



CHENNAI
ACADEMY OF
ARCHITECTURE AND
DESIGN

PERIYAPALLAYAM, CHENNAI.

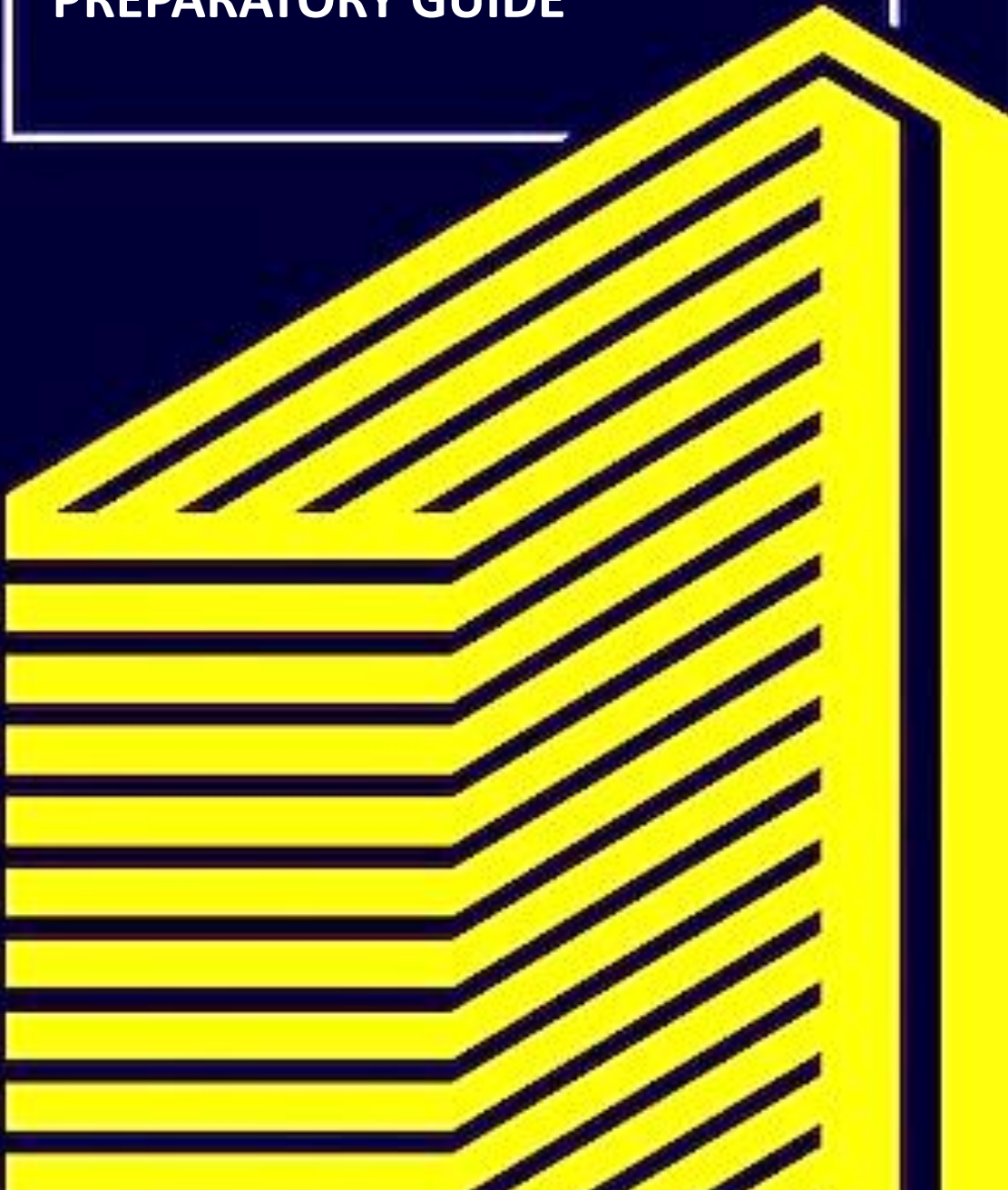
NATA 2024

PREPARATORY GUIDE

B.Arch.,

ANNA UNIVERSITY
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ARCHITECTURE & DESIGN

General awareness of architecture and design, current issues, recent episodes etc., Knowledge about important buildings, historical progression, innovation in materials and construction technology.

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ELEMENTS OF BUILDING

The following are the basic elements of a building:

1. Foundation
2. Plinth
3. Walls and columns
4. Sills, lintels and chejjas
5. Doors and windows
6. Floors
7. Roofs
8. Steps, stairs and lifts
9. Finishing work
10. Building services.

1. FOUNDATION:

Foundation is the most important part of the building. Building activity starts with digging the ground for foundation and then building it. It is the lower most part of the building. It transfers the load of the building to the ground. Its main functions and requirements are:

Distribute the load from the structure to soil evenly and safely.

To anchor the building to the ground so that under lateral loads building will not move.

It prevents the building from overturning due to lateral forces.

It gives level surface for the construction of super structure.

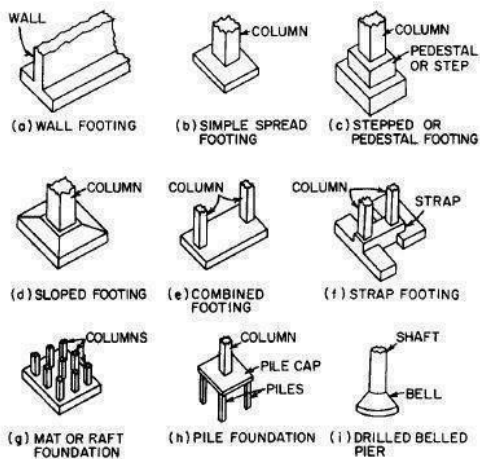
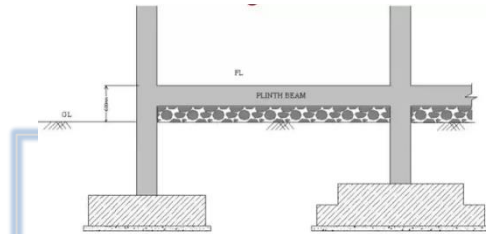


FIGURE 9.41 Common types of foundations for buildings.

2. PLINTH:

The portion of the wall between the ground level and the ground floor level is called plinth. It is usually of stone masonry. If the foundation is on piles, a plinth beam is cast to support wall above floor level. At the top of plinth a damp proof course is provided.

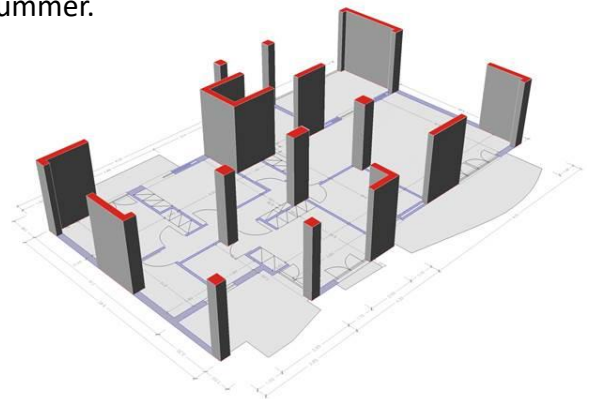
It is usually 75 mm thick plain concrete course. The function of the plinth is to keep the ground floor above ground level, free of dampness. Its height is not less than 450 mm. It is required that plinth level is at least 150 mm above the road level, so that connections to underground drainage system can be made.



3. WALLS AND COLUMNS:

The function of walls and columns is to transfer the load of the structure vertically downwards to transfer it to foundation. Apart from this wall performs the following functions also:

It encloses building area into different compartments and provides privacy. It provides safety from burglary and insects. It keeps the building warm in winter and cool in summer.



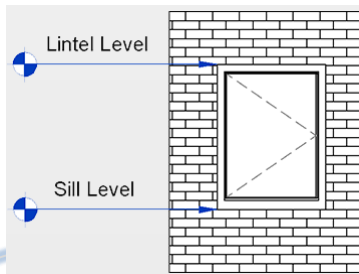
Reference: <https://www.civilengineeringx.com/building-planning/elements-of-a-building/>

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ELEMENTS OF BUILDING

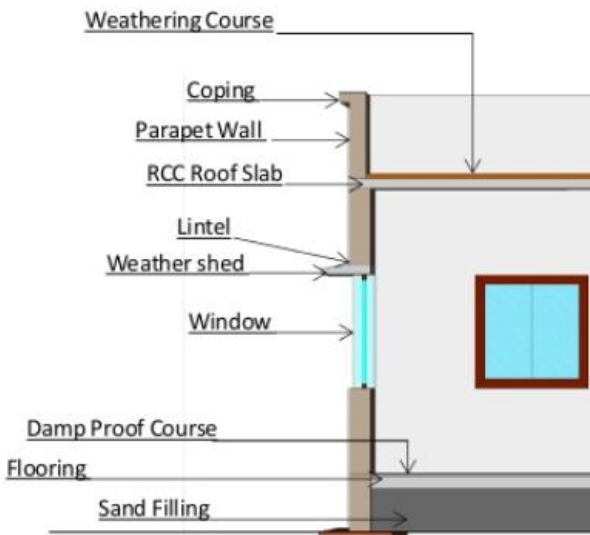
4. SILLS, LINTELS AND CHEJJAS:

A window frame should not be directly placed over masonry. It is placed over 50 mm to 75 mm thick plain concrete course provided over the masonry. This course is called as sill. Lintels are the R.C.C. or stone beams provided over the door and window openings to transfer the load transversely so as to see that door or window frame is not stressed unduly. The width of lintels is equal to the width of wall while thickness to be provided depends upon the opening size.



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

The projection of chejja varies from 600 mm to 800 mm. Sometimes drops are also provided to chejjas to improve aesthetic look and also to get additional protection from sun and rain.



5. DOORS AND WINDOWS:

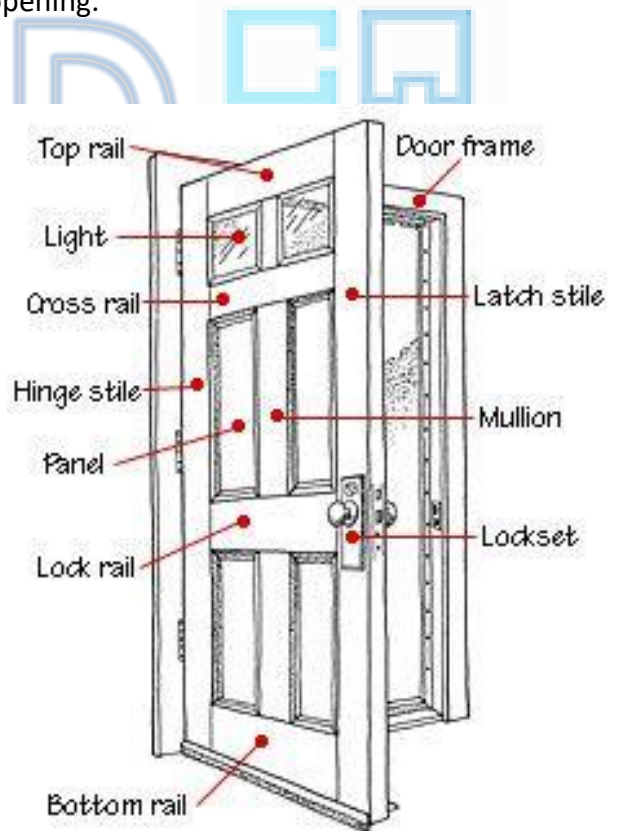
The function of a door is to give access to different rooms in the building and to deny the access whenever necessary.

Number of doors should be minimum possible. The size of the door should be of such dimension as will facilitate the movement of the largest object likely to use the door.

Windows are provided to get light and ventilation in the building.

They are located at a height of 0.75 m to 0.9 m from the floor level. In hot and humid regions, the window area should be 15 to 20 per cent of the floor area.

Another thumb rule used to determine the size and the number of windows is for every 30 m³ of inside volume there should be 1 m² window opening.



Reference: <https://www.civilengineeringx.com/building-planning/elements-of-a-building/>

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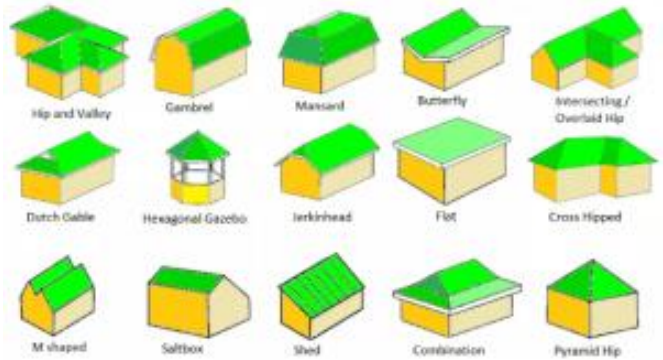
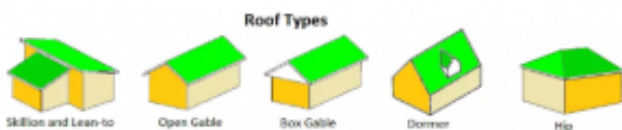
6. FLOORS

Floors are the important component of a building. They give working/useful area for the occupants. The ground floor is prepared by filling brick bats, waste stones, gravel and well compacted with not less than 100 mm sand layer on its top. A lean concrete of 1 : 4 : 8, 100 mm thick is laid. On this a damp proof course may be provided. Then floor finishing is done as per the requirement of the owner. Cheapest floor finish for a moderate house is with 20 to 25 mm rich mortar course finished with red oxide. The costliest floor finish is mosaic or marble finishing. Other floors are usually of R.C.C. finished as per the requirements of the owner.



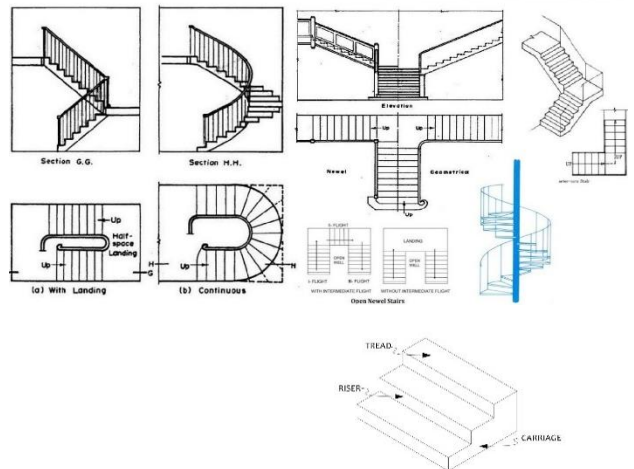
7. ROOF:

Roof is the top most portion of the building which provide top cover to the building. It should be leak proof. Sloping roof like tiled and A.C. sheet give leak proof cover easily. But they do not give provision for the construction of additional floor. Tiled roof give good thermal protection. Flat roofs give provision for additional floors. Terrace adds to the comfort of occupants. Water tanks can be easily placed over the flat roofs.



8. STEP, STAIRS AND LIFTS:

Steps give convenient access from ground level to ground floor level. They are required at doors in the outer wall. 250 to 300 mm wide and 150 mm rise is ideal size for steps. In no case the size of two consecutive steps be different. Number of steps required depends upon the difference in the levels of the ground and the floor. Stairs give access from floor to floor. They should consists of steps of uniform sizes. In all public buildings lifts are to be provided for the conveniences of old and disabled persons. In hostels G + 3 floors can be built without lifts, but in residential flats maximum floors permitted without lifts is only G + 2. Lift is to be located near the entrance. Size of the lift is decided by the number of users in peak hours. Lifts are available with capacity 4 to 20 persons.



Reference: <https://www.civilengineeringx.com/building-planning/elements-of-a-building/>

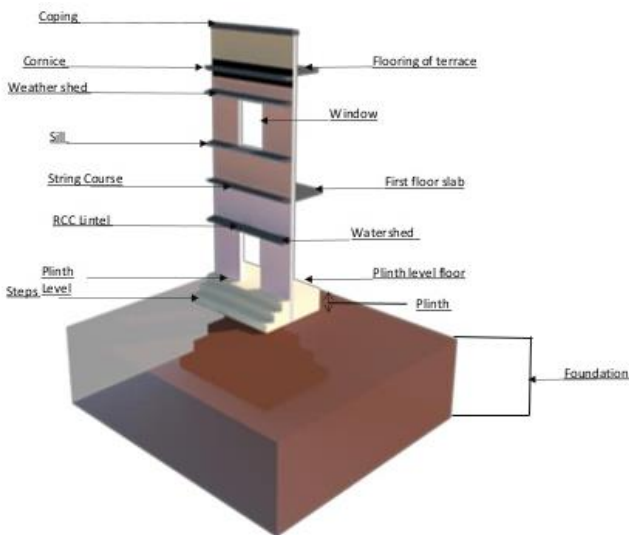
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ELEMENTS OF BUILDING

9. FINISHING:

Bottom portion of slab (ceiling), walls and top of floor need smooth finishing with plaster. Then they are provided with white wash, distemper or paints or tiles. The function of finishing work is:

- Give protective cover
- Improve aesthetic view
- Rectify defective workmanship
- Finishing work for plinth consists in pointing while for floor it consists in polishing.



For draining rain water from roofs, down take pipes of at least 100 mm diameters should be used. Proper slopes should be given to roof towards down take pipe. These pipes should be fixed at 10 to 15 mm below the roof surface so that rain water is directed to the down take pipe easily. The sanitary fittings are to be connected to stone ware pipes with suitable traps and chambers.

Stone ware pipes are then connected to underground drainage of municipal lines or to the septic tank.

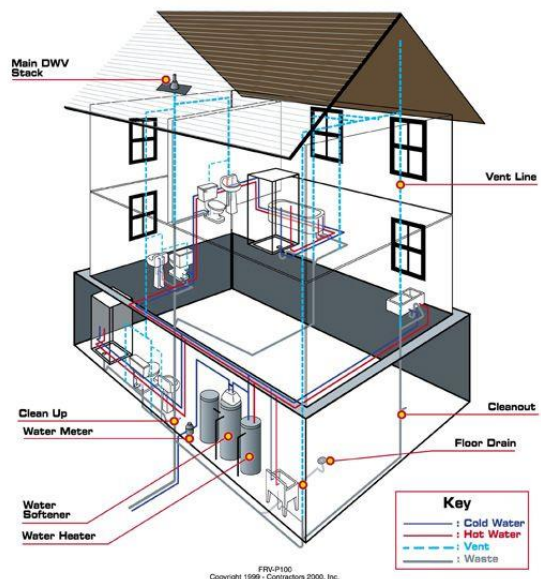
Many carpentry works are required for building service. They are in the form of showcases, cupboards, racks etc.

Electric supply is essential part of building services. The building should be provided with sufficient points for supply of lights, fans and other electric gadgets.

10. BUILDING SERVICES:

Water supply, sanitation and drainage works, electric supply work and construction of cupboards and show cases constitute major building services. For storing water from municipal supply or from tanker a sump is built in the house property near street. From the sump water is pumped to over head tanks placed on or above roof level so as to get water all the 24 hours. Plumbing work is made so as to get water in kitchen, bathrooms, water closets, sinks and garden taps.

HOUSE PIPING SYSTEM Water Supply Household DWV



Reference: <https://www.civilengineeringx.com/building-planning/elements-of-a-building/>

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BUILDING TYPOLOGY

A building structure is a man-made structure with a roof and walls standing more or less permanently in one place, such as a house or factory.

BASED ON THE OCCUPANCY

Every building or portion of land shall be classified according to its use or the character of its occupancy as a building of Occupancy. They are categorized into the following types.

- 1) Agricultural buildings
- 2) Commercial buildings
- 3) Residential buildings
- 4) Educational buildings
- 5) Government buildings
- 6) Industrial buildings
- 7) Military buildings
- 8) Religious buildings
- 9) Transport buildings
- 10) Power plants

1) Agricultural buildings

They are the structures designed for farmers and for agricultural practices, for growing and harvesting crops, and to raise live stock.



2) Commercial buildings

They are the buildings, which are used exclusively for commercial use.



3) Residential buildings

A Residential building is that, in which housing predominates, as opposed to industrial and commercial areas. building may vary significantly between, single-family building, multi-family building, or mobile homes.



4) Educational buildings

This occupancy type shall include any building or portion thereof in which education, training and care are provided to children or adults.



Reference: Building-typology-adapted-from-Hecht

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BUILDING TYPOLOGY

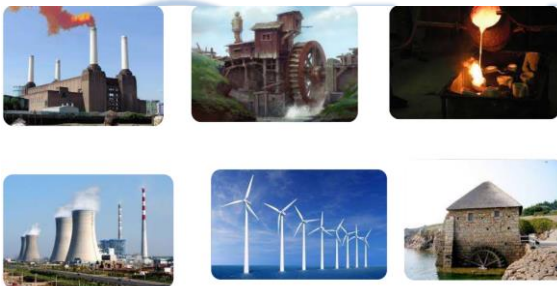
5) Government buildings

It is a building that houses a branch of government.



6) Industrial Buildings

These buildings are designed to house industrial operations and provide the necessary conditions for workers, and for the operation of industrial equipment.



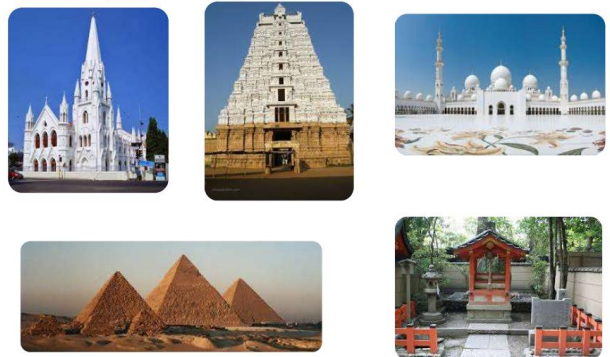
7) Military Buildings

This building is a structure designed to house the functions, performed by a military unit.



8) Religious Buildings

These are the buildings for religious purposes, with a large open interior or other monumental qualities. They often have spires, towers, domes rising above the main structure.



9) Transport Buildings

This is a structural building which consists of the means of equipment necessary for the movement of passengers or goods on land, water, and air ways



10) Power plants

These buildings serve as the industrial facility to generate electric power



Reference: Building-typology-adapted-from-Hecht

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THE ELEMENT OF RELIGIOUS BUILDINGS

BASIC FORM OF A HINDU TEMPLE

Hindu Temple's were a gradual evolution starting from the rock cut- cave temples to monolithic rathas which finally culminated in structural temples. The basic form of a Hindu structural temple consists of the following.

1. GARBHAGRIHA:

- It literally means 'womb-house' and is a cave like a sanctum.
- In the earliest temples, it was a small cubical structure with a single entrance.
- Later it grew into a larger complex.
- The Garbhagriha is made to house the main icon (main deity) which is itself the focus of much ritual attention.

2. MANDAPA:

- It is the entrance to the temple.
- It may be a portico or colonnaded (series of columns placed at regular intervals) hall that incorporates space for a large number of worshippers.
- Dances and such other entertainments are practiced here.
- Some temples have multiple mandapas in different sizes named as Ardhmandapa, Mandapa, and Mahamandapa.

3. Shikhara or Vimana:

- They are mountain like the spire of a free-standing temple.
- Shikhara is found in North Indian temples and Vimana is found in South Indian temples.
- Shikhara has a curving shape while vimana has a pyramidal-like structure.

4. AMALAKA:

- It is a stone disc like structure at the top of the temple and they are common in North Indian temples.

5. KALASHA:

- It is the topmost point of the temple and commonly seen in North Indian temples.

6. ANTARALA (VESTIBULE):

- Antarala is a transition area between the Garbhagriha and the temple's main hall (mandapa).

7. JAGATI:

- It is a raised platform for sitting and praying and is common in North Indian temples.

8. VAHANA:

- It is the mount or vehicle of the temple's main deity along with a standard pillar or Dhvaj which is placed axially before the sanctum.

CLASSIFICATION OF INDIAN TEMPLES

Indian temples can be classified into two broad orders as

- **Nagara** (in North India)
- **Dravida** (in South India)
- At times, the **Vesara** style of temples as an independent style created through the mixing of Nagara and Dravida orders.

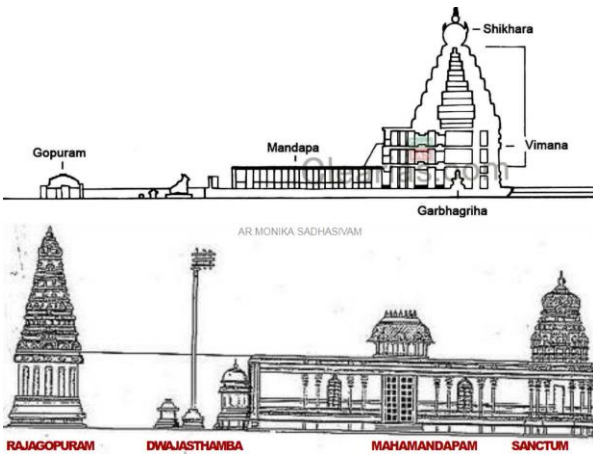


Nagara (in North India)

Reference: Temple Architecture and Sculpture – Hindu, Buddhist and Jain (Indian Culture Series – NCERT)

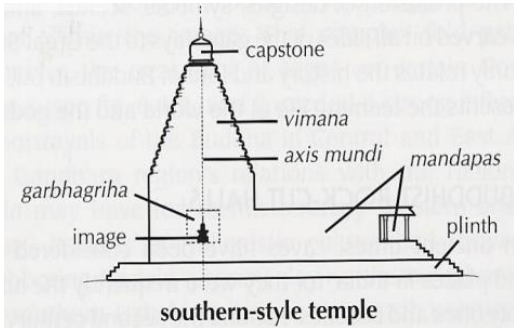
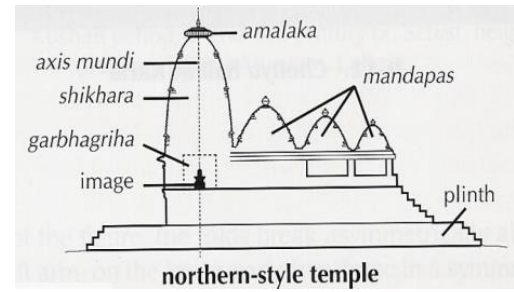
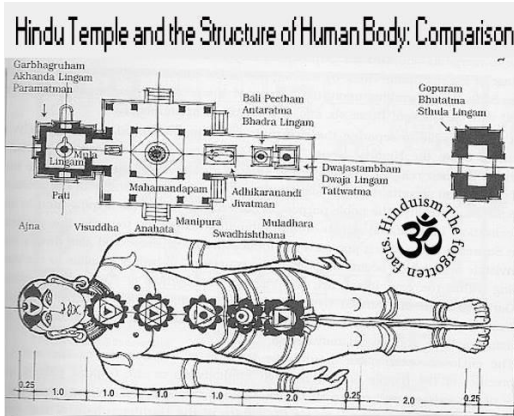
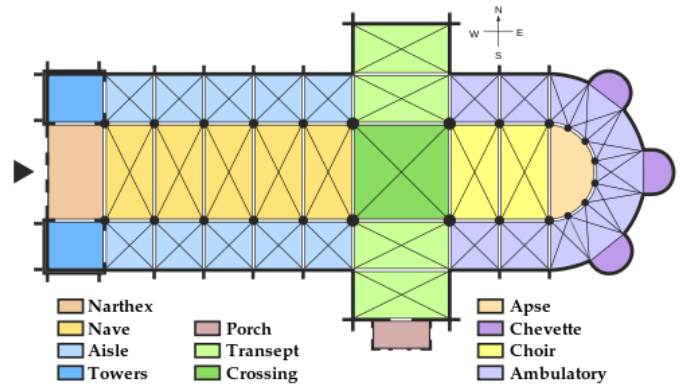
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Dravidian (South Indian)

CHURCH ARCHITECTURE



PROPYLAEUM

The entrance building of a sacred precinct, whether church or imperial palace.

ATRIUM

In early Christian, byzantine, and medieval architecture, the forecourt of a church; as a rule enveloped by four colonnaded porticoes.

NARTHEX

The Entrance hall or porch proceeding the nave of a church.

NAVE

The great central space in a church. In longitudinal church, it extends from the entrance to the apse (or only to the crossing if the church has one) and is usually flanked by side aisles.

SIDE AISLE

One of the corridors running parallel to the nave of a church and separated from it by an arcade or colonnade.

Reference: Temple Architecture and Sculpture – Hindu, Buddhist and Jain (Indian Culture Series – NCERT)

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CROSSING

The area in a church where the transept and the nave intersect.

APSE

A recess, sometimes rectangular but usually semicircular, in the wall at the end of a Roman basilica or Christian church. The apse in the Roman basilica frequently contained an image of the Emperor and was where the magistrate dispensed laws. In the Early Christian basilica, the apses contained the “Cathedra” or Throne of the bishop and the altar.

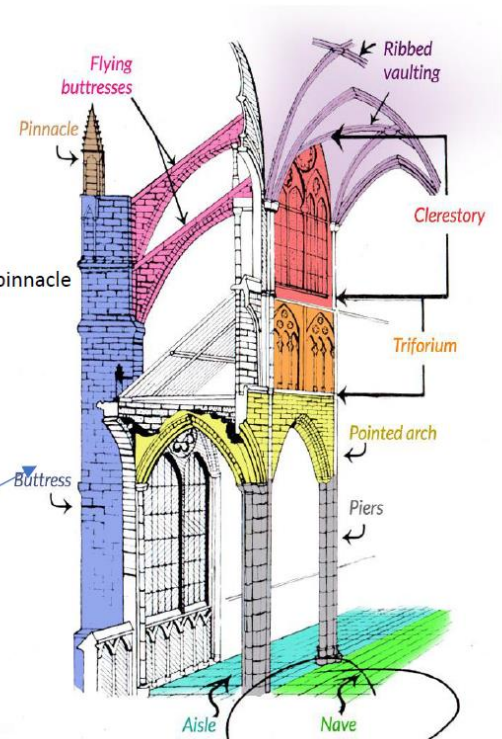
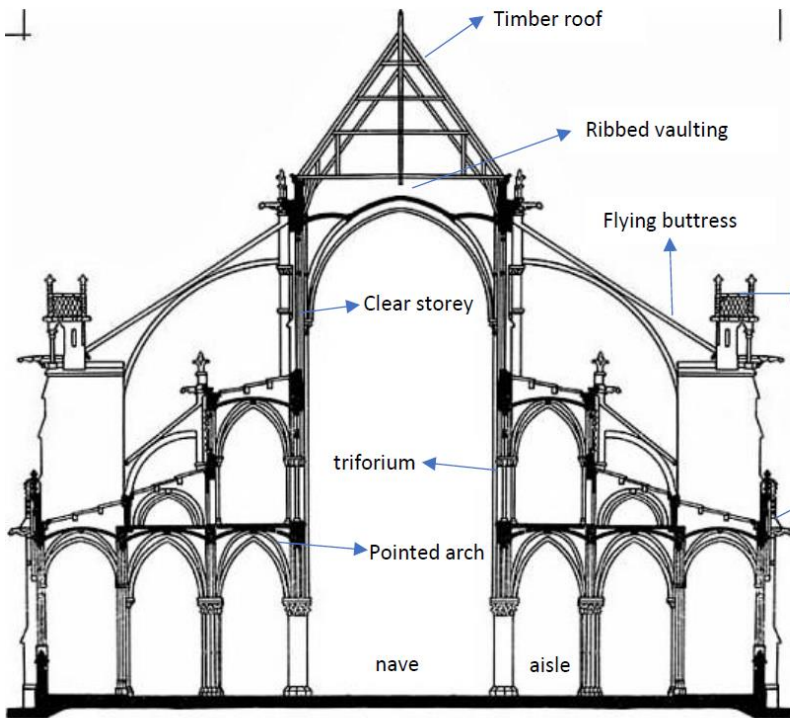
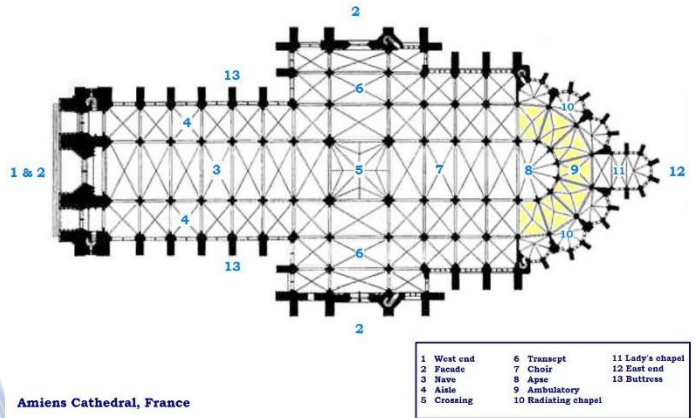
CHOIR

Area of the church where the priest performs the mass.

TRANSEPT

In a cruciform church, the whole arm set at right angles to the nave.

NOTE: The Transept appears infrequently in Early Christian churches. The Transept became a standard component of the Christian church until the Carolingian period.



Reference: Architecture_of_cathedrals_and_grat_churches

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THE ELEMENT OF RELIGIOUS BUILDINGS

ISLAMIC BUILDINGS

The major building types during the Islamic period were:

- The Mosque
- The Tomb
- The Madrasa
- Caravanserai
- Wells
- Gardens
- Market – places
- Palaces and forts

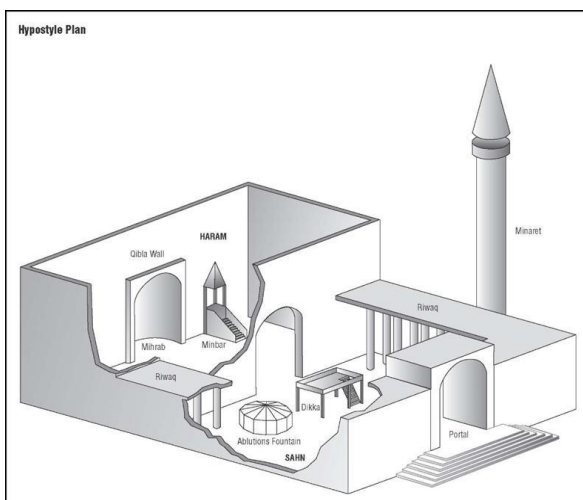
ESSENTIAL PARTS OF A MOSQUE:

Two ancillary structure are necessary for Islamic worship : the minaret, from which the muezzin gives the call to prayer, and a fountain for ablution.

The courtyard afforded an opportunity for architectural display, which the ottoman the safavids and especially the mughals seized with enthusiasms. In India the courtyard of the 'Jami Masjid' is surrounded by finely sculptured arches.

Ablution tank can be at the middle of the courtyard.

Inside the mosque, the chief feature is the mihrab, a niche, in the centre of the qibla wall to define the direction of Mecca.



Reference: Islamic Architecture – Form, Function, and Meaning by R Hillenbrand

On the right side of the mihrab stands the 'mimbar' or pulpit. The top step of the mimbar is reserved for the prophet, the imam stands for the second step of the mimbar and uses the top one as a seat.

A portion of the sanctuary is screened off into a compartment for women - maqsura screen.

MIHRAB

The pillared hall which forms the sanctuary with the wall at the back containing an elegant arched shaped niche called "mihrab" which shows the Qibla.

Qibla - prayer side or Mecca side.

MIMBAR - Imam stands to deliver sermons.

Pulpit – present at the right side of the mihrab

Dikka - The reading desk in mimbar.

Zenana - Woman's compartment.

Maqsura - A screen of arches.

MINARET

A raised structure for a person to stand to make the call for the prayer.

Iman – belief-in god – his unity

Ibadat – religious obligation

Ihsan –right doing.

TOMB

It usually consist of a single compartment or tomb- chamber, know as 'huzrah'or 'estanaah' , in the centre of which is the cenotaph or 'zarih' that is a raised platform to indicate position of burial.

The whole structure is roofed over by a dome.

In the ground, underneath this building , resembling a crypt , is the mortuary chamber called the 'maqbarah or takhana' , with the grave or 'qaba' in the middle.

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THE ELEMENT OF RELIGIOUS BUILDINGS

RAUZA – TOMB COMPLEX

The tomb along with the garden enclosure is called 'RAUZA'.

MAUSOLEUM

mosque + tomb. Eg: Taj Mahal.

DARGAH

These are the important tombs of nodes and are occasionally called as "Dargah". Derived from a Persian word – meaning court palace.

MADRASSAH

Educational complex

It's a **collegiate mosque** which has Lecture halls

KHANS (SERIAS) : Caravanserai

Travelers bun-glow.

These are **the inns** where the travelers took rest.

This is generally a two storied building, the ground floor for stable camels or horses and the first floor for residences/rest houses for the travelers.

FORTS / FORTRESSES :

The cities were **fortified** with tall spreading **bastions** at frequent intervals.

Generally, the fort walls had **gateway on all the four cardinal, direction – forming an axis.**

The fortress housed a number of **imperial building , edifices such as the emperor's palace , audience halls , mosque , tombs.** Eg – Forts in Agra, Delhi etc.

PALACES, CITADELS & FORTIFICATION

A gate serves to **admit and to exclude.**

It is also a symbol of **strength , of security and of wealth.**

The expression of power is in many ways an automatic attribute of **monumental architecture.**

Three consistent components of Islamic military and defensive architecture are – **wall and towers , gates , citadels.**

BAUDIS OR WELLS

These are the **common utilitarian structures.**

It had **large rectangular tank** which is enclosed within high walls.

There were **rest houses** on the either side of the entrance towers.

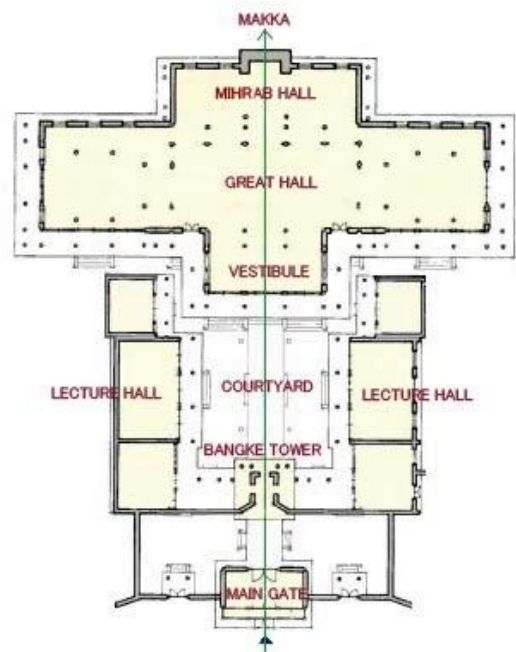
There was a common landing with passage ways on either sides which can be descended stages to the level of water.

CHARBAGH :

The garden was divided into **4 quadrants** which was spilt by the water flow.

The principal axis is formed by a **waterway** which had **coniferous trees** along the length which emphasized it.

Eg : **Shalimar Gardens , Nishak Gardens etc,**



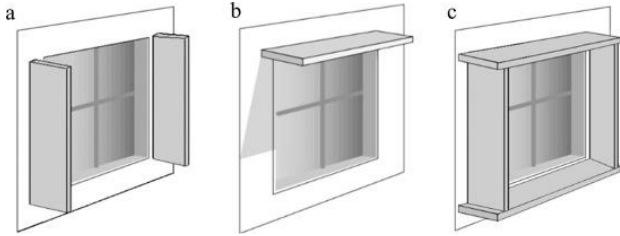
Reference: Islamic Architecture – Form, Function, and Meaning by R Hillenbrand

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CLIMATE ORIENTED ARCHITECTURE

TYPES OF SHADING DEVICES

- Vertical devices
- Horizontal devices
- Egg-crate devices



FENESTRATIONS

Prime Parameters:

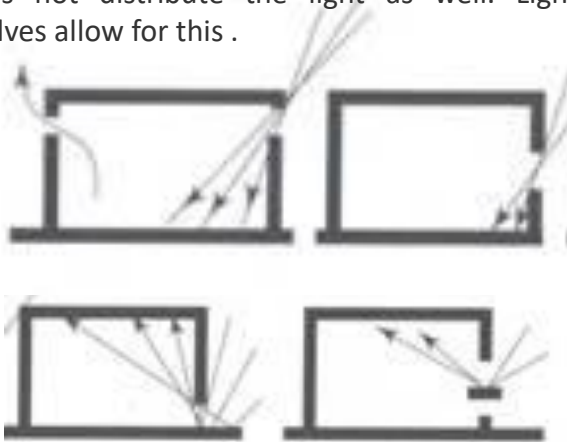
- Air movement
- Day light

Effect of window position on light and ventilation.

High windows act as ventilation points and also allow for the best distribution of light from overcast skies.

Low windows do not allow much ventilation but allow an even distribution of ground reflected light.

Middle windows allow for even ventilation but does not distribute the light as well. Light shelves allow for this .



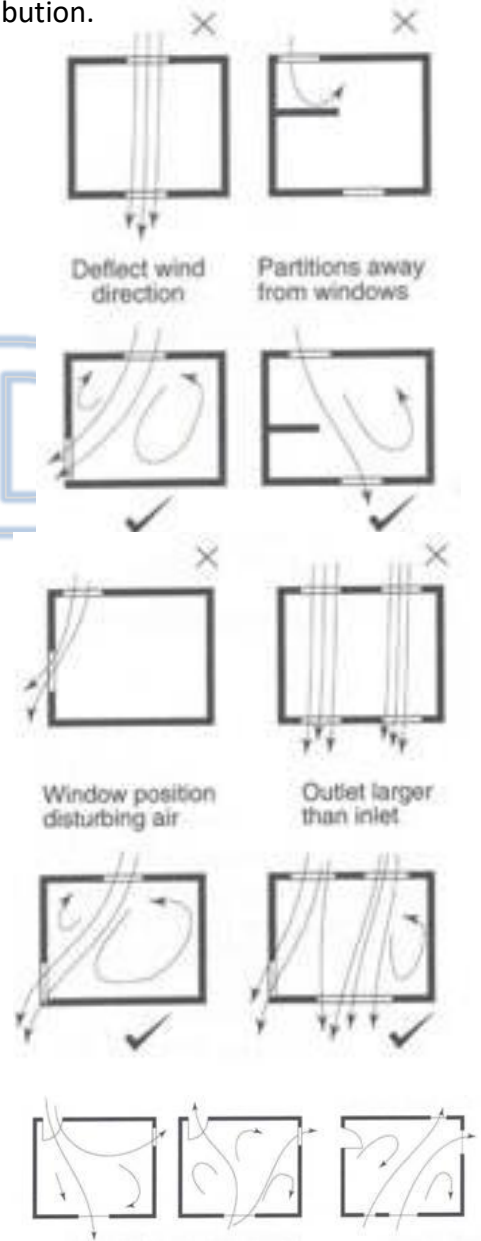
AN IDEAL CASE FENESTRATION POSITIONING:

Openings (windows), are placed on two external walls with the door on one internal wall.

If air is incident on any of the external windows, then the fenestration configuration not only ensures a good distribution of air but also has a larger outlet area than inlet area.

If the air is incident on any of the other walls then the door could act as the inlet into the room.

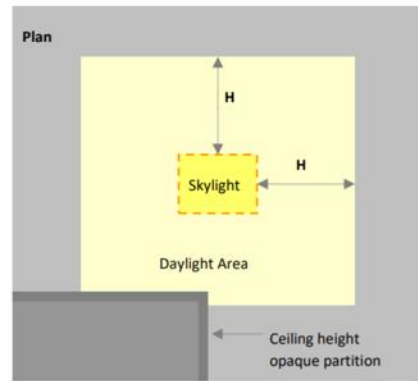
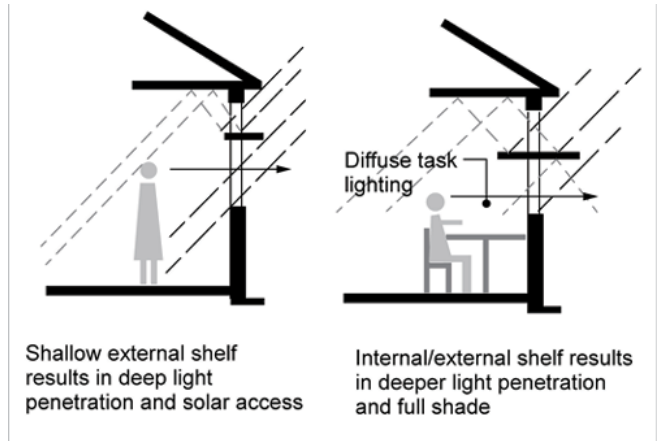
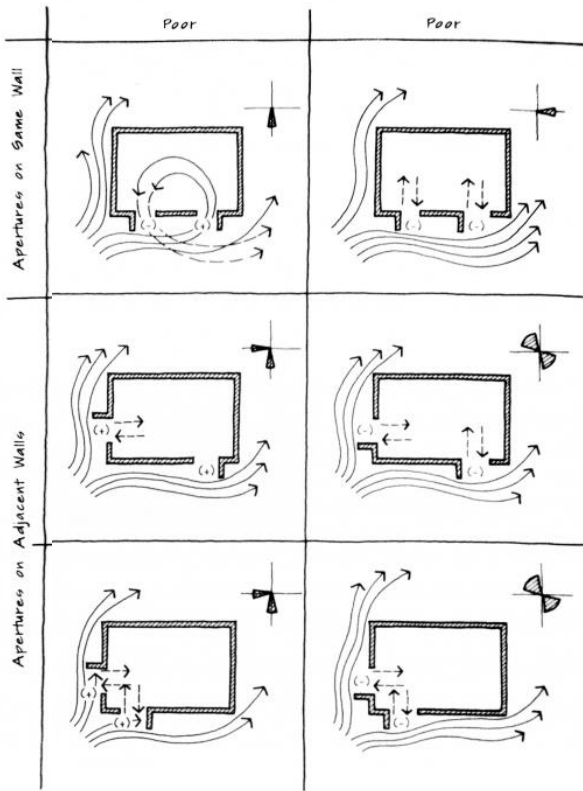
Once again the outlet would be larger than the inlet and the configuration would allow good air distribution.



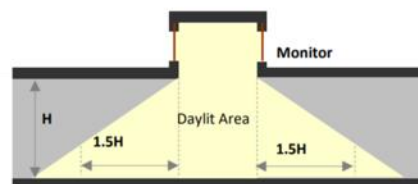
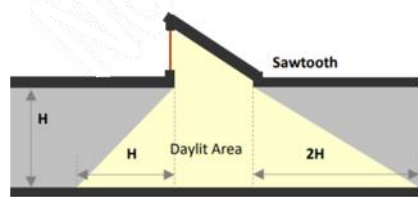
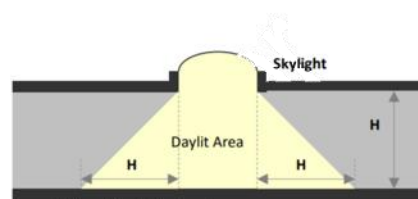
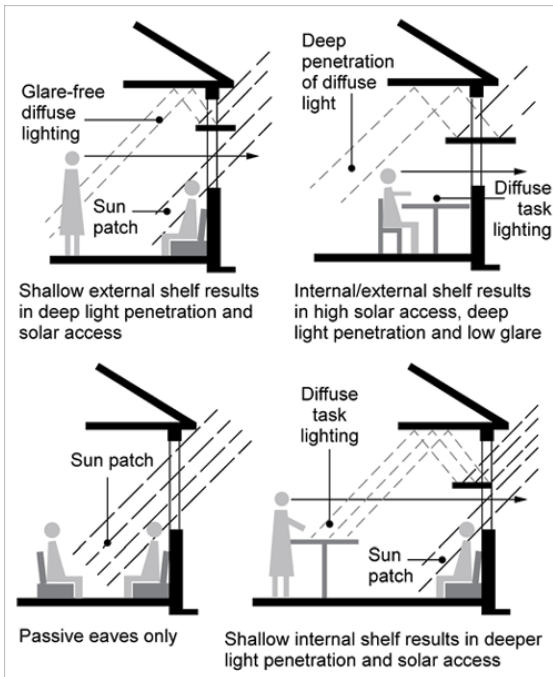
Reference: Koenisberger, Manual of tropical Housing

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CLIMATE ORIENTED ARCHITECTURE



WINDOW/ DOOR POSITIONS FOR GOOD LIGHTING



Reference: Koenisberger, Manual of tropical Housing

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CLIMATE ORIENTED ARCHITECTURE

ROOF TYPES FOR DIFFERENT CLIMATIC CONDITIONS

Roofs for Warm Humid Climates

Sloped roofs with wide overhanging eaves are ideal to facilitate rapid rainwater run-off and to protect and shade outer walls and openings. Horizontal valley and internal gutters should be avoided, as these accumulate dirt and water.

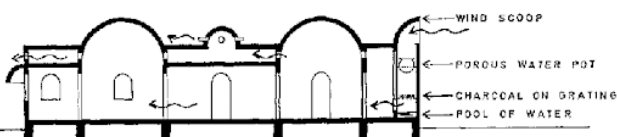


Roofs for Hot Dry Climates

As rainwater run-off is no major requirement, flat roofs are most common, providing space for outdoor activities and sleeping. Vaults and dome shaped roofs are also common, providing good thermal comfort.



HOT-DRY CLIMATE



Roofs for Composite climates

Flat roofs with good drainage are common in composite and upland climates with warm dry seasons, which permit activities and sleeping on roofs.



Roofs for cold climates

Deep pitched roofs to drain the snow.



Reference: Koenisberger, Manual of tropical Housing

G.K., ARCHITECTURE & DESIGN

TIMELINE OF MODERN ART STYLES AND MOVEMENTS



Impressionism(1860's)

With a focus on life and movement, the Impressionism movement was influenced by French art. It used realistic colors and lighting to depict life.



Art nouveau(1890's)

In time, people moved away from the popularity of Impressionism. The Art Nouveau period focused on natural decoration, such as paintings of flowers, which has survived today.



Expressionism(1884)

Expressionism began in Dresden, and it quickly spread through Germany and Europe. It focused on freedom to create on a level, often depicting primitive imagery. The roots of Expressionism can be traced to Vincent van Gogh, Edvard Munch, and James Ensor.



Cubism(1900)

Along with a handful of other artists, Picasso helped bring in the Cubism movement. It was an early abstract art movement, and while it took several years to catch on, the work today is considered priceless.

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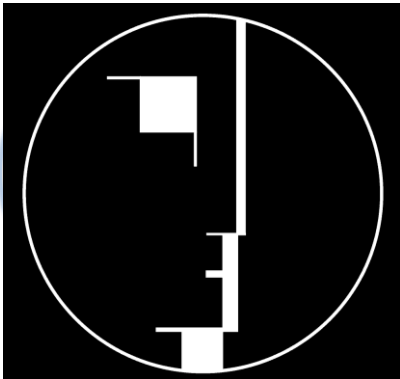
Futurism(1910)

Futurism developed in Italy with a focus on advanced technology. Painters in Milan wanted to do away with outdated types of living and celebrate the modern world.



Constructivism(1915)

Constructivism was an artistic and architectural philosophy that originated in Russia beginning in 1915 by Vladimir Tatlin and Alexander Rodchenko. Abstract and austere, constructivist art aimed to reflect modern industrial society and urban space.



Bauhaus(1919)

The school of art and design founded in Germany by Walter Gropius in 1919, and The faculty brought together artists, architects, and designers, and developed an experimental pedagogy that focused on materials and functions rather than traditional art school methodologies.

Pop Art

The pop art movement emerged in the 1950s, composed of British and American artists who draw inspiration from 'popular' imagery and products from popular and commercial culture, as opposed to 'elitist' fine art.



Surrealism(1938)

Those artists who followed Freud's theories developed a type of art that dealt in the subconscious. Surrealism was an expression of the secret chambers of the mind, and it remained popular into the 1960's.

