

Building Construction.

The art of constructing building's design for residential, occupation and other purposes according to their design and drawing is called building construction.

After studying this we will enable to differentiate various components of buildings, like pillars, foundation (footings), lintel etc. This subject also enable us to study & understand various buildings that are different from each other according to their construction, occupancy and fire resistance.

(*) Building:-

Any structure made of whatever material for residential, occupation purpose is called building.

As we see in our daily life different kinds of buildings that are constructed to serve as for health care in form of hospitals, to serve for residency in the form of hotels, home etc. Actually building can be constructed from different component. It includes foundations, plinth, walls, floor

Why we study Building Construction:-
→ To know about various equipment used during building construction.
→ To develop ability in people & engineers to differentiate b/w good and bad work.
→ So that to reduce construction fault & defect to minimum.
→ To inform the engineers about building techniques well improved so that they must build buildings that economically, safely & aesthetically good.

roof, verandah & doors etc.

Purposes of Buildings:-

Some of purposes (needed) of constructing building are described below.

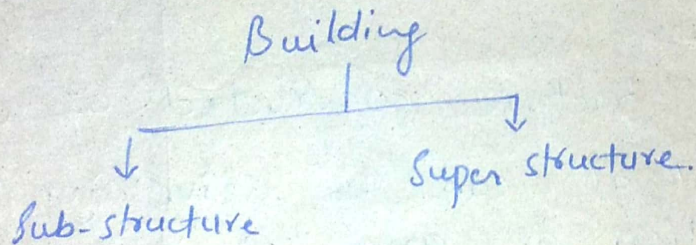
- It gives us shelter.
- It provides sufficient accommodation for the purpose for which it is constructed.
- To provide protection from heat and bad weather like raining, snow etc.
- To provide protection from thieves and house breakers.

Note:-
Tents, Shamianas and Jarpulin are not building.

Parts of Building:-

or Basic Components of Building:-

A building is usually consist of two parts.



1. SubStructure:-

A structure below the ground level of building is called substructure.

In some building a portion is built which is used for accommodation. If the purpose is just accommodation then such portion of building is called basement.

On this case the basement along with other portion is supported by footing or foundation laying below basement.

(*) The portion of building which acts as foundation for building not use for accommodation & it transmit load of building successfully to soil under it. Then such portion of building is called foundation or footing.

→ The construction of foundation start from certain level depend upon the cost and nature of building.

(*) Super Structure:-

The part of building that are above the ground level is called Super structure.

The Super structure of building consists of walls, floor, windows, Verandah, door etc which briefly discuss below.

Walls:-

The structure component of building that are use to enclose an area, support roof and floor and to divide the floor of building into required number of room are known as wall.

(2) Roof:-

The covering constructed over the closed space of building is called roof.

→ When we are building some construction like house, hospital or other residential and occupation place we should give a cover of any-thing like it may be in form of Lumber, plastic or steel so that the people living inside that are safe from weather effect like rains, heat etc.

Floor:-

The surfaces which provide rooms for inmates to live at different level in a building is called floor. (Book).

or The part of room ^{on} which people stand may be hard in form.
(Merriam Webster).

(*) Floor are essential that provide different level to live on it it also divides a building into different storey.

(4) Verandah:-

The portion of building covered by walls from two or three sides that is adjacent to living room is called Verandah. If on front then called front Verandah if back called rear Verandah.

Verandah are important to protect the rooms from direct rain, sun glare etc.

(b) Door:-

The component of building through which we can go inside or outside of building is called door.

(c) Windows:-

The component of building which allow the fresh air and sun light inside the room and allow other gases like CO_2 etc outside the room is called window.

(d) Plinth:-

The portion of structure between surrounding ground and surface of floor above ground is called plinth.

And the level of top of plinth with respect to surrounding ground portion is called plinth level.

→ It should be noted that plinth level should be kept at 500mm to 600mm in order to get adequate drainage.

Jambs:-

The vertical sides of door or window opening which support the door or window frame is called jamb.

Classification of Buildings:-

All buildings are classified into various types depending on following basis.

- i. Based on occupancy.
- ii. Based on type of construction.
- iii. Based on fire resistance.

i) Types of Building based on occupancy:-

(a) Group A (Assembly Buildings):-

The building in which people or group of people are join together for amusement, recreation, social, religious, civil, travel and other similar purposes.

Examples:-

Common examples of assembly buildings are
→ Assembly hall, place of worship, Class rooms, museums, restaurant, exhibition hall, dancing halls, Club rooms, passenger station etc.

Range:-

Here the number of people range
From $300 \leq \text{Number} \leq 1000$.

(b) Group B (Business Building):-

The type of building which are used for transaction of business, for keeping accounts and records and for other similar process.

The examples of such types of buildings are City hall, Town halls, court room, restaurant, bank, Police stations, etc.

Range:

The number of people assemble at a time should not be more than 50.

c) Group E (Educational Building):-

The buildings that are used for school, college and other day care is called educational buildings. building

(+) It should be noted University[↑] is not included in such type of building.

→ These buildings provide rooms for teachers and students and used eight hours per week^(daily) for a purpose to assemble for instructions & sharing of information etc.

Examples:-

Examples of such type of buildings are School, (Primary & Secondary), Colleges, Coaching Centre etc.

(d) Group F (Factory Building):-

The buildings which are used for factory uses i.e. in order to create or make something but its side effect is less i.e. less hazardous. The

or air apart from it are less toxic to health.

→ Also called moderate hazard building.

(5) Group H (High Hazard):-

The building used for storage, handling, processing or manufacturing of high hazard or explosive materials.

Examples:-

The buildings in which high toxic materials made or process such as acids, atomic bomb centre, fumes, explosive & poisonous substances where made.

(6) Group I (Institutional Building):-

The building used for medical or other treatment purpose is called Institutional building.

→ These buildings provide care for both physical & mental treatment, illness, disease etc. These buildings provide sleeping accommodation for occupants.

Examples:-

Important examples are Hospitals & Sanitarium.

(7) Group M (Merchandise Buildings):-

The buildings that are used for sell & buy of goods (products) either on wholesale or retail is called merchandise buildings.

Examples:-

- The important examples are store, shop, market etc.

These buildings also include office, storage and office facilities which are provided for sale of merchandise and are located in the same building.

(8) Group R (Residential Buildings):-

The buildings in which sleeping as well as eating accommodation is provided for inmates living there.

Examples:-

Examples of such buildings are houses (rent or normal) houses, apartments, hotel etc.

(9) Group S (Storage Buildings):-

The buildings that are used for storage or protecting goods, fruits, vegetables or other important things from both natural and man made destructions. Such kinds of buildings are called storage buildings.

Examples:-

Important examples are garages, store house, Ware house, cold storage, truck & marine terminals etc.

(10) Group U (Utility Buildings):-

The buildings that are used to install any type of equipment to provide any service to other buildings or offices near that building.

Examples:-

Important examples are private garages, agriculture buildings fence over 6' height etc.

Types of Buildings on basis of Construction:-

(i) Brick/Block Masonry Buildings:-

The buildings in which bricks or blocks are used as basic structure components.

or

The buildings which are made from bricks and blocks are called brick/block buildings.

Examples:-

Common examples are our homes, hospital etc.

(ii) Stone masonry Buildings:-

Those buildings in which stones are used as basic components. or Those buildings which are made from stones are called stone masonry buildings.

→ These buildings are built where there come more consumption over brick than stone.
or If there is too much expensive to carry bricks to that place.

Examples:-

These buildings are usually built in north area in form of houses that are built from stones.

(3) Reinforced Concrete (R.C) frame buildings:-

The buildings which are made from steel and concrete are term as R.C buildings.

Examples:-

The towers and stores (of many storeys) that are nowadays built are example of R.C frame buildings.

(4) Structure Steel Building:-

The buildings which are almost made or built from steel.

Examples:-

→ The bridges in BRT are examples of structure steel buildings.

Importance:-

→ These buildings can be built in short time as nut & bolt connection.

→ steel can be easily carry to any place

(5) Wooden Buildings:-

The building which are mostly made from woods are known as wooden buildings.

Examples:-

These buildings usually found in northern area and all (complete) house is built from woods.

→ These buildings are less resistance to fire.

⑤ Adobe Buildings:-

The buildings that are usually made from mud is known as adobe buildings.

Examples:-

Common examples of such building found in villages, where all homes are made from mud.

Types of Buildings on basis of resistance to fire:-

① Type-1 Buildings:-

The type of building which are resistant to fire upto 4 hours.

→ It means it gives 4 hours to you to take some actions in order to save yourself.

② Type-2 Buildings:-

→ Buildings which give resistant to fire upto 3 hours.

③ Type-3 Buildings:-

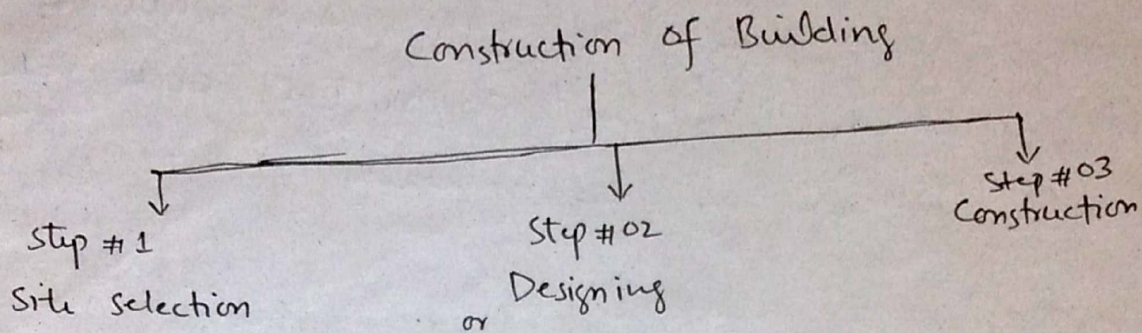
→ Buildings which give resistant to fire upto 2 hours.

④ Type-4 Buildings:-

Building which give resistant to fire upto 1 hour.

Lecture # 2 (BCE)

We have ~~four~~^{three} steps in order to execute a building. Step #1 is to select an appropriate site for a building and perform necessary planning for the building. Step #02 is to design the building we make technical drawings. Step #3 is construction of building.



Site Selection of Building:-

It is the duty of site selection committee to select appropriate site for building.

→ The selection of site for building depends upon the nature of building. (Type of building)

Selecting site of building means to select a good or possible location for the construction of building.

→ Selection of site for building plays an important role as it has direct effect on the following factors.

i. Cost of Construction:-

If you select a site for building which is made of bricks. If bricks not available so it will be transported. It will cost

(2) Maintainance:-

When once building is constructed we will repair it with time. The components of building after building get damage. So it also effect maintainance of building.

(3) The Living Condition:-

After construction of building we will imagine whether the occupants will live a healthy life or not. Whether they will face water, air or noise pollution. So we constructed and select such site where they lead healthy life.

Conclusion:-

So on basis of type of building we select site for that building.

FACTORS EFFECTING SITE selection:-

There are some factors which effect site selection of building therefore we must consider the following factors while selecting a site for building. (We have to prepare a priority list before selecting a site for building).

i- Level of Site:-

The level of site for building should be higher than ground level for good drainage. If level of site is above than drainage to sewerage will be done easily by gravity and no pumping or machine is used. i.e.

electricity cost will save.

→ If the site level and ground level same then we have to provide local soil to that site in order to increase level of site.

(2) Climatic Condition:-

We have to look at climatic condition of there. It means we should know about intensity of rain fall, which kind of season there. We have also look the water table of that location. If the level of water near the ground than site is not to suit for selection.

(3) Condition of Soil:-

There are different kinds of soil ranging from soft soil to stiff soil. We will prefer stiff soil for foundation along with some rocks i.e. in order to make foundation strong. If we have tough soil & rocks there then we will need drilling which will cost and affect our money. So therefore it is better to check soil of that location before selecting its site.

Availability of Services:-

We should select such site for building in which facilities like electricity, gas, water & other services that are important to life are there. We should give benefit to occupants by selecting proper site.

Surrounding:-

For which purpose the building is to be constructed, the surround and its location is very much important.

The site selection of different buildings depend upon surrounding around that building. For example the site selection for factory will different from site selection for university block.

(*) In Case of Residential Building:-

For residential building, the site should be select which has the following facilities.

- (*) There should be bank, post office, hospital good transports in order to access to these facilities.
- (*) There should have not such large multistorey buildings which obstruct to useful sun light and fresh air to occupants.
- (*) The buildings should maintain privacy of occupant.

→ In Case of Commerical Building:-

For Commerical building such site will be select which has;

- Good roads in order to access occupants for Commerical activities.
- Such buildings have enough space used for parking in order to make occupant focus on their work. (Commerical).
- Some buildings have parking in basement or top.

(a) Educational Building:-

To select site for educational building, the following things should be noted.

- i. The site should be quiet place i.e. away from bus stop, factories and other noisy places.
- ii. There should be certain playground to be built.
- iii. There should be chance to built other extension regarding education in future.
- iv) There should be good roads in order to access.

For Hospital:-

We should select such site which is in quite locality and there is better roads in order for good access of ambulances and other cars. As in hospital different disease patients are admitted so it should be away from local area where people resident in order to prevent infections disease.

Recreation Building:-

We should select such site for building which are not too far so that problem in gathering (access) occur, or it not too near so that if there any noisy function held (of wedding) so that it not disturb the resident people.
→ It should also have assessable roads and

for vehicle.
parking.

→ Industrial Building:-

We should select such a site which is away from residence of people so that people less effect from the toxic air, water or factory.

→ Such site have good roads in order to get good access for raw materials and employee.

→ It should be near to village or city to which employee or raw materials supplied.

Orientation of Building:-

It is defined as:

The art of placing building, its front view in such a manner so that we get maximum benefit from it."

or

"The art of placing a building in such a position so that its front faces is at particular direction is called orientation of building."

→ If the orientation of building is decided good we will get maximum benefits.

→ This is an art which we get from experiences. This art is about placing different components of buildings in proper way and our building should be energy efficient so

Objectives of Orienting a building:-

We get two objectives after orienting a building.

- i. To provide natural comfort to occupants.
- ii. To make building energy efficient.

→ The amount of sun light such that not affect the occupants and we not need too much lights in room. If we did proper orientation of building then the energy consumption will be eliminate.

Purposes of Orientation of Building:-

Following are purposes of building orientation.

- i. We perform orientation so that we place building in such a way so it suit surrounding.

→ Building settled best to its surrounding.

→ We should keep eyes on roads, multistorey building etc.

(2) To provide maximum comfort to occupant by proper ventilation, fresh air etc.

(3) To maintain the privacy of occupants we should orient the building.

(4) The building orientation is such that the occupant safe from dust & noise.

(5) We should orient a building in such a way so that its minimum portion comes in contact with direct rain in order to prevent from damp.

We should orient such a building that utilized minimum amount of purchasable energy i.e. self sufficient energy saving building.

FACTORS EFFECTING ORIENTATION:-

Before selecting orientation of a building the following factors must be taken into account.

1) Climatic Condition:-

Climatic condition greatly effect our building orientation. For e.g. if we are living or we have site of such location that place are too hot in summer. So we should select such site for building which has trees and building in its surrounding in order to obtain useful sun light and fresh air inside the building.

→ We should take benefit from nearby trees & large building there

2) Sun Path:-

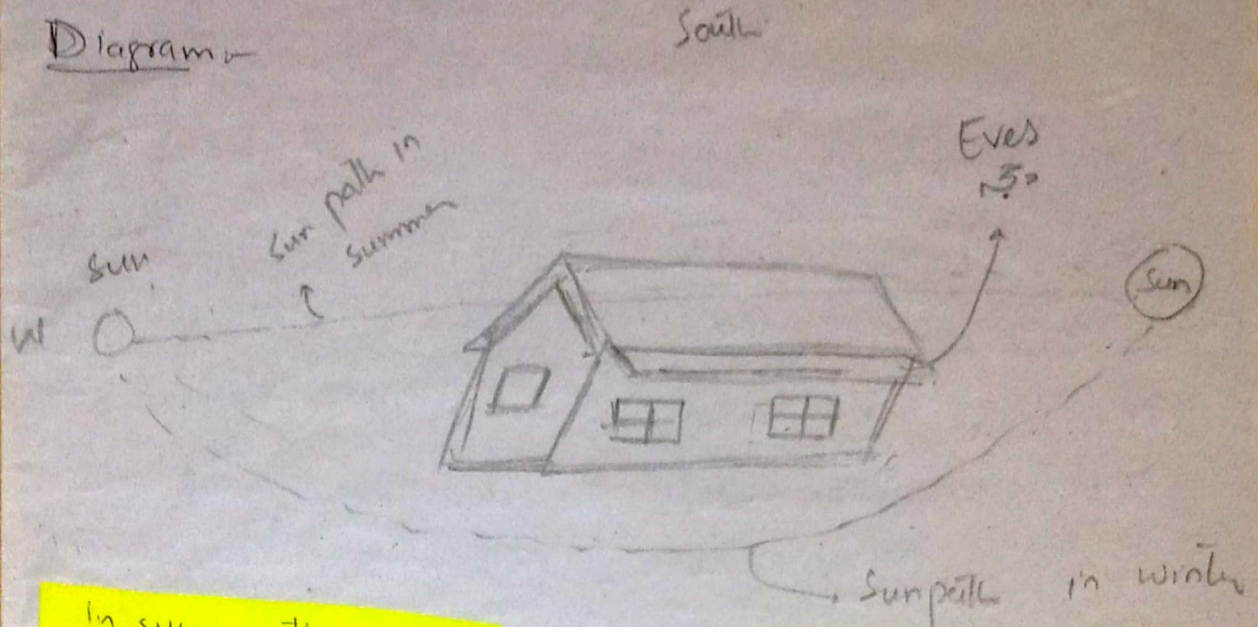
As we know that Pakistan is located in Northern hemisphere. So our building is so oriented so that its front view is towards north. We are doing because in winter the sun not moving high but moving at some angle around earth. This rotation is little toward north as shown in fig.

So if our front elevation is towards north so will get maximum benefit from sun light. The sun light that enters in

In windows will maintain the room temperature normal and also kill germ of Tuberculosis.

→ In summer the sun move over head so we provide eves to building in order to stop harmful and hot rays of sun from entering.

Diagram



In summer the sun passes over head.
In winter sun passes through side.

We make opening toward north
bez.
→ In order to maintain temperature normal due to green effect after entering sun light inside room.
→ It also kills germs that grow in humid condition.

In northern hemisphere the building should be oriented in such a way as shown.

(3) Proximity of roads & street:-

Availability of roads and street also effect building orientation. We should select such site which have good access to roads and street available there for easy access to shops & market.

Direction of Wind:-

We should orient a building in such a direction so that fresh and cool breeze blow during summer inside building while to stop it

ing winter
→ It also prevent the entry of high intensity wind so that to protect it from dust and other internal components.

(5) Nature of Rainfall -

We have to orient a building in such a way that it is less effected by direct shower of rain. We also give eyes to building in order of wind & rain to stop its entry into the building.

→ If have some wall of building that is in direct contact with rain we blacken it in order to pour the holes in that wall. So if raining occur, rain water does not enter inside the foundation of building.

→ If rain water enter into foundation then foundation get damage and dampness occur in building.

Method of Placing rooms of residential building w.r.t - the direction of Sun.

As Pakistan is in located in northern hemisphere we have plenty of sun light during summer and winter toward north. We have to utilize it while orienting a building. We have general chart from which we can better orient different rooms

of residential building.

Example:-

Kitchen = North east or ^{South} ~~North~~ east west

because the window receive maximum amount of sunlight

Zooming is fixing position of rooms inside a building

during sunlight summer and

winter so that the rooms that are frequently used, get the intensity of heat like lobbies, drawing room etc.

→ As in kitchen we used to make & cook meal so we want that place germ free. which can prevent by suitable amount of sunlight.

+ Place the rays of light in other part of building by placing kitchen Toward S-E or N-E.

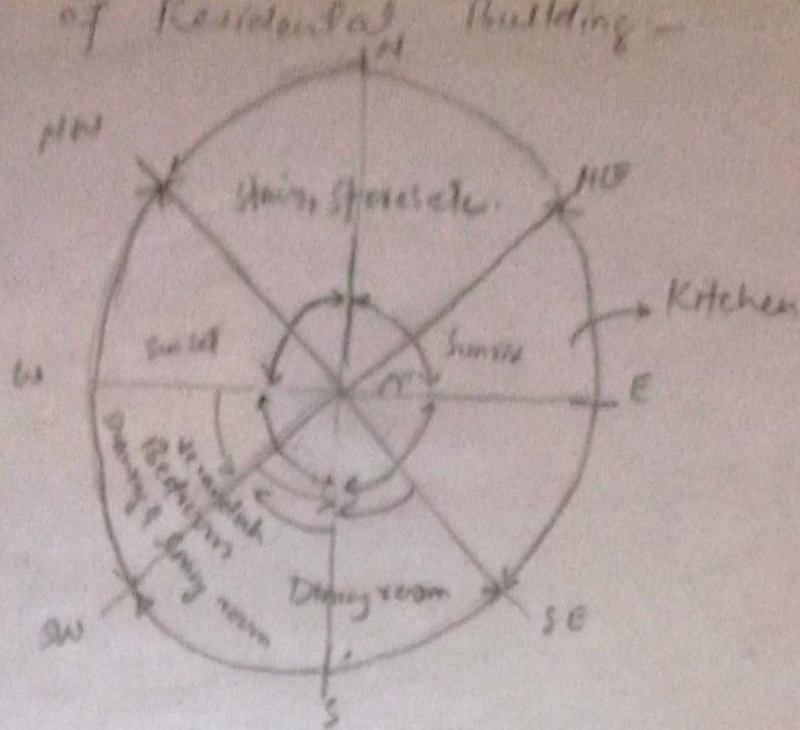
(2) Verandah:-

The Verandah should be place at South west location so that at some time it receive Sun light when need and sometime not

Store & Stairs:-

As for store and stairs we not need any sun light so we place it in north place.

→ The Zooming is shown in fig for residential buildings



Summary for placing rooms (Zoning)

Kitchen → East

Stairs, store house → ~~West~~ North

Verandah, Bedroom, Drawing & Living room → South west

Dining room → South

③ Topic:-

Ventilation:-

The process of supply of fresh air and removal of foul (unpleasant) air from different part of building called ventilation.

Explanation:-

As we know that human bodies are radiator our normal body temperature is 37°C while room temperature is lower than 37°C than due to temperature difference the heat will radiate from our

body due to which the room will be getting humid and temperature of building will increase in order to remove such foul air and allow to come fresh air we use ventilators.

OBJECTIVES OF FRESH VENTILATOR:-

1. Supply of Fresh Air:-

To provide comfort to occupant we use ventilator which allow fresh air to come and remove foul air from building.

2) Removal of Unpleasant Odour:-

We can also remove the unpleasant smell which is due to humidity and warmth.

(3) To Kill germs:-

This is done indirectly as germ growth is better in a such place which is humid and more temperature there. So by removing foul and humid air so fresh air come which stop the growth of germs like which causes disease like tuberculosis.

BASIC ELEMENTS OF VENTILATION:-

There are three basic elements of

dilation which are discussed below.

1. VENTILATION RATE:-

It is defined as;

"The amount of fresh air come inside building and removal of foul air out from the building is called rate of ventilation."

⇒ This supply of fresh air & removal of foul air tells about ventilation rate.

(2) AIR FLOW DIRECTION:-

It is direction of air from high concentration to low concentration.

→ The air flow direction in building should be from high (clean zone) to low (dirty zone).

(3) AIR DISTRIBUTION OR AIR FLOW PATTERN:-

It is defined as;

The distribution or supply of fresh air to each and every part of building to kill germ and stop its growth rate."

→ As germ are growing in humid condition

So by supplying fresh air it growth stop & kill it.

METHOD OF VENTILATION:-

We can achieve ventilation through the following three ways.

i- Natural Ventilation:-

"Providing fresh air and removal of foul air without any use of artificial energy source."

→ It is also called cross ventilation.

For Example:-

This type of ventilation is done by providing opening in building for example by providing doors and windows which will allow fresh air in and foul air out.

General Guide for Natural Ventilation:-

The area of natural ventilation (opening) should not be less than $\frac{1}{7}$ th of total area of building.

For example if total area is 70 sq. ft so the area for opening like doors, windows etc should not be less than 10 sq. ft.

Artificial Ventilation:-

"The Ventilation which is done i.e. providing fresh air and removal of foul air by some energy source i.e. in mechanical form."

→ This is ^{also} called mechanical ventilation.

For Example:-

By providing Exhaust fan due to which when we on, the pressure inside the room decreases so the fresh air rush into room and we get natural comfort to breathe in fresh air.

(3) Hybrid Ventilation:-

When both natural and artificial ventilation are done in building.

This is done when natural ventilation is not enough to provide fresh air so we also provide artificial ventilation.

For Example:-

If we have to required specific rate of ventilation which is not fulfilled by natural ventilator i.e. in hospital where infections spread so we required a certain rate of ventilation which is done by hybrid ventilation.

→ This is also called mixed ventilation.

Building Code of Pakistan:-

* Set of minimum standards or guidelines which the executing body or Engineer must follow while construction a building."

These standards and guidelines are about health of occupant, safety, welfare, structure of building and deal about different detail i.e about geotechnical, plumbing and electrical design of building.

Building Code of Pakistan says every building in Pakistan will be fit in one of the following facilities.

- i. Essential facility.
- ii. Hazardous facility.
- iii. Standard occupancy structure.
- iv) Special occupancy structure.
- (v) Miscellaneous structure.