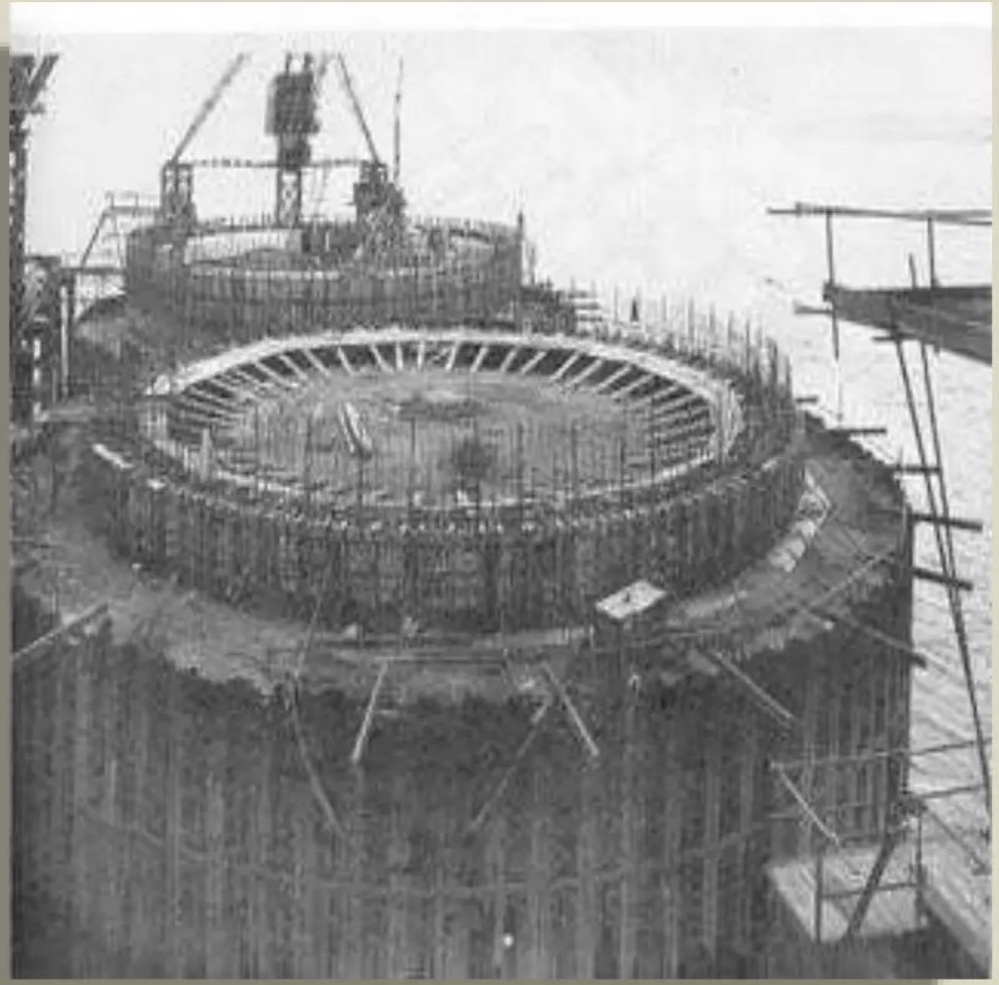
- **Pier Foundation:** A Pier foundation consist of cylindrical column of large diameter to support and transfer large superimposed load to the firm strata below.
- Generally, pier foundation is shallow in depth than the pile foundation.





- **Well Foundation:** Well Foundation or Caisson are box like structures which are sunk from the surface of either land or water to the desired depth. They are much larger than the pier foundation or drilled caissons. Caisson foundations are used for major foundation works like
- Bridge piers
- Docks
- Large water front structure such as pump house.

Well Foundation



SHUTTERING WORK IN PROGRESS WELL FOUNDATION OF SIMBLE Br AT KM 18.044
ON SIMBLE Br JAMMU-AKHNOOR ROAD

Super Structure

- **Plinth:** 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

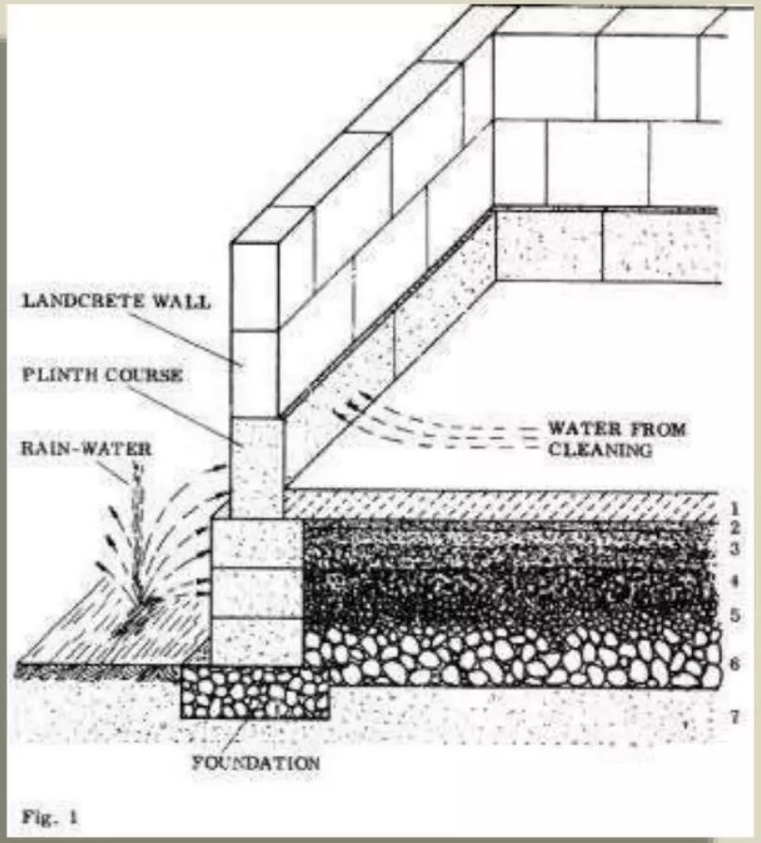
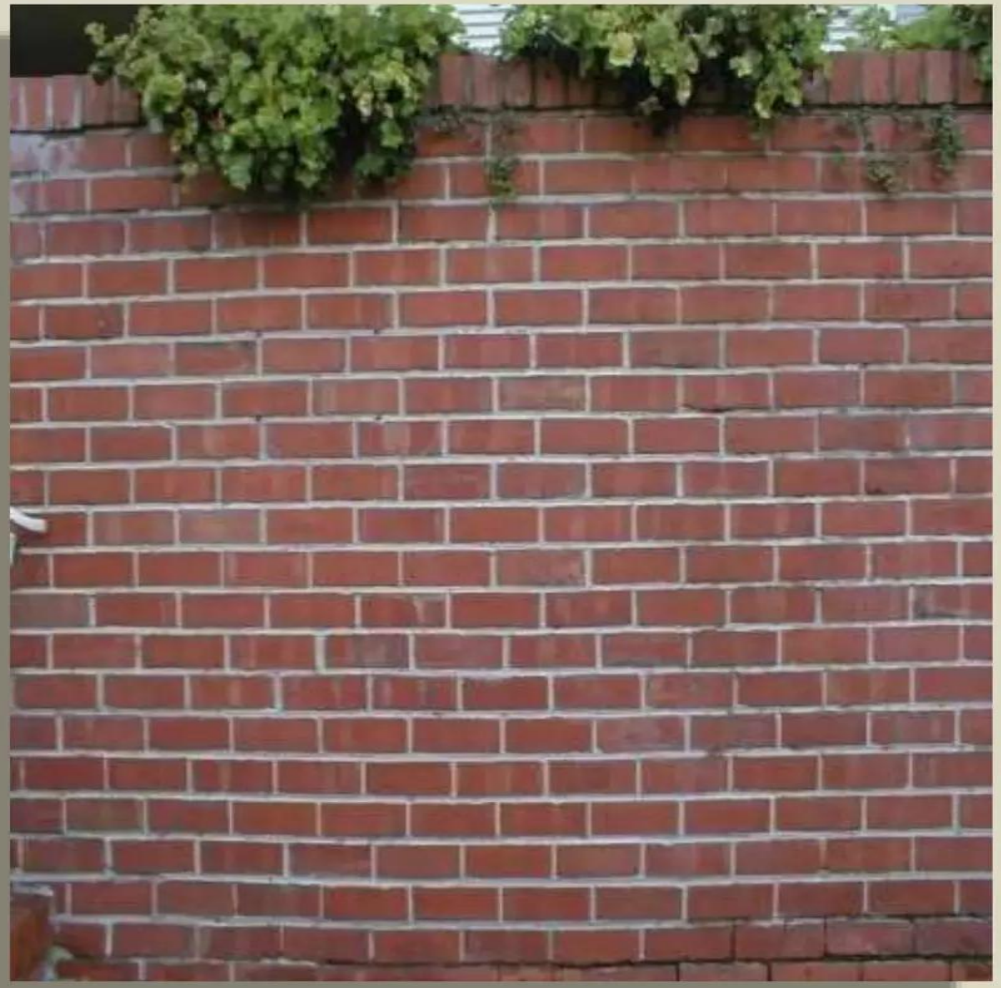


Fig. 1

- **Wall:** 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. They offer resistant to firewalls may be of
- Brick masonry
- Stone masonry

Walls

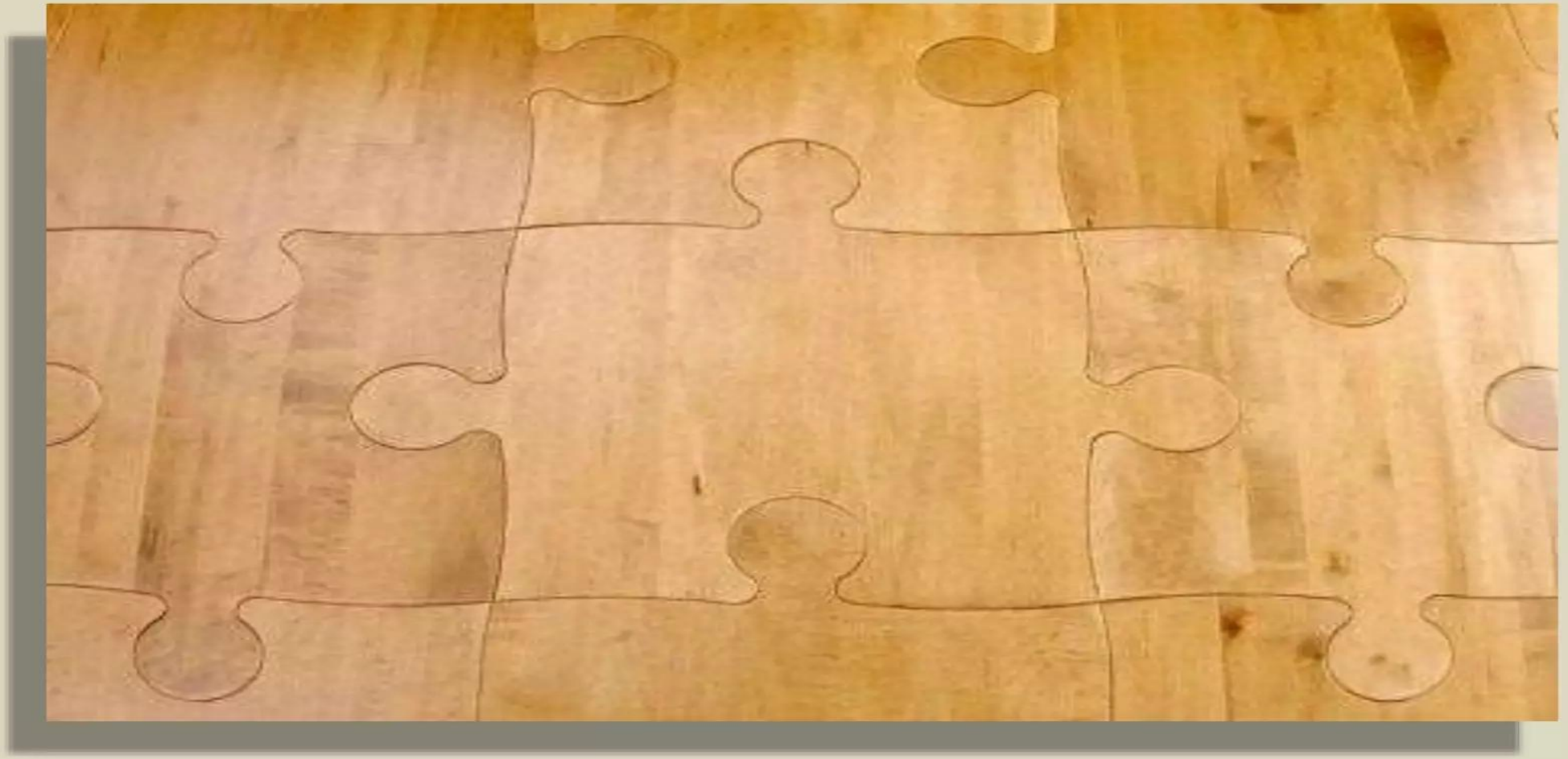


- **Columns** are vertical members along which beams and slab /roof is supported They are square, rectangular and circular in shape in C/S
- **Floor:** A floor is a plane area to support occupants, furniture's, and equipments.
- **Roof:** The upper most part of the building constitutes the roof. The Slab and roof encloses the space and offers protection from rain, heat, snow, wind, sound, fire. Slabs are 10,12,15 cm the.

Columns

Roof/ Slab

Floor



Doors And Windows

- A door provides a connecting link between rooms, allowing easy free movement in the building. Window are opening provided in walls. Doors and windows provide lighting and ventilation. The provide resistance to weather, sound and heat. They provide security and privacy

Sizes of Doors

- **For Residential Area**
- Internal doors 0.9 x 2.0 m
- External doors 1.2 x 2 m
- Door for bath and w.c. 0.75 x 2.0 m
- **Industrial Buildings**
- Width 1.5, 2.0, 2.5 m
- Depth or height 2.0 m, 2.5 m

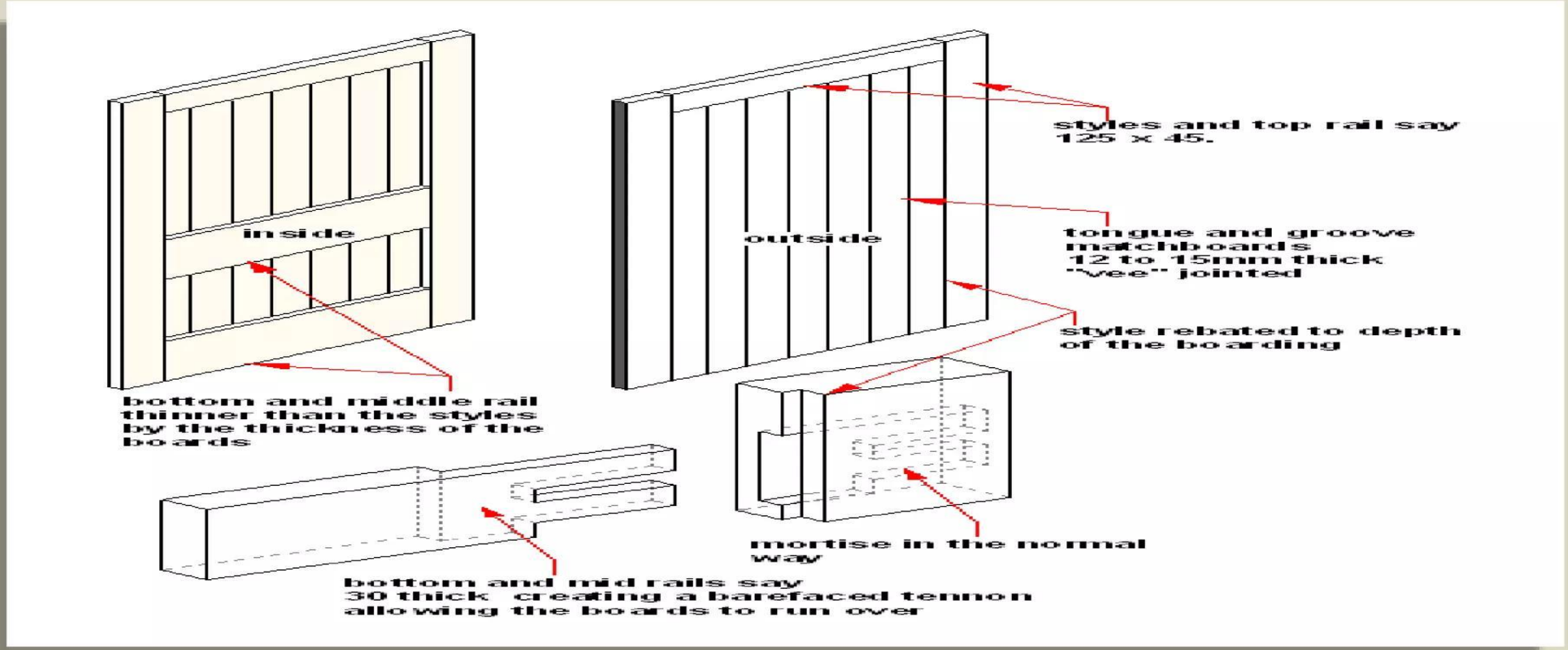
Types of Doors

- Battened and ledge door
- Battened and braced door
- Battened and framed door
- Battened, ledge, and framed door
- Framed and paneled door
- Glazed door
- Flush door
- Louvered door
- Wire gauged door
- Revolving door
- Sliding door
- Swing door
- Collapsible steel door
- Rolling shutter door
- Mild steel sheet door
- Hollow metal door
- PVC door

Battened And Ledge Door

Battened And Braced Door

Battened, Ledge, And Framed Door



Framed And Panneled Door

Glazed Door

Flush Door

Louvered Door

Revolving Door

Sliding Door

Collapsible Steel Door

Rolling Shutter Door

Hollow Metal Door

PVC Door


JK-3001
JK-3002
JK-3003
JK-3004
JK-3005
JK-3006
JK-3007
JK-3008
JK-3009
JK-3010
JK-3011
JK-3012
JK-3013
JK-3014
JK-3015

Sizes of Windows

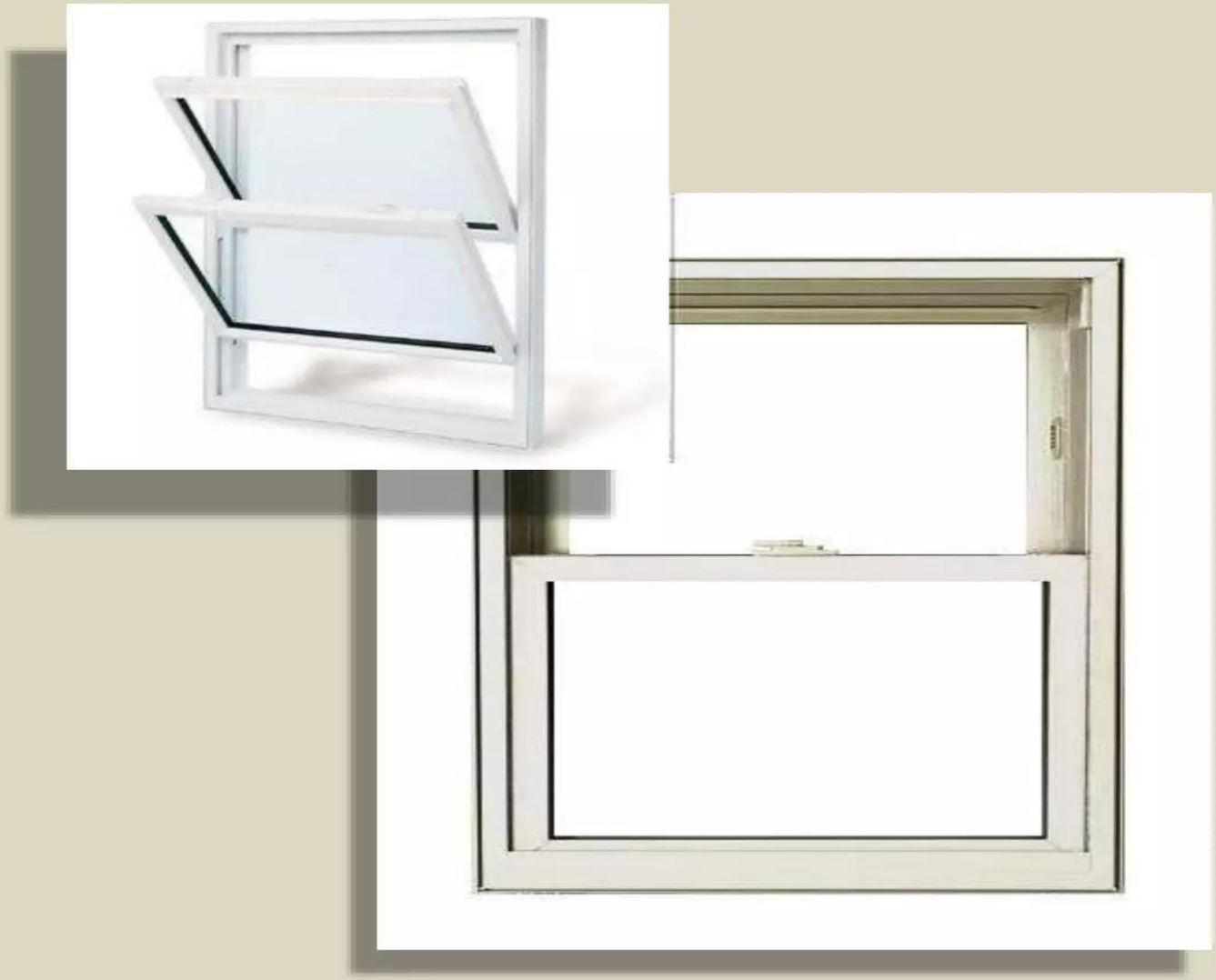
- **Sizes of Windows**: 0.6, 0.75, 0.9, 1.0, 1.2, 1.5, 1.8m
- **Depth**: 0.6 0.75, 0.9, 1.0, 1.2, 1.5, 1.8 m
- **Size of Ventilator: Width**= 0.3, 0.45, 0.6, 0.75, 0.9 m

Types of Windows

- Fixed
- Pivoted
- Double hung
- Sliding
- Casement
- Sash
- Louvered
- Metal
- Bay
- Corner window
- Dormer window
- Gable window
- Lantern
- Skylight

Pivoted Window

Double Hung



Sliding Window

Casement Window

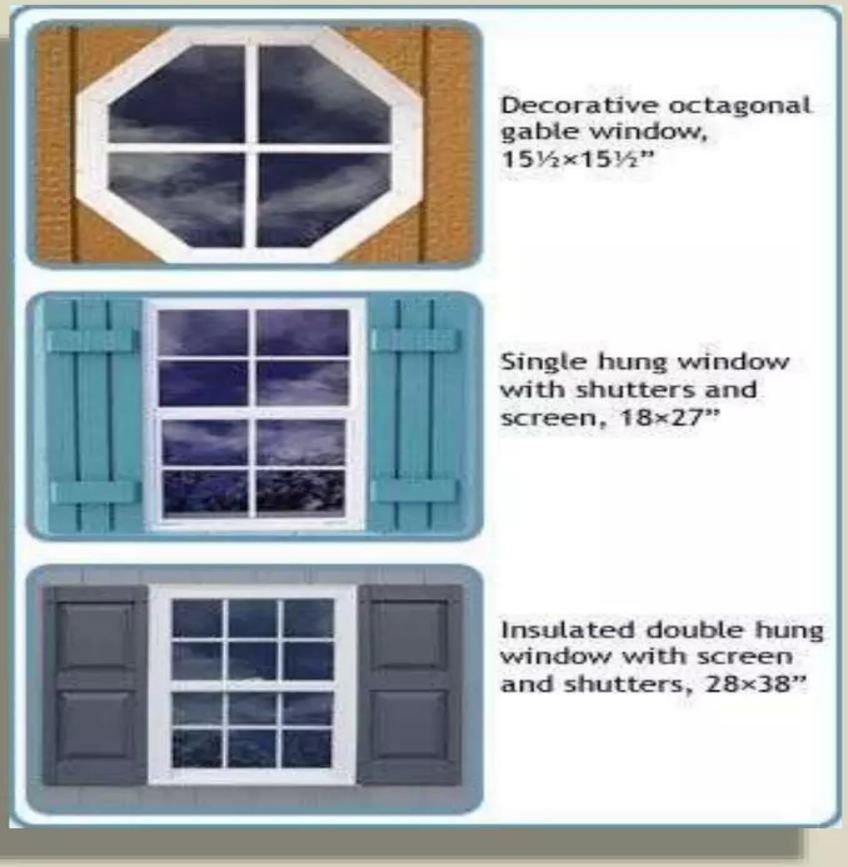
Sash Window

Louvered Window

Bay Window

Dormer Window

Gable Window



Skylight Window

Lantern Window

Corner Window

Sills

- Sills are lower portion of window and ventilator opening

Building Components II

Week 3-4

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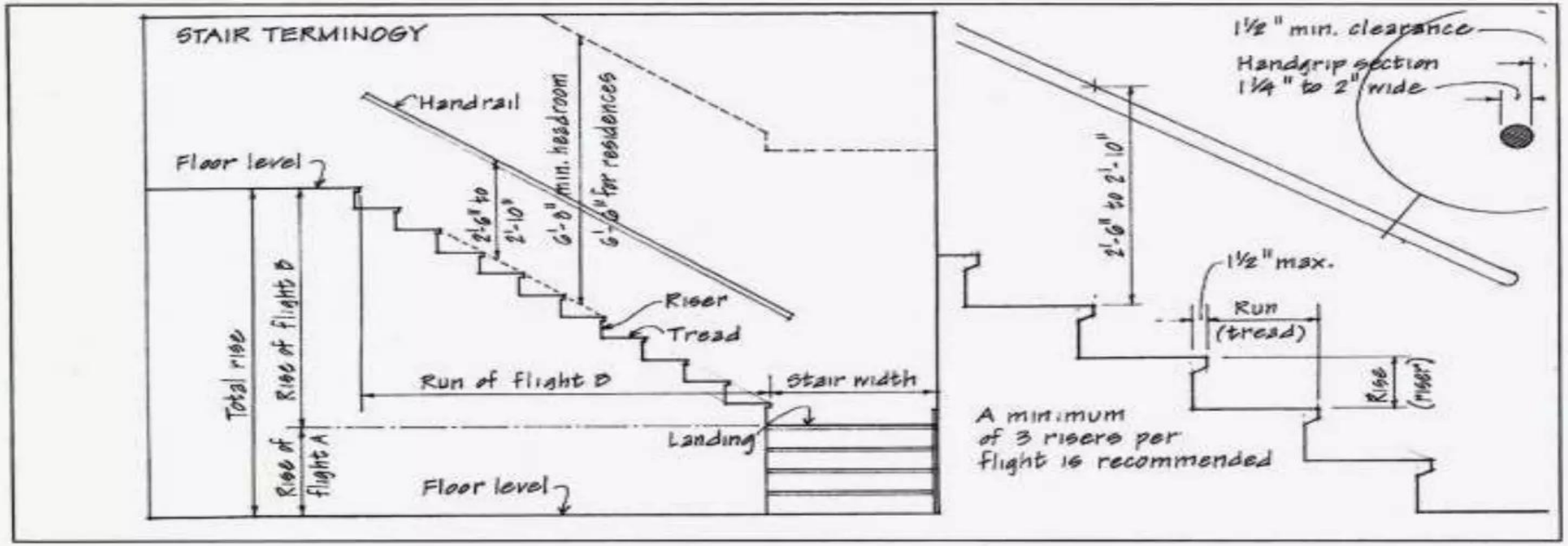
Steps and Stairs

- Steps and stairs are meant to provide access between different levels. Stairs should be properly located to provide easy access and fast services to the building.
- In one flight maximum 8 steps should be provided for more than 8 steps it is recommended to provide them with lending.
- Generally for residential building width of stair is
  1.0 m and 1.2 m
- No of risers= Total height of floor/ Height of riser
- No of tread= Number of riser-1

Steps and Stairs

Steps and Stairs

Stair Terminology



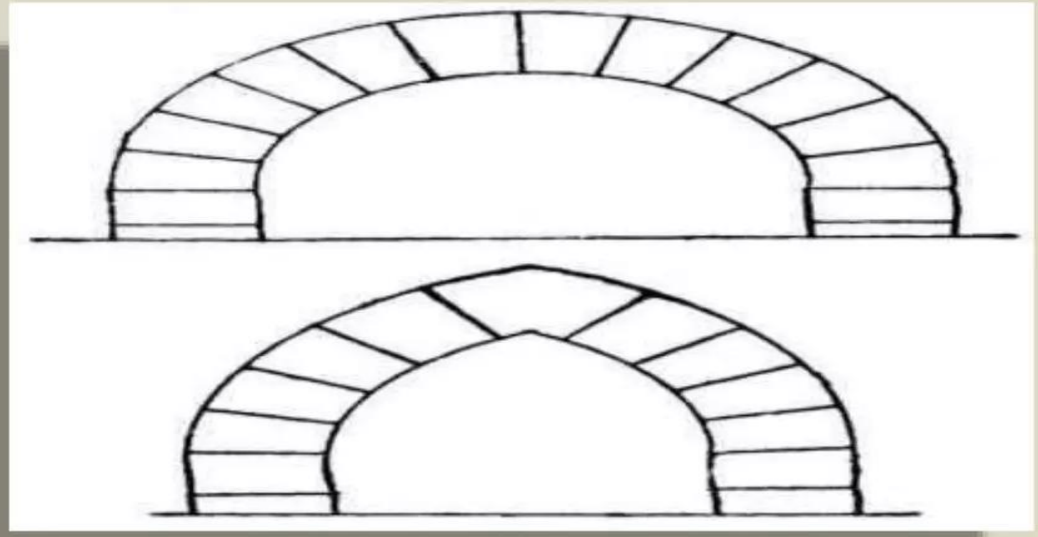
Beams

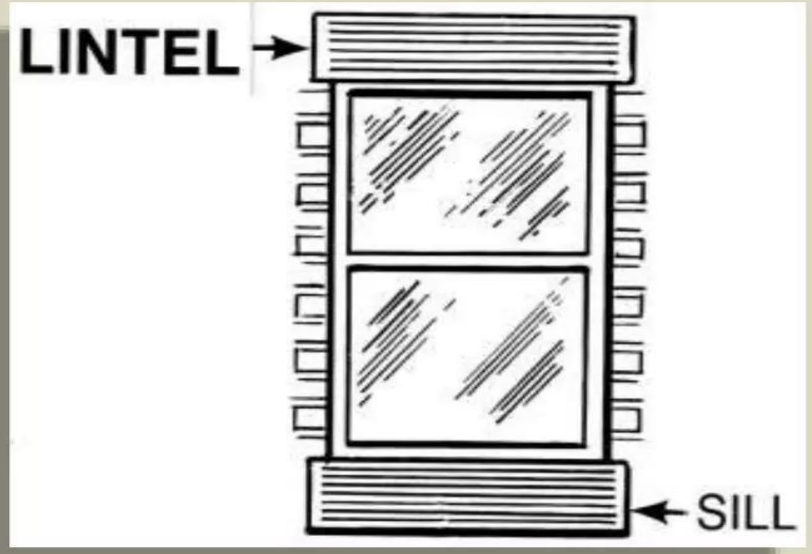
- Beams are horizontal members above which the slabs are provided. The beams are instead supported on walls and columns
- They are generally 20, 39, 45, 60 cm thick and deep members as per structural design

Beams

Lintels And Arch:

- Lintel is a horizontal member which is placed across the opening.
- An arch is normally a curved member comprising of wedge shaped building blocks holding each other with mutual pressure.



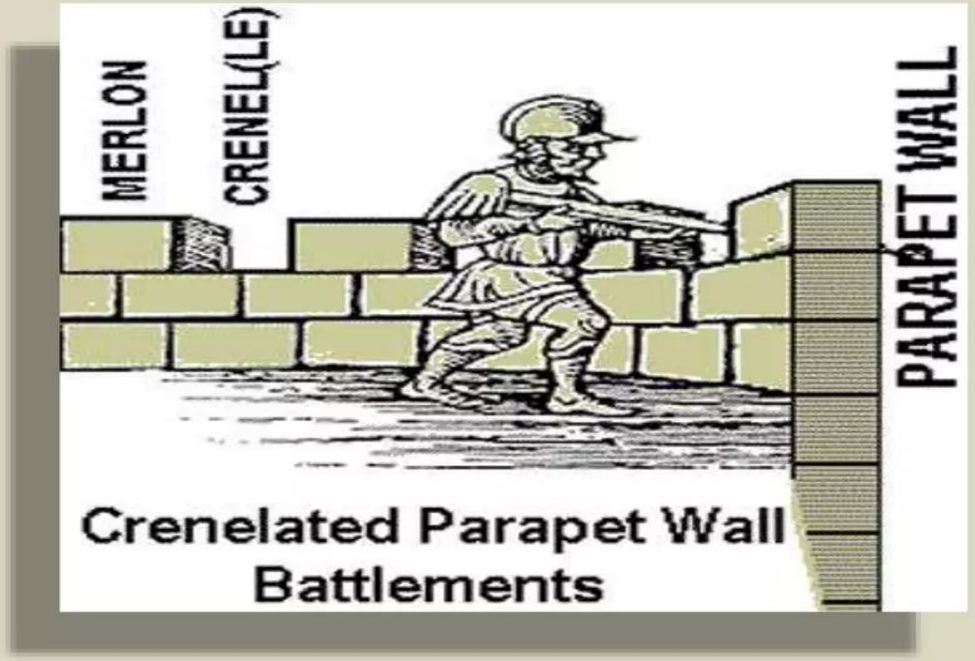


Chajjas:

- Chajjas are provided on external wall opening to get protection from rain, snow and heat. They are weather sheds. Their thickness tapers from 100 to 75 mm and projection is 30, 45, 60, 75, 90 cm

Parapet

- Parapet: Parapet is generally 10 cm thick partition wall constructed above slab to enclose the terrace open to sky. Thickness is 10 to 15 cm height is 1.0 m to 1.2 m



Different Types Of Buildings

- Buildings are classified based upon its occupancy and structure
- Building are classified based upon occupancy as
- Residential Building
- Educational Building
- Institutional Building
- Assembly building
- Business buildings
- Mercantile buildings
- Industrial Buildings
- Storage buildings
- Hazardous buildings

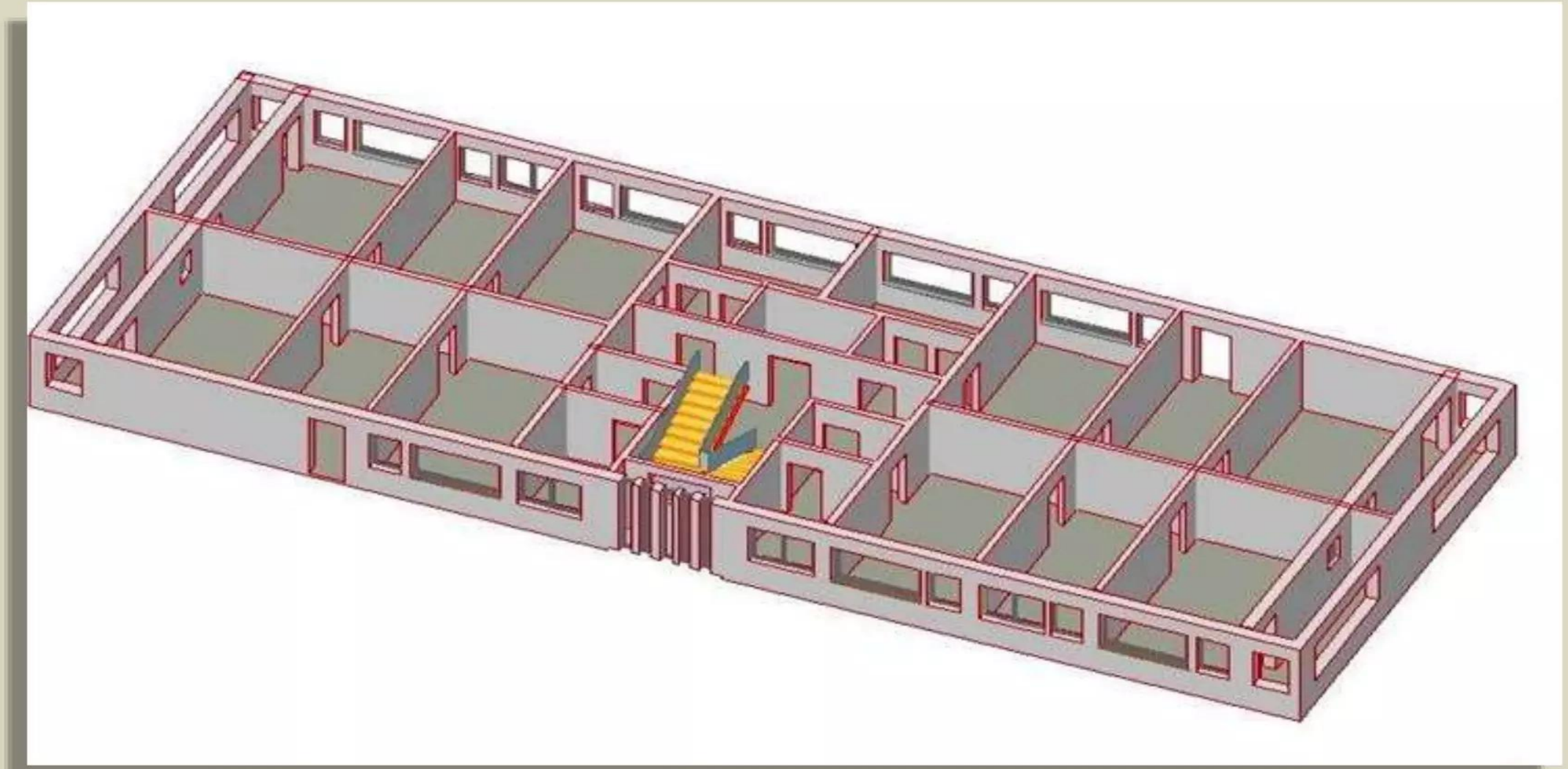
- **Residential Building:** Buildings in which sleeping arrangements are provided with or without cooking arrangement. It includes single or multi-family dwelling, apartments, lodgings, restaurants, hostels, dormitories and hotels
- **Educational building:** These Include any building used for school, college, education purposes.
- **Institutional Building:** these buildings used for different purposes, such as medical or other treatment. They include hospitals, sanatorium, jails, asylum

- **AssemblyBuildings:** These are the buildings where group of peoples meet or gather for amusement, social, religious, political, civil, travel and similar purposes. E.g. theatres, motion pictures, houses, assembly halls, restaurants assembly halls.
- **Business buildings:** These buildings are used for transactions of business, for keeping accounts and for similar other purposes.
- **Mercantile building:** These building are used as shops, stores, market for display and sale of merchandise either wholesale or retail, office, shops, storage services.

- **Industrial Buildings:** These are buildings where products or materials of all kinds and properties are fabricated, assembled, manufactured or processed
- **Storage Buildings:** these buildings are used primarily for the storage or sheltering of goods, wares or merchandise, vehicles and animals, grains
- **Hazardous Buildings:** These buildings are used for the storage, handling, manufacturing or processing of highly combustible or explosive materials or products

Classification Based On Structure

- Load bearing Structure
- Framed structure
- **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.



- **Framed Structures:** Reinforced cement concrete structures are the most common type of construction today. They consist of a skeleton 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.
- The open spaces in the skeleton are to be filled with brick walls or glass panels.


Region represented
by sub-assembly

Types of Loads

- Various loads are taken into account while designing the foundation of a structure.
- Dead loads;
- Live load;
- Wind loads;
- Earthquake loads;
- Erection loads; and

- **Dead Load:** Dead load comprises of the weight of all walls, partitions, floors and roofs including all other permanent construction in the building
- **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 in the vertically exposed surface of the walls and columns.

- **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/m^3 per cm depth of snow
- **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.

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

Elements of Building Construction

Part-2

Planning

Planning

- Elementary Principles and basics of a building planning, layout of residential and industrial buildings

Principles And Building Planning

- The term planning of a building refers to mean the arrangement of all the units of a building on all the floors and at all the levels.
- There are certain general principles which as a engineer should bear in mind while planning a building.

The General Principles Are

- Aspect
- Prospect
- Privacy
- Grouping
- Roominess
- Flexibility
- Furniture requirements
- Circulation
- Elegance
- Economy
- Sanitation

Aspect

- **Aspect:** different rooms of the buildings are placed and located accordingly to the functional utility in such a way that maximum advantage of natural elements like sun, wind, can be obtained. To obtain sufficient sunlight inside the room windows are placed in external walls
- **Kitchen aspect:** Kitchen should have window in east, because morning sun kills the germs. So kitchen should have **eastern** aspect.
- **Bed room aspect:** Bed room is a unit of residential building generally used in night time, for sleeping so evening sun rays, which are cool in nature should enter the bed room to create cheerful atmosphere. So bed room should have **western aspect, south-western or north-western aspect.**
- **Drawing room aspect:** It is a room which is used by the occupants for maximum hours of the day. To achieve good sunlight it should be placed in south or **south-east** or **north-east**. Windows should be provided in external walls
- **Study room aspect:** Windows in this room should be in **northern** side to obtain sufficient light throughout the day. So aspect of this room is north.
- **Verandah**: there should be sufficient light in the above unit throughout the day so they should be placed with opening in **north-direction**.

Kitchen (Eastern Aspect)

Bed Room (Western South Western, North Western Aspect)

Drawing Room (South East or North East Aspect)

Study Room (Northern Aspect)

Verandah (North Direction)

Prospect

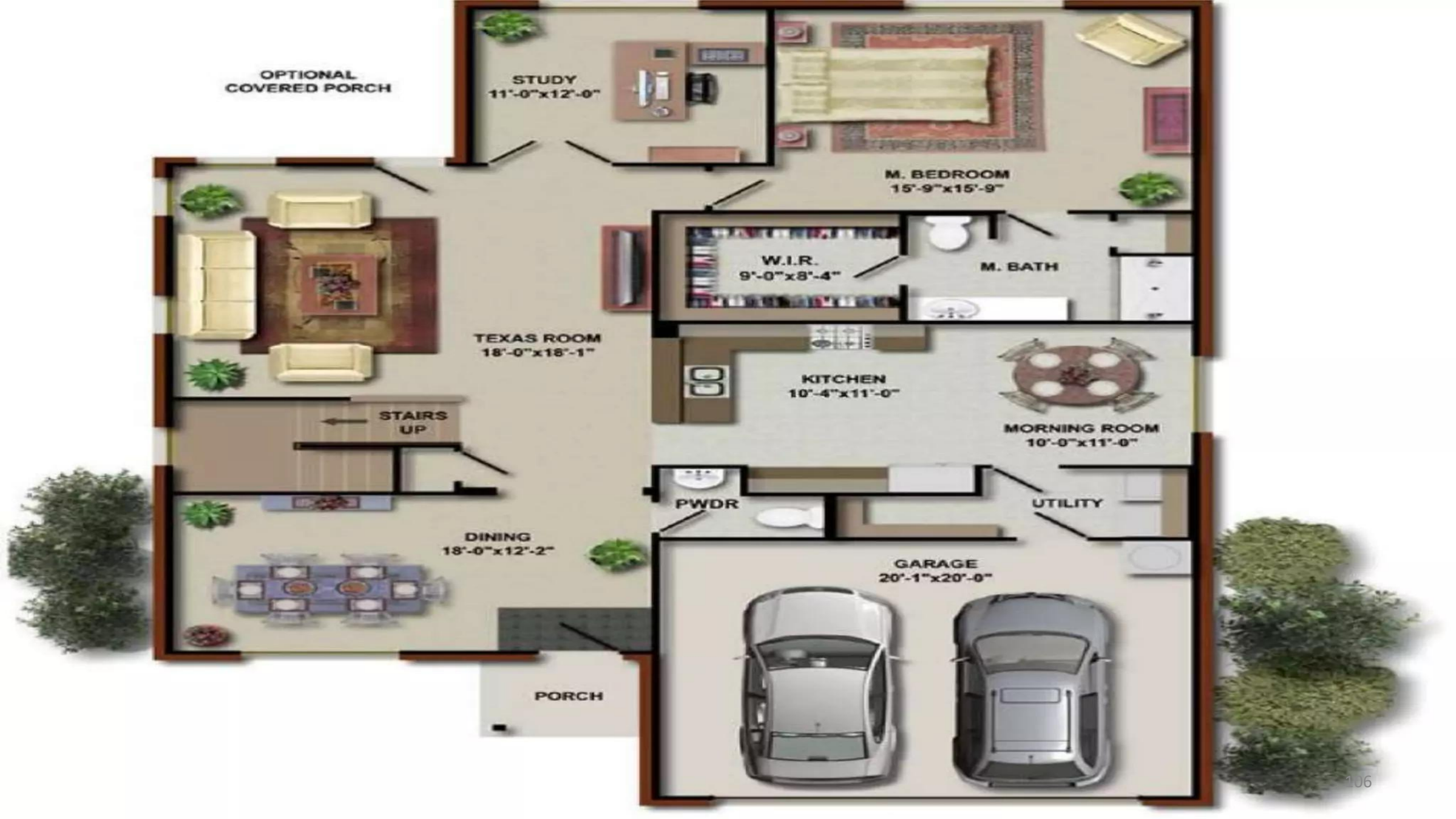
- **It Is Related With The Views As Seen Of The Outside From Doors And Windows In The External Wall.** For Pleasant Atmosphere View Of A Garden, Hill And A River, etc Is A Good Prospect. Towards These Objective Doors And Windows Should Be Provided In The External Wall Of The Building. Undesirable Views Like A Small Nallah, Slum Area, Drainage Disposal Unit, Garbage Collection Centers Should Be Concealed By Not Providing Windows In That Direction
- Prospect Of Living Room Should Be Toward The Main Road To Keep Control On The Plot. Prospects Of Bed Should Be On The Rear Side Of The Building So That To Avoid Disturbance Due To Noise.

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 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.
- 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. Privacy is very important in bed rooms and wick. and the view of bed room should not be visible from any other room.

Grouping

- It is the arrangement of various rooms with respect to their functions, In case of residential building to achieve maximum efficiency of the plan the grouping should be done as follows
- Verandah should be the first unit after the entrance of the house
- Living room and dining room should be close next to verandah
- Kitchen and dining should be close to each other
- Sanitary arrangements should be close to bed rooms.
- Staircase should be approachable from each room
- Passages connecting various rooms should be well lighted and ventilated


OPTIONAL
COVERED PORCH
STUDY
11'-0"x12'-0"
M. BEDROOM
15'-9"x15'-9"
W.I.R.
9'-0"x8'-4"
M. BATH
TEXAS ROOM
18'-0"x18'-1"
KITCHEN
10'-4"x11'-0"
STAIRS
UP
MORNING ROOM
10'-0"x11'-0"
PWDR
UTILITY
DINING
18'-0"x12'-2"
GARAGE
20'-1"x20'-0"
PORCH


DINING
FAMILY
KITCHEN
MASTER BEDROOM
MASTER BATHROOM
W.I.R.
LAUNDRY
BATH 2
LINEN
LINEN
LIVING
ENTRY
BEDROOM 2
BEDROOM 3
PORCH

Roominess

- This principle of planning is directly related to dimensions of the room. A rectangular room is found more convenient as compared to a square room of the same size. Hence 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. Height of doors and windows, ceilings, floorings, color treatment also affect the roominess of the building unit. Light color give effect of more space whereas dark color makes the room look smaller. Height of ceiling should be low as more height gives a feeling of a cave.

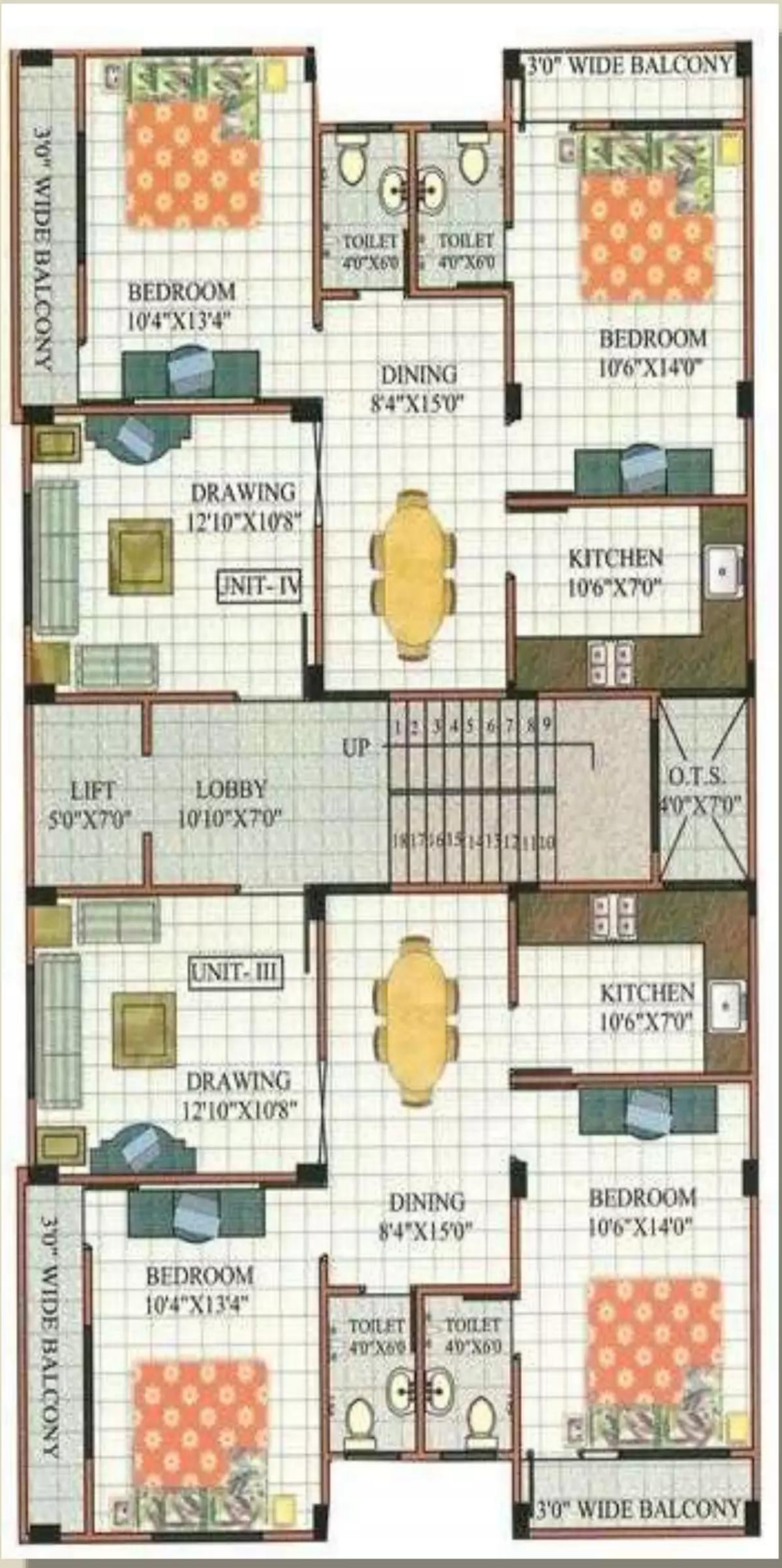
Flexibility

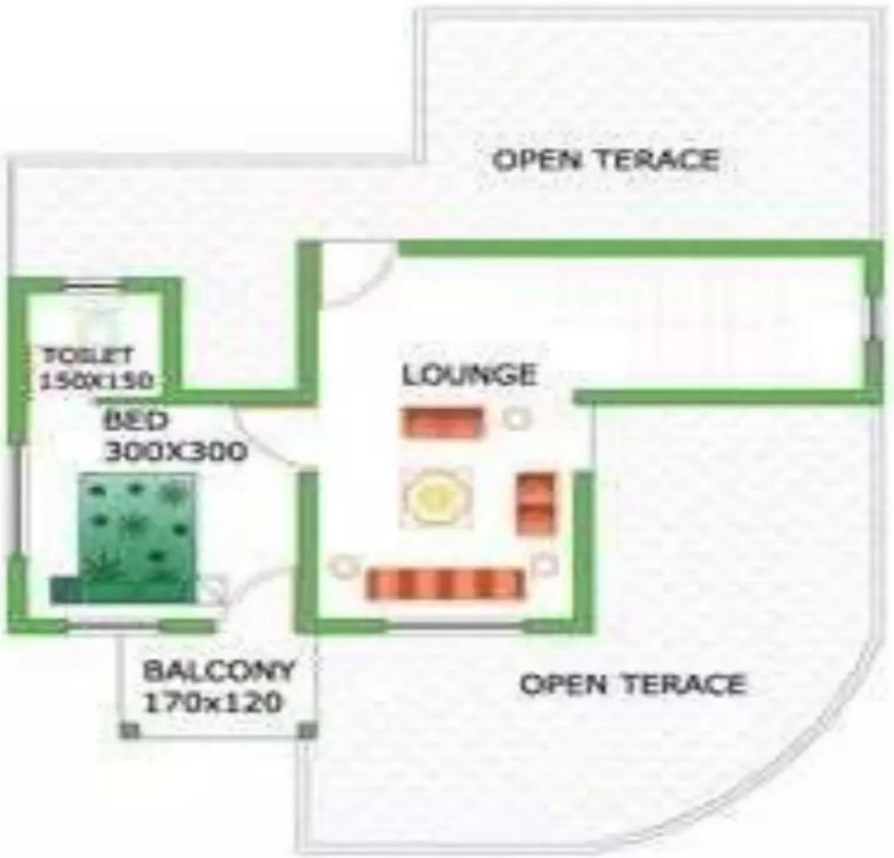
- **Flexibility means a room which was planned for one function can be used for other, if so required.** If rooms are big enough and are having a minimum width of 3m are more flexible and even the activities of various rooms can be exchanged.

Furniture Requirement

- One of the most important requirement of a building planner, is to know how much space is needed by each function in a particular building. The room sizes for a particular function can be completed on the basis of permanent furniture's to be used in the room. Hence while planning a building furniture arrangement must be shown.


PLANTER
STUDY
2440 x 2745
MASTER BED ROOM
3150 x 4200
SERVICE YARD
2025 x 2150
LIVING
3512 x 5640
DINING
2540 x 3250
BED ROOM
3850 x 3150
TOILET
KITCHEN
2850 x 2390
2390 x 1022
DRY YARD
ENTRY


3'0" WIDE BALCONY
3'0" WIDE BALCONY
BEDROOM
10'4"X13'4"
TOILET
4'0"X6'0
TOILET
4'0"X6'0
DINING
8'4"X15'0"
BEDROOM
10'6"X14'0"
DRAWING
12'10"X10'8"
UNIT- IV
KITCHEN
10'6"X7'0"
UP
1 2 3 4 5 6 7 8 9
LIFT
5'0"X7'0"
LOBBY
10'10"X7'0"
O.T.S.
4'0"X7'0"
UNIT- III
KITCHEN
10'6"X7'0"
DRAWING
12'10"X10'8"
DINING
8'4"X15'0"
BEDROOM
10'6"X14'0"
BEDROOM
10'4"X13'4"
TOILET
4'0"X6'0
TOILET
4'0"X6'0
3'0" WIDE BALCONY
3'0" WIDE BALCONY



GROUND FLOOR PLAN
AREA =81.63 M2

SCENIC

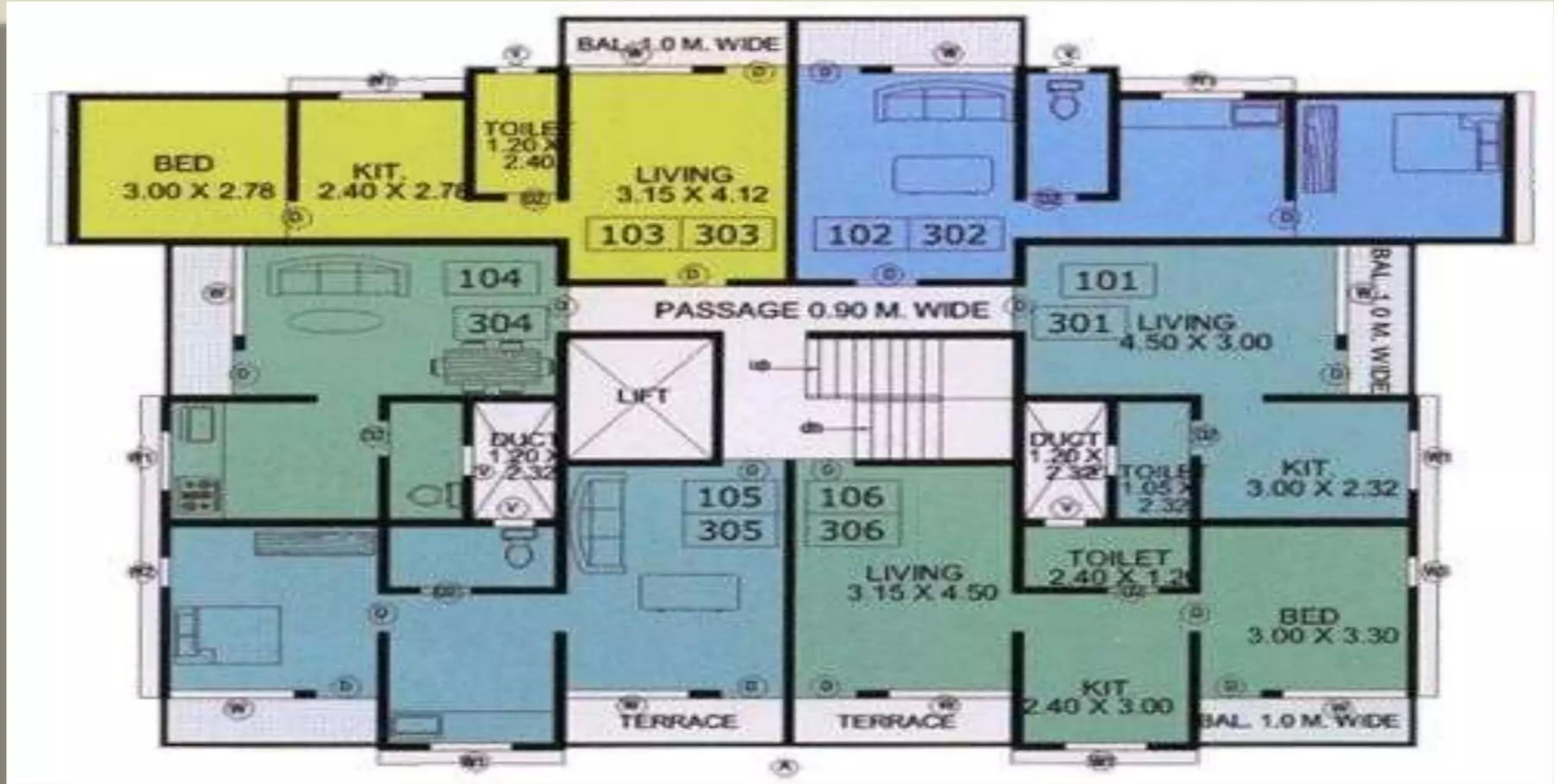
FIRST FLOOR PLAN
AREA =39.27 M2

TOTAL AREA =1300 SQ.FT

Dimensions may vary during construction - All Dimensions are in centimetres.

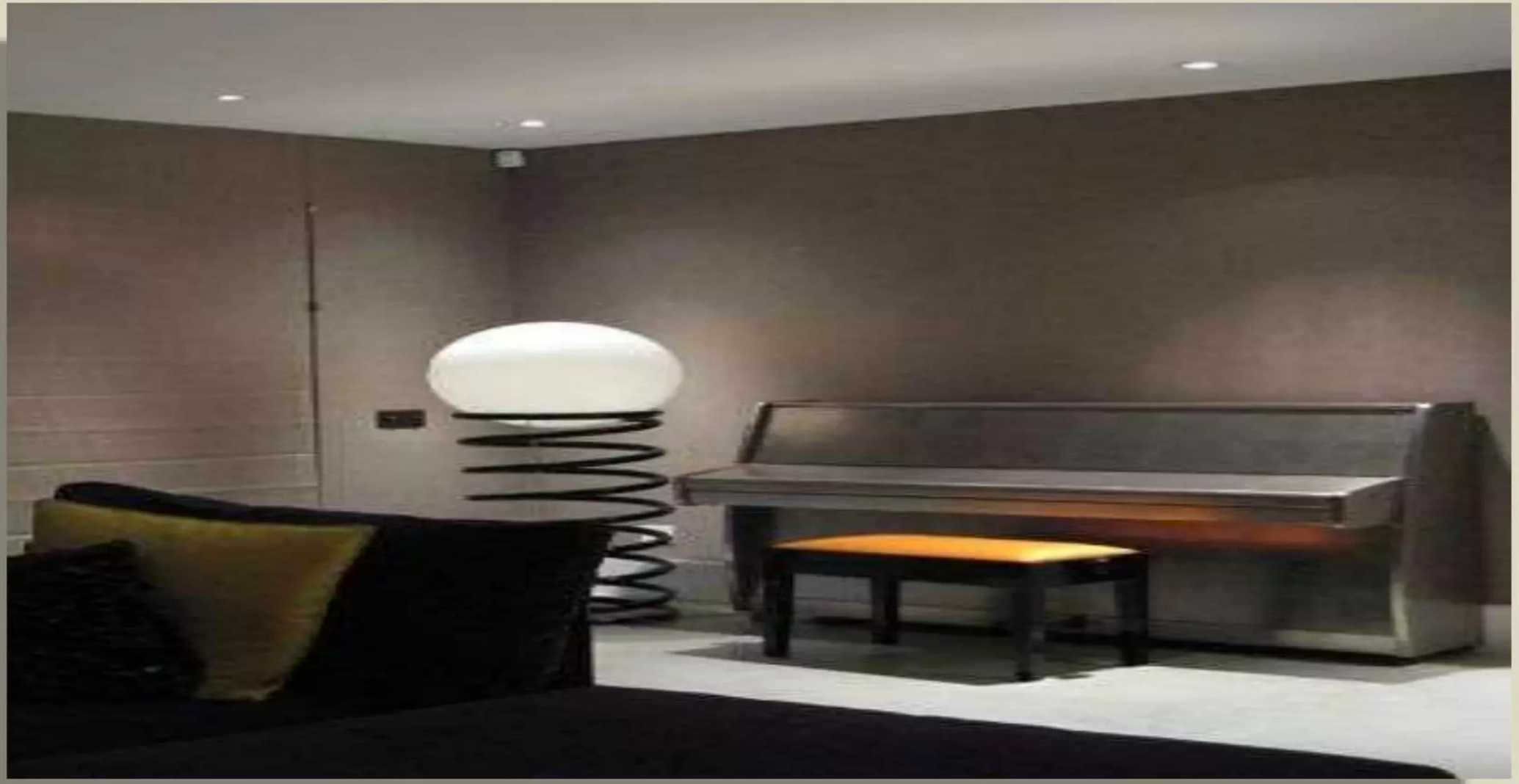
Circulation

- 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 .
- Circulation should nor affect the privacy of a room nor interfere with the utility space
- Circulation in a building is of two types
- **Horizontal circulation** and **vertical circulation**
- Circulation within a floor is called horizontal circulation
- And circulation between different floor is called vertical communication.


BAL. 1.0 M. WIDE
BED
3.00 X 2.78
KIT.
2.40 X 2.78
TOILET
1.20 X
2.40
LIVING
3.15 X 4.12
103
303
102
302
104
304
PASSAGE 0.90 M. WIDE
101
301
LIVING
4.50 X 3.00
BAL. 1.0 M. WIDE
LIFT
DUCT
1.20 X
2.32
105
305
106
306
DUCT
1.20 X
2.32
TOILET
1.05 X
2.32
KIT
3.00 X 2.32
LIVING
3.15 X 4.50
TOILET
2.40 X 1.2
BED
3.00 X 3.30
KIT
2.40 X 3.00
TERRACE
TERRACE
BAL. 1.0 M. WIDE

Lighting

- It can be natural light as that obtained from the sun during the day or artificial light. Adequate illumination is essential in day to day activities to execute the safety and comfort and efficiency
- Good visibility is a must for accident prevention, comfortable watching and reading to reduce fatigue, avert confusion, and efficient security.



Elegance

- **Elegance refers to the planning of elevation and layout of the plan to give an impressive appearance to the building.** The proper width, height, location of doors and windows, materials employed in construction of exterior walls etc create elegance. The result of elegance is aesthetics of building

Economy

- **Building planning should be carried out in the financial limit of the client.** An engineer should know in advance, the client intends to spend for the building and accordingly material of construction, finishing items, stage of construction should be suggested. By estimation proposed amount should be derived and as per that progress should be followed to avoid delay in work progress

Satisfied Owner

Sanitation

- **Provision for cleanliness, lighting and ventilation in sanitary units avoid growing of bacteria's, and spread of diseases and give hygienic condition.** In bath and w.c. glazed tiles and dado should be provided on wall to maintain clean condition. The ventilator in bath, w.c. permit sunlight and air collation to maintain hygienic condition.
  flooring material should be easy to clean, skirting's should be provided in rooms. Bath tubs, w.c., kitchen sink should be made of ceramic material to maintain clean easily.

Building By Laws

- During planning and construction of any building, certain regulations are laid by Municipal bodies, authorities, and other government departments as town planning so as to prevent haphazard development of city such rules and regulations are called as building bylaws.

Objectives of Building by laws

- Building bylaws allow disciplined and systematic growth of buildings and towns and prevent haphazard development
- Building bye-laws protect safety of public against fire, noise, health and structural failure.
- They provide proper utilization of space, hence maximum efficiency in planning
- They provide health, safety, and comfort to peoples living in the building.

Different By Laws

- **Building frontage:-** It is the margin to be left beyond the extreme edge of the road to the front of the building line.
- It depends upon Status of area, Nature of Road.
- Residential building requires minimum clearance. Public building requires more clearance.
- The purpose of this frontage is to facilitate
- Widening of road in future
- More sight distance at corners
- Minimum sound pollution

Frontage based on type of building

Type of residential Building	Plot size m2	Frontage
Detached Building	Above 250	12 m
Semidetached Building	125-250	8-12 m
Row type building	50 to 125	4.5 to 8 m

Open spaces

- **Open spaces are essential to satisfy the lighting and ventilation requirement.**
- Outer open space: They are additional margins to be left within the plot to isolate the building from road and neighboring buildings.
- Inner open space: They are open spaces within the building. They are needed in heavily congested area to
- Provide lighting to the interior rooms
- Create inner courtyard

Exterior Open Space

- Exterior open space maybe in front , rear or sides of the building.
- Front open space: Every building fronting a street shall have a front space.

Width of street	Front open space
Up to 7.5 m	1.5 m
7.5 to 18 m	3 m
7.5 to 18 m	4.5 m
Above 30 m	6.0 m

Rear Open Space

- Every residential building shall have a rear open space of 3 m and in no case it should be less than 1.8 m.
- **Side open space:** Detached building should have a minimum 3m side open space at both the sides, whereas semidetached building will have 3m on one side only.
- The open spaces mentioned are for residential building up to height 10 m

Minimum standard dimensions of building elements

- Area requirement
- The limitation of area is achieved by satisfying floor space ratio. FAR
- Floor space Ratio:
- FSR: $\frac{\text{Total area covered area of all floor}}{\text{Plot area}}$
- It ranges from 1 to 2

Height of Building

- The height of Building are related to FAR and provision of open space
- The maximum height of building should not exceed two times the (width of road + front open space)

Minimum Sizes Of Rooms

No	Name of Room	Minimum area	Minimum size of sides	Minimum Height
1	**HABITAT ROOM** **BED ROOM** **LIVING ROOM** **DRAWING ROOM** **DINING ROOM** **STUDY ROOM**	**9.5 m^2**	2.4 m	Should not be less than 2.75 m
2	**KITCHEN**	**5 m^2**	1.8 m	Should not be less than 2.75 m
3	**BATHROOM** **W.C**	**1.8 m^2**	1.2 m	Not less than 2 m
4	**STORE ROOM**	**3 m^2**		Not less than 2.2 m
5	**GARAGE**	**12.5 m^2**		Not less than 2.2 m
6	**STAIR CASE**		The minimum width of stair is 1.0 m	The minimum clear head room shall be 2.2 m

Sizes of Rooms

- **Drawing room**: Drawing room should be the very first room of a house as we enter
- The minimum area should be 15 to 20 sq m
- General sizes: 3.5m x 5.5 m
- 5m x 6 m
- 7 m x 9 m
- **Ventilation in Drawing rooms:** Minimum window area should never be less than 10 % of floor area but 20 % is preferred

- **Dining room**: It is a place where families take their breakfast, lunch, dinner.
- Size: 4 m x 3 m
- 4m x 5 m
- 5 m x 6 m
- **Kitchen:** A Kitchen is a place where food is prepared and stored for consumption
- Sizes: 1.5 m x 3m
- 3 m x 5 m
- 4 m x 6 m
- Ventilation in kitchen : window area should be at least 15 % of floor area

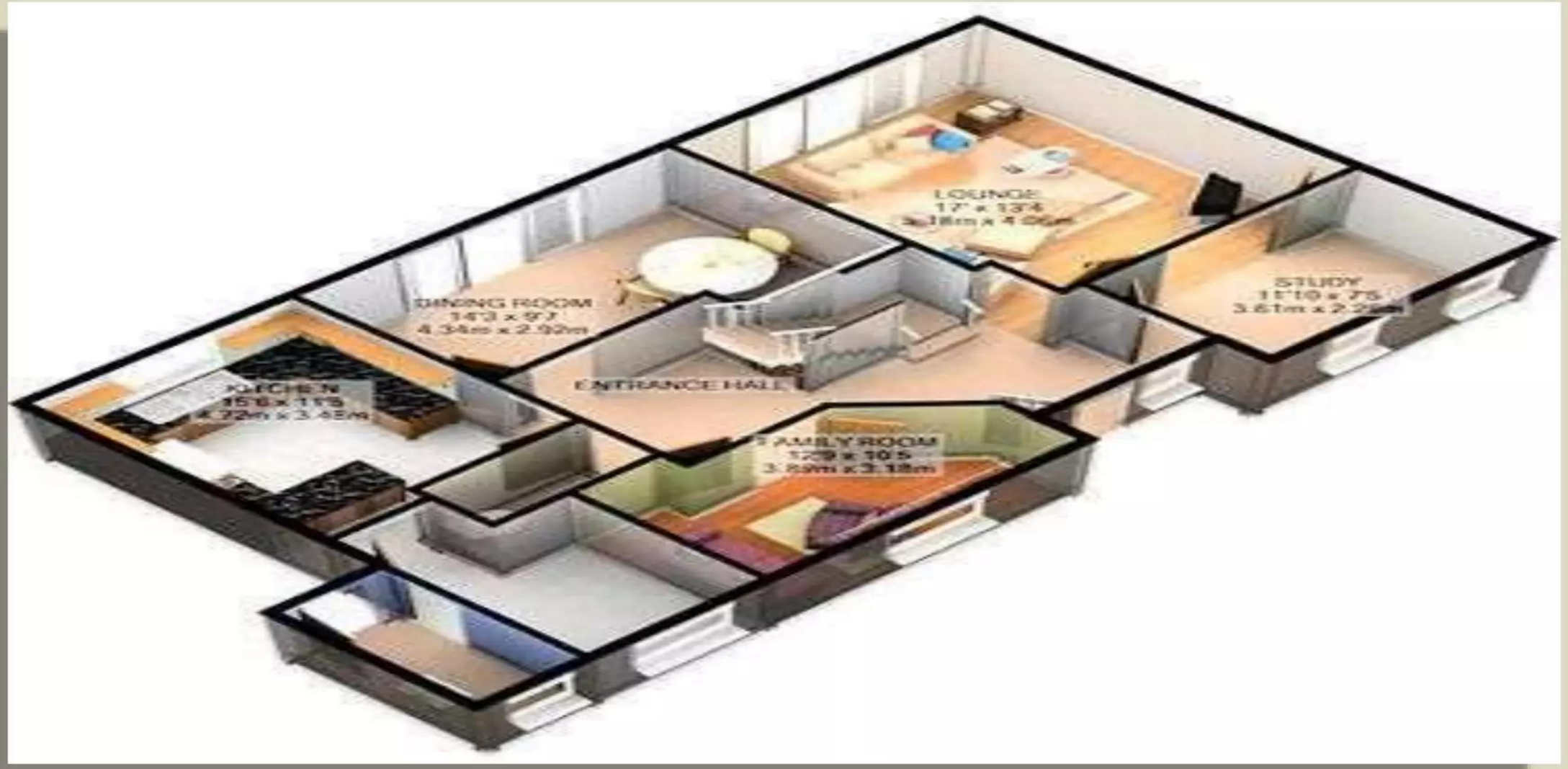
- **Bed room:** A man spends major part of the day in the bed room either sleeping or relaxing.
- A minimum floor area 0f 10 sq m should be provided
- Sizes: 4 m x 3 m
- 5 m x 4 m
- 3 m x 3m
- 4 m x 4 m
- **Ventilation :** Minimum window area of 10 % of floor area.

- **Bath and W.C.:** Bathroom is a place where inmates take bath and the waste water is collected and conveyed off
- Water Closet is the place of collection of human discharge
- A minimum floor area of 1.8 sq m
- Floor are of Bath and w.c should not be less than 2.8 m^2 with minimum width of 1.2 m
- W.C should have a minimum width of 0.9 m and minimum length of 1.2 m
- A minimum floor area of 1.1 sq m is to be provided for w.c

- Ventilator of 500 mm x 300 mm is to be provided at a height of 1.8 from floor area.
- Sizes: 1.5m x 2 m
- 2m x 3 m
- 3m x 4m

- **Store Room**: It is to store Items like food grains cylinders, utensils etc.
- Floor area 15 sq m to 20 sq m
- **Verandah:** It is area open on 1 side, 2 sides or 3 sides.
- Minimum width 1.5 m not greater than 4m
- Minimum Height of verandah 2.1 m

- **Pooja Room:** Many people perform pooja in houses. It is Quite calm space to perform pooja.
- It should be located in N-E corner of the building
- Sizes : 2.1 m x 2.1 m
- Roughly 4 m^2 in area
- **Study Room:** It is place where study material are stocked and read
- Area of study room should be 10 m^2 to 12 m^2


LOUNGE
17' x 13'4
DINING ROOM
14'3 x 9'7
4.34m x 2.92m
KITCHEN
15'8 x 11'5
ENTRANCE HALL
STUDY
11'10 x 7'5
3.61m x 2.26m
FAMILY ROOM
12'9 x 10'5
3.89m x 3.18m


DINING
KITCHEN
FAMILY
MASTER BEDROOM
MASTER BATHROOM
W.I.R.
LAUNDRY
BATH 2
LINEN
LIVING
LINEN
ENTRY
BEDROOM 2
BEDROOM 3
PORCH

Building Components III

Week 5-6

Page 146-166

INTRODUCTION

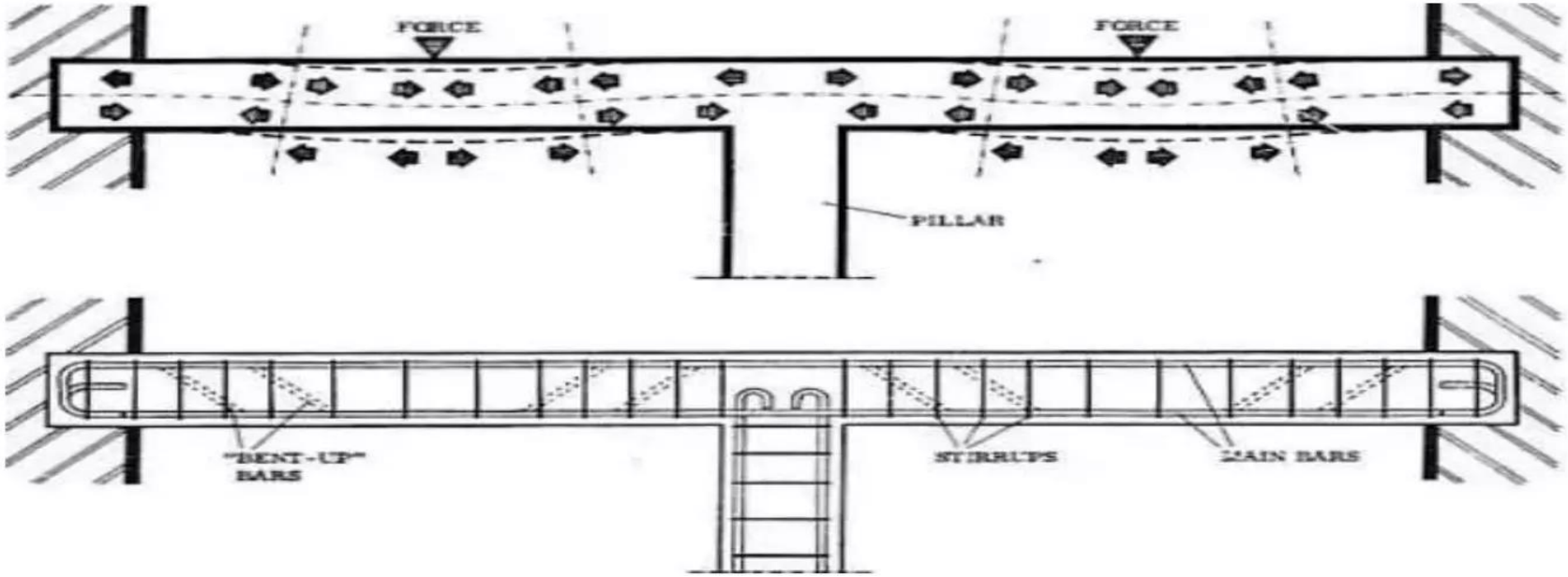
- **What is meant by a beam in Engineering?**
- A beam is a structural element which is capable of withstanding transverse loads. Simply a beam transfers its applied loads to the supports
- **What is meant by a support?**
- A support is an element which bears the weight of a beam and keeps it upright. Simply we can say that it is a thing which keeps beam in Equilibrium.
- **What is meant by a load?**
- A load in this concept refers to the forces acting on Structures. This is the reason these can be also called as structural loads.

Types of supports

- Basing on the concept how they are supporting the beam they are classified into 4 types
- 1. Fixed Support
- 2. Simple Support
- 3. Roller Support
- 4. Hinged Support

FIXED SUPPORT

- This support keeps the end of the beam fixed, i.e. The beam end resists to take any kind of translation or bending moment.
- In the below figures we are going to see how this support will be.



FIXED SUPPORT

ROLLER SUPPORT

- A Roller support gives capability of movement to the respected beam connected to it may be along normal to the guides or it can also rotate about the support as we can see in below figures.

HINGED SUPPORT

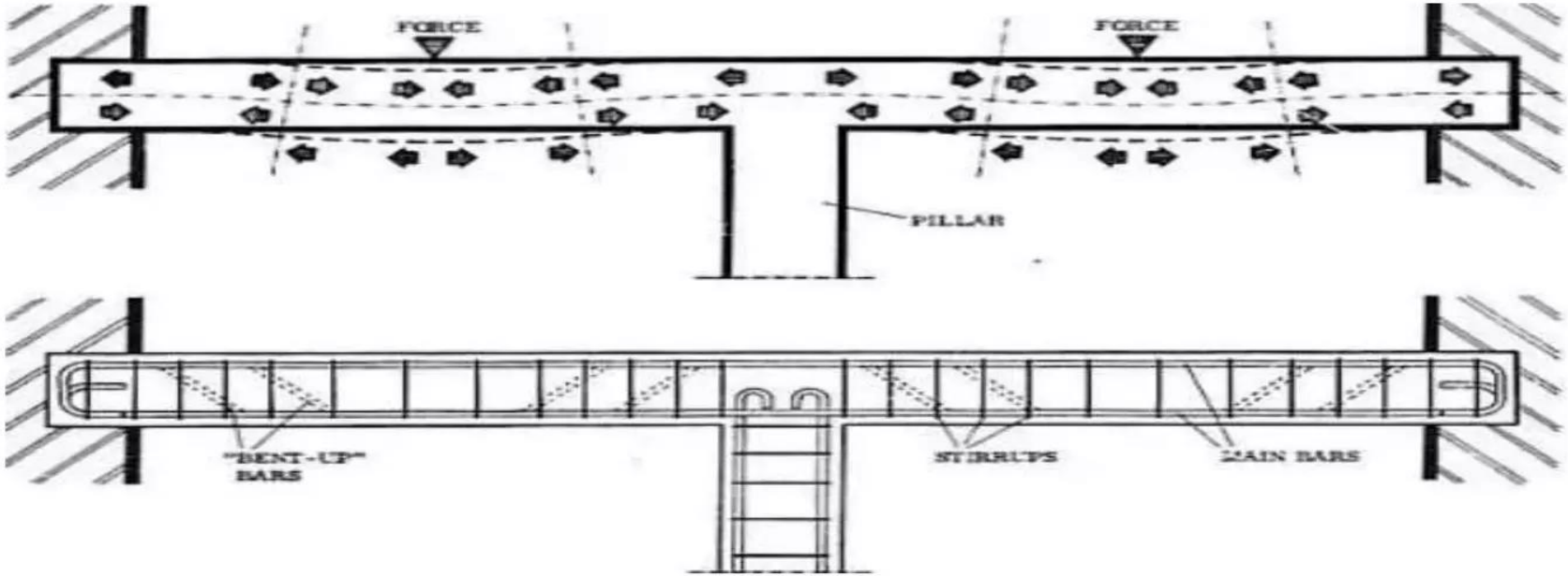
- A Hinged support restricts the movement of the beam in any directions but it will allow the beam to rotate about the support just like a door which is a best example of hinged support.

TYPES OF BEAMS

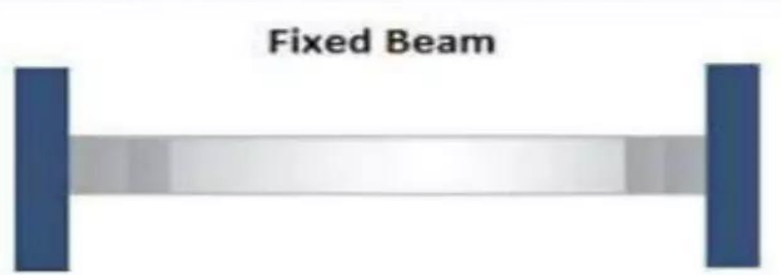
- Basing on the concept how they are supported they are classified into floowing types
- 1. Fixed Beam
- 2. Cantilever Beams
- 3. Simply Supported Beams
- 5. Over Hanging Beams
- 6. Continuous Beams

1. FIXED BEAM

- A Beam which is having fixed supports on both of its ends, it is named as fixed beams and we can see some animated and real examples of these kind of beams and how they are restricting the movement of the beam



1.FIXED BEAM

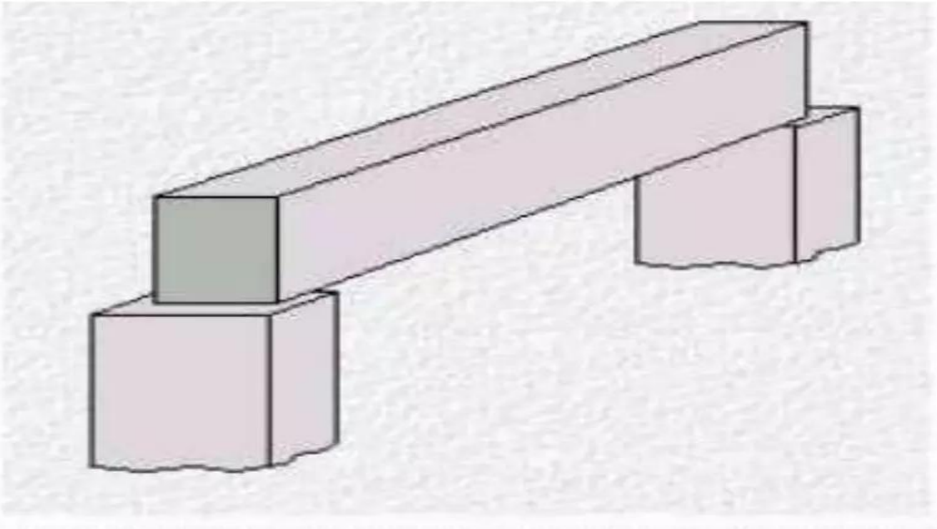


2. CANTILEVER BEAM

- A Beam which having a fixed support on one end and other end is set free, it is known as cantilever beam as we can see some best examples of cantilever beam below

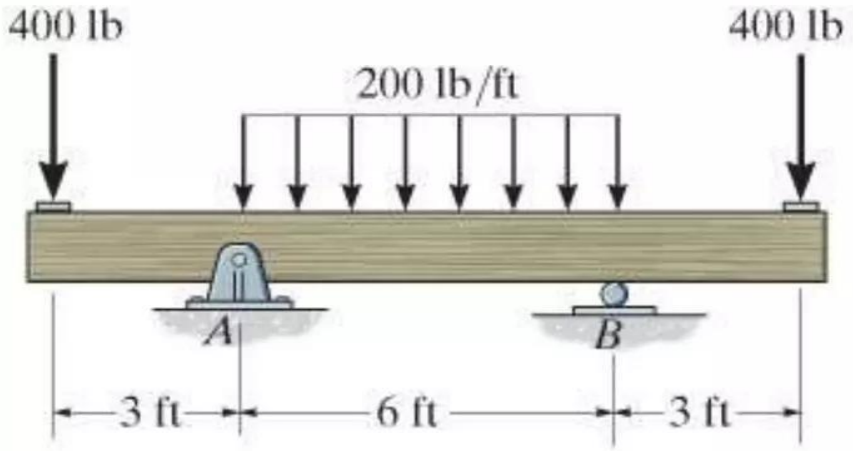
SIMPLE SUPPORTED BEAM

- A Beam with simple supports exactly at two ends of the beam then it is called as simply supported beam.
- In the real world people wont tend to design anything with simple supports, but one of the ancient monument was built up by this concept



OVER HANGING BEAMS

- These beams will also have supports but one end or both ends of the beam will be having some extension after the supports as we can see in below figure.



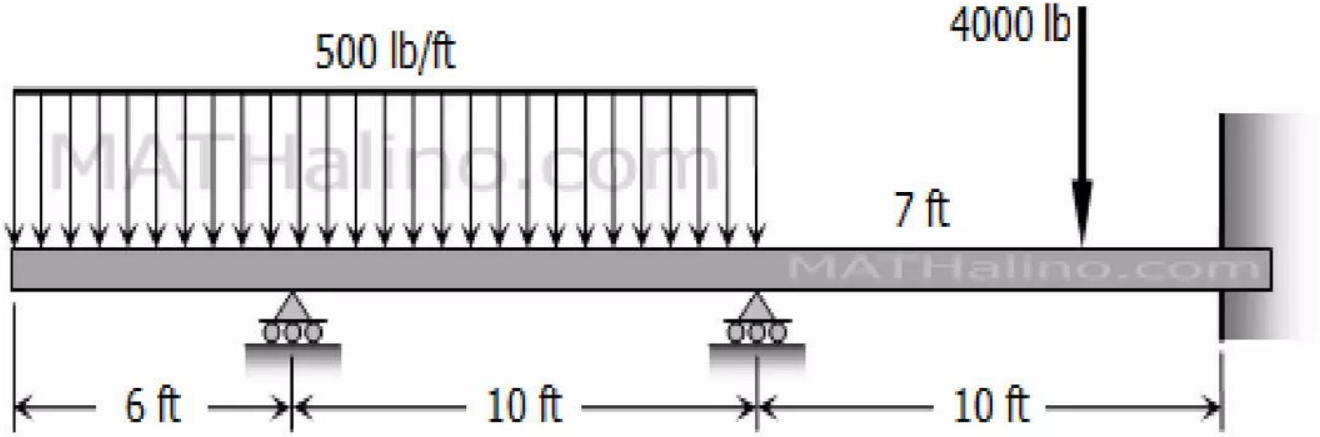


Figure P-845

CONTINUOUS BEAMS

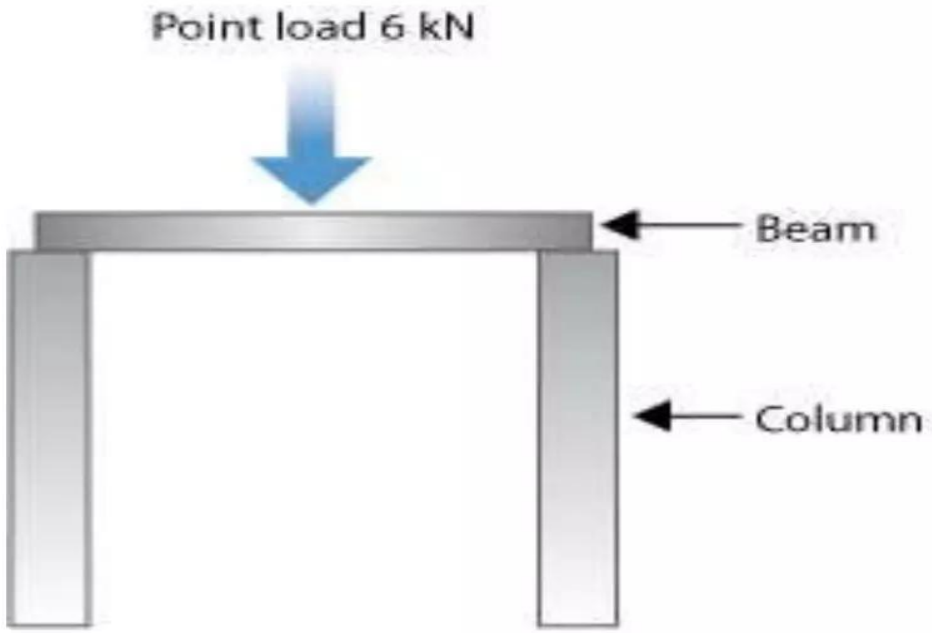
- It is a beam which carries more than two supports and some of the examples of continuous beams are bridges which are shown below

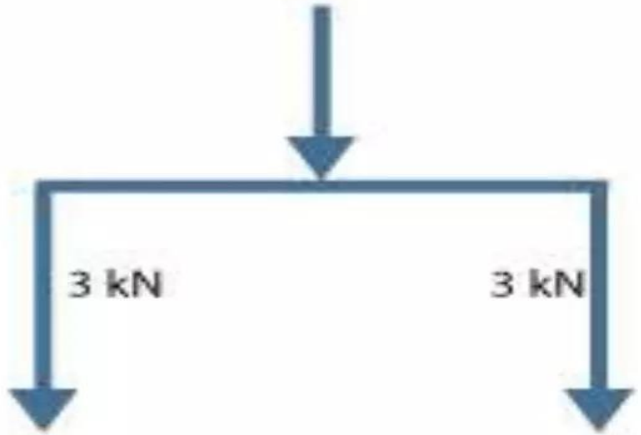
TYPES OF LOADS

- Basing on the action of the forces the loads are classified into 3 types
- 1. Point Load (or) Concentrated Load
- 2. Uniformly Distributed Load
- 3. Uniformly Varying Load

POINT LOAD (OR) CONCENTRATED LOAD

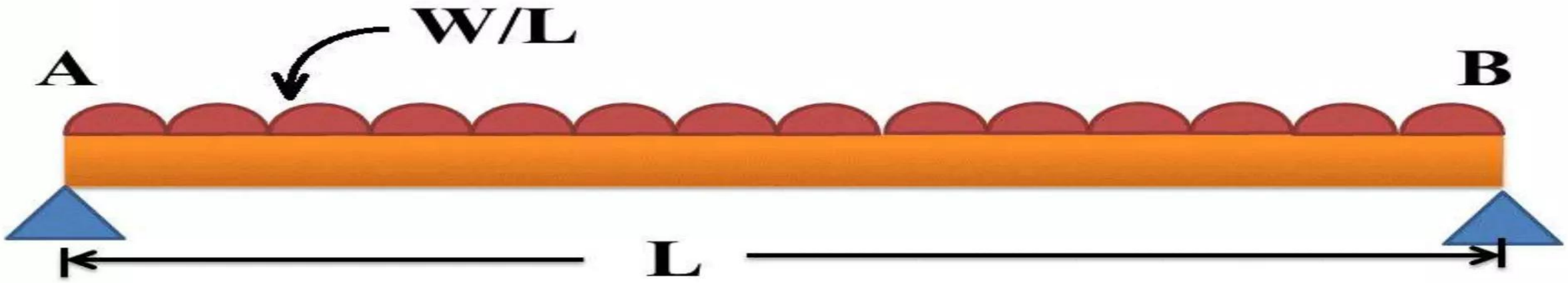
- When a load acts concentrated at a definite point then it is named as a concentrated load or point load. We can see some best examples of point load in the below figures





UNIFORMLY DISTRIBUTED LOAD

- A distributed load is a load which is spread on some length of a beam, i.e. The reason it is measured in intensity with units Newton/meter. If the intensity is constant along the length then it is named as uniformly distributed load.



Uniformly Distributed Load(UDL)

UNIFORMLY VARYING LOAD

- Whenever the load distributed along the length of the beam varies in intensity uniformly, according to some law. Then it is named as uniformly varying load and we can see some conventional figures below which are representing uniformly varying loads

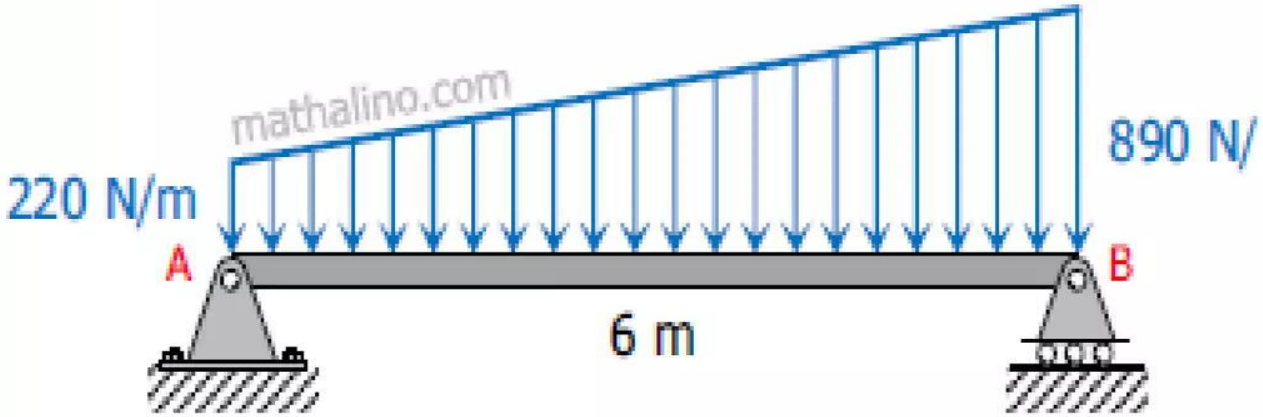
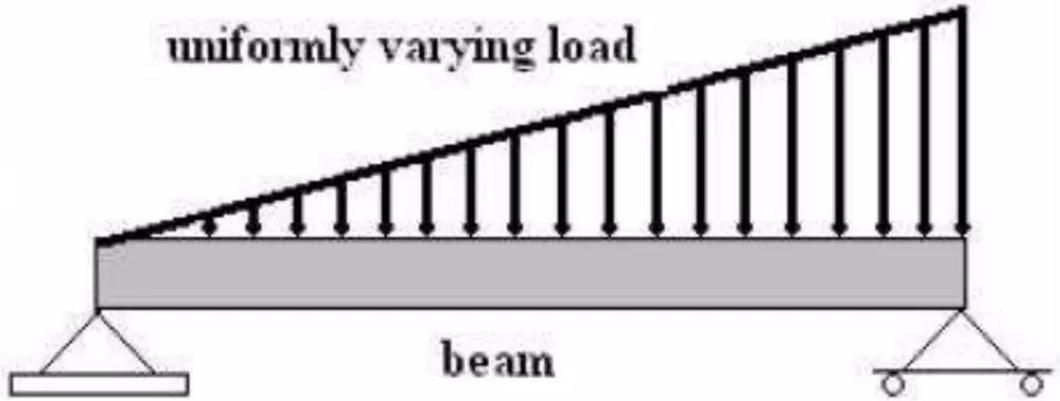


Figure P-238



Stiffness

STIFFNESS

- Stiffness is the extent to which a body resist deformation in response to an applied force.
- The complementary concept is **flexibility** or pliability: the more flexible an object is, the less stiff it is

- The stiffness, *k*, of a body is a measure of the resistance offered by an elastic body to deformation.
- For an elastic body with a single degree of freedom (DOF) (for example, stretching or compression of a rod), the stiffness is defined as,
- K = F/displacement (S)
- where,
- *F* is the force on the body.
- S is the displacement produced by the force along the same degree of freedom (for instance, the change in length of a stretched spring).

- In the International System of Units, stiffness is typically measured in newtons per meter.
- In Imperial units, stiffness is typically measured in pounds (lbs) per inch.

- The inverse of Stiffness is **flexibility** or compliance , typically measured in units meters per Newton.

Reference/Courtesy: Quaid-e-Awam University of Engineering, Sciences & Technology, Eng. Mir Zafarulla zamali

Building Components IV

Week 7-8

Page 168-206

Types of building as per NBC (National Building Code)

1. Residential buildings
2. Educational buildings
3. Assembly buildings
4. Institutional buildings
5. Mercantile buildings
6. Business buildings
7. Storage buildings
8. Industrial buildings
9. Hazardous buildings

1. Residential buildings-

- These are the buildings in which sleeping accommodation is provided for normal residential purposes with or without cooking or dining or both facilities.

Residential building

1. Residential buildings-

- It includes,

i. Private dwelling houses
ii. Apartment houses (flats)
iii. Bungalows
iv. School and college dormitories
v. Hostels
vi. Hotels
vii. Military barracks, etc

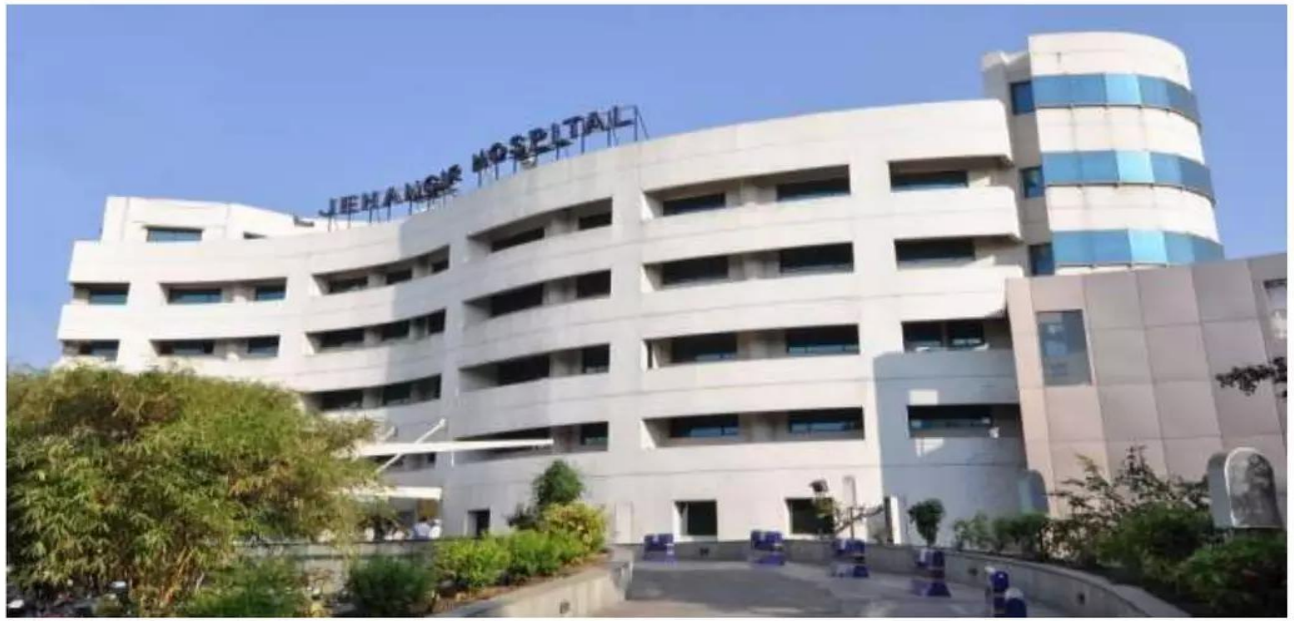
2. Educational buildings-

- These hall include any building used for school, college or assembly for instruction, education or recreation.

school

3. Institutional Buildings-

- This group include any building or its part which is used for the purposes such as medical, health, recovering health after illness, physical or mental diseases etc.



Hospital

3. Institutional Buildings-

- It includes -

i. Hospitals
ii. Nursing homes
iii. Sanatoria
iv. Mental Hospitals
v. Jails, Prisons
vi. Orphanages, etc.

4. Assembly Buildings:

- These shall include any building or part thereof where a group of people gather for recreation, amusement, social, religious, political, civil, travel and similar purposes.

Dance Hall

Assembly Buildings

4. Assembly Buildings:

- For example,

i. Theatres
ii. Cinema halls
iii. Assembly halls
iv. Exhibition halls
v. Auditoriums
vi. Gymnasiums
vii. Marriage halls
viii. Museums
ix. Places of worship Club rooms
x. Dance halls
xi. Railway stations
xii. Bus stations
xiii. Airports etc.

5. Business Buildings:

- These shall include any building or part of a building which is used for transaction of business, for the keeping of accounts and records for similar purposes.

town hall

5. Business Buildings:

- For example,

i. Court houses
ii. City halls
iii. Town halls
iv. Libraries
v. Offices
vi. Banks, etc.

6. Mercantile Buildings :

- These shall include any building or a part of a building which is used as shops, stores, market, for display and sale of merchandise, either wholesale or retail.

Shop

7.Industrial Buildings:

- These shall include any building or part of a building or structure in which products or materials of all kinds and properties are fabricated, assembled or processed.

Industrial Building

7.Industrial Buildings:

For example,

- Assembly plants
- Power plants
- Refineries Mills
- Gas plants
- Industries, etc.
- Dairies

8. Storage Buildings:

- These shall include any building or part of a building primarily used for the storage or sheltering of goods, wares or merchandise.

Ware house

8. Storage Buildings:

For example,

- Warehouses
- Transit sheds
- Freight depots
- Garages
- Hangers
- Grain elevators
- Stables etc.

9. Hazardous Buildings:

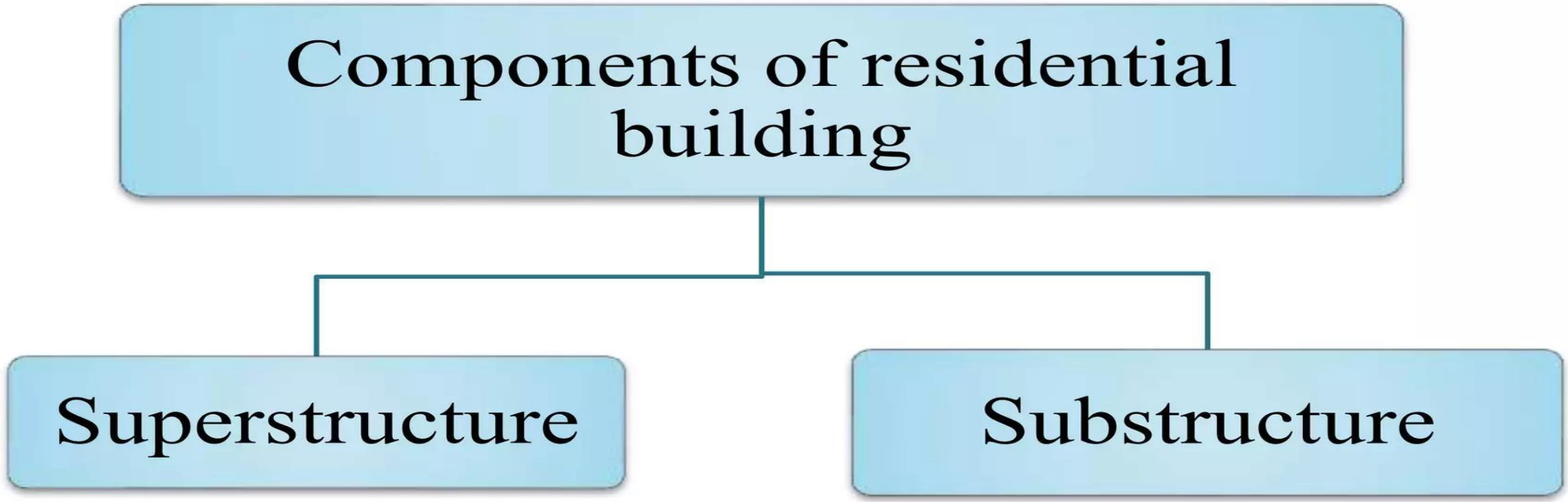
- These shall include any building or part of a building which is used for the storage, handling, manufacture or processing of highly combustible explosive materials or products which are liable to burn with extreme rapidity or which may produce poisonous fumes or explosions.

Hazardous Buildings

9. Hazardous Buildings:

- These shall also include buildings used for storage, handling, manufacturing or processing of highly corrosive, toxic or noxious alkalies, acids or other liquids or chemicals producing flame, fumes and explosive etc.

Components of residential building:



Substructure & superstructure:

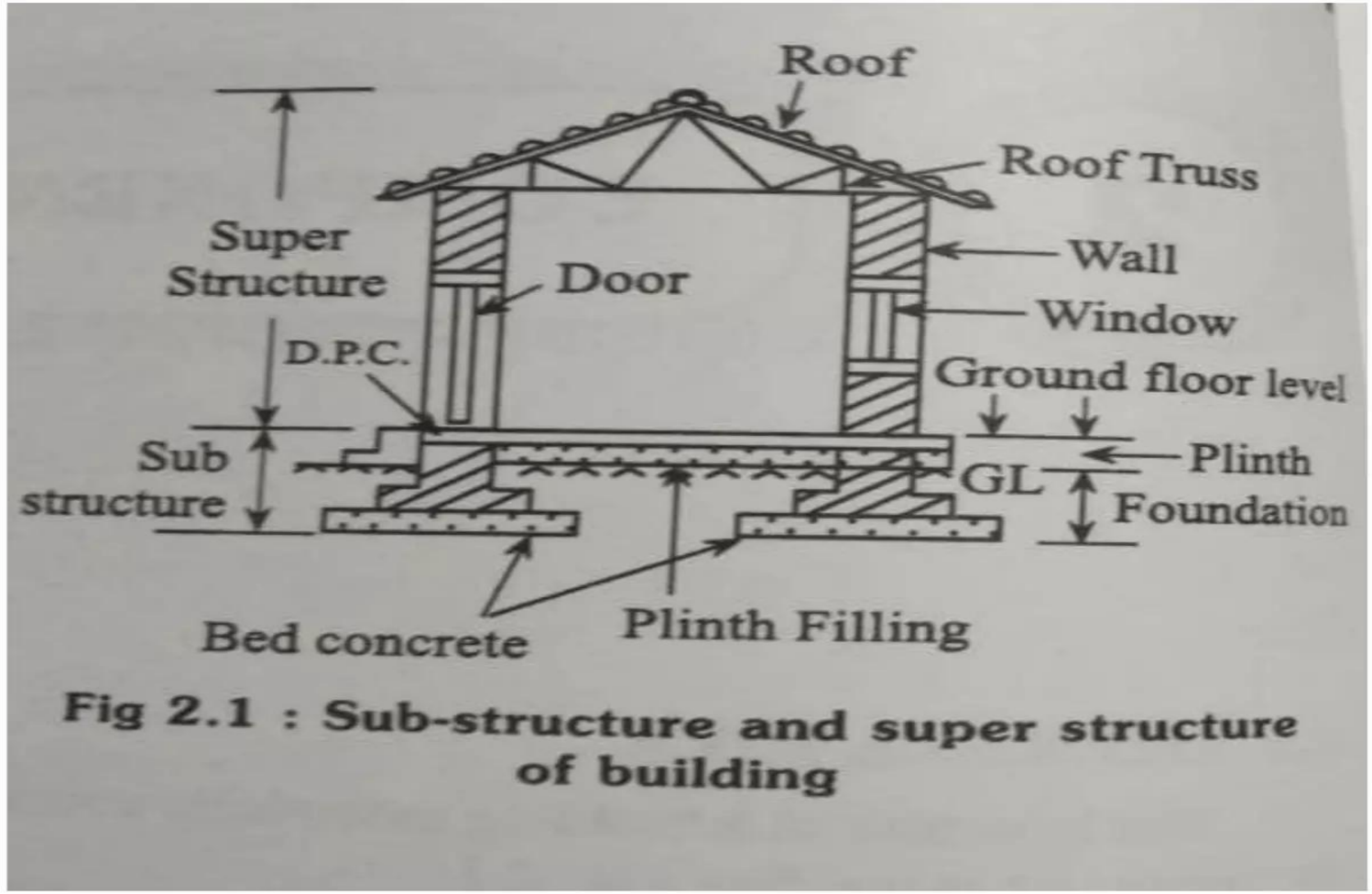


Fig 2.1 : Sub-structure and super structure of building

Sub Structure Of Building-

- It is that part of the structure which is below the ground level i.e. foundation.
- It also includes the portion below the ground level since the height between the ground floor level and the ground level is negligibly small as compared to the height of the building.
- **Sub structural Components of building-**

1.Foundation

2.plinth

3.DPC (Damp Proof Course)

1. Foundation-

- It is the lowermost part of the building below the ground level and it forms the base of the building.

P.C.C bed provided below foundation
^

Foundation

Foundation and plinth beam

❑ Functions of foundation:

(a) To transfer the load of the super structure to soil.

(b) To sustain the load of the building without yielding.

(c) To provide a level surface for concreting and masonry work.

(d) To provide stability and strength to the building.

- **Materials:**

➢ Plain concrete, Reinforced Cement Concrete (R.C.C.), Stones are used.

2. Plinth:

- It is the portion of the sub-structure between the level of the surrounding ground and the level of ground floor.

- Minimum height of plinth

I. 45 cm above the ground level

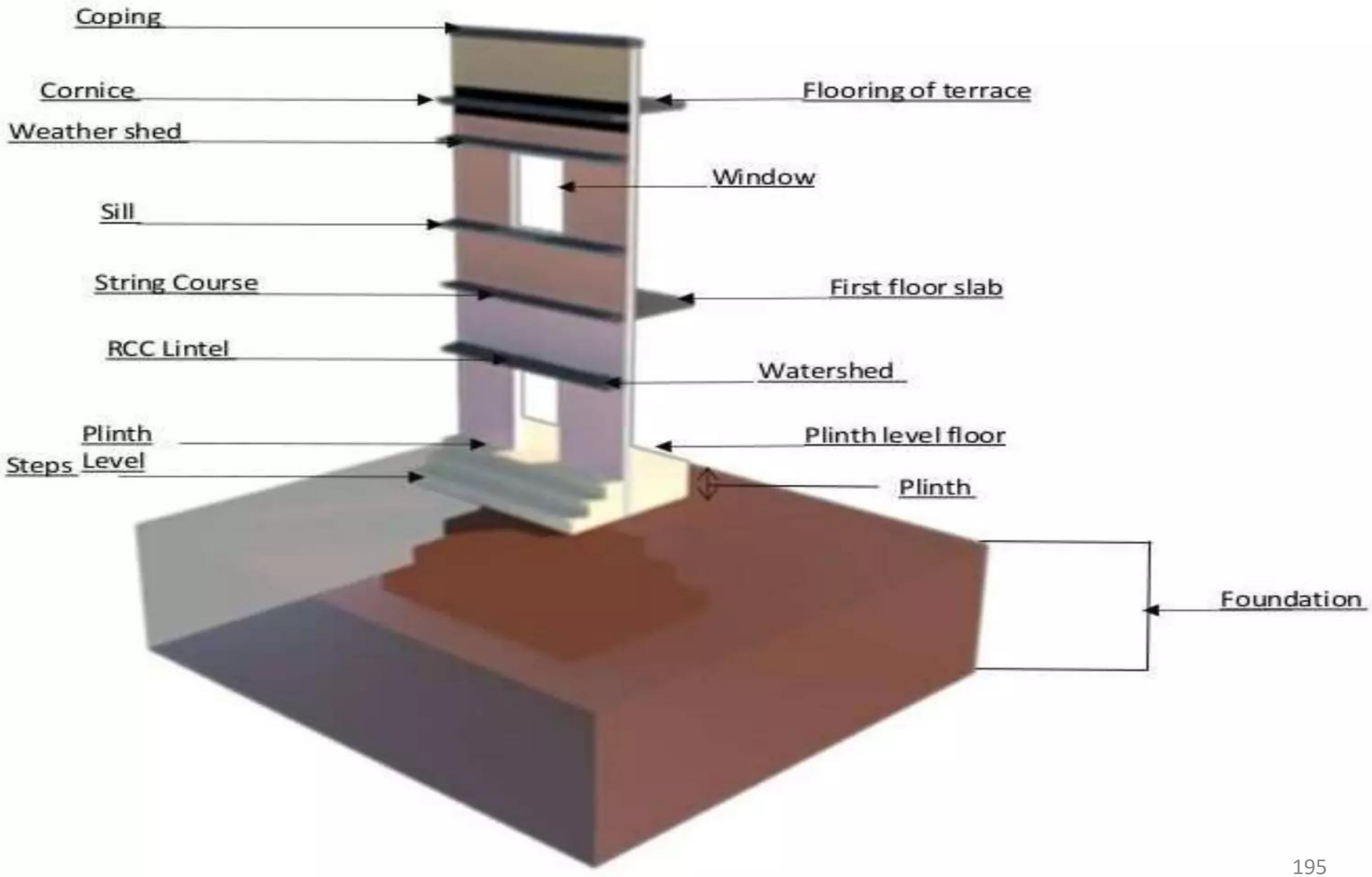
II. highest flood level of the surrounding area

(which ever is greater among both of above.)

- Its thickness depends upon the weight of super structure and the width of foundation concrete.

Plinth height

Outside part of building ⟷ **Inside part of Building**



❑ Functions of plinth:

(a)To support the super structure and provide stability and strength.

(b) To transfer the load from the building to the foundation layer.

(c) To retain the plinth filling.

(e) To provide safety against rats, rodents, flood on roads, etc.

(f) To give aesthetic aspect to the elevation of the building.

- **Materials:**

➢ Stones, bricks are used.

3. Damp Proof Course (D.P.C.):

- It is the layer provided in between the sub-structure and super-structure

D.P.C. layer

❑ Functions of D.P.C:

- It prevents the entry of moisture into the foundation below and super-structure above and vice-versa.

- **Materials:**
- Stone slabs of impervious variety, plain cement concrete are used for damp proof courses.

Superstructure of building:

- It is that part of the structure which is above the ground level or ground floor level.
- The principal parts of the super-structure which carry the structural loads are (i) Masonry walls, (ii) Pillars or columns, (iii) Beams, (iv) Lintels, (v) Arches, (vi) Floor slabs and (vii) Roofs etc.
- The other parts of the super-structure which do not carry any structural loads are (i) Curtain or partition walls, (ii) Doors, (iii) Windows and (iv) Parapet wall etc.

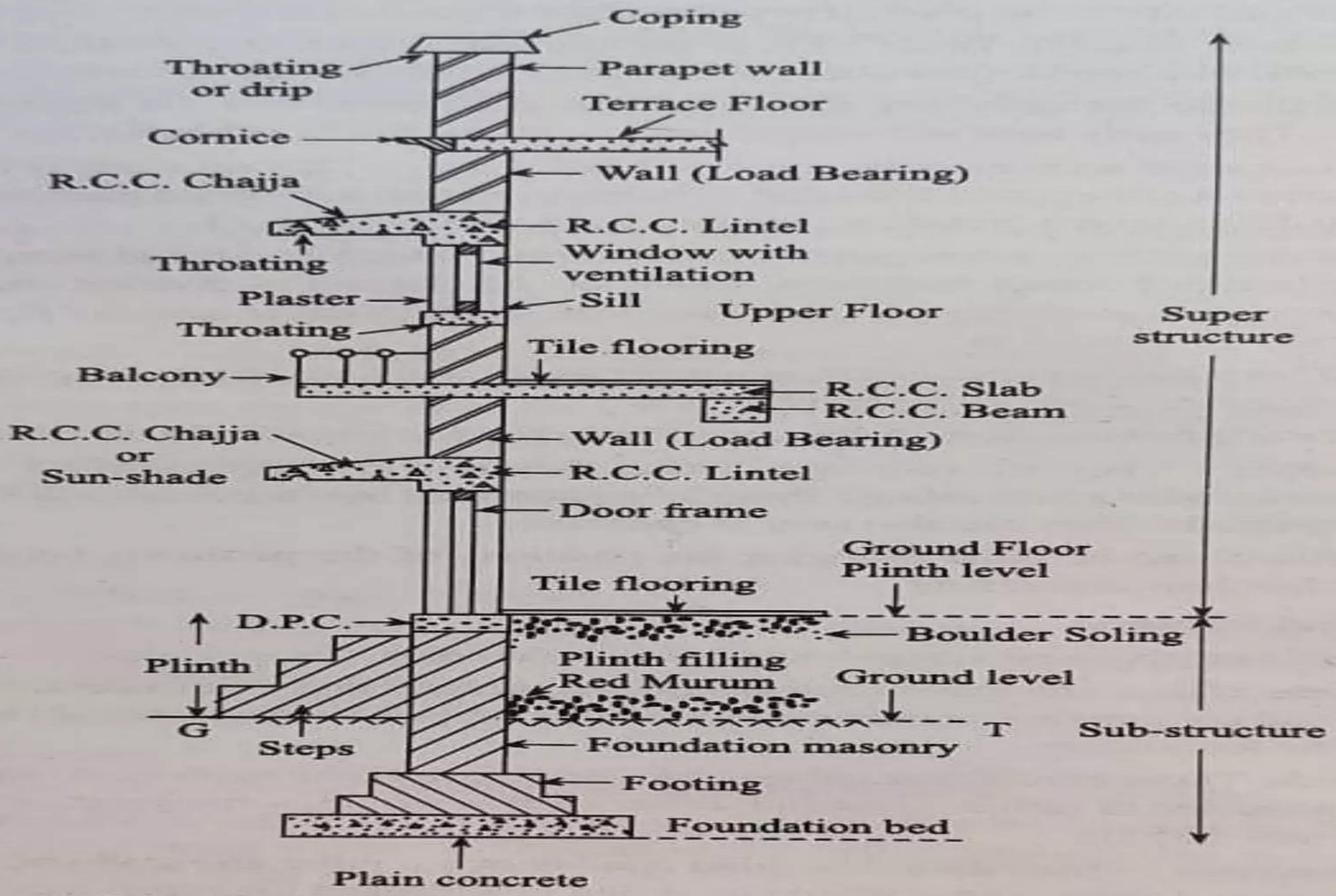


Fig. 2.2 : Typical Section Showing Various Building Elements.

Components of superstructure-

1)Wall-

There are two types of walls-

I. Load bearing walls

II. Non- load bearing walls

Fig. wall

I. **Load bearing walls-**

- These are built in brick and stone masonry which carry the structural loads and transfer them from floor to foundation.
- These are commonly used for single or double storeyed buildings.

- **Functions:**

(i)To enclose or divide the space to make it functional and useful.

(ii) To transfer the load of floors to foundation.

(iii) To provide privacy, security and protection against weathering conditions.

Requirements:

- These walls should be strong enough to bear the self-load, superimposed loads etc.
- They should be stable against wind, sliding and over-turning, vibrations etc.
- They should be fire-proof and weather resistant.
- They should be plumb.
- They should not bulge under the load and should not crack.
- They should have good appearance

II. Non-load Bearing Walls:

- These are the thin curtain and partition walls built in various materials like, wood, plywood, glass, metals, bricks, hollow concrete blocks etc.
- These walls do not carry any structural load and hence, they are known as non-load bearing walls.
- They carry their self weight and rest on the floors or beams.
- Two types of non load bearing walls depending on their functions are-

i. Curtain wall

ii. Partition wall

i. **Curtain walls -**

- act as external non-load bearing walls.
- They should only be sufficiently thick to withstand weather conditions and have required heat and sound insulation.
- These are also known as filler, screen, panel, or cladding walls.

ii. **Partition walls -**

- act as internal non-load bearing walls.
- They should be only sufficiently thick to have heat and sound insulation.
- These are also known as division walls since they divide the floor area into different rooms.
- They may be taken either upto full floor height like the curtain walls or upto 2.5 m.

2. Pillar & column –

columns

Pillars

2. Pillar & column-

- These are the structural vertical members of a building.

- **Functions-**

- These are constructed at suitable intervals to provide lateral stability to the wall.
- Pillars and columns are constructed to provide support to the beams, slabs and transfer the loads to the foundation.

- **Materials-**

- These are constructed in bricks, stones, steel and reinforced cement concrete.
- These are constructed in various sizes and shapes such as square, rectangular, circular, etc.

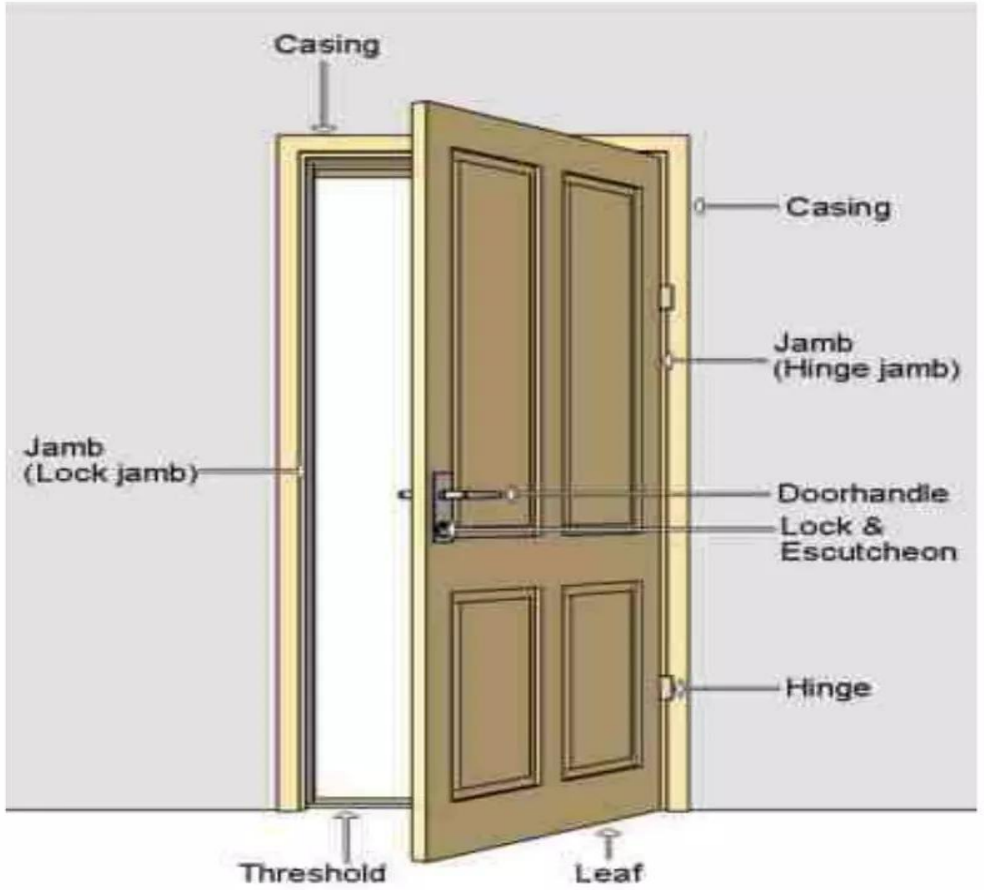
Building Components V

Week 9-10

Page 208-259

3.Doors-

Fig.- sliding door



3.Doors-

- These are the movable panels constructed in the openings through a wall

- **Functions:**
- They provide horizontal circulation or movement of the inmates from one room to another of the building.
- They provide good ventilation, privacy and protection to the inmates. Hence they should be located properly.

- **Materials**:
- They are made up of wood, ply-wood, plastic, metal and glass.

Doors-

- **Requirements:**

➢ They should be strong enough to provide protection and security.

➢ They should be of good quality. Minimum size should be 90 cm. wide and 200 cm. high.

- **Types :**

According to the type of shutters, these are termed as Panelled doors, Flush doors and Glazed doors. There are also rolling shutters, collapsible doors, swinging doors, revolving doors and folding doors

Types of Doors -

1. panelled doors-

Fig.- double panel door

Fig.- single panel door

2. Flush doors-

- Flush doors are simple door designs that have plain facings on both sides.

Fig,- flush door

3. Glazed Doors-

- A glazed door consists of glass panels made in different sizes and shapes, to fit the door.

4.Rolling shutters-

5. Swinging doors-

6. Collapsible doors-

- The collapsible door is one which can be opened or closed by slight pull or push.

7. Revolving doors-

- A revolving door generally consists of door wings that hang on a central shaft and rotate around a vertical axis within a cylindrical enclosure.

8.Folding doors-

- A folding door comprises a number of panels which the user can fold or unfold to open or close the door.
- The door is also dubbed 'bi-fold door'

4. windows-

- These are the openings built in the walls.

- **Functions:**
- They provide light, air, cross ventilation etc.
- They also provide privacy and security.
- They should be built considering the direction of wind, exterior view i.e. aspect, prospect etc.

- **Materials:**
- They are made up of wood, ply-wood, plastic, steel and glass.

- **Requirements:**

- They should be of good quality and provide privacy and security.
- Steel grill work can be provided to the windows to protect the house from theft etc.
- Their size, shape and number depend upon the size of room, out side view and weathering conditions.
- From point of view of light, ventilation, the minimum area of the windows should not be less than one-seventh of the floor area.

- **Types:**
  - According to the type and shutters, these are termed as Panelled windows, Glazed windows etc.

Panelled Window

Glazed Window

5. Window sill-

- These are provided below the windows.

- **Functions:**
- They provide a uniform surface and support to the window and also protect the top of the wall from wear and tear.
- These are usually weathered and throated to throw the rain water off the surface of the wall.

- **Materials:**
- Materials used are stone-slabs and cement concrete.

5. Window sill-

Window sill

6. Lintels and Arches-

- These are provided over the openings of doors and windows.
- **Functions:**
- Lintels support the load of the wall above the opening since the frame of the door or window is not strong to bear it.
- The load of the wall is distributed to the area coming in the zone of 45° or 60°.
- Arches can also be provided which take load by arch action, unlike the lintels or beams.

- **Materials:**

- **Lintels** are constructed with sound timber and R. C. C.
- The R.C.C. lintels are preferred because they are structurally stable and simple to construct.

- **Arches** are constructed with bricks and wedged shaped stones, the joints being filled with mortar.
- They are also constructed in reinforced cement concrete.

Lintels-

Fig.- steel lintel

Fig.- concrete lintel

Arches-

7. Weather shades, chajjas and Sun-breakers-

Fig.- chajja

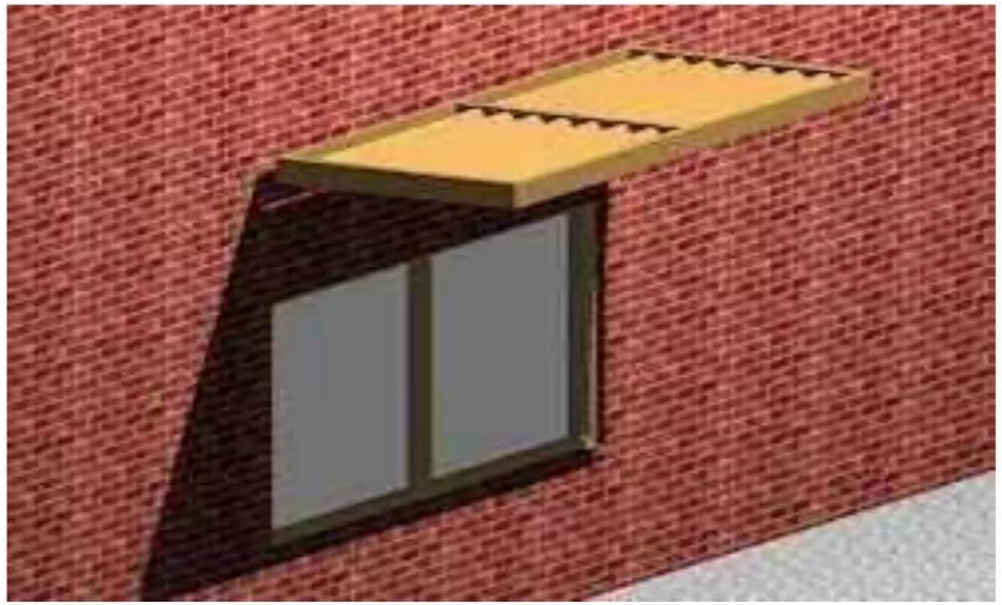


Fig.- Sun breakers

Fig.- weathering shades

7. Weather shades, chajjas and Sun-breakers-

- These are the projections over doors and windows.

- **Functions:**
- They provide protection against sun, rain, frost etc.

- **Materials:**
- R.C.C. is widely used.

8. Floors-

Fig.- Floors

8. Floors-

- Floors are the parts of the building over which the occupants live, move and keep their materials.
- The floors constructed under-ground are called basements.
- The floor immediately above the ground is called the ground floor and other floors above this floor are called first floor, second floor, third floor etc.

- **Functions:**
- They divide the building at different levels one above the other and create roominess or more accommodation in a limited space.

- **Types and Materials:**

➢ These are classified according to the materials used for construction, such as Murum floor, Shahabad floor, Glazed tiled floor, and Mosaic tiled floor etc.

➢ Murum floors and Shahabad floors are usually used in rural areas whereas Mosaic tiled floor is used in urban areas.

- **Requirements**:

(a) Durable with good appearance,

(b) Easy to clean and repair.

(c) Smooth but not slippery.

(d) Wear and fire resistant.

(e) Low cost of construction and maintenance.

Types of floors-

- Murum floor

- Shahabad floor

- Glazed tiled floor-

- Mosaic tiled floor

9. Ceiling-

- It is the lower part of upper floors.

- **Functions:**
- They are used as insulators against sound and vibrations of upper floors.
- They are provided to look more pleasing and beautiful.

- **Type:**
- False ceiling made of plaster of Paris, plastics etc.

9. Ceiling-

Fig.- false ceiling

10. Beams-

- Beams are structural horizontal members of a building.

- **Functions:**
- These are constructed to support the floors and transfer their loads to the columns.
- They give lateral rigidity to framed structures.

- **Materials:**
- Materials used are timber, steel and R.C.C.

- **Types:**
- Beams may be simply supported, fixed or cantilever type.

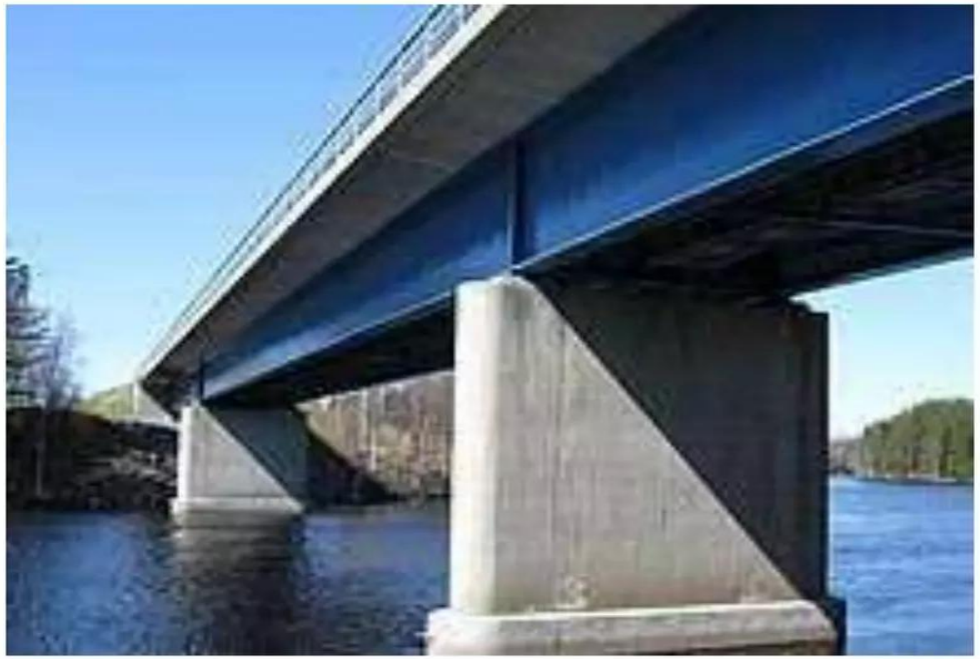


Fig.- simply supported beam

Fig.- cantilever beam

Fig.- fixed beam

11. Slabs-

- These are the horizontal surfaces supported on beams and columns.
- **Functions:**

(a) It provides space for the occupants to live, move and keep their materials.

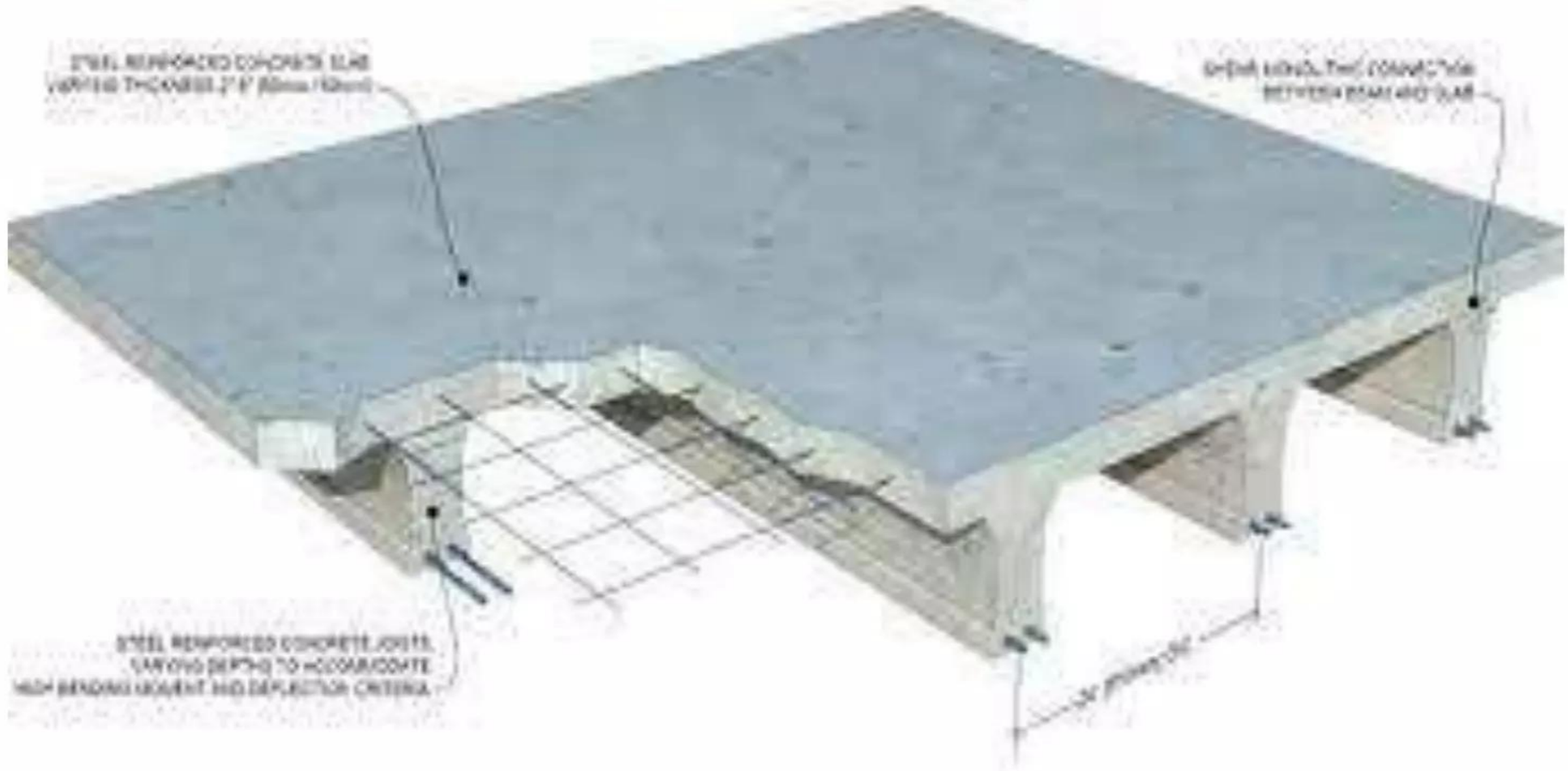
(b) It distributes the load of the floors, uniformly and transfer it to the columns and walls through beams.

(c)It acts as floor or roof for multi storeyed buildings.

- **Materials:**

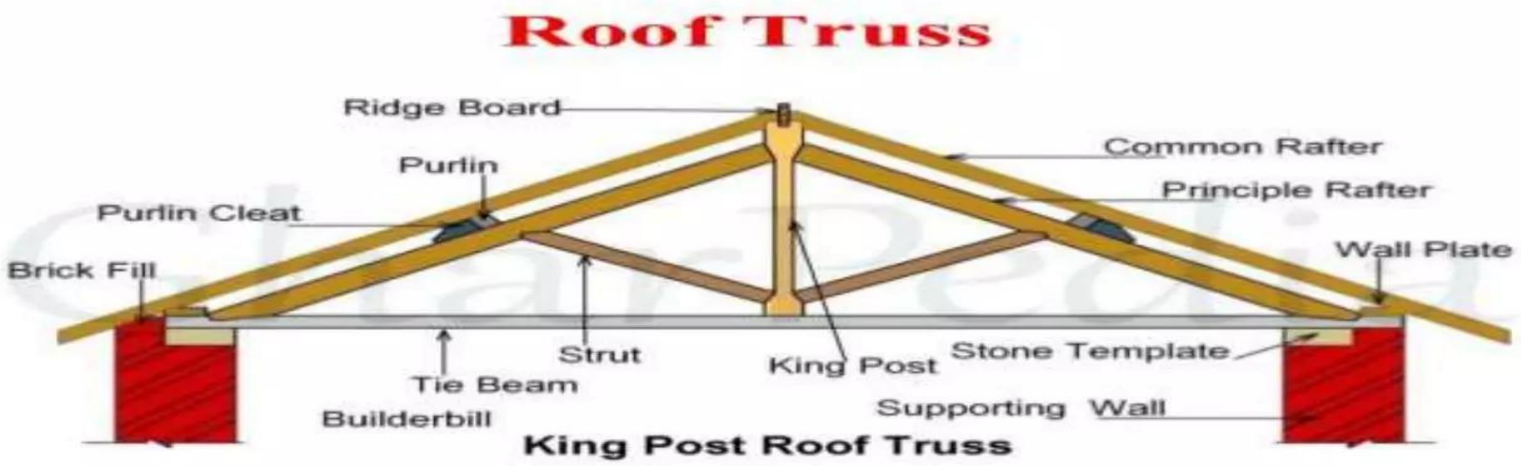
- The material used is R.C.C.

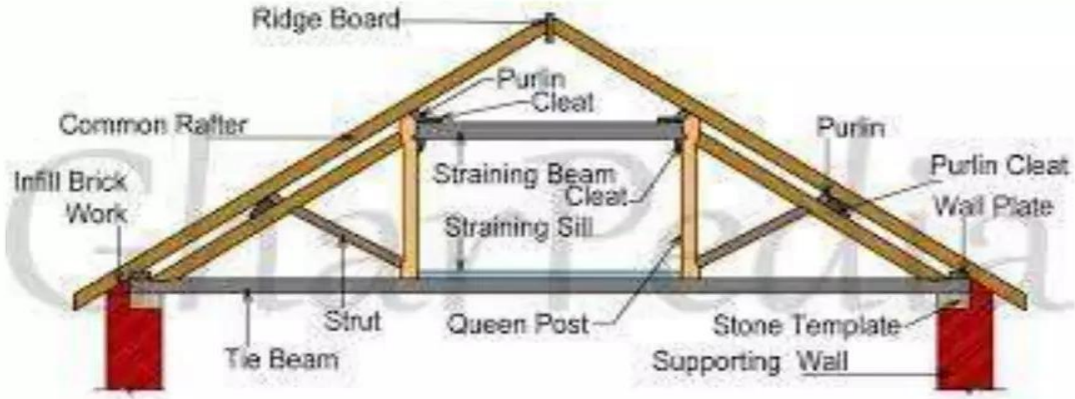
11. Slabs-



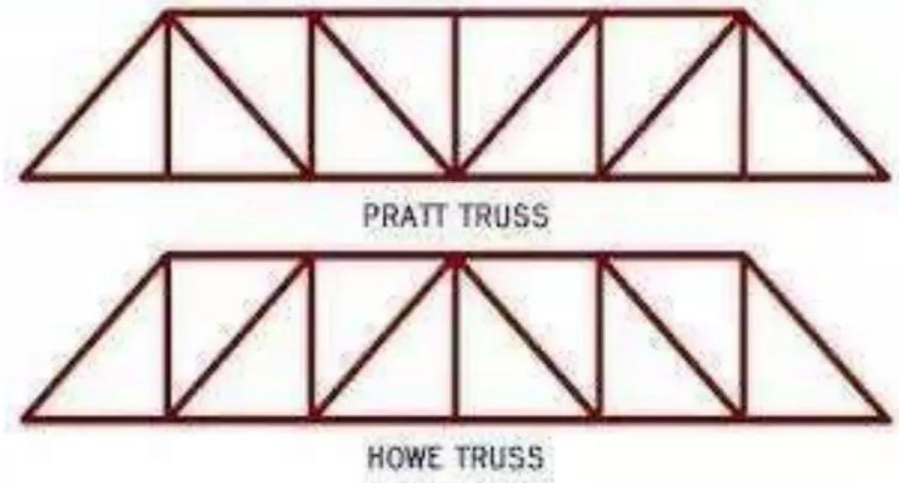
12. Truss-

- It is the structural element used at the top of the building to support the roof.
- These are made up of mild steel
- e.g. King post truss, Queen post truss, Pratt truss, North light truss etc.





Queen Post Truss



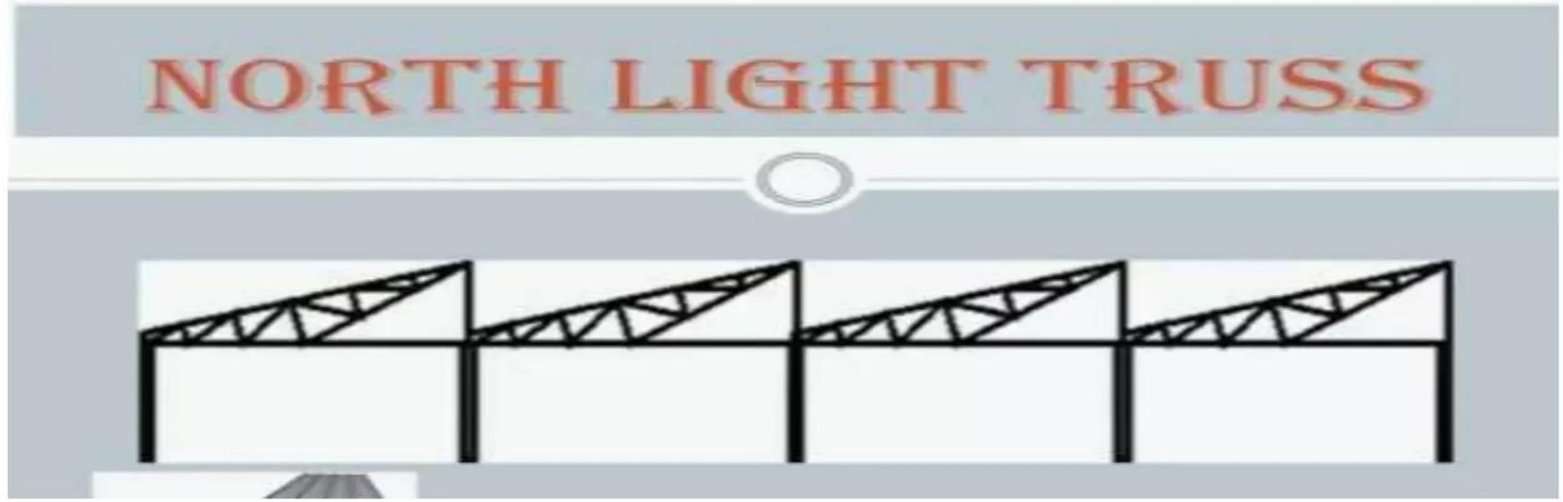


Fig.- Queen post truss

Fig.- Pratt truss

13. Roof-

- This is the top most part of the building.

- **Functions:**
- It protects against sun, wind, rain, snow, thefts etc.

- **Materials:**
- It is covered with a suitable material such as country tiles, Mangalore tiles, Allahabad tiles, Asbestos sheets, Galvanised iron sheets or reinforced cement concrete.

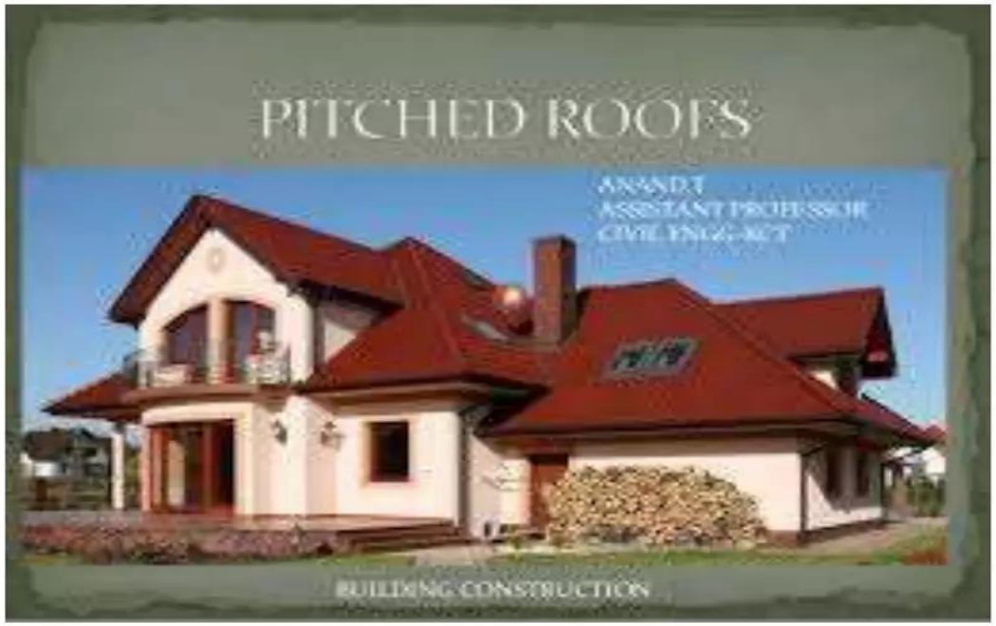
Roof

- **Types of Roofs-:**

- There are three types of roofs such as flat roof, pitched or sloping roof and curved roof.
- Flat roofs are commonly used where there is less rain fall Flat roofs can be used for other purposes. Future construction is possible.
- Pitched roofs such as thatch roof, shingle roof, tiled roof, truss roof are used in regions of heavy rain. Curved roofs are used as shell roofs, domes. for factories, monuments etc. Generally these are built in R.C.C.

Fig.- flat roofs

Fig.- pitched roof



Curved Roof

14. Parapet wall & Coping-

- **Parapet wall-**

➢ Parapet wall is a short wall constructed on the top of slab roof, or terrace floor.

➢ **Functions:** It is constructed for safety and viewing.

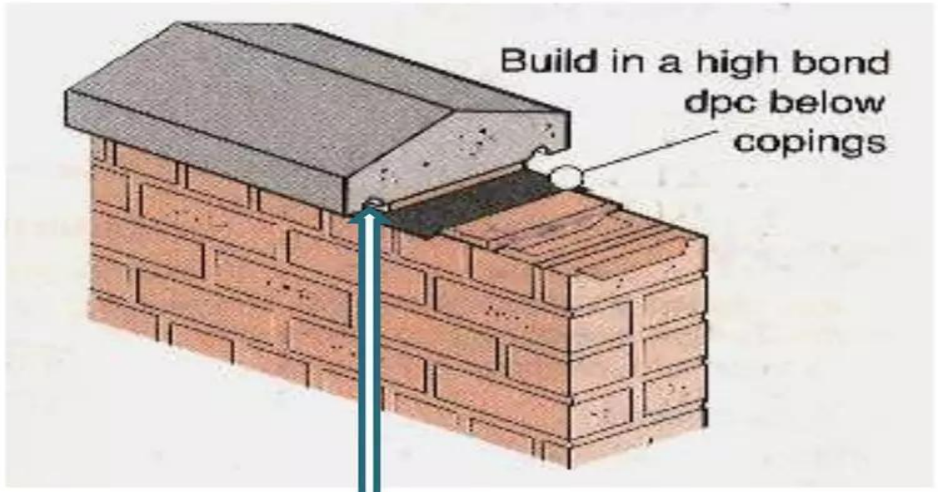
- **Coping-**

➢ top portion of parapet wall is known as coping.

- **Function-**

➢ It is provided with throating to throw off the rain water.

14. Parapet wall & Coping-



15. Steps ,stairs & lift-

- **Steps-**

- Steps are provided for reaching the ground floor from ground level of the building.
- Two or three steps are generally provided depending upon the plinth height. (Min 45 cm).
- Steps may be provided in the building for going up or coming down.

- **Stairs-**

- Stairs consisting of number of steps are provided for movement between the floors.
- They may be of stone, wood and R.C.C. and of various types such as straight, half-turn, circular or spiral.
- They provide aesthetic look in a hall.

Fig.- Straight Stairs

Fig.- Half turn staircase

Fig.- circular staircase

- **Lifts-**
  - Lifts are mechanical devices generally provided in multi-storeyed or high rise buildings.

16. Finish for walls-

- It is done by plastering, pointing with cement mortar or even painting.

- **Functions:**
- They protect the exposed surface, conceal the bad workman ship and give a pleasant look.

- **Requirements:**

(a) They should be smooth

(b) They should be non-absorbent.

Field Visit

Week 11-14

Review and Practical Exams

Week 15-17

Thanks For your Attention....