



UNIT- 4 (SYLLABUS)

Elements of Building Construction

- Planning: General Requirement of Building, Importance of Planning, and Layout of residential buildings.
- Introduction to Plan, Elevation & Section of Residential Building, the concept of sunlight and ventilation.
- Construction: Classification of buildings based upon occupancy, Types of Structures,
- Types of Loads acting on the structure, Elements of building drawing, Introduction to building bye-laws.
- Types and uses of different building foundations.

Construction of building

Introduction

A **building** is an assemblage that is firmly attached to the ground and that provides total or nearly total shelter for machines, processing equipment, performance of human activities, storage of human possessions, or any combination of these based on occupancy.

Building design is the process of providing all information necessary for construction of a building that will meet its owner's requirements and also satisfy public health, welfare, and safety requirements.

Building construction is the process of assembling materials to form a building.

Classification of buildings

According to National building code of India 1970, buildings on the basis of occupancy are classified as:

Group A- Residential buildings

Group B- Educational buildings

Group C- Institutional buildings

Group D- Assembly buildings

Group E- Business buildings

Group F- Mercantile buildings

Group G- Industrial buildings

Group H- Storage buildings

Group I- Hazardous buildings

Classification of buildings

Group A- Residential building

All those building in which sleeping accommodation is provided for dwelling permanently with or without cooking or dining facilities are called residential buildings.

Exp: Flats, bungalows, villas, cottages, hostels, hotels, houses.

Group B- Educational building

All those building which are meant for imparting training or providing educational facilities right from nursery to university level.

NBC recommends that building should be used for more than 8 hours per week.

Group C- Institutional building

These buildings deals in health care. They includes buildings for purposes such as medical, health, recovering health after illness, physical mental diseases etc.

Classification of buildings

Group D- Assembly building

All those building where group of people assemble/ gathers for amusement, recreation, social, religious or some other purposes theatres, cinema halls.

Group E- Business buildings

This group includes buildings used for purposes such as transaction of business, keeping of accounts and records, clinics, city halls, court houses, banks etc.

Group F- Mercantile buildings

This group includes buildings used for shop, store, market for sale or display of products on whole sale or retails

Group G- Industrial buildings

This group includes buildings in which products of different kinds ad properties are fabricated, processed or manufactured. Exp: assembly plants, power plants etc.

Classification of buildings

Group H- Storage buildings

This group of building include those structures which are used for storage of goods, products, warehouse, vehicles, cold storages etc.

Group I- Hazardous buildings

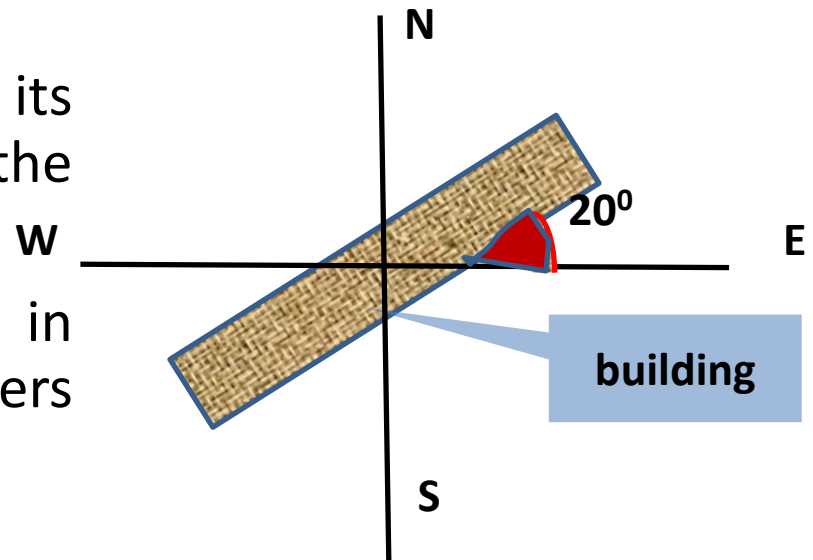
These buildings are used for storage, handling and manufacture or processing of materials which are combustible or liable to burn or explode and proves to be hazardous. Hazards may be due to fire, poison, gases, fumes, ignition etc.

Orientation of buildings

Orientation of buildings mean, positioning the various apartments of a building relative to the environment so as to get maximum comfort from sun, light and air.

While orientating the building followings points should be considered:

- Sun's path throughout the year and its relative position with respect to the locality.
- The direction of prevailing wind in summers when it is desired and in winters when not desired.
- The character of rain and its intensity
- The exposure of sun should be received as much as it is possible by providing short walls facing towards east and west and longer walls towards north and south.

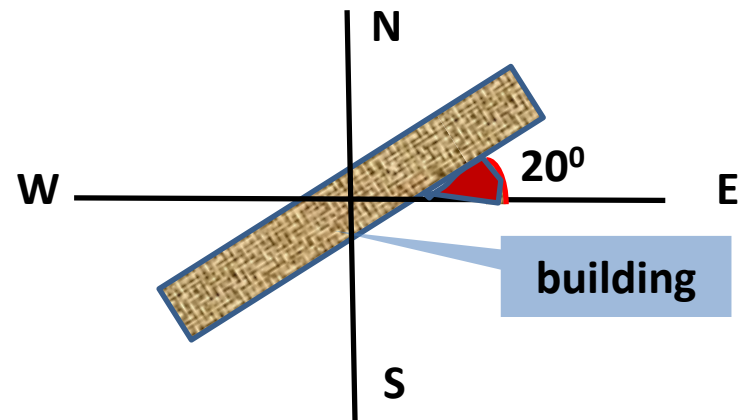


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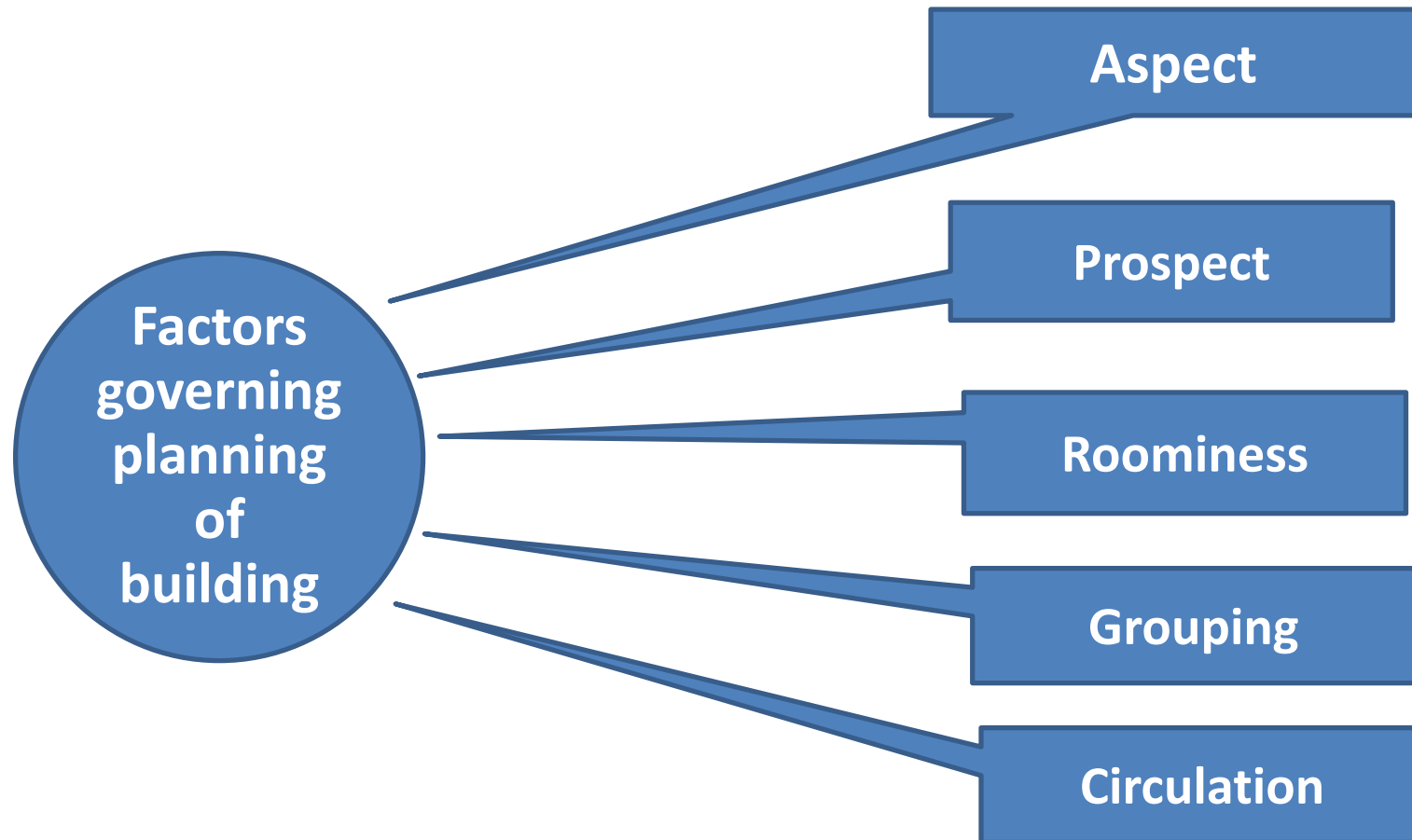
- Sun is towards south during the hottest part of day with high altitude in summer and low altitude in winters, the exposure of south walls should be suitably protected.



To have maximum comfort in building the building should be oriented 20° to 40° east of south.

Planning of buildings

Planning of building is the placement of different apartments of a building in such a way so as to provide maximum convenience, maximum utilization of space, privacy, comfort and economy in construction.



Planning of buildings

Aspect:

Aspect is positioning of different rooms of house according with our activities of different hours of day

It means the arrangement of doors and windows in the external walls so as to provide opportunities to have sunshine, breeze and natural scenery.

Aspect provides comfort as sun rays are the powerful bacterial agent, essential for growth of life, kill germs, facilitate ventilation and impart a cheerful air to rooms.

SUN DIAGRAM

Kitchen – Eastern aspect – fresh sun rays at morning to purify air

Living room – Southern or south eastern aspect – sun towards south during winters and toward north during summer

Bedrooms – Western and southern faces – wind breezes in summers from west

Verandah, gallery, study room, drawing rooms – North – No direct sunrays in any season



Planning of buildings

Prospect:

Prospect is the view from outside of a house. The house should have a proper prospect so that it can give a feeling of cheerfulness to the people living in it. It should create a good impression on a person who views it from outside. Prospect should reveal pleasant features and hide unpleasant and undesirable features of the house.

Roominess:

Roominess refers to the effect produced by deriving the maximum benefits from the minimum dimensions of a room. Giving due importance to the furniture placement in the room.

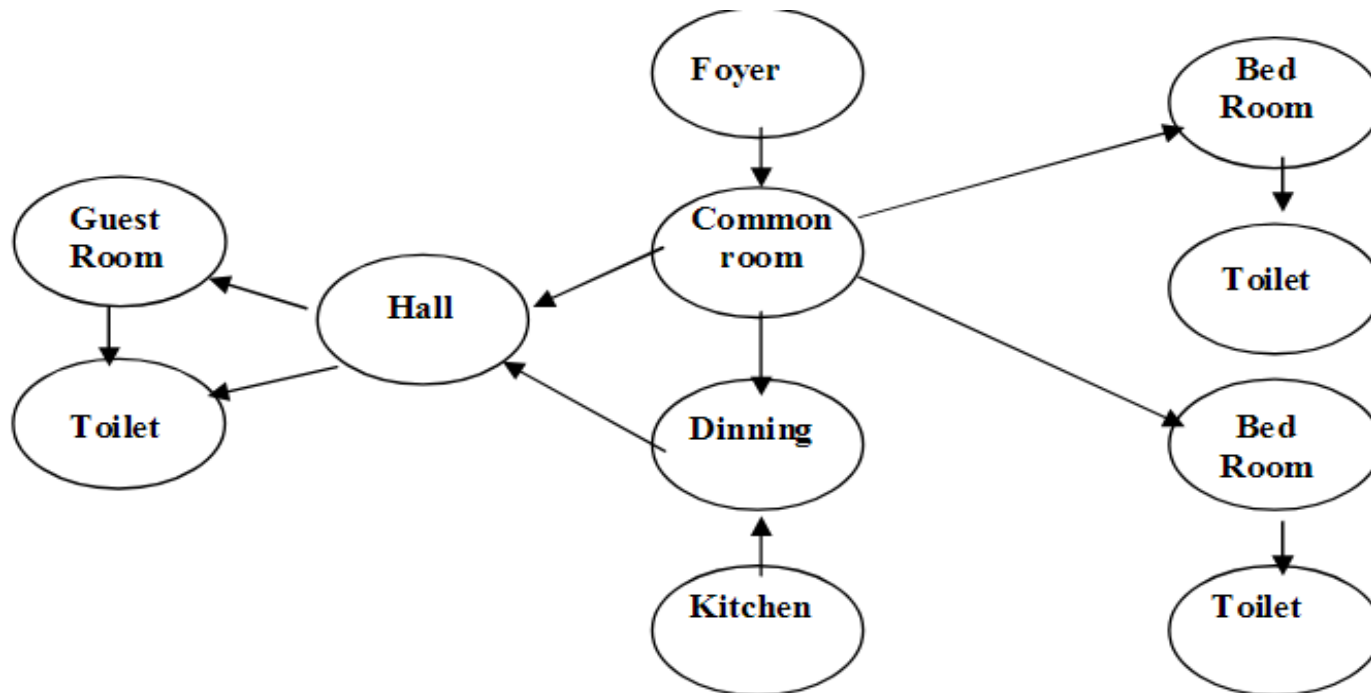
Factors effecting of roominess are:

- Size of the room
- Shape
- Furniture used
- Positions of doors and windows

Planning of buildings

Grouping:

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



Planning of buildings

Circulation:

It is nothing but the movement. This is two types of circulation

1. Horizontal Circulation
2. Vertical Circulation

Horizontal Circulation : It is the circulation on the same floor i.e. it may be between rooms.

Area of horizontal circulation may be consists of 20% to 25% of the total building area.

Vertical circulation: It nothing but the movement of upward and downward movement.. There are normally stair case. For multi storage structures electric lifts are provided, still stair are necessary if there is any electric fail, or the escape exist for fire disaster.

E.g.: Stair case , lift, ramp . escalators etc.

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

Building Bye-laws

For the better planned developed of towns and cities, the urban improvement boards, town planning authorities or municipal corporations of all towns laid down some rules and regulations. The proposed plans of buildings are to be prepared according to these bye-laws, which are checked and approved by approving authorities.

The buildings bye-laws and regulations govern following aspects:

- Building frontage lines
- Built up area of building
- Height of building
- Open space to be left in the sides, back etc.
- Provision to the size, height and ventilation of the rooms and apartments.
- Provision of water supply and disposal of waste water and other sanitary provisions
- Structural design of the building for its safety.

Building Bye-laws

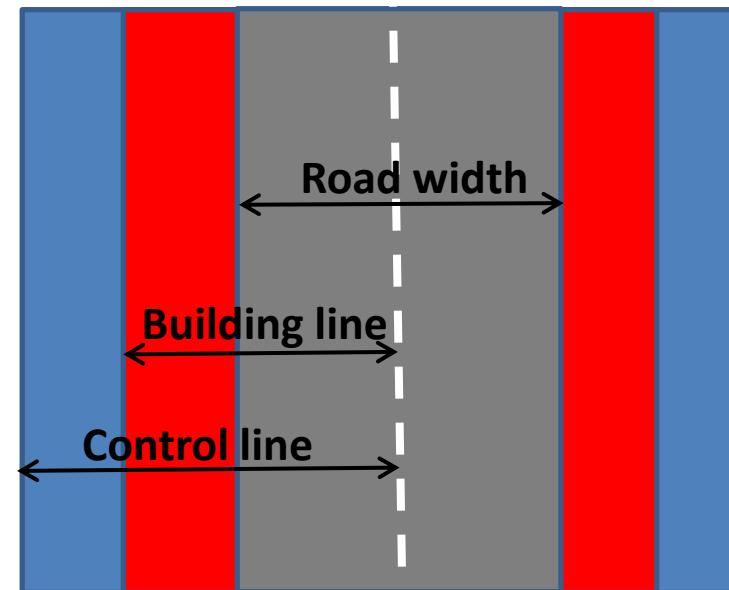
Building lines:

It is the line up to which the plinth of a building adjoining a road may lawfully extend. Beyond this no construction work is allowed towards plot boundaries. This space is provided keeping in view future widening of roads.

Control lines:

To setback further distance apart from building line in public buildings who attract large no. of vehicles. Control line is about 1.5 times of building lines.

S. No.	Type of roads	Building line	Control line
1.	Village roads	9 m	15 m
2.	Other district roads	9 m	15 m
3.	Major district roads	15 m	34 m
4.	National/ state highways	30 m	45 m



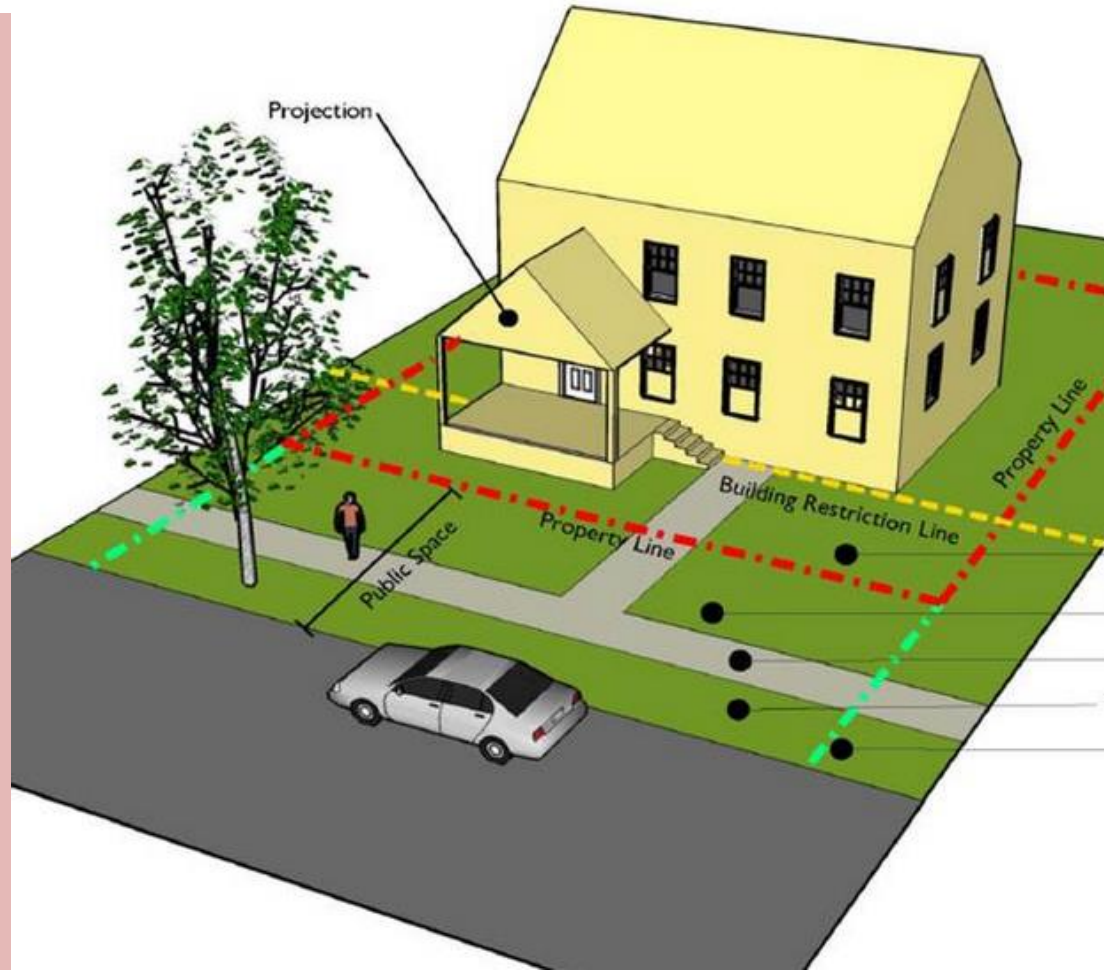
Building Bye-laws

Building lines (continued):

National Building code (NBC) of India recommends minimum frontage of 6 m on any street.

The main aim of building line are:

- I. It prevents the building from dust and noise of street.
- II. It allows widening of lanes in future.
- III. It prevents formation of blind corners at intersection of street and prevents accidents.
- IV. It increases aesthetic appearance of the town.



Building Bye-laws

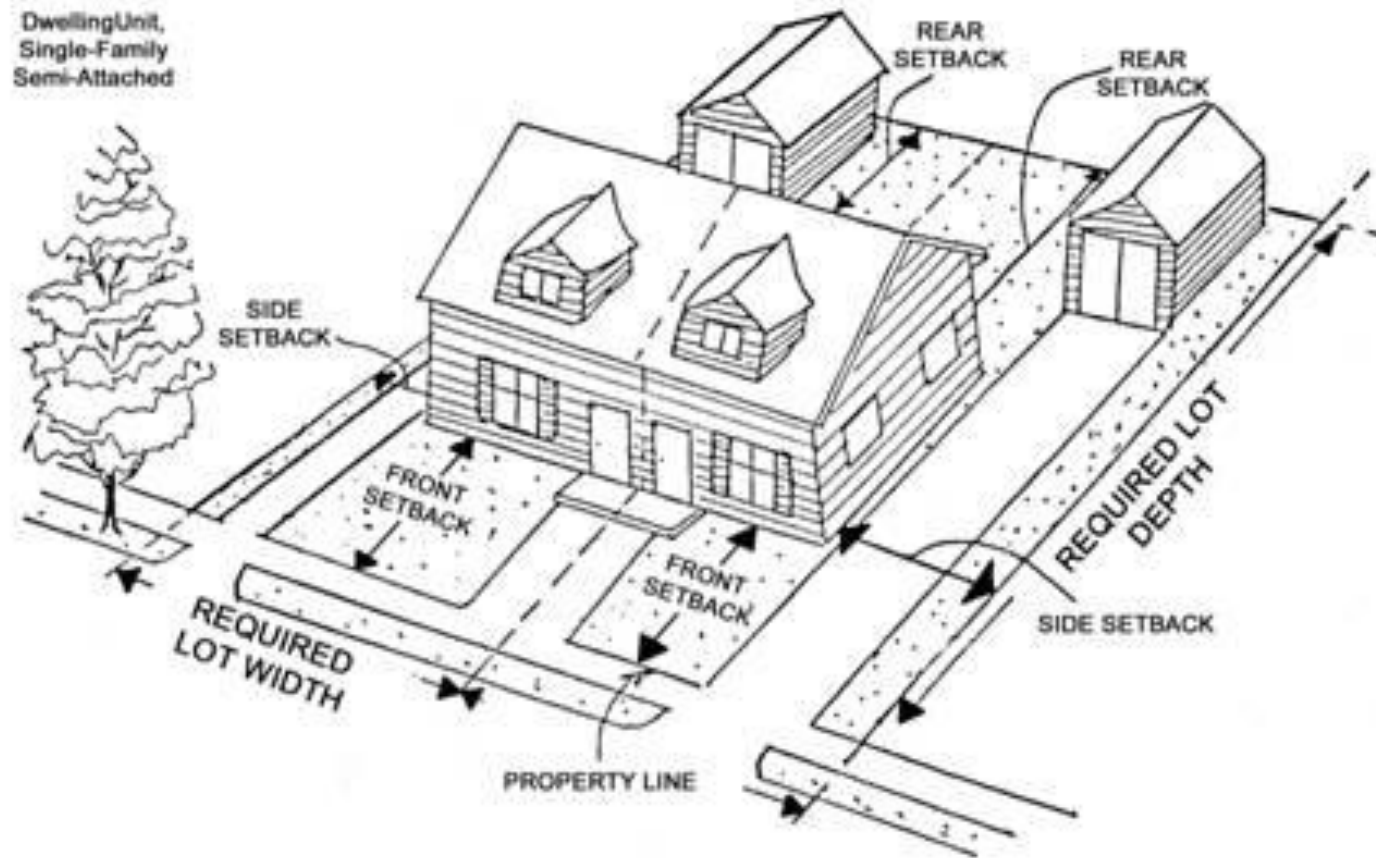
Open space around buildings:

For purpose of providing windows and ventilators, the main walls are to be constructed with an offset from plot boundaries. Authorities laid down bye-laws for minimum width of open spaces to be provided around buildings for purpose of natural ventilation and lighting.

Description of building (Height)	Front open yard or width	Side yard or open space width	Rear yard or open space width	Remarks
< 10 m	3m	3 m	3m (never less than 1.8 m)	Min building line 7.5 m
10 m- 25 m	3 + C1	3 + C1	3 + C1	C1 is 1m for every 3 m beyond 10m height of building
25m – 30 m	10 m	10	10	
> 30 m	10 + C2	10 + C2	10 + C2	C2 is 1 m for every 5 m beyond 30 m

Building Bye-laws

Open space around buildings:



Building Bye-laws

Covered area:

The maximum built up area limitations are fixed by authorities depending on the types of constructions and occupancies, width of lane fronting building, density of locality parking facilities, local fire fighting facility.

Built up area for residential buildings

S. No	Area of plot	Max. permissible cover area of plot
1.	More than 1000 sq. m	33.3 %
2.	Between 500- 1000 sq. m	40 %
3.	Between 200- 500 sq. m	50 %
4.	Below 200 sq. m	60 %

Limitations on the other types of areas:

Types of Area	Max. Covered Area
Business area	75 %
Industrial area	60 %

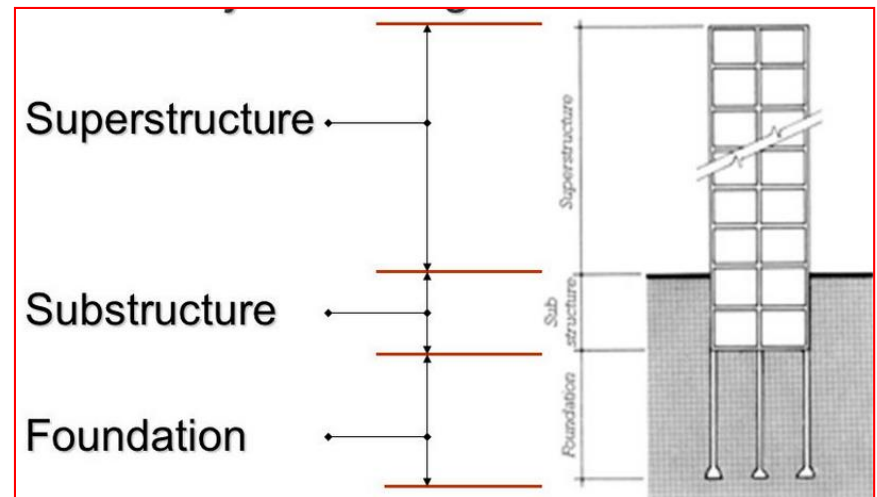
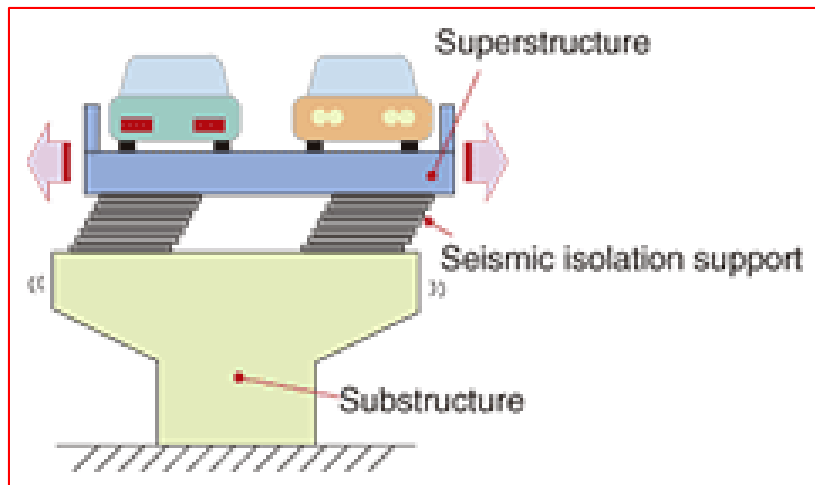
Foundations

INTRODUCTION

Every building consist of two basic components:

1. Superstructure: Part of building which is above ground and serves the purpose of its intended use
2. Substructure: lower portion of building located below ground level, which transmits load of super-structure to sub-soil.

A foundation is that part of structure which is in direct contact with ground to which the loads are transmitted. The soil which is located immediately below the base of foundation is called sub-soil while the lowermost portion of foundation in contact with sub-soil is called footing.



Foundations

FUNCTIONS OF FOUNDATIONS

- 1) **Reduction of load intensity**: Foundation distributes loads of the superstructure to a larger area so that intensity of load at its base does not exceed the safe bearing capacity of the subsoil.
- 2) **Even distribution of load**: Foundation distribute the non- uniform load of superstructure evenly to subsoil which prevents unequal or differential settlements
- 3) **Provision of level surface**
- 4) **Lateral stability**: The stability of a building against sliding and overturning due to lateral forces (earthquake, wind) is increased.
- 5) **Stability against undermining**: It provides structural safety against undermining due to flood water etc.
- 6) **Protection against soil movements**: Foundation minimizes the distress (or cracks) in the superstructure due to expansion or contraction of subsoil because of moisture movement in problematic soils.

TYPES OF FOUNDATIONS

Foundations are broadly classified as:

- (a) Shallow foundation
- (b) Deep foundation

According to Terzaghi, a foundation is shallow if its depth is equal to or less than its width. In case of deep foundations, the depth is equal to or greater than its width.

Foundations (types)

SHALLOW FOUNDATIONS

Shallow foundations may be of following types:

1. Isolated footings
2. Combined footings
3. Strip footings
4. Mat/Raft footings



Isolated footings



Combined footings

Foundations (types)

SHALLOW FOUNDATIONS

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Strip footings



Raft/Mat footings

Foundations (types)

DEEP FOUNDATIONS

Deep foundations may be of following types:

1. Pile foundation
2. Well foundation



Pile foundation



Well foundation

Foundations

CRITERIA FOR SELECTION OF SUITABLE FOUNDATION

Criteria for selecting suitable foundation based on soil condition:

Where soil close to the surface is capable of supporting structure loads, shallow foundations can be provided.

Where the ground close to surface is not capable of supporting structural loads, hard strata is searched for, and in some cases, it may be very deep, like in case of multi-storey buildings, where loads are very high. So, deep foundations are suitable for such cases.

Field up ground have low bearing capacity, so deep foundation is required at that place, whereas uniform stable ground needs relatively shallow foundation.

Level of the ground also affects foundation selection. If the ground is not leveled, and has gradient then step foundation may be preferred.

Foundations

CRITERIA FOR SELECTION OF SUITABLE FOUNDATION

Selection of foundation based on Loads from Building:

The loading condition i.e. type and magnitude of loads, depends on the form and type of building to be constructed. In case of low rise building with large span, the extent of loading is relatively modest, so shallow foundation is preferred in this case. While high-rise building with short span has high loads. Therefore, deep foundation is required in such cases. Deep foundation is provided because ground at greater depth are highly compacted.

In case of framed structure multi-storey building, where loads are concentrated at the point of application, the use of pads and piles are common. Where, loads of the buildings are uniformly distributed, like from masonry claddings, the piles are not needed.